# VALUATION AND VALUE RELEVANCE OF THE FIRM-LEVEL, AND GEOGRAPHIC AND BUSINESS SEGMENT-LEVEL ACCOUNTING INFORMATION

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# ABSTRACT

In this study I empirically examine the valuation and value relevance characteristics of specific consolidated and segment-disaggregated corporate financial information.

On the consolidated level, I investigate the relationships (in terms of value relevance and pricing) between the UK firms' equity market values and the firm-level contemporaneous equity book values, earnings and dividends. The objective here is to identify and explore factors and contexts that impact on the value relevance and pricing of consolidated financial statement information reported by UK publicly traded firms over the period from 1987 to 2002.

On the segmental level, the study capitalises on the insights gained from the consolidated level findings and investigates (i) whether financial information, on specific geographic and line-of-business segments' operations of a cross-section of UK multi-segment firms, is associated with the equity market value of the entire firm (i.e., value relevant); (ii) whether such operations are being differentially priced (by the stock market) into the equity market value of the firm; and (iii) how the factors/contexts affecting value relevance and pricing of the firm-level accounting fundamentals impact on the value relevance and pricing of the segment-level results. Additionally, this study provides further empirical evidence on the adequacy of the UK segment reporting accounting standard SSAP 25, and the quality of segment disclosures in the UK.

The employed valuation model represents a fusion of valuation frameworks developed in earlier studies [e.g., Edwards and Bell (1961), Peasnell (1981, 1982), Ohlson (1989, 1995), Rees (1997), Garrod and Rees (1998), Wysocki (1998)]. On the consolidated-level, the model expresses the size-deflated equity market value of the firm as a linear function of size-deflated equity book value, earnings for ordinary, dividends for ordinary shareholders and additional control/dummy variables. In the segment-level analysis, the earnings variable is further disaggregated into its segment-level elements.

With regard to the firm-level analysis, the study uncovers a range of contexts and factors that affect the value relevance and pricing of specific accounting value drivers. Among these are: the sign of reported earnings and book values; whether the

firm trades at a premium/discount to its book value; the economic periods; the dividend status of the firm; diversification profile of the firm; and the industrial affiliation of the firm. In addition, the firm-level analysis indicates that the industrially diversified firms have lower valuation than the focused firms, while the geographically diversified firms have higher valuation than the domestic firms.

The segment-level accounting data is found to communicate value relevant information, which is often incremental to the consolidated-level data. In particular, segment disclosures have incremental information content in situations where on the consolidated level the firm reports losses (which are not priced), while on the disaggregated level profits are reported for some of the disclosed segments. Nevertheless, geographic segment reports are, on average, relatively more informative (value relevant) than the business segment reports. This, perhaps, reflects the relatively lower precision, implied in SSAP 25, with which firms are allowed to identify, group and report the line-of-business operations.

It is also found that neither value relevance nor relative pricing of different segments remains constant throughout the sample period. For example, during the early economic periods (pre-1994 or pre-1996) segmental profits reported from the America segment had the highest capitalisation, while in the period from 1994 to 1997 the UK segment was associated with the highest relative contribution to firm value. In the most recent economic period (1998-2002) none of the foreign segments are value-relevant.
There is considerable variation of the value relevance of segmental earnings among business segments operating in different industries. Segments operating in the Hi-Tech and knowledge-intensive sectors (e.g., IT, Telecommunication services, etc.), and services sectors have the highest pricing and relevance to the value of the firm. In contrast, the 'traditional' sector segments, such as Agriculture, Mining, Basic Industries and Utilities, are associated with the lowest relative contribution to the equity market value of the firm.

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# CHAPTER 1

# INTRODUCTION

## 1.1. PURPOSE OF THE STUDY

The growing importance of financial markets in recent decades has led to a continuous increase in the demand by the investment community for more comprehensive and timely financial information to be reported by companies. In response to these needs, accounting regulators have amended existing and/or produced new financial reporting standards which invariably require companies to disclose more comprehensive and detailed corporate information in their financial statements. One such development in the UK has been the adoption of the SSAP 25 standard, in June 1990, where companies are required to disclose specific financial information about their geographic or business segments, subject to materiality thresholds (10% rule) in respect of the identification of reportable segments. This standard reflects the increasingly global-orientation and multi-industry versatility of UK listed companies and recognises the need for informative segment-level financial information to be disclosed to the general investment public in assessing the future of the company.

It is recognised in both the academic and professional literature that the disclosure of segment-disaggregated information is (or should be) of some value or relevance to investors. As is mentioned in SSAP 25, the reporting of segment disaggregated information should be more beneficial to the consumers of this information to the extent that firm's operations in particular segments are associated with different expected risk, return and growth characteristics[1]. According to Herrmann and Thomas (2000), financial analysts worldwide consistently identify segment information as vital to their

[1] A narrow definition of 'consumers of information' is implied here: principal parties, investors, – e.g., market analysts and informed investors – who actively contribute to the formation of the market value of the firm's equity.

work. In a survey of sell-side analysts, Brown (1997) finds that segment reporting is ranked as one of the three most useful corporate financial data items along with the statement of income and the statement of cash flows. The extant literature, reviewed in Chapter 2, identifies and tests conditions under which reporting disaggregated data would be more informative in terms of its usefulness for:

(i) the assessment of the firm's expected future performance, or

(ii) the valuation of the equity market value of the firm.

The current research builds, in part, on this literature, though the focus is different. The fact that multi-segment firms are required to report segmental data enables an investigation into the value association of specific disclosed segments. I investigate whether the operations of a cross-section of UK multi-segment firms, reported from specific geographic or industrial segments are perceived by investors to have differential relative contributions to (and associations with) the equity market value of the entire firm. Stated differently, the research questions are: whether consistent valuation patterns (e.g., differences) can be identified for segments that have specific geographic or line-of-business profiles, and what contextual factors impact upon the identified differentials. This should not be confused with the firm's performance on the segmental level per se. This is an empirical investigation of the market's assessment of the average (cross-sectional) value contributions associated with distinct geographic locations or business lines of a generic UK multi-segment firm. Among the questions that this study seeks to answer is, for example, whether investors value operations reported by UK firms from the 'America' geographic region higher/lower, on average, than those from the 'Continental Europe' region, and what context-specific factors affect the observed valuation differential.

In addition to the segment-related analyses and results, this study also provides further empirical evidence in relation to a number of broader issues, including: the value relevance of financial statement information in the UK settings over the period from 1987 to 2002; the adequacy of the segment reporting accounting standard SSAP 25; and the quality of segment disclosures in the UK.

The empirical findings might contribute to our knowledge and understanding of the complex relationships existing between the market's perception of equity value and the specific accounting fundamentals. In addition to the contribution to the academic literature, the findings of this study may also be of interest to corporate and regulatory policy makers such as accounting standards setting bodies, investors and corporate finance directors, who remain largely responsible for decisions regarding the content and detail of segment disclosures.

The following methodological considerations underpin the empirical analysis of the study. By considering the multi-segment firm as being the sum-total of its reported constituent parts (geographic or, on the other dimension, industrial segments), the value of the entire firm should then reflect values contributed by or associated with each of its specific segments. I acknowledge that the equity value of the firm might reflect more than a simple sum-total of its separate segments. In addition to the simple sum-total of values contributed by each segment individually, the entire firm value could also reflect positive/negative synergies resulting from combining different operations (segments). Although in some empirical sections I test the relative valuation of diversified vs. non-diversified firms, the direct investigation of synergies associated with geographic or industrial diversification is, however, outside the scope of this study.

The premise that the value of the multi-segment firm should reflect the sum of values contributed by the segments constituting the firm, allows the use of a rigorous accounting-based valuation model. The empirical analysis consists of a decomposition of this accounting-based valuation model to assess the relative value contributions associated with specific segments.

Empirical research into the valuation contributions associated with geographical segments is limited, and has largely been restricted to US data [e.g., Bodnar and Weintrop (1997)]. To the best of my knowledge there have only been two studies, Garrod and Rees (1998) and Bodnar *et al.* (2003), that have investigated the value association of foreign operations reported by UK multi-segment firms. Furthermore, I am unaware of any empirical work that uses UK firms to investigate the value contributions associated with specific business segments (i.e., relating to specific economic sectors or industries).

This study extends the mentioned above studies in several respects. First of all, I investigate both dimensions of the corporate segment disclosures: geographic and line-of-business. Secondly, in addition to testing the differential valuation of 'domestic' vs. 'foreign' operations, I investigate the relative pair-wise valuations across all geographic segment locations (i.e., *UK*, *Europe*, *America*, *Asia*, and *Middle East & Africa*). A similar pair-wise approach is used to assess the differential value contributions associated with segments operating in specific industries. Finally, this study uses a longer time period and a wider range of valuation-affecting contexts than has been applied in prior studies.

## 1.2 IS IT DIVERSIFICATION OR DISCLOSURE?

Although such terms as 'geographic/industrial diversification' and 'geographic/business segment-disclosure' are used in this study as synonyms, it is important to note that strictly speaking this study concerns more the segment-disclosure side of the story. On a technical level, there is an important distinction between these two terms. A firm might operate in more than one geographic area or economic sector/industry, yet choose not to report segmental information. Or, for disclosure purposes, it might report segmental data using highly firm-specific (i.e., idiosyncratic) amalgamation and classification criteria and methods. This might happen, for instance, when in the opinion of the firm's directors the disclosure of any information required by SSAP 25 would be seriously prejudicial to the interests of the reporting entity. Non-reporting is also likely when none of the segments of a diversified firm surpasses the standard's 10% materiality threshold. Furthermore, as pointed out in SSAP 25, there can be considerable heterogeneity, within the cross-section of the UK multi-segment firms, in how segments are classified, both in geographic and line-of-business terms. In other words, segmental identification and break-down for reporting purposes would not necessarily mirror the patterns of the actual operating segments, i.e. the firm's diversification characteristics. It would, therefore, be fallacious to equate segment disclosures with the actual diversification profile of the firm. Therefore, in strict terms, this study is not an investigation into the valuation properties of 'real' operational components of diversified firms. However, because the literature in the area of corporate diversification, nevertheless, relies on the segmental disclosures as the primary source of data, the suggestion that these terms are synonyms is difficult to avoid in relation to discussions of the existing empirical literature.

## 1.3 DATA AND METHODOLOGY

To investigate the differences in valuation across specific geographic or industry segment operations and estimate the valuation differentials between the diversified and domestic firms, an augmented version of the Edwards-Bell-Ohlson residual income model is employed. While the detailed derivation of the empirical estimation model is the subject of Chapter 3, it suffices to mention here that the model is designed to explain the cross-sectional variation of the scale-deflated equity market value through the scale-deflated contemporaneous earnings, book value, dividends and a set of control variables. For the segment-level analysis, the model's firm-level accounting data is then disaggregated into (or, alternatively, appended with) the segmental components. The valuation differentials associated with segments, operating in diverse geographic regions or lines-of-business, are inferred by analysing the differences between the estimated segment earnings multipliers.

The sample consists of pooled over time observations that belong to a cross-section of the UK multi-segment non-financial publicly limited companies covering the period from 1987 to 2002. This data is collected from the Extel Financial Company Analysis database.

## 1.4 HYPOTHESES AND FINDINGS

It is not the objective of this study to test hypotheses that would have been specifically formulated at the outset, based on the prior literature. The investigation here is more of a general exploratory nature, with the objective being to tap into one of the weakly researched areas of market-based accounting research, and to uncover empirical evidence on specific relationships. Some testable propositions, however, do arise in the process of analysis, leading to the subsequent formulation and testing of hypotheses.

The main findings of this study relate to (i) the firm-level valuation, and (ii) geographic and line-of-business segment valuation. With regard to the firm-level analysis, the study uncovers a range of factors and contexts that influence the value relevance and pricing of such firm-level financial statement variables, as book value, earnings and dividends. These relationships are found to be affected significantly by: the sign of reported earnings and book values; whether the firm trades at a premium/discount to its book value; the economic periods; the dividend paying status of the firm; diversification profile of the firm; industrial affiliation of the firm.

Findings on the segmental level provide an insight into how the market perceives and prices, into the equity market value of the firm, operations that the UK firms might carry out in specific geographic locations or industries. In addition, the study provides further evidence on how the international and/or industrial diversification profile of UK firms reflects upon the market's valuation of the firms. Finally, the study provides new evidence on the *de facto* quality of corporate segmental reporting and the adequacy of the requirements of the UK segment disclosure standard.

## 1.5 STRUCTURE OF THE THESIS

**Chapter 2** presents the literature review classified into four sections relevant to the study. The first section reviews segment disclosure requirements in the UK and some debate in the literature on its relevance to financial statement users. In the second section I review literature on usefulness and value relevance of line of business and geographic segment information. The third section examines previous studies on valuation of geographical and industrial diversification. Section four discusses some of the studies in the area of accounting-based valuation models.

**Chapter 3** consists of seven sections and deals with methodology used to conduct the study. Following the introduction section, the second section justifies the selection of a rigorous accounting based valuation model, which is used in the subsequent empirical analysis chapters. Section 3 presents alternative approaches to the formal derivation of the model, the underlying assumptions and further adjustments used for operationalising the theoretical model. Section 4 discusses the issues of scale and scale effects, and measures that can mitigate this problem in the context of market based accounting research in general, and in the employed test design in particular. Section 5 augments the model for the purpose of segment-level analysis. Section 6 discusses the hypothesised economic (and, where relevant, econometric) role of the intercept, additional valuation factors, and instrumental variables included in the model. Section seven concludes the chapter.

**Chapter 4** analyses empirically the properties of the empirical valuation model for the firm-level data and consists of five sections. Following the introduction section, Section 2 explains the data selection and collection procedures, defines variables, examines some primary characteristics of the entire sample, and reports and analyses the variables' descriptive statistics. Section 3 presents the results of empirical tests for alternatively partitioned samples, in order to identify influential contexts that need to be controlled for during the segment-level analysis. Section 4 discusses the issue of sensitivity of the results to alternative definitions of outliers and performs additional robustness checks. Section 5 discusses major finding of the firm-level analysis in light of their implications to segment-level analysis.

**Chapter 5** consists of four sections and is devoted to the analysis of value contributions associated with operations reported from specific geographical locations. Section 2 follows the introduction section, and provides details on data collection procedure, variables description and the analysis of data descriptive statistics. Section 3 is the core of the chapter and presents the regression results and subsequent analysis of findings. In section 4 I perform additional checks for the robustness of the previous findings, by using alternative deflators, and conclude the chapter.

**Chapter 6** is methodologically and structurally similar to Chapter 5, but concentrates on the analysis of value contributions associated with specific line-of-business segments.

**Chapter 7** concludes the study, by providing the summary of results, their importance and implications, outlines the limitations of the study and directions for the future research.

# CHAPTER 2

# BACKGROUND AND LITERATURE REVIEW

## 2.1. INTRODUCTION

In this chapter I examine the literature in specific areas of such disciplines as accounting, market based accounting, and finance, that contextualise the objectives of this research and set up the background for the research questions addressed in this study.

The chapter is organised as follows. Section 2.2 outlines and discusses the segment disclosure requirements in the UK. Section 2.3 reviews three main strands of the literature in the general area of usefulness of segmental information, i.e., (i) predictive ability of segmental data, (ii) market's reaction to segment information, and (iii) differential valuation of different business and geographic segments. Section 2.4 examines some of the empirical works in the area of valuation of corporate industrial and/or geographic diversification. Section 2.5 discusses accounting-based valuation models in light of their application to this study.

## 2.2 BACKGROUND AND DISCUSSION OF SEGMENT DISCLOSURE REQUIREMENTS IN THE UK

The introduction chapter stresses that the primary issues of my research are the investigation of value contributions, as perceived by the stock market, of specific geographic and industrial segments of UK multi-segment companies, as well as the equity value implication of such corporate characteristics as industrial and/or geographic diversification. In this study, the very fact of whether the firm is diversified or not and, if so, whether it is diversified into specific geographic regions and/or lines of business, is inferred from the firm's disclosure or non-disclosures of segment-level information in its financial reports. It is, therefore, of vital importance to understand how and what segment information might be reported by UK companies. For this purpose, it is necessary to review the rules, set by the accounting standard setting bodies, which guide segment reporting in the UK. In the section that follows I present a summary of current UK segment disclosure rules, along with some literature on the quality of segment disclosure rules and segment disclosures *per se*.

In the UK the requirements to provide segmental information come from two sources: the Companies Act 1985, and a more recent segment reporting standard, the Statement of Standard Accounting Practice No. 25, adopted in June 1990.

### 2.2.1 Companies Act 1985

Until the adoption of SSAP 25, the UK segment disclosure requirements, stipulated by the Companies Act, were generally considered less onerous. According to the Companies Act, UK companies were only required to disclose turnovers by (a) Class of business and (b) Geographical market, including the destination (i.e., geographic locations where products/services were marketed) and the origin (i.e., geographic locations where products/services were produced)[2]. The Act requires that where a company has operated in classes of business or supplied markets, which, in the opinion of the directors, **differ substantially** from each other, the notes to the accounts should disclose turnover attributable to classes of business and to markets [GAAP 2004]. Only those classes of business or markets which contribute materially need be disclosed. The amounts which are not material may be included in amounts stated in respect of another class or market, or combined together and shown as 'other'.

The Act gives little guidance for determining classes of business, but suggests that the directors should have regard to the manner in which the company's activities are

[2] The requirements in the US where more extensive, with FAS 14 calling for disclosure of line of business and geographical information on sales, intra-group transfers, profits and identifiable assets (FASB, December 1976).

organised. It is suggested that this term might reasonably be regarded as equivalent to the 'principal activities' of the company which should be disclosed in the directors' report. Similarly, for markets, it states that a market means a geographical market, but it gives no further criteria for determining when markets differ substantially from each other [GAAP 2004].

The requirements of the Act are subject to the proviso that when, in the opinion of the directors, disclosure of this information would be seriously prejudicial to the interests of the company, it need not be given, but the fact that the information has not been disclosed must be stated [GAAP 2004].

### 2.2.2 Statement of Standard Accounting Practice 25 (SSAP 25)

SSAP 25 recognises the fact that segment information is becoming increasingly important as more and more companies trade globally and carry out numerous classes of business or operate in several geographical areas, with different rates of profitability, different opportunities for growth and different degrees of risk. The standard notes that it is not usually possible for the user of the financial statements of such an entity to make judgements about either the nature of the entity's different activities or their contribution to the entity's overall financial results unless the financial statements provide some segmental analysis of the information they contain. As mentioned in SSAP 25, the purpose of segmental information is to provide information to assist the users of financial statements:

(a) to appreciate more thoroughly the results and financial position of the entity by permitting a better understanding of the entity's past performance and thus a better assessment of its future prospects; and

(b) to be aware of the impact that changes in significant components of a business may have on the business as a whole.

SSAP 25 repeats the statutory disclosures of the Companies Act and then adds the requirement to disclose both profit/loss before tax and net assets by class of business and geographical market. These disclosures are required to be given by certain companies and are encouraged to be given by all other entities. It does not seek to change the requirement of the Act to report segments which differ substantially from each other, but rather seeks to provide guidance to assist the directors in determining what is 'substantially different'. It is the directors who make the decisions as to what defines a reportable segment [GAAP 2004].

Those definitions, once made, should be reviewed annually and redefined as appropriate. If a change is made to the definitions of the segments or to the accounting policies that are adopted for reporting segment information, the nature, reason for and effect of the change should be disclosed. Comparatives should be restated in accordance with the newly defined segments [SSAP 25].

SSAP 25 is meant to ensure that the segmental information reported by an entity is disclosed on a consistent basis, year by year. The fundamental objective of this standard is to achieve, as far as possible, consistency and comparability between years. However, the standard emphasises that caution should be exercised in comparing similar segments in different entities, because, in addition to any differences in accounting policies adopted, the basis of accounting for inter-segment sales or the treatment of common costs may not be consistent between entities.

Under SSAP 25 an operating segment is likely to be determined in substantially the same way information is reported internally and used by the enterprise's chief operating decision maker to evaluate performance and make operating decisions. This means operating segments could include components of an enterprise that sell products to others in the consolidated group (vertically integrated operations) as well as start-up operations. The measures and amounts of assets and operating results of these segments reported to the chief decision maker are likely to be those the company would be disclosing in its financial statements. The financial statements are also required to report reconciliations of segmental amounts to consolidated totals, and often include the nature/characteristics of reconciliation differences.

In identifying a reportable segment, the SSAP 25 requires that directors have regard to the overall purpose of giving segmental disclosure, which is to provide information that will allow a more thorough understanding of the results and financial position of a reporting entity and highlight the impact of changes on significant components of the business. SSAP 25 cites paragraph 55 of Schedule 4 of The Companies Act 1985, where it is stated that it is for the directors to determine whether the company has carried on business of two or more classes or has supplied markets that differ substantially from each other. Similarly, where, in the opinion of the directors, the classes of business or the markets do not differ substantially from each other they may be treated as one.

Because SSAP 25 emphasises a management approach in reporting segments, its primary benefits to financial statement users are (as noted in GAAP 2004) expected to include:

(a) the ability to see an enterprise through management's eyes, thereby making it easier for the user to predict management actions or reactions that can have a significant effect on the enterprise's prospects for future cash flows; and

(b) reporting that is more consistent with discussions about the enterprise's components elsewhere in the annual report and in company press releases.

*Classes of business* or *geographical segments* should be identified if they are significant to the entity as a whole. A segment is normally considered significant if it accounts for 10 per cent or more of the total turnover, results or net assets [SSAP25].

In SSAP 25 a **class of business** is defined as being a distinguishable component of an entity that provides a separate product or service or a separate group of related products or services and accounts for 10 per cent or more of the total turnover, results or net assets. The determination of classes of business depends on the judgement of the directors and there is no single set of characteristics that can be universally applied to differentiate classes of business, but the following factors should be taken into account:

(a) The nature of the product or services;

(b) The nature of the production process;

(c) The markets in which the products or services are sold;

(d) The distribution channels for the products;

(e) The manner in which the entity's activities are organised; and

(f) Any separate legislative framework relating to part of the business.

A **geographical segment** is defined by SSAP 25 as a geographic area comprising an individual country or a group of countries in which an entity operates, or to which it supplies products or services. A geographical analysis should help the user to assess the extent to which an entity's operations are subject to such factors as:

(a) Expansionist or restrictive economic climates;

(b) Stable of unstable political regimes;

(c) Exchange control regulations;

(d) Exchange rate fluctuations.

Where an entity has carried on business in two or more different business classes or geographical areas the SSAP 25 requires the following disclosures for each segment:

(a) Turnover by location of operations;

(b) Results, before accounting for taxation, minority interests and extraordinary items, normally by location of operations; and

(c) Net Assets by location of operations.

SSAP 25 provides some further guidance on segmental **results**. As interest is normally a result of the company's financial policy rather than individual segments' policy, it is usually excluded from the segments' results as it would lead to a meaningless allocation between segments. Where interest income or expense is central to the business, interest should normally be included in arriving at the segment result. A problem arises where costs are incurred which are common to more than one segment. The SSAP gives some guidance on this and suggests that entities may apportion common costs to segments in a way that the directors deem appropriate, as long as the apportionment would not be misleading. Any common costs not apportioned should be deducted from the total of the segment result.

Regarding segmental **Net Assets**, SSAP 25 notes that in most cases the net assets of each reportable segment will be the non-interest bearing operating assets less the non-interest bearing operating liabilities. Interest bearing assets and liabilities will only be included if the segmental results include interest because the entity's business is to earn and incur interest. Where assets or liabilities do not relate exclusively to one segment (i.e., common assets), they should be allocated to segments on a reasonable basis. The total of any assets or liabilities not allocated to segments should be shown as an item reconciling the segment net assets to the total balance sheet net assets.

In general, the importance of segment-level information is well recognised not only in the UK, but across the international investment community. In the United States the American Institute of Certified Public Accountants, the Financial Accounting Standards Board (FASB), financial analysts and investors have all stressed the important role which segment reports have in the financial reporting arena. For example, the Association for Investment Management and Research (AIMR) concluded in its paper (AIMR 1993, pp. 59-60) that industry-level segment reports are "vital, essential, fundamental, indispensable and integral to the investment analysis process...

Different segments will generate dissimilar streams of cash flows to which are attached disparate risks and which bring about unique values. Thus, without disaggregation, there is no sensible way to predict the overall amounts, timing, or risks of a complete enterprise's future cash flows. There is little dispute over the analytic usefulness of disaggregated financial data."

In response to calls from the investment community for more desaggregated information, standard setters and regulators worldwide have made considerable efforts to expand segment disclosure requirements (e.g., Statement of Standard Accounting Practice 25 in the UK; SFAS No. 131 in the US; and International Accounting Standard No.14R).

One of the main rationales for a segment disclosure standard is to provide investors with improved predictive ability regarding corporate prospects. SSAP 25 provides a wide range of factors which may be taken into account when determining reportable segments. However, the list is so diverse that various approaches might be consistent with this standard, allowing companies to define segments in the way they find suitable. Therefore, the level and the mode of aggregation of transactions reported in corporate financial statements and, connected with this, the quality of disclosures is a central debate in financial accounting (both in the UK and abroad).

There is a large body of US and UK literature on quality of segment disclosures. In the UK, some studies address the issue of quality of segment disclosures [Emmanuel and Garrod (1999, 2002)] and, in particular, changes in disclosure quality associated with the adoption of new segment disclosure standards [Emmanuel *et al.*, (1999)].

Emmanuel *et al.*, (1999) address the issue of the initial impact of SSAP 25 on segment disclosure, the ways in which managers have interpreted the standard and its materiality guideline, and whether these have changed as company directors have become more familiar with the disclosure requirements. Their findings suggest that although the introduction of the standard has increased the volume of disclosure, notably net asset data, the growing familiarity with the standard led to a subsequent decline in the detail of disclosure[3], particularly the number of reported geographic segment operations. They also find that, contrary to the intention of the standard, the rule is used to identify fewer and larger segments and, overall, the 10% rule has induced a disclosure pattern which confounds the original intention of the standard. Additionally, they analyse the issue of ambiguity associated with possible interpretations of SSAP 25 disclosure requirements. Their critique of SSAP 25 includes the following arguments: (i) directors might select one criterion – turnover, result or net asset – to identify reportable segments; (ii) the 10% rule might be applied individually on **any** of the criteria; (iii) the guidance rule might be interpreted as meaning that segments are to be individually identified if they exceed 10% of turnover, result **and** net asset. Based on a hypothetical example, Emmanuel *et al.*, (1999) also demonstrate that under these alternative interpretations, different numbers of segments will be reported. They conclude that the 10% materiality rule is flawed by not stating maximum materiality criteria for reportable segments, by failing to recognise negative assets and by failing to state whether that rule is to be applied separately or in combination.

The interpretation of segment disclosure rules by firms' managers is believed to be influenced by their perceptions of advantages/disadvantages associated with the provision of segmental information. Some US literature, for example, suggests that because of the considerable laxity of segment disclosure requirements, firms will increase disclosure when the valuation benefits from disclosure exceed the cost of disclosure [Verrechia (1983), Dye (1986), Healy and Palepu (1993), Hayes and Lundholm (1996)]. That is, managers of firms with 'good news' about the value of the entire firm will disclose the additional information, thereby receiving a valuation greater

[3] This conforms with findings from an earlier study by Emmanuel and Garrod (1992) which suggested that companies were particularly sensitive to providing return information for small segments, as this might provide return information on single investment projects.

than the current non-disclosure price. On the other hand, Choi and Levich (1991) infer that US firms believe that disclosure of geographic operations results in a competitive disadvantage by providing privileged information to competitors. Therefore, to minimise US multinationals' competitive disadvantage, management might report ambiguous measures, which can be done easily considering the discretion allowed management in complying with disclosure requirements. The authors conclude that market participants may find geographic disclosures of limited value because the disclosing firm is attempting to provide limited information to its competitors.

A counterargument to the competitive disadvantage hypothesis is that management wants to disclose useful information to market participants to reflect the profitability, growth, and risk associated with each significant geographic component of cash flow [Lev (1988)]. Management may be motivated to reduce excess price variability. The author suggests that one means of accomplishing this goal is to reduce information asymmetry by disclosing useful geographic disaggregation. To the extent that management desires to provide useful information to the market, market participants may perceive geographic segment disclosures as providing useful information.

The above review of the segment reporting standards and some of the literature on disclosure requirements exposes the problematic character of segment information and the controversy regarding its adequacy to the intended objectives of disclosure standards. The implications of SSAP 25 for the segment-level empirical results of my study are discussed in relevant sections of Chapters 5 and 6.

## 2.3 LITERATURE ON USEFULNESS OF LINE OF BUSINESS AND GEOGRAPHIC SEGMENT REPORTING

In the previous section I reviewed the past and present segment disclosure requirements in the UK and briefly touched on some of the literature concerned with the effectiveness of the segment disclosure standards and disclosure quality. This was necessary for a better understanding of the nature and attributes of segmental information which constitutes an input for the subsequent empirical analyses of this study.

In the current section, I review and analyse the literature which focuses on the valuation-related aspects of the segment-level information and, therefore, constitutes the theoretical and methodological background for this study. Depending on the research objectives, these studies could be categorised into three strands of research[4]:

*1. Predictive ability of segmental data.*

This strand of research investigates:

- whether geographic or line of business data disclosed by companies contains additional information that can be used to improve forecasts (of earnings or the firm's market value) that outperform forecasts based on past consolidated data only; and
- whether segment disclosures help improve the accuracy of forecasts made by financial analysts.

*2. Market's reaction to segment information.*

This strand of research investigates:

[4] It shall be noted that the boundaries between these categories might not always be distinct.

- whether the stock market reacts to segment disclosures and contemporaneously discounts this information into the share price;
- whether the equity returns react to segment disclosures;
- whether the segment disclosures affect the market's perception of the equity's risk.

*3. Differential valuation of segments.*

This strand of research investigates:

- whether segmental disclosures might provide evidence of differential valuation of operations from specific geographic locations or lines of business.

In the following sections I will review the literature related to each of these categories.

**2.3.1 Predictive ability of segmental data**

The research on the usefulness of segment data to the predictive ability of decision makers is the most extensive and includes numerous studies. Overall, earlier research finds that forecasts using segment information are more accurate than forecasts using only aggregated information [e.g., Barnea and Lakonishok (1980)]. Studies by Kinney (1971), Collins (1976), and Silhan (1982) using model based research methods show that disclosure accompanies improved earnings predictions. Market-based research by Kochanek (1974), Collins (1975), and Foster (1975) find evidence of an association between segment disclosure and improved accuracy of earnings estimates, as well as a positive predictive relationship between release of segment data and market returns. The results presented by Kochanek support the position that external financial reports, which contain segmental data, do provide a useful source of information to investors appraising the investment potential of a diversified firm. Collins (1976) also supports this conclusion in a finding that market prices do not fully reflect the non-public-segment data.

More recent research, by and large, reconfirms earlier research findings. Emmanuel and Pick (1980) investigate whether industrial segmental disclosures by 39 UK firms improve the ability to forecast corporate sales and profit. Using several alternative prediction models (that use line of business data vs. consolidated data to generate forecasts of earnings) they test the hypothesis that industrial segment sales and profit disclosure, together with industry sales projections, provide significantly more accurate estimates of future total-entity sales and earnings than do those procedures that rely totally on consolidated data. Their results strongly support the hypothesis.

Silhan (1983) conducts a similar study in the US settings and comes to similar conclusions. These findings of improved forecasts when line of business data is used has also been found by Baldwin (1984) who considers the forecasts of financial analysts. However, there is evidence that the relative superiority of line of business based forecasts depends upon the specific characteristics of the individual company, in particular the degree of diversification of the company and the correlation of the performance of specific industries with the overall economy [Garrod and Emmanuel (1987)] as well as the size of company and number of segments reported [Silhan (1984)].

Roberts (1989) examines whether the geographical segment data disclosed by some 78 UK multinationals over the period of 1981-1982 can be used to generate forecasts of earnings that outperform forecasts based upon past consolidated data. By using modifications of the random walk model and alternative methods of segment-based multiples, she finds that the segment sales and segment earnings based models generally outperform the consolidated random walk model. Roberts (1989) also finds that there is no significant additional advantage in terms of forecast accuracy in using segmental earnings vs. segmental sales data.

Investigation of geographic segment disclosure more recently have included work by several researchers. Using both random walk and growth adjusted models for a sample of 89 US multinational companies over the period from 1979 to 1985, Balakrishnan, Harris and Sen (1990) examine whether geographic segment revenues and earnings provide more accurate predictions of future consolidated revenues and earnings, respectively, than do consolidated data. To control for errors in forecasting Gross National Product (GNP) and exchange rates, the authors assume perfect foresight using the actual year-ahead changes in these economic factors. The perfect foresight assumption is then relaxed so that forecasts of these variables can be examined. The results are not conclusive. In the case of perfect foresight, the segment model outperforms the consolidated model for both revenues and earnings. However, the results using forecasts of GNP and exchange rates find no significant differences in the predictive ability of the segment and consolidated forecast models. The authors attribute the insignificant results when using forecasts of GNP and exchange rates to the lack of detailed geographic segment disclosures (i.e., insufficient disaggregation), which reduce the ability to utilise certain country-specific macroeconomic forecast variables. A caveat, they suggest, is that inaccuracy in forecasting country-specific growth and exchange rates restricts the potential usefulness of the geographic segment data. Overall, their results suggest that geographic area disclosures can enhance the information set used to predict annual income and sales. Balakrishnan *et al.*, (1990) also discuss a formal mathematical proof demonstrating theat the use of disaggregated geographical information can result in less accurate forecasts.

Herrmann (1996) examines whether geographic information disclosed at an increasingly disaggregated level (i.e., consolidated vs. continent vs. country) results in increased predictive ability of operating results. Fifty-five multinational companies were simulated by combining the annual operating results of six individual companies, one from each of six countries, in order to compare the forecasting accuracy of data disclosed at the country, continent, and consolidated level. The study finds that, consistent with the fineness theorem, the accuracy of forecasts increases as sales and gross profit are disclosed at a more disaggregated geographic level. Forecast accuracy is significantly greater at the country level in comparison to the continent level.

Hussain (1997) investigates the impact of finer segment definitions on the accuracy (errors) of UK analysts' corporate earnings forecasts, generated 22 months prior to the announcement dates. His results provide evidence of predictive gains to both line-of-business data and geographic data, although these gains appear to be concentrated within a sub-sample of firms for which analysts appear to have specific difficulty in forecasting earnings, i.e., those experiencing negative changes in earnings.

In their theoretical paper Herrmann and Thomas (2000) point out that the most common approach used by analysts in estimating future earnings is to disaggregate the company into individual segments and develop forecasts of the performance for each segment. The forecasts are then aggregated to form an overall forecast of company performance[5]. The authors suggest an analytical model of the usefulness of segment information in forecasting earnings. The model derives four conditions under which segment information is expected to increase earnings forecast precision. According to their analytical framework, forecast precision should increase with (1) greater differentiation across segment forecasts factors (i.e., expected segment growth, expected inflation, political risk), (2) greater disaggregation of earnings, (3) greater predictive accuracy of segment forecast factors, and (4) greater accuracy in measuring the segment

[5] Surveys of UK analysts' forecasts procedures by Arnold and Moizer (1984) also show that many use a break-down and build-up approach to forecasting earnings. They find that segmental data is used in conjunction with specialist industrial and economic forecasts, to predict future consolidated earnings.

weights. They also outline conditions when forecasts using consolidated information would outperform forecasts using segment information.

Herrmann, Inoue and Thomas (2001) question the market's efficiency with respect to accounting information, yet it is of relevance to my study, particularly with respect to possible interpretations of my empirical findings and suggestions for future research. They investigate the extent to which parent-only earnings and subsidiary earnings in the current year persist into consolidated earnings in the next year. They also examine whether the market understands these time-series behaviors of earnings components, and hypothesise that if subsidiary earnings are important in predicting next year's consolidated earnings and market participants do not fully understand this, then stock prices will lag reported subsidiary earnings.

Their sample consists of 8490 firm-year observations, drawn from Japanese listed firms, over the period 1985-1997.

Their results indicate that the Japanese stock market adjusts correctly for the persistence of parent-only earnings, but the market appears to underestimate the persistence of subsidiary earnings in current stock prices. Consequently, stock prices correct in a predictable manner in the subsequent year, resulting in a significant, positive relation between stock returns in year *t+1* and **subsidiary** earnings in year *t*. In other words, subsidiary earnings provide information beyond parent-only earnings in forecasting next period's consolidated earnings and prices do not fully reflect the persistence of incremental subsidiary earnings in the current period. The authors note that this anomaly is more likely attributable to market mispricing than failure to control for cross-sectional differences in risk.

Overall, regardless of the empirical test designs or models employed in different studies, their general findings appear to be in consensus. That is, forecasts developed by using the segment information are more accurate than those that totally rely on the firm-level aggregated data.

### 2.3.2. Market's reaction to segment information

Early research into stock market reactions to line of business information tends to suggest that the disclosure of this data, in general, conveys useful information to investors, with the average effect being a significant downward shift in their assessment of a firm's market riskiness (i.e., the company's beta) [Simonds and Collins (1978), Collins and Simonds (1979), Ajinkya (1981)].

Dhaliwal (1978) found a decrease in the cost of capital for US firms affected by the Security Exchange Commission disclosure requirement, suggesting that the market values such disclosures positively. In addition, there appears to be a higher correlation in the risk-equalised returns on portfolios of companies that did and did not voluntarily produce industrial data after industrial disclosures were made compulsory [Ajinkya (1980)].

Prodhan (1986) investigates the association between geographic segment disclosures and the time-series behaviour of equity security return systematic risk (betas) for a group of firms listed on the London Stock Exchange and affected by the UK geographic area disclosure requirements. Using an uninterrupted time series analysis, he finds an abrupt decrease in the equity security systematic risk for sample firms (i.e., the disclosure of geographic segment data results in a significant shift in these firms' betas). These results imply that geographic segment disclosures have information content to market participants in the UK.

In related work, Prodhan and Harris (1989) conducted a beta shift study after the enactment of FASB Statement No. 14 (in December 1976) using 82 US multinationals and found that disclosing geographic information for the first time decreases the systematic risk and the cost of capital to disclosing firms when compared to nondisclosing firms.

More recent papers have generally supported earlier research findings. Senteney (1991) investigates whether the onset of geographic area disclosure results in decreased systematic risk for US firms. He estimates the market model for each of 121 US multinational companies for the five-year period before and the five-year period after implementation of SFAS 14. If geographical segment disclosures are useful to investors, then such disclosures should reduce investor uncertainty and prompt an informationally induced shift in the parameters of the market model. The study finds a significant change in the market model parameters after implementation of SFAS 14. Both the intercept and slope coefficients for the market model decrease for the majority of companies. Consistent with the expectations of portfolio theory, risk appears to decrease after the *initial* disclosure of geographic segment information. However, the *overall* results do not provide *conclusive* evidence that disclosure results in a decrease in systematic risk.

Senteney and Bazaz (1992) investigates potential improvement of investor's earnings expectations and find a reduction in the unexpected security price revision for US-based multinationals to their consolidated earnings releases. Their results suggest that the SFAS 14 geographic segment disclosures result in improved expectations regarding consolidated earnings releases and provide investors with important information. Among the more recent studies is the one by Conover and Wallace (1995). They empirically explore the equity market effects of releasing geographic segment information by US firms and show that as firms disclose more geographic segment information, their equity market returns increase.

Doupnik and Robert (1990) conduct a field experiment to investigate the relevance of data on less aggregated geographic areas. Chartered Financial Analysts, assigned to six different treatment groups, were presented with financial statement data, including geographic area disclosures, and asked to assess the riskiness of investing in the hypothetical multinational corporation depicted. The cases varied only by the level of geographic segment disaggregation by the multinational company. Relevance was measured as the difference in risk assessment between groups receiving different levels of aggregated geographic area data. The results indicated that the level of aggregation significantly affects financial statement users' assessments of the risk of investing in a company with foreign operations. Consistent with the expectations of signalling theory, the study finds that individuals' assessments of risk generally decline as the level of disaggregation increase. Another finding of this study, which is of direct relevance to my research, is that disaggregation by itself does not automatically provide useful information. Thus, decomposing a hemispheral level of aggregation into two components can significantly affect risk assessment. The disaggregation of the Eastern hemisphere category into 'Europe/Middle East/Africa' and 'Far East/Pacific' did not significantly affect the subjects' perception of risk[6], while disaggregation of 'Europe/Middle East/Africa' into two components can significantly affect risk assessments. With regards to information content of disaggregation, they conclude that disaggregation by itself does not automatically provide useful information unless geographic areas are disaggregated into groups that better reflect differences in investment risk.

Conover, Conover and Karafiath (1994) observe the equity market performance of US multinationals surrounding the closure of the Mexican peso foreign exchange market on August 12, 1982. The closure caused the risk of Mexican operations to greatly increase and should therefore have caused a reduction in security prices for companies with operations in Mexico. The authors find that companies disclosing a

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[6] They suggest that this might be due to the amount of variability that exists in each of the categories.

specific ‘Mexico’ geographical segment experienced a significant drop in share prices following the crisis. Companies consolidating Mexican affiliates’ results with other geographical regions, companies using the equity method of accounting for Mexico affiliates, and companies with export sales to Mexico also experienced a decline in share prices. The authors conclude that investors used geographic segment information to determine risk characteristics and revalued shares accordingly.

Herrmann and Thomas (1997) present two theoretical frameworks that establish a link between disaggregation and the risk assessment. First, in the spirit of signalling theory, they argue that by disaggregating geographical operations into specific segments, the company can change (reduce) its overall perceived risk. Greater disaggregation of geographic segments should decrease investor uncertainty and should, in most cases, decrease investors’ overall assessment of risk. An exception is a situation in which finer disaggregation results in the disclosure of an especially high-risk segment, increasing investors’ overall risk assessment.

The second framework relates to portfolio theory. According to the portfolio theory, the benefits of portfolio diversification increase as the correlation among the assets’ returns decline. Herrman and Thomas (1997) suggest that a single company may be thought of as a portfolio of assets with its geographic segments representing the different assets. As such, the expected return of the company (i.e., the portfolio) is simply the weighted average expected return of each segment where the weights are the proportions of returns generated from each geographic area. If the returns of each segment are less than perfectly positively correlated, then the overall risk level of the company is reduced through diversification. In the absence of sufficiently fine levels of disaggregation, investors may be unable to determine the extent to which the returns of the individual geographic segments correlate. If only consolidated data are disclosed, then it will be difficult for investors to determine the extent to which the company’s diversification into different geographic areas results in portfolio diversification benefits. As the level of disaggregation increases, the diversification benefit becomes more apparent to investors and should, in general, decrease the overall perceived risk of the company.

Piotroski (1999) investigates whether a discretionary increase in the number of segments reported communicates value-relevant information to investors and, given the decision to improve disclosure, yields positive valuation revisions. He employs the return-based analysis as a main test design and further complements it with price-earnings regressions. The sample includes 423 U.S. firms that choose to increase the number of reported segments between 1989 and 1995. His findings show that firms who choose to expand their segment reporting practices experience positive earnings forecast revisions and market-adjusted stock returns in the period surrounding the reported change. These revisions and returns are positively related to the new segments' information, yet do not coincide with an improvement in actual short-term consolidated operating performance. Piotroski's analysis also suggests that the reporting changes were opportunistically motivated, that is, managers choose to report a new segment to disseminate good news about the preponderance of firm operations.

Of particular relevance to my study is his finding of a long-term shift in the association between equity prices and expected earnings. This shift is reflected by larger cross-section earnings multiples after the reporting change, highlighting the fact that not only did expectations about future earnings improve, but a dollar of expected earnings after reporting the change is being capitalised at a higher valuation multiple. This increase is consistent with a lower average cost of capital and greater expected persistence of future earnings.

Basu, Douthett and Lim (2000) investigate what segment characteristics help make industry segment reporting *more* useful in equity valuation. They identify three factors that influence the usefulness of segment earnings: growth potential (or persistence), the relative size of segments, and the correlation in segments' earnings. They measure the valuation usefulness by comparing the explanatory power of disaggregate segment earnings to aggregate company earnings in a regression of cumulative abnormal return (over 12 month period) on earnings changes.

Their empirical tests are designed under a two industrial segments structure, that is, primary segment (the one with higher sales growth rate) and secondary segment (the one with lower sales growth rate). Their data sample of 7653 U.S. companies covers the period of 1987-1993 and comprises 42780 firm-year observations.

They found that $R^2$ increases (due to segment reports) when: (i) the degree of differential growth rates in segments' sales is high, (ii) the segment size is equivalent or comparable between the two segments and, (iii) the two segments' earnings have higher absolute correlation.

Bens and Monahan (2002) examine the valuation implications of differences in firm's disclosure practices for a set of firms that are diversified by line of business. In particular, they investigate if there is a positive association between the excess value attributable to diversification and the quality of firm's voluntary disclosures. They estimate pooled time-series and Fama-MacBeth regressions, where AIMR industry-adjusted disclosure ratings serve as a disclosure quality proxy, and Berger and Ofek's measure of excess value serves as a proxy for the valuation effect attributable to diversification. They use multivariate regression, where they regress the excess value proxy on the disclosure quality proxy and other potentially influential factors, for a sample of about 1200 firm-years, drawn from U.S. multi-segment firms over the period of 1980-1996. Their results reveal positive association between excess values and disclosure quality in multi-segment firms. They, in part, attribute their results to the *monitoring effect* of disclosure – a situation where commitments to higher disclosures potentially reduce management's proclivity for investing in assets that destroy value.

Overall, despite some variance of findings in different studies, the general conclusion from this literature is that the disclosure of segmental data conveys useful information to the market, in that it impacts upon the market's valuation of equities and investors' perception of risks associated with segment-disclosing firms.

### 2.3.3. Differential valuation of industrial and geographic segments

The area of research into the valuation of diversification into specific geographical locations or lines of business has been substantially less extensively addressed than the issues of: (i) the valuation of international and/or industrial diversification, and (ii) the predictive quality of (or market's reaction to) industrial and geographic segmental information. It is the issue of differential valuation of industrial and geographic segments which is the primary focus of my current research.

Among the studies that directly link to my research are those by Boatsman *et al.*, (1993), Prather-Stewart (1995), Thomas (1996, 2000), Bodnar and Weintrop (1997), and Wysocki (1998) who focussed on US multisegment firms, and Garrod and Rees (1998) who conduct their study in the UK settings. Of these studies, Garrod and Rees's (1998) paper has, perhaps, the closest relation to my research both methodologically and data-wise. Below I review these studies in greater detail.

Among the earliest studies to investigate the market's valuation of geographic segment earnings is Boatsman, Behn, and Patz (1993). They examine the relationship between unexpected security returns and unexpected geographic segment earnings, where unexpected security returns are regressed on unexpected geographic segment earnings for the period 1985-1989. Unexpected returns are measured over a 16-day period surrounding the release of the annual report for a sample of 970 firm-year observations using data from SFAS No. 14. Unexpected geographic segment earnings are measured as the annual change in earnings for that geographic segment, adjusted for exchange rate movements for the year unless it is not possible to identify the specific source of geographic segment earnings. They find that the use of geographic segment earnings by market participants is highly contextual and that, in general, the market does not appear to value geographic segment earnings differently. Evidence that geographic segment earnings are used to price securities is found if the market reaction to unexpected geographic segment earnings varies across geographic segments. Specifically, they find that geographic segment earnings are used to value securities only when there is an unusually large change in the geographic segment's earnings. When outlying observations are eliminated, there is no evidence of differential valuation of geographic segment earnings. This evidence might suggest that the market does not value geographic segment earnings differently because risk and growth characteristics do not vary across geographical areas. Alternatively, the finding might suggest that firms do net disclose geographic segment earnings in such way that would provide value-relevant information to the market.

In his study Thomas (2000) notes several methodological issues which may have caused the lack of significant results in Boatsman *et al.,* (1993). Firstly, Thomas (2000) argue against their use of a 16-day return window surrounding the filing of the Form 10-K to measure the association between unexpected returns and unexpected geographic segment earnings. The assumption is that this is the first time the information is made available to the market and could therefore be incorporated into security prices. However, some firms may have voluntarily released this information in quarterly reports or press releases so that the change in annual geographic earnings is largely known before the Form 10-K is filed. Secondly, consolidated earnings have already been released before the 16-day window and the market may be able to reasonably infer the changes in current geographic segment earnings based on the change in total current earnings. In this case, geographic information may be impounded well before the filing of the Form 10-K.

Prather-Stewart (1995) tests the impact of geographic segment disclosures on cumulative abnormal returns (CAR), as a measure of market reaction, around the date of release of the 1984 and 1985 financial reports. She is primarily interested in the usefulness (information content) of the accounting disclosures to the stock market by looking at segment sales rather than profits, and incorporates a country risk adjustment to the sales figures. Prather-Stewart (1995) tests the relationship between the CAR and (1) the number of foreign geographic segments disclosed, (2) unexpected risk-adjusted foreign segment sales, and (3) unexpected risk-adjusted US segment sales. The two measures of geographic segment disclosures, used in her study, are risk-adjusted geographic sales and the number of foreign geographic segments disclosed. She concludes that geographic segment information is reflected in equity market returns and that unexpected sales from different geographic regions are valued at different rates. Overall, her study suggests that foreign operations are valued less highly than domestic ones.

Thomas (1996) investigates the association between security returns and geographic segment earnings over long return intervals varying from one to five years. When returns and geographic segment earnings are measured over long windows (at least a three-year period), the market differentially values geographic segment earnings consistent with the segment's risk and growth characteristics, and the predictions of the earnings capitalisation model. However, when returns and geographic segment earnings are measured over one or two-year intervals, no evidence is found that the market valued geographic segment earnings differently. That is, geographic segment disclosures do not appear to be a timely source of information in the securities markets, because there is little or no association between current returns and current geographic segment earnings [Boatsman *et al.*, (1993), Thomas (1996)].

Bodnar and Weintrop (1997) investigate the valuation of foreign and domestic income for US based multinationals. Using 2570 US firm-year observations between 1985 and 1993 they utilise the segmental data on the breakdown of earnings into domestic and foreign components and consider two questions: (1) are changes in the domestic and foreign components of earnings significantly associated with changes in the market value of the firm?, and (2) are the domestic and foreign components of earnings capitalised by the market at a similar rate? Their results show that both foreign and domestic earnings changes have significant positive associations with annual excess return measures. However, the association coefficient on foreign income is significantly larger than the association coefficient on domestic income, suggesting that the market views foreign and domestic income changes differently for the purposes of firm valuation. They interpret this as an indication that changes of foreign earnings are more persistent than those for domestic earnings, possibly due to the unpredictable impact of exchange rate change. They also demonstrate that a larger association coefficient for foreign income is consistent with differences in growth opportunities between domestic and foreign operations. For those firms where domestic sales growth is higher than foreign sales growth, the earnings response coefficient is greater for domestic earnings. Their analysis also suggest that the results are not driven by exchange rate effects, decisions concerning the length of the event window, negative earnings, nor special charges to earnings. Unlike event studies that examine short windows around earnings announcements (or other events), their study is interested in the relation between earnings changes and price changes **over the reporting periods**. This approach is commonly referred to as an association study.

Garrod and Rees (1998) investigate two value-related issues associated with corporate international diversification of UK firms, over the period of 1991-1996.

Firstly, they address the valuation association of international operations of UK multisegment firms and estimate whether or not foreign earnings and net assets are more highly valued by investors than their domestic equivalents. By using segment disclosure of profits and net assets, which has been required of UK companies since the enactment of SSAP 25, they examine the relative value of specific foreign operations, according to broad geographical classifications: UK, Europe, America, and the rest of the world. They find that for multinational firms, there is no clear difference between the valuation of domestic and foreign earnings and net assets. However, the US appears to be an anomaly and is more highly valued than other areas of operations. They explain this finding with the fact that during that period (1991-1996) the American economy was going through a golden period.

Secondly, they contrast multinational and domestic UK firms to identify relative valuation of these two groups of firms. They find that earnings and net assets are more highly valued (capitalised) for multinational firms than for domestic firms, even though UK GAAP should have been applied to the computation of the accounting numbers across both sets of firms. Their results also indicate that the valuation differences between multinationals and domestic firms applies equally to all the operations of the multinationals. That is, UK based operations themselves are more highly valued for multinationals than for their domestic counterparts.

Methodologically, Garrod and Rees (1998) operationalise their empirical analysis by using a modified version of the Edward-Bell-Ohlson's residual income valuation model, which explicitly models the security price and expresses it through contemporaneous equity book value and earnings. This levels model allows disaggregating firm-level earnings and book value into their geographical components and conducting the direct comparisons of the valuation of specific geographical operations. The model is applicable to both domestic and multinational firms, so that direct comparison of the valuation of these two groups of firms can be made.

Garrod and Rees (1998) argue that in comparison to return-earnings models used in similar studies, where results are sensitive to the window over which returns are cumulated, their model is theoretically valid at any point in time, assuming a timely incorporation of information into prices, and captures long run relationships whereas a returns-earnings model can only identify short run associations. Furthermore, they argue, the parameters estimated using valuation models are reasonably close to those theoretically expected, and the explanatory power of such models is much higher than in returns-earnings models.

They note that levels models are also able to illuminate long run relationships, which are hidden from models of differences. Thus, an event study can say little about the value of multinationalism for a firm if the firm's degree of diversification is stable.

Of direct relevance to my research, both in terms of research question and the methodology employed, is the work by Wysocki (1998). He examines the informativeness of segment disclosures using a real-option framework. He hypothesises that segment disclosures are useful because they contain information about managerial options to *adapt* under-performing segments and *expand* segments with investment opportunities[7]. Wysocki (1998) hypothesises and empirically validates that the existence of these real options implies: (1) that segment earnings association coefficients and the incremental explanatory power of segment earnings for stock prices are lower for loss-making segments compared to profitable segments[8]; (2) segment earnings association coefficients are higher for segments with higher relative growth

[7] Adaptation encompasses any real operating decision that changes the current use of an asset to a superior alternate use.

[8] This prediction generalises the firm-level adaptation and abandonment option results discussed in Hayn (1995).

options; and (3) the incremental explanatory power of book value of equity for stock prices is increasing in the number of loss segments. He tests these hypotheses by using a simple value association model where per share stock prices are regressed on firm-level per share book value and firm-level (or segment-level) earnings per share, for a sample of 3,150 U.S. firms (covering the period 1990-1996) that disclose two business segments.

He finds that there is association between stock prices and segment profits and that the incremental explanatory power of segment earnings is higher for profitable segments compared to loss-making segments, suggesting that investors view segment losses as transitory. Furthermore, the incremental explanatory power of book value of equity for stock prices is increasing in the number of loss-making segments, consistent with the hypothesis that book value of equity is more relevant to investors as adaptation of segments becomes more likely than their continued use.

His regression results also demonstrate that earnings association coefficients are higher for segments with higher relative growth options as measured by industry market-to-book ratios, and that earnings association coefficients are reliably lower for negative firm-level and segmental earnings. His results also suggest that investors utilise industry information in valuing segments within multi-division firms. Although Wysocki's tests are all performed for business-disaggregated segments, his hypotheses, the model and testing methods would also be directly applicable for researching the valuation of geographically disaggregated segments.

Thomas (2000) examines whether geographic segment earnings reported by US firms over the years 1984-1995 provide value-relevant information. The author estimates earnings coefficients for specific geographic locations by (i) regressing unexpected security returns on unexpected geographic segment earnings and (ii) regressing leading-period returns on current geographic segment earnings. Evidence of the value-relevance of geographic segment earnings is found if earnings coefficients differ across geographic segments, but if the coefficients do not differ, then total earnings is sufficient for examining security returns. The results of the unexpected returns/earnings model show a significant difference in the valuation of unexpected earnings across geographic segments. Specifically, the results suggest that unexpected earnings from Canada and Asia/Pacific regions are not significant, while earnings from the Domestic (i.e., U.S.) and South America/Mexico segments are generally valued less than the earnings from other areas, whereas earnings from the U.K., Europe and Other Foreign segments are generally valued more highly. For the leading-period returns model, little significant evidence is found for the market's differential valuation of geographic segment earnings coefficients for one- and two-year return intervals. When the return intervals extend to three years or more, significant evidence is found that the market values geographic segment earnings differently, which suggests that such disclosures reflect information used by market participants in setting security prices.

Chen and Zhang (2003) apply a real-option-based valuation approach to develop and test a model that addresses the incremental value relevance of segment data beyond firm-level accounting data. Their question is: given aggregate data that firms are already required to report, how is equity value related to the information conveyed *incrementally* by segment data? They note that in a multiple-segment firm, different segments generally face different investment opportunities (due to different external market conditions), and have different investment opportunities (due to different abilities to manage business). They establish that the cross-sectional variation in usefulness of segment data beyond aggregate data relates to *heterogeneity* of investment opportunities across segments, caused by divergences of *segment profitability* and *growth potential.* More generally, when a firm's segments operate in industries or markets that have different growth opportunities, equity value depend not only on the divergence of profitability, but also on the distribution of growth opportunities across segments.

Their model decomposes equity value into (1) the part explained by aggregate firm-level accounting data, and (2) an incremental component attributable to differences across segments in operating profitability and investment opportunities as conveyed by segment-level data.

They estimate their regressions of scaled market values on scaled segmental profits and other option-related parameters for a sample that includes 13463 firm-years of U.S. quoted multi-segment firms over the period 1986-1997.

Their empirical findings indicate that: (1) controlling for firm-level accounting information, divergence of segments' profitability (DOP) exhibits a significantly positive effect on equity value; (2) the incremental value effect of a given DOP varies with firm overall profitability and growth opportunity; and (3) the distribution of segment growth opportunities within a firm is important in determining the value effect of DOP. That is, the incremental value effect of DOP is positive if growth opportunities are more highly concentrated in segments that are relatively profitable, and is negative if the opposite is the case. Their results suggest that segments can be aggregated without loss of information when they have similar profitability and growth opportunities.

By and large, in this strand of literature there is little or no consensus across the findings reported in different studies. The empirical evidence on the differential pricing and value association of specific geographic or business operations, and contexts affecting the pricing and value relevance of segments, remain inconclusive. The further thorough examination of these issues constitutes the primary objective of my study.

## 2.4 LITERATURE ON VALUATION OF GEOGRAPHICAL AND INDUSTRIAL DIVERSIFICATION

In chapters 5 and 6 I provide some empirical evidence on the relative valuation of firms which are diversified geographically or industrially. To put these results into perspective they need to be related to previous findings from other studies. Most research on this subject has focused on the negative impact on firm value of diversification across different lines of business. These studies tend to conclude that, on average, industrially diversified firms are notably less valuable than combinations of comparable single industry firms. In contrast to the negative value impact of industrial diversification, the majority of the theoretical predictions and empirical studies regarding geographic diversification suggest that there is a positive value impact on the firm. Below I review some of these studies in more details.

### 2.4.1 Industrial diversification

The impact of industrial diversification on firms' value has been more thoroughly examined (both theoretically and empirically) than that of geographic diversification. Overall, studies concerned with valuation effect of product or **industrial diversification** find that related diversifiers outperform unrelated diversifiers, and that multisegment firms are valued at a discount compared to focused firms [e.g., Bettis (1981), Rumelt (1982), Palepu (1985), Lang and Stulz (1994), Berger and Ofek (1995), Comment and Jarrell (1995)].

Lang and Stulz (1994) investigate whether the market's valuation of a firm, proxied by Tobin's q, is correlated with its degree of diversification. By studying the relation between q and the degree of diversification at a point in time, they investigate the relative efficiency of diversified firms even if these firms do not change their degree of diversification. This yields important insights into the interpretation of studies of stock returns around changes in firms' degree of diversification.

By comparing the Tobin's q of diversified US firms, over the period of 1978-1990, to the Tobin's q of specialised firms, they find that through the late 1970s and the 1980s, *single-industry* firms are valued more highly by the capital markets than diversified firms.

Further, highly diversified firms (defined as those firms that report sales for five segments or more) have both a mean and a median Tobin's q below the sample average for each year in their sample.

They also check whether this relation reflects industry effects (i.e., whether diversified firms are concentrated in industries with fewer growth opportunities) yet results remain qualitatively unchanged. They also find that shareholder wealth would increase on average if diversified firms could be dismantled in such a way that each division would have the average q of specialised firms in its industry.

Berger and Ofek (1995) use segment-level data to estimate whether diversification enhances or decreases corporate value and to examine the potential sources of value gains or losses. They do so by comparing the sum of the imputed stand-alone values (using the industry multiplier approach) of the segments of diversified companies to the actual values of these companies.

In their sample of US firms (5233 multisegment firm-year observations covering the period from 1986 to 1991) they document that diversified firms have values that are 13-15% below the sum of the imputed values of their segments. They also show that loss in value is considerably less for related diversification, and the value loss increases with the number of segments.

They also examine the potential sources of these value losses. Among sources include (1) the greater propensity of multi-segment firms to overinvest, and (2) the cross-subsidisation of poorly performing segments.

Comment and Jarrell (1995) investigate valuation consequences of increases/decreases in focus of the firm. Their formal analysis correlates fiscal-year changes in focus with both same-year stock returns and prior-year returns, using a multivariate, pooled, time-series cross-sectional regression covering about two thousand exchange-listed firms per year, over the period from 1978 to 1989. They control for the size effect and find that focused firms are significantly less frequently involved in acquisitions and divestitures. Their main result was to find that during the 1978-89 period there was an increase in focus, which is consistent with shareholder wealth maximisation, implying that focus increased in part because economies of scope were negative on balance.

Sambharya (1995) examines the individual and joint effects of product and international diversification on firm performance by using multiple measures of both international and product diversification, and accounting measures of performance. He also examines the interaction between product diversification and international diversification.

The study finds that firms that were more internationally diversified according to four different measures were no more successful than less diversified ones. In large firms there exists an inverse relationship between product and international diversification, that is, multinationals in single businesses are the most diversified internationally and vice-versa. The author also finds that both international and product diversification strategies are not profitable by themselves, that is, neither type of diversification leads to better firm performance. Among the limitations of the study is that it does not use market measures of performance and it only include data from 53

U.S.-based multinationals for the year 1985, which restricts the generalisability of findings for longer time periods, and wider cross-section of firms.

Servaes (1996) focuses on the issue of whether industrial diversification leads to higher market values during the period of the conglomerate merger wave, examining whether the benefits of diversification outweigh the costs. He examines samples of U.S firms in three year intervals over the 1961-1976 period to gauge how diversification was perceived by capital markets.

He finds that diversified firms are valued at a discount compared to single segment firms in the 1960s and early 1970s, but the discount declines to a zero level in later years. These results hold after controlling for industry effects and for differences between diversified and undiversified firms in profitability, leverage and investment policy. The author concludes that what causes the diversification discount to change over time remains a puzzle.

Lins and Servaes (1999) examine the valuation effects of industrial diversification for 174 (227) German, 808 (118) Japanese and 391 (341) UK firms for years 1992 (1994) using Berger and Ofek's (1995) excess value-based approach. Their results suggest that diversification is differently reflected in the firm value across different countries. Thus for German firms, diversification does not reduce shareholder wealth, yet the Japanese and UK firms are valued at a discount of 10 and 15 percent respectively. The valuation discount of UK firms is very similar to the discount reported by Berger and Ofek (1995) for the US firms. The major factor that the authors find to be contributing to the differential valuation of industrial diversification across these countries is the cross-country differences in corporate governance.

Graham, Lemmon and Wolf (2002) provide evidence on whether the *fact* of corporate diversification destroys value, or whether the divisions that make up conglomerates would trade at a discount, even if they operated as stand-alone firms. The papers holds that the diversification discount calculation can be misleading if there are systematic differences between the divisions of conglomerates and the stand-alone firms to which they are benchmarked. By using a sample of 356 acquisitions of U.S. firms, over the period of 1980-1995, they find that the units that are combined into other firms are systematically different to stand-alone firms, and suggest that methodologies that benchmark divisions of conglomerates to stand-alone firms might overstate the magnitude of diversification discount. That is, a main point of their paper is that value measurement methodology destroys value, but not the fact of diversification. What is particularly relevant to my study is their finding that firms, which increase their reported number of segments due to pure reporting changes, do not experience a decline in excess value at the time of reporting new segments.

The three studies reviewed below have attempted to investigate valuation effects when firms are simultaneously diversified across the geographical and industrial dimension.

In their studies, Bodnar, Tang and Weintrop (1999, 2003) suggest that the failure to simultaneously consider geographic diversification as a potential source of value for corporations affects the interpretation of existing studies on the effect of industrial diversification on firm value. They examine the joint effect of geographic and industrial diversification on firm value for a sample of 31,000 firm year observations of US firms from 1984-1997. They use such measures of firm valuation as (i) excess market value of equity-to-sales ratio, (ii) asset-to-book value of asset ratio, and (iii) a technique similar to that used by Berger and Ofek (1995). Their results indicate that the value of a firm with international operations is 2.7% higher than a comparable single-activity domestic firm, while the value of a multiactivity firm is 6% lower than a comparable portfolio of single-activity domestic firms. They also find that the value of geographic diversification is increasing in the degree of diversification, but that the industrial diversification effect is not related to the number of the firm's different activities. They also show that the international diversification premium is negatively related to the value of the US dollar, but positively related to the breadth of international diversification as well as corporate characteristics consistent with growth opportunities.

Senteney and Bazaz (2002) consider geographic and business diversification simultaneously and investigate how investors perceive the impact of US based firms' diversification on the association between the firms' cumulative abnormal equity returns and annual changes in earnings. Using pooled cross-sectional annual earnings response regressions for the years 1993-1997 they find that firms with higher geographic diversification have greater association between magnitudes of annual earnings changes and equity security returns than multinationals with lower geographic segment diversification, especially when the companies have low business diversification. Furthermore, multinationals with greater industrial diversification have comparatively similar association between magnitude of annual earnings changes and equity security returns at both high and low levels of geographic segment diversification.

### 2.4.2 Geographic diversification

Studies that focus on the value implications of international/**geographic diversification** tend to find that internationally diversified firms perform better than domestic firms. For example, studies by Leftwich (1974), Buhner (1987), Grant (1987) find that multinationals are more likely to have higher profitability and profit stability. These firms also tend to have higher valuation than their domestic counterparts.

Most research in this area has been concerned with the performance of multinationals, which may be viewed as portfolios of internationally diversified assets, relative to the performance of pure domestic firms. The empirical findings, however, are both inconclusive and unable to document whether the value of the firm is enhanced by incremental value embedded in the firm's multinational dimensions. Below I outline just a few of the studies in this area in greater detail and summarise the findings for other studies in the area.

Errunza and Senbet (1981) investigate the existence of monopoly rents (excess valuation) associated with international operations of UK firms due to such factors as differential international taxation and imperfections in the product, factor and financial markets. This study involves empirical assessment of the effects of international operations in the market value-theoretic framework. Their empirical results cover the period of 1968-1977 and are based on the analysis of multipartial correlations between the regression coefficients of excess market value and measures of diversification. Their main finding is that firms' excess values are positively related to (the degree of) international involvement. They also find some evidence that this relationship is dynamic, as it was stronger during the earlier period characterised by stronger barriers to capital flows.

They note that the full value of the special opportunities that a multinational firm possesses should be reflected in the current price of its stock. Consequently, an empirical analysis based on a risk-return trade-off cannot capture these special opportunities. In other words, since the diversification services provided by multinationals are already 'priced out', attempts to verify these services through traditional performance evaluation techniques as well as through risk-return generating processes are unwarranted. They note, however, that benefits of direct foreign investment can be detected by an empirical investigation based on market valuation[9].

[9] Errunza and Senbet (1984) continue this investigation over a different time frame. By holding constant firm's capitalised equity value and using various measures of the degree of international involvement, they find a robust and positive association between firms' share value and degree of international involvement.

Among other points of relevance of their research to mine is their theoretical analysis of factors that might contribute to differential excess valuation of miltinationals. My measures of diversification are similar to those referred to by Errunza and Senbet (1981), that is, foreign operations' net earnings, net assets or sales. They use group sales as a regression deflator. They theoretically specify the conditions under which differential international taxes contribute to differential market valuation for the domestic and multinational firms.

Fatemi (1984) investigates the rates of return realised by the shareholders of the internationally diversified relative to those of domestic firms. He also provides some evidence on the effect of the *event* of corporate international diversification on shareholders' returns. His sample covered the period of 1976-1980 and included 84 multinational and 52 domestic firms. His results indicate that the rates of return on the two types of firms are identical, yet the rates on multinationals fluctuate less than those on domestic firms, suggesting that corporate diversification reduces the degree of systematic risk. Results also indicate that the relative degree of riskiness declines as the degree of international involvement increases.

Fatemi (1984) also touches on some other aspects that are of relevance to my research. Among those is his analysis that to the extent that economic activity in foreign countries is less than perfectly correlated with domestic economic activity, foreign operations should provide the stockholders of multinationals with risk-return opportunities superior to those available to the stockholders of purely domestic firms. The author suggests that if the markets are rational and efficient, any net advantage associated with corporate international diversification will be discounted and reflected in the price of the multinational's shares around the time of such diversification. This will bring the subsequent returns to the 'normal' level.

Doukas and Travlos (1988) presents evidence on the impact of the event of international diversification on the stock market values of US firms, in an attempt to provide evidence on whether direct foreign investment is a wealth-increasing corporate action. Their data cover the period of 1975 through 1983 and include 301 foreign-acquisition announcements. Their results indicate that shareholders of the firm not operating in the target firm's country experience significant positive returns at the announcement of acquisitions[10]. Shareholders of the multinational firms already operating in the target firm's country experience insignificant negative abnormal returns.

Agmon and Lessard (1977), regressing the returns of 217 US multinationals on the US stock market index and an international factor, found the coefficient of the world factor to be correlated with a sales measure of multinationals' international involvement. They suggested that the international diversification objective of the investor can be achieved by holding a portfolio of multinational stocks. Jacquillat and Solnik (1978), using a sample of forty European and twenty-three US firms, concluded that investing in multinationals is a poor substitute to international portfolio diversification. Senchack and Beedles (1980) arrived at the same conclusion. Hughes, Logue and Sweeney (1975) showed that the results obtained in all these studies are sensitive to the market index used to compute the betas. Mickhail and Shawky (1979) reported that multinationals earn excess returns. However, Brewer (1981), using a different research design, reported no difference between multinationals and pure domestic firms in terms of the security market line. Michel and Shaked (1986) found that domestic corporations have significantly superior risk-adjusted market-based performance, are significantly less capitalised, and have higher total risk as well as higher systematic risk relative to multinationals.

[10] Another finding is that shareholders of multinationals benefit the most when their firms' expansion is taking place in less developed countries, that is geographical areas that are less related and developed relative to the US economy.

Morck and Yeung (1991) examine the value impact of various measures of geographic diversification for 1644 US domestic and multinational firms for the year 1978. They show that geographic diversification is positively related to Tobin's q and that even upon controlling for other sources of intangible assets such as R&D and advertising expenditure, q is positively correlated with the number of foreign subsidiaries or countries in which the firm operates. Their results suggest that each foreign subsidiary increases q by 0.33% and that operations in an additional foreign country increases q by 0.55%.

In brief, the existing literature emphasises the risk-reduction aspects of international diversification, but it does not provide conclusive evidence regarding the effect of international corporate expansion on shareholders' wealth.

## 2.5 LITERATURE ON ACCOUNTING-BASED VALUATION MODELS

### 2.5.1 On valuation models

Conducting research within a particular area of empirical accounting requires the articulation of a research design which can 'best' operationalise the testing of relationships or phenomena in question. Empirical research into value relevance, valuation or predictive ability of accounting information must often choose between return-earnings type of models, in which returns are regressed (typically) on scaled earnings, earnings changes and other financial statement variables, and price-levels models, in which equity market values are regressed on earnings and other accounting variables.

Both price and return models begin with a standard valuation model in which price is the discounted present value of expected net cash flows or dividends. Both models also rely on the hypothesis that current earnings contain information about expected future net cash flows [Kothari and Zimmerman (1995)]. Although both types of models are similar in essence, they are often used in the literature to address somewhat different research questions. Furthermore, both model types are not free of econometric problems and the importance of the avoidance of the specific econometric problem(s) in the context of a given research question often determines the choice of model type. Below I briefly review some of these issues, as referred to in the literature.

The vast majority of market based accounting research studies tend to choose to model returns rather than value. Return-earnings models have been extensively employed by event studies investigating the information content of accounting numbers. Using short returns windows (usually several days) these studies are designed to investigate whether an earnings announcement, per se, contains information which causes investors to revise their cash flow expectations, whilst studies using returns over much longer periods address the slightly different question of whether the earnings figure, or any other accounting data, captures relevant information for the market [Collins and Kothari (1989)].

In contrast to return-earnings models, price-levels or ***valuation*** models are increasingly more often used to gauge the link (association) between the market's valuation of the firm and its accounting fundamentals. Walker (1997) points out that researchers adopting an association perspective tend to turn to valuation rather than returns models, and this change in emphasis is partially due to the Edwards-Bell-Ohlson (EBO) model. In the literature this model is often referred to as Edwards-Bell-Ohlson, residual value or residual income valuation model.

EBO provides a solid theoretical framework for a simple accounting based valuation model, which is equivalent to the traditional dividend discounting model. The EBO (or RI) makes no assumptions not already incorporated in the dividend discounting model and expresses the market value of the equity of the firm as the sum of the book value of the firm plus the present value of future residual incomes. A theoretical link between current market value of the firm and current book value and future residual incomes is established, in one way or another, by Preinreich (1936), Edwards and Bell (1961), Peasnell (1981, 1982), Ohlson (1989) and others. A recent straightforward derivation is provided by Ohlson (1995), and Feltham and Ohlson (1995). They establish how the clean surplus relation transforms the classical valuation model based on discounted future dividends into an accounting model, based on two fundamental accounting variables: book value and earnings.

Despite its appeal to the empirical accounting research literature which deals with valuation issues, this model, however, includes expectations of abnormal income. This does not make it practically more applicable than, say, the dividend or cash flow discounting models. The literature has dealt with this problem in different ways.

On an empirical level, for instance, Frankel and Lee (1998) incorporate analysts' forecasts into the model. On a theoretical level, the studies of Ohlson (1995) and Feltham and Ohlson (1995) establish how the clean surplus relation, in conjunction with linear information dynamics of abnormal accounting earnings, transforms the EBO or classical dividend discount valuation model into an accounting model. This model is based on two fundamental accounting variables: book value and earnings. In his study Rees (1997) suggests an alternative avenue for re-expressing the EBO into a simple accounting model. Here, the firm value is expressed in terms of the current book value and earnings. This is achieved by imposing a structure for expectations: expected earnings and book values are increasing functions of current earnings and book values. It shall be noted, however, that there is still little consensus regarding the appropriate specification of these models, and many of these studies have taken an *ad hoc* approach to model building. The Chapter on Methodology and Test Design provides more detailed review of how EBO is usually operationalised.

Despite the disadvantages associated with the need to deal with expectations, the use of such accounting based valuation models resolves the problems associated with the length of returns windows and the definition of unexpected earnings. The latter is not required and the valuation model is theoretically valid at any point in time as long as all publicly available accounting information is reflected in security prices [Rees (1997)]. Thus, even if prices lead earnings the information contained in accounting data will be incorporated into security prices at any point in time.

Valuation models have the additional desirable property, especially for the research questions addressed in this study, of lending themselves to explanatory variable decomposition.

In this study, a price-levels accounting valuation model is chosen as the research tool as it is more adequate for addressing the research question.

Below I present some arguments, drawn from the literature, highlighting the shortcomings of returns-models in comparison with value-based modelling.

1. A substantial number of studies in this area indicates that the forecasting focus of event studies, used since the work of Ball and Brown (1968), is misplaced and that returns relationships are only fully revealed when prices are allowed to lead earnings [Kothari (1992), Kothari and Sloan (1992), Kothari and Zimmerman (1995), Donnely and Walker (1995), Basu (1997), and Rees (1999)] [11]. Rees (1999) notes that because prices are likely to anticipate the accounting variables used as regressors (i.e., prices lead earnings), the changes in price for one period may well relate to the change in the regressors for a subsequent period, giving rise to potential 'errors in variables' problems. This problem does not occur when using levels, as all

[11] Collins and Kothari (1989) demonstrate that a twelve month period concluding shortly after the announcement of the years financial results, is not necessarily the period that gives the highest explanatory power. This is because share prices incorporate expected changes in earnings somewhat before the conventional event window starts and hence the normal formulation of the returns-earnings model is misspecified. Easton *et al.*, (1992) provide supporting evidence showing that modelling long run returns by long run earnings mitigates the above problem and results in higher explanatory power. In general the window should often be extended backwards to capture the share price reaction to changes in expectations which only appear in accounting numbers sometime later.

price reactions to available information are included in the current price [Rees (1997)][12].

2. Estimated regression coefficients on earnings, in the returns model, tend to be biased [Collins and Kothari (1989), Kothari and Zimmerman (1995)]. Bartov *et al.*, (2001) point out that one of the most persistent features of the return-earnings based research is the finding of implausibly small earnings response coefficients. They name two sets of factors that likely contribute to the small earnings response coefficients: measurement error (e.g., choice of the earnings expectations proxy, noise in reported earnings, etc.); and model misspecification (e.g., failing to model nonlinearities, etc). Kothari and Zimmerman (1995) and Rees (1997) note that empirically, unlike the parameters estimated in returns-earnings models, the parameters estimated using valuation models are closer to those expected from theory. Furthermore, Ohlson (1995) and Collins, Pincus and Xie (1999) conclude that price-level models provide a clearer theoretical interpretation with respect to valuation coefficients than return models.
3. Collins and Kothari (1989) and Kothari and Zimmerman (1995) demonstrate that the performance of returns models is sensitive to the window over which returns are cumulated. Also the conclusions reached by return-earnings studies are heavily influenced by their sample period and the width of the event-windows, resulting in difficulty of interpretation of a finding of poor/good performance.
4. Return-earnings models are also associated with the difficulty of separating (or controlling for) the value effect of other value relevant events that coincide with the event of interest [Lang and Stulz (1994)].
5. From the literature it is also evident that problems exist in all return studies in the definition and computation of unexpected/abnormal equity returns or earnings. Lang

[12] Rees (1997) notes that although the price will include the information derived from expectations regarding future accounting numbers, this will only constitute noise in the dependent variable, and is not a serious econometric problem.

and Stulz (1994), for example, note that the choice of a benchmark for performance comparisons is always a problem. As is evident from studies by Brown *et al.*, (1987), Capstaff *et al.,* (1995), Garrod and Rees (1999) and others, there is no consensus about the most appropriate forecasting model based on temporal series of earnings, and whether statistical models such as these are to be preferred to expectations based on financial analysts' forecasts.

6. Rees (1999) argues that explanatory variables which are relatively stable from period to period can have little effect on the model when incorporated as differences even if they are substantive drivers of value.
7. Another characteristic of the price-levels regression models is that they demonstrate substantially higher explanatory power than returns models.
8. The valuation model is also desirable as it captures the long run relationships, while a return-earnings model only captures the short run associations.
9. Changes in accounting practices, in capital structure, or in the composition of the group may render the change variables (in the returns models) misleading. Rees (1997) argues that this problem can be avoided by working with levels (where only the current year's accounting variables need be used) rather than changes.
10. Garrod and Rees (1998) suggest that in the levels equation it is a simple matter to investigate the influence of elements of the income statement or balance sheet, by restating earnings or book value into their component parts. In other words, it allows comparing the value relevance of various constituent parts of an accounting variable in question. For the research question addressed in my study, this property of the levels model is particularly desirable.

The price-levels models are less prone to the above listed ten problem areas. Nevertheless, the review of the literature reveals that albeit considerably similar, the design of price-level models changes considerably from study to study, reflecting different assumptions regarding the formation of expectations, or different objectives in hypothesis testing. The differences include: measuring market value at the accounting year-end or with a delay to ensure that all relevant information is publicly available; not deflating or deflating the model by a wide variety of scale-proxies (number of shares, beginning or end-of-period book value or market value of equity, as well as total assets or turnovers); using linear or other functional form for the model; using alternative regression types (OLS, MAD, WLS, rank-regression, etc.); choosing how outliers or influential observations should be dealt with; incorporating control and/or signal variables; and choosing precisely which variables (fundamentals) should be included as regressors.

The issue of how the EBO is operationalised in this study is the subject of Chapter 3. For now, it suffice to point out that in its basic form the model that I use in this study expresses the market value of equity in terms of three basic value drivers: current book value, earnings and dividends. It is, therefore, important to review some of the empirical findings on the valuation of these three basic value drivers, reported in papers that use similar research design.

### 2.5.2 On value relevance of accounting numbers

Earnings, book value of equity and dividends are key financial statement summary measures and extant research asserts that they are priced [Easton and Harris (1991), Kothari and Zimmerman (1995), Feltham and Ohlson (1995), Rees (1997), Stark and Thomas (1998)].

In modelling equity market value or returns, earlier studies tended to rely on some variant of the simple earnings capitalisation model [Kormendi and Lipe (1987), Collins and Kothari (1989), Kothari (1992)]. More recent studies, however, argue that simple earnings capitalisation models that do not incorporate book value are likely misspecified because book value is believed to be a value-relevant factor in its own right. Thus, in the spirit of works by Peasnell (1982) and Ohlson (1995), when a firm is viewed as a going concern, its book value would be a proxy for expected future normal earnings. Alternatively, when the firm's going concern status becomes questionable, its book value will then proxy for the liquidation value and/or the adaptation value [Burgstahler and Dichev (1997), Berger *et al.,* (1996)].

A substantial body of literature is concerned with the subject-to-context relative value relevance of book values and earnings. Works by Hayn (1995), Burgstahler and Dichev (1997), Barth *et al.,* (1998), Penman (1998), Collins *et al.,* (1999), Ou and Sepe (2002) are just few to name among the studies that examines conditions under which book value or earnings would be relatively more important in equity valuation.

Ou and Sepe (2002) argue that when a firm's current earnings are not perceived to be a good indicator of future earnings, due to either a large transitory component in current earnings or a change in the firm's future prospects, such as an increased possibility of liquidation, market participants will likely turn to book value for guidance in valuation. The value-relevance of book value will thus increase. Ou and Sepe (2002) finds robust evidence that the larger the spread between analysts earnings forecasts and reported current earnings (which proxies for earnings persistence), the less value-relevant are current earnings and the more the market relies on book value for equity valuation.

Penman (1998) shows that on average, book value carries more weight than earnings in equity valuation for firms with an extreme earnings-to-book ratio (i.e., ROE). Similarly, Burgstahler and Dichev (1997) report that when the earnings-to-book value ratio is high (low), earnings (book value) is a more important determinant of equity value.

Jan and Ou (1995) demonstrate that for firms reporting net losses, earnings explain very little of equity price, while book value is an important determinant of value. Barth *et al.,* (1998) show that pricing multiples on book value and the incremental explanatory power of book value (earnings) increase (decrease) as a firm's financial health deteriorates. Collins *et al.,* (1997) report that the value-relevance of earnings and book value move inversely to each other. They report that while the incremental value-relevance of earnings has declined over the past forty years, the combined value-relevance of earnings and book value has not. The decreased importance of earnings has been replaced by the increased value-relevance of book value. They also find that much of the shift in value-relevance from earnings to book value over time can be explained be several changes over the same time period: the increasing frequency of nonrecurring items and negative earnings, increasing intangible intensity, and decrease in average firm size. These factors all imply reduced persistence of current earnings. Barth, Beaver and Landsman (1998) show that for firms in financial distress, the value relevance of book value dominates that of earnings. They also demonstrate that the relative importance of each variable might differ across industries due to the degree of unrecognised assets. That is, the greater the amount of unrecognised assets, the lower the relevance of book value.

In short, this strand of literature supports the premise that when a firm's current earnings is not perceived to be a good indicator of its future earnings power, market participants will turn to book value for guidance in valuation[13].

Studies by Rees (1997), Hand and Landsman (1999), Brief and Zarowin (1999) extend previous research into relative valuation of earnings and book value by incorporating dividends into the analysis. Rees (1997) operationalises the Edwards-Bell-Ohlson residual income valuation model and uses it to analyse the value

[13] Earnings persistence has also been identified as one major determinant of the magnitude of earnings response coefficients in earnings-return models [Kormendi and Lipe (1987), Collins and Kothari (1989), among others)].

associations of earnings, book values and dividends for a sample of UK firms. He finds that dividends have a bigger impact on value than does retained earnings. Inclusion of dividends into the model also improves its explanatory power. His findings also indicate that in an environment characterised by information asymmetry, basic accounting values, such as earnings and book value, are less reliable value drivers. Retained earnings are also found to be relatively weak for smaller firms and firms with negative (and, therefore, likely transitory) earnings or higher-than-average return on equity. The book value variable is most influential where return on equity is either abnormally high or low. The relevance of book value to the market value of equity is relatively weak for larger firms. Dividends are found to be highly value relevant and are always positively related to value.

Hand and Landsman (1999) test the predictions that emerge in Ohlson's (1995) model by examining the information content of dividends. They employ a price-levels model to assess the pricing of dividends in stock prices and find robust evidence that dividends have information content and are materially positively priced, which contrasts with the negative relation predicted by the dividend displacement theory. They also find that the positive pricing of dividends is at least three times larger for loss making firms (i.e., when earnings are transitory) than for profit-making firms. The authors' explanation of these results is that managers of loss-making firms use dividends to signal future profitability, while to a lesser degree managers of profitable firms use dividends to alleviate concerns about the misuse of free cash flow. They conclude that dividends are a component of other information about abnormal earnings that is reflected in price but is not yet captured by current financial statements.

Brief and Zarowin (1999) compare alternative valuation models that relate share price to book value and earnings, and to book value and dividends and identify some of the contexts affecting valuation relevance. They find that book value has greater explanatory power for price than either earnings or dividends. However, the combination of book value and dividends has virtually identical explanatory power as book value and earnings. Furthermore, earnings and dividends alone have about the same individual and incremental explanatory power. For firms with transitory earnings, dividends has greater individual explanatory power than earnings, but once again book value and earnings and book value and dividends have about the same explanatory power. This shows that book value compensates for the largely valuation irrelevant transitory earnings. For firms with permanent earnings, earnings has the greatest explanatory power of the three variables. Finally, dividends have superior valuation relevance when book value is a poor indicator of value (e.g., due to the presence of unrecognised assets in some industries), and when earnings are transitory.

## 2.6 SUMMARY AND CONCLUSIONS

This chapter reviews different strands of literature that directly concern the research objective and research questions of this study. This literature provides the necessary anchors and 'benchmarks' for (i) the theoretical arguments put forward in this study, and (ii) the analysis and synthesis of the empirical finding.

The conducted review of literature on the usefulness of segmental information reveals the lack of consensus in the core area of interest of this study, i.e., valuation and value relevance of segmental information. This issue is extensively investigated in Chapters 5 and 6.

The section 2.5 of this chapter is deliberately kept concise because the theoretical aspects of the chosen accounting-based valuation framework are the primary subject of detailed investigation in Chapter 3, while the empirical side of the story is examined in Chapter 4.

# CHAPTER 3

# METHODOLOGY AND TEST DESIGN

## 3.1 INTRODUCTION

The purpose of this chapter is to examine the empirical methods, models and methodological issues, as well as the choices and assumptions made in respect of the test design.

The chapter has the following structure. Section 3.2. discusses the issue of model class selection and outlines the reasons for choosing a specific class of market-based accounting valuation model. Section 3.3 concerns the derivation of the basic model used in this study. Section 3.4. examines the implications of the cross-sectional difference in scale on the potential inferences drawn from the empirical application of the basic model. Section 3.5. demonstrates how the basic models can be extended for its application on the segmental level. Section 3.6. provides further explanations on how the basic models' coefficients should be interpreted when drawing the inferences in the process of empirical analysis. Section 3.7. concludes the chapter.

## 3.2. MODEL CLASS SELECTION

In the empirical accounting research, a choice often has to be made between: (i) return-earnings models, in which returns are typically regressed on a scaled earnings variable (or earnings component); and (ii) price-levels models, in which share values might be regressed on earnings, book values, dividends, research and development costs, etc. Because the goal of this study is to uncover/capture the long-term relationships and the adequacy of segmental financial statement information as a summary of the segment-level events that have affected the firm to date, I argue that the price-levels model specification is more appropriate.

To link and explore the relationship between the market value of the firm's ordinary equity and the segmental information disclosed in the notes to financial statements, I adapt the residual income valuation model (RIV). This produces a price-levels model which, in its most basic form, expresses the market value of equity as a linear function of the firm's book value and earnings for ordinary.

The review of the literature, presented in Chapter 2, suggests that the majority of studies that have investigated the valuation of operations of diversified firms, have used returns-based models. On this basis some researchers might view a return-earnings type of valuation model as an alternative to a price-levels research design. However, the emphases in these studies have mainly been the stock market performance of firms, **measured over a period of time.** Returns models consider the adequacy of financial statement data as a summary of events that have affected the firm over a specific 'return interval'. As Easton and Sommers (2003) point out, inferences from the return model may be more pertinent to addressing questions regarding the validity of the accounting summary of (specific) events that have affected the firm during the return period. That is, returns models permit tests of hypotheses regarding the **timeliness** of the summary.

However, investigation of the timeliness of the accounting summary of segment-level events is not the purpose of this study. The purpose here is to reveal the long-term relationships and examine the value association of segmental information at a point in time.

As discussed in Chapter 2, a price-levels model captures the long-term relationships, as it considers the adequacy of financial statement data as a summary of all events **that have affected the firm to-date** (i.e., it captures all returns since the firm came into existence). The model, therefore, does not depend on timing since it deals directly with the value per se [Easton and Sommers (2003)].

The research question would, therefore, be best addressed through the use of the price-levels model.

### 3.3 DERIVATION OF THE MODEL

Various studies [e.g., Peasnell (1982), Ohlson (1995), Rees (1997)] have demonstrated that the residual income valuation model is theoretically identical to, and can easily be derived from, the classical dividend discount model (DDM). RIV based models are popular valuation tools in market based accounting research. What positively differentiates the RIV model from the DDM, given the purpose of our research, is that RIV relies entirely on accounting numbers. The only assumption used in the process of derivation of RIV from DDM is that the relationship between the future periods' per share earnings, book values and dividends follows clean surplus accounting. Clean surplus accounting assumes that changes in per share book value between two dates equals to net income minus dividends. Furthermore, for the RIV model to follow from DDM it is only necessary that the estimates of future accounting numbers, rather than past numbers, follow 'clean surplus' identity [Rees (1997)].

Below I outline the sequence of steps used in the literature to derive the RIV model from DDM [see, for example, Edwards and Bell (1961), Peasnell (1981, 1982), Ohlson (1989, 1995)]. The DDM holds[14]:

$$p_t = \sum_{\tau=1}^{\infty} \frac{E_t[d_{t+\tau}]}{[1+r]^{\tau}} \tag{1}$$

where:

$p_t$ = price of the ordinary share at time t; $d_t$ = ordinary dividends at time t; $r$ = the discount rate; and $E_t[.]$ = expectations operator at time t.

[14] Investors may either be assumed to be risk neutral or the cost of capital may reflect the risk of the dividend stream. It is also assumed that there is no information asymmetry (i.e., homogeneous beliefs), interest rates are non-stochastic and have a flat term structure.

The assumption that the book value, earnings and dividends develop in line with the 'clean surplus' accounting holds:

$$bv_t = bv_{t-1} + er_t - d_t \qquad (2)$$

where:

$bv_t$ and $bv_{t-1}$ = book value of equity at time t and t-1, respectively; $er_t$ = clean surplus earnings for period t.

The dividend variable in equation (1) can be replaced by the expression for dividends from (2). This and some rearrangement gives:

$$p_t = bv_t + \sum_{\tau=1}^{\infty} \frac{E_t[er_{t+\tau} - r * bv_{t+\tau-1}]}{[1+r]^{\tau}} \qquad (3)$$

In the literature, model (3) is frequently being referred to as the Edward-Bell-Ohlson (EBO) model, residual income valuation model, or abnormal earnings model. In this study these terms are used interchangeably. This model has a straightforward interpretation: the market value of a firm's equity is a function of its current book value plus the present value of the stream of future periods' expected abnormal earnings. The model implies that any deviation of a firm's market value from its book value occurs due to limitations in the accounting-based book values in recognising the contemporaneous future expected abnormal earnings, that bears on a firm's goodwill. It is important to note that the required rate of return '*r*' used in conjunction with *bv* is the same as that used for discounting future abnormal earnings.

The abnormal income of each of the future periods is equal to the difference of that period's earnings ($er_t$) and 'normal' or 'required' earnings ($r*bv_{t-1}$) that investors require the firm to earn on their 'beginning-of-period' investment in the equity of the firm. The abnormal income, second term in equation (3), can, therefore, be decomposed into its two constituent parts: the present value of future expected earnings [second term in (4)], and present value of future expected 'required' or 'normal' earnings [third term in (4)], respectively. That is:

$$p_t = bv_t + \sum_{\tau=1}^{\infty} \frac{E_t(er_{t+\tau})}{[1+r]^{\tau}} - \sum_{\tau=1}^{\infty} \frac{E_t(r * bv_{t+\tau-1})}{[1+r]^{\tau}} \tag{4}$$

The good news about this valuation model is that it relies on accounting numbers only. The bad news, however, is that the model also relies on the expected at time 't' future values of *'bv'* and *'er'* from time *'t+1'* to *infinity*. Although the expected values for the immediate future periods may, arguably, be proxied by analyst forecasts, there are no reliable proxies (forecasts) for future expected accounting values in more distant future periods. This fact makes the model, in its current format, inapplicable for real-life valuation. For the purposes of empirical utilisation, the model requires some further modification. The literature suggests several approaches to how this model can be operationalised empirically. Although somewhat different in the underlying logic, all approaches rely on some additional assumptions with respect to the process of expectations formation. The resulting operationalised models are, nonetheless, very similar whatever approach one takes.

In the sections that follow I briefly review three approaches to operationalising the EBO that have been most frequently used in the literature, and explain the choice of the approach taken in this study[15].

**First approach:**

Ohlson (1995) transforms equation (3) into a linear function of equity book value, current net income, net dividends, and a scalar *'v'* representing other information about future abnormal earnings that is reflected in price but is not yet captured by current

[15] In section 3.5 of this chapter I review the third approach, used by Wysocki (1998) specifically for segment-level analysis, that results in the same operationalised model.

financial statements. He does so by assuming that abnormal earnings (or unrecorded goodwill) and other information obey an autoregressive process[16].

$$\begin{aligned} x_{t+1}^a &= \omega * x_t^a + v_t + \varepsilon_{1,t+1} \\ v_{t+1} &= \gamma * v_t + \varepsilon_{2,t+1} \end{aligned} \tag{5}$$

where $x_t^a$ = abnormal earnings for period $t$, and is defined as $x_t^a = er_t - r * bv_{t-1}$; $v_t$ is other information that impacts on the firm equity value at time $t$ but is not yet captured in contemporaneous accounting numbers; $\varepsilon_{\cdot,t}$ and $\varepsilon_{2,t}$ are zero-mean unpredictable disturbance terms. $\varpi$ and $\gamma$ are fixed at time $t$ known autoregressive parameters, restricted within the interval of 0 to 1.

By combining equations (2), (3), (5) and the definition of abnormal earnings (i.e., $x_t^a = er_t - r * bv_{t-1}$), the following model can be derived:

$$p_t = (1-k)bv_t + k(\varphi * er_t - d_t) + \delta_2 v_t \tag{6}$$

or

$$p_t = bv_t + k(\varphi * er_t - d_t) - kbv_t + \delta_2 v_t \tag{6.1}$$

where $d_t$ = net dividends plus net capital outflow, and parameters $\varphi$, $k$ and $\delta_2$ are, respectively:

$$\begin{aligned} &\varphi = (1+r)/r > 0 \\ &k = r\omega/(r+1-\gamma), \quad with \quad 0 \le k \le 1 \\ &\delta_2 = (r+1)/(r+1-\omega)(r+1-\gamma) \end{aligned}$$

The book value works as a 'rough' measure/estimate of value, whereas the abnormal earnings and '$v$' augment book value as "correcting" information. Ohlson (1995) demonstrates that ignoring the other information '$v$', the valuation model (6) can be viewed as a weighted average of an earnings capitalisation model and a book value

[16] It also follows that goodwill equals current abnormal earnings scaled by a constant.

model. By letting $k = \omega = 1$, the value is determined only by earnings and dividends ('pure' earnings/dividends model):

$$p_t = \varphi * er_t - d_t$$

Alternatively, by letting $k = \omega = 0$, just book value is sufficient to determine the value ('pure' book value model):

$$p_t = bv_t$$

Ohlson's model (equation 6) also cleanly reflects Modigliani and Miller's (1958, 1961) dividend displacement property. That is, equity value and dividends are negatively related in that a pound of dividends reduces equity value by exactly one pound[17]. However, the existing empirical evidence seems to suggest the opposite: dividends have a positive association with value (see Chapter 2). I return to the issue of dividends in greater detail later in the chapter.

Because equation (6) is a simple linear model that expresses the value '$p$' through '$bv$', '$er$', '$d$' and '$v$', one can rewrite it as:

$$p_t = \alpha_1' bv_t + \alpha_2' er_t + \alpha_3' d_t + b' Z_t + u_t \qquad (6.2)$$

where $Z$ is a vector of other value-relevant variables, including the other information component $v_t$, and various control variables; $\alpha_1' = (1-k)$, $\alpha_2' = k\varphi$, $\alpha_3' = -k$ and $b'$ subsumes coefficients on the elements of vector $Z_t$.

Model 6.2, with or without the dividends term, is frequently applied in the empirical studies by regressing stock price on current book value and current net income [e.g., Rees (1997), Hand and Landsman (1999)] as follows:

$$p_t = \alpha_0 + \alpha_1 bv_t + \alpha_2 er_t + \alpha_3 d_t + bZ_t + u_t \qquad (7)$$

[17] Hand and Landsman (1999) argue that this valuation property of dividends in Ohlson's model results from the standard dividend discount model permitting no information asymmetry.

where $\alpha_0$, $\alpha_1$, $\alpha_2$ and $b$ are, respectively, the intercept, and regression-generated estimates of coefficients $\alpha_1'$, $\alpha_2'$, $\alpha_3'$ and $b'$, respectively; $u_t$ is the regression error term.

Model (7) is one of the possible operationalised valuation model versions of the theoretical EBO (equation 3), and the process of derivation bears on the Ohlson's linear information dynamic assumptions.

**Second approach:**

A virtually identical specification to model (7) is also attainable by following a different set of assumptions. Rees (1997) suggests modelling future periods' earnings and book values as growing at constant rates $g_{er}$ and $g_{bv}$. That is:

$$E_t[bv_{t+\tau}] = (1+g_{BV})^{\tau} * bv_t \quad \tau = (1,\infty)$$

$$and \qquad (8)$$

$$E_t[er_{t+\tau}] = (1+g_{ER})^{\tau} * er_t \quad \tau = (1,\infty)$$

However, constant growth in earnings and book values in each future time period is not a requirement of the model. The only requirement is that growth expectations are equated, in present value terms, to a constant growth term.

The assumption of how future expected values develop is necessary because expectations are not observable in practice, and the only factual information available to investors/analysts at time "t" is the firm's $bv_t$ and $er_t$. In other words, to operationalise the EBO model a certain relationship should be assumed between the current observable and the next-period's accounting variables. The hypothesised structure of expectations allows the substitution of all currently "non-observable" accounting values for future periods with those that are currently observable[18]. By substituting (8) into (3) and noting that $g_{ER}$ and $g_{BV}$ must, in the long-term, be less than unity, equation (3) can be transformed to:

$$p_t = bv_t + er_t * \left(\frac{1+g_{ER}}{r-g_{ER}}\right) - bv_t\left(\frac{r}{r-g_{BV}}\right) \tag{9}$$

or

$$p_t = bv_t\left(1-\frac{r}{r-g_{BV}}\right) + er_t * \left(\frac{1+g_{ER}}{r-g_{ER}}\right) \tag{9.1}$$

Model (9) demonstrates that one can express the firm's equity value via two currently observable accounting variables: $bv_t$ and $er_t$, where the firm value $p_t$ is equal to $bv_t$ (the baseline value) plus a linear function of $bv_t$ and $er_t$ that represents the abnormal earnings.

By denoting $a_1 = \left(1-\frac{r}{r-g_{BV}}\right)$ *and* $a_2 = \left(\frac{1+g_{ER}}{r-g_{ER}}\right)$, model (9.1) can be presented in a simple linear regression form:

$$p_t = \alpha_0 + \alpha_1 bv_t + \alpha_2 er_t + u_t \tag{10}$$

Rees's model is another operationalised version of (3) and is essentially identical to the Ohlson's equation (7). In other words, virtually the same operationalised version is attainable by following substantially different derivation procedure and assumptions. The interpretation or economic meaning of coefficients $a_1$ and $a_2$, in across models (7) and (10), is also qualitatively identical. Therefore, in this study I adopt this operationalisation as the basic valuation framework.

[18] It is possible that the way the currently observable values relate to future unobservable ones may vary within the investing community, as well as with respect to different firms, industries and over time. Whatever assumption one makes regarding the form of that relationship, it is going to be of restrictive nature. More importantly, however, is the very existence of that relation but not its true pattern.

Some explanations of the model's relation to the firm's accounting system are necessary. Assuming that the firm's assets are all marked-to-market and the firm generates (and is expected to generate in the future) 'normal' earnings, the equity market value $p_t$ should on average equal its book value $bv_t$. This is not to say that under those conditions there could not be short-term random fluctuations of MV around BV due to the influence of other value-relevant factors of a random nature, which are not reflected in accounting numbers. The important point is that the model captures long-term relationships where the short-term random disturbances are assumed to balance out in the long-term.

The relaxation of the marked-to-market condition does not change the above argument. For example, if the accounting system used by the firm shows a persistent bias (e.g., conservatism), and investors are aware of this fact, then it is likely that investors would simply adjust the reported book value figure to what they believe is its perceived fair value. In other words, the notion is that analysts would apply a weighting multiplier to reconcile the reported and 'fair' book values. That is $bv^{unbiased}{}_t = \mu * bv^{biased}{}_t$, where $\mu$ is the book value weighting multiplier. If book values are perceived (in the long term) to be equal to fair value, the weighting multiplier would assume the value of unity. For downward (upward) biased reported book values the weighting multiplier would be larger (smaller) than unity. Therefore, the weight-adjusted theoretical coefficient in Ohlson's framework [equation (6)] would be $(1-k)\mu$, and in Rees's approach [equation (9.1)] it would be $\left(1-\frac{r}{r-g_{BV}}\right)\mu$.

It follows, that this weighting multiplier will then be subsumed in coefficient $a_1$ in regression models (7) and (10). That is, other things being equal, $a_1$ in model (7) and (10) will be higher (lower) if the firm's accounting system is perceived to be generating downwards (upwards) biased book values. Some empirical results that might support or refute this expectation are reported in Chapter 4.

Leaving aside the issue of accounting system-induced biases in reported *bv*, the model (3) predicts a departure of a firm's market value from its book value if the present value of future expected earnings varies from the 'normal' or 'required' level. In the operationalised versions of the model, the term '$a_2 * er_t$' proxies for the present value of future expected earnings, and the term '$(a_1 - 1) * bv_t$' proxies for the capitalised normal or required earnings. Therefore, the difference between the former and the latter terms bears on the firm's expected abnormal earnings (goodwill), which, in turn, explains why the firm's market value might depart from its book value. The model predicts that, all other things being equal, the higher the capitalised earnings the higher would be the market value of the firm. If the capitalised expected earnings are above what is considered as 'normal' earnings, the market value will exceed the book value. The market value will fall below book value when the capitalised expected earnings fall short of normal earnings. Of two otherwise identical firms, the one that has higher capitalised expected earnings will have higher market value. In other terms, relative valuation of two firms is entirely determined by perceived difference in capitalised expected earnings. Difference between capitalised expected earnings of two firms is inferred by comparing the values of regression-estimated earnings multiplier '$a_2$'. Therefore, other things being equal, the higher the earnings multiplier, the larger is the associated abnormal earnings.

On the whole, in the context of this research, to differentiate between valuations (value contribution) associated with different firms (segment-level operations), one must be able to compare in relative terms the abnormal earnings associated with different firms (segments). Relative abnormal earnings associations are inferred from the regression estimated earnings multipliers. This basic rule, in my study, guides the process of drawing inferences regarding the valuation or value contribution associated with of different firms or segments.

### 3.3.1 Other valuation factors: dividends

One can notice that dividends explicitly enter the operationalised model (6) that bears on Ohlson's framework, while dividends are not present in model (9) that draws on Rees's framework. One can argue that the operationalised models oversimplify the original EBO model, because they totally rely on current period data rather than the future expected values. The closeness of the operationalised model to the EBO model would depend on: (A) how well the current-period variable values proxy for values expected in the future; and (B) the credibility of the assumptions used during the modification of the EBO, resulting in a simple linear relationship between firm value and accounting variables.

The condition (A), in turn, depends on at least two factors. Firstly, it is the quality of accounting numbers in the broad sense. That is, how closely accounting numbers reflect the underlying economic performance of the firm and the fair value of its assets. Secondly, it is the perceived degree of persistence of these accounting variables. In other words, even in the ideal case where all assets and liabilities are continuously marked-to-market and the firm does not resort to any form of earnings management or manipulation, current values might still convey little information regarding the future expected values for the same variables.

Condition (B), in turn, may not hold. For example, parameters in these operationalisations are modelled as constants or, at least, are assumed to be independent of the values of accounting numbers. In reality, however, this might not be the case. Extant literature (see Chapter 2) suggests that parameters might vary depending on, for instance, the sign of earnings, book values, or might be affected by a range of other contexts. Furthermore, the model predicts that the firm equity value would be zero if all accounting numbers entering the model were zeros. It is possible that the model's linearity/non-linearity and the set of major value drivers are contextual to the properties of the firm (e.g., the economic sector affiliation of the company, size, life cycle stage, accepted accounting practices, extremity of reported accounting numbers, etc.) and the degree of market's miss-pricing of the firm's value.

To limit information loss and mitigate possible miss-specification, one should try to improve the model by appending it with some 'forward-looking' variables. Dividends might be one such additional valuation factor[19]. Various authors attribute different yet complementary roles to dividends in models similar to (7). For example, dividends are imbedded in Ohlson's analytical model (6). This model predicts a negative relation between dividends and market value, which closely reflects the Modigliani and Miller dividend displacement proposition. Application of a set of assumptions [e.g., such as in Rees (1997)] which are different from those used by Ohlson to operationalise the EBO, may generate similar models but without the dividend variable [e.g., equation (10)]. Dividends are often added into those models as an additional value-relevant variable. Common arguments for adding dividends into the model include:

1. First is the signalling hypothesis: management signals its inside information on the firm's expected economic performance via dividends. In this sense, dividends might proxy for other value-relevant information that is yet to be reflected in future period financial statements. In this capacity, dividends can be applied to Ohlson (1995) model and proxy for the 'other information ($\nu$)' variable.

[19] Some studies include in a similar valuation framework other forward-looking value-explaining factors, such as research and development costs [e.g., Green et al (1996), Stark and Thomas (1998), Stark *et al.*, (2003)], or advertising expenses [e.g., Chauvin and Hirschey (1993)]. However, it is essential not to overcomplicate the valuation model, particularly when it comes to the segment-level analysis, by trying to control for all possible value drivers. Of the above factors I include only dividends, as I believe dividends have a more fundamental role in equity valuation and dividend information is more readily available.

2. Secondly, because firms are reluctant to frequent changes of dividend policy, dividends can also be viewed as the high-persistence component of current period earnings [Lintner (1965)].

3. Finally, depending on the set of specific assumptions used to operationalise EBO, the resulting model may explicitly include dividends as a valuation factor. For instance Hand and Landsman (1999) demonstrate how two alternative sets of assumptions give different roles to dividends in a model similar to (7). In one case, the multiplier attached to dividends has a theoretical value of '-1', reflecting Modigliani and Miller's (1958, 1961) dividend displacement theory. While in the other case the theoretical value of the dividend multiplier is positive and has a specific structure [see equation (6.1)].

The above arguments suggest that including dividends into the model is likely to mitigate possible miss-specification and value-relevant omitted variable problems. Empirical studies both in the UK and the US that use price-level regressions and include dividends as an additional valuation factor tend to find that the valuation of dividends is contextual to firm-specific characteristics and, contrary to the dividend displacement theory, positively associated with firm value [e.g., Rees (1997), Hand and Landsman (1999), Akbar and Stark (2003a)].

Some studies advocate the use of additional value-drivers such as R&D costs [Hirschey and Spencer (1992), Green *et al.*, (1996) and Stark and Thomas (1998)], advertising expenses [Chauvin and Hirschey (1993)], or capital contributions [Hand and Landsman (1999)]. The motivation for including these variables in the regression is best expressed in Akbar and Stark (2003a) who state that equation (10) is clearly a stripped down model that omits a number of (above listed) variables that have been argued to be value-relevant in prior studies in the US and the UK.

However, it is essential not to overcomplicate our valuation model, particularly when it is modified for the segmental level analysis, by trying to control for potentially numerous valuation factors. Of the financial statements variables considered by the literature as potentially value-relevant, only dividends are included in the model as I believe dividends have a more fundamental role in security valuation. Additionally, in terms of availability of data, in the Extel Financial Company Analysis database – the primary source of data for this study – dividends is a more frequently reported data item than R&D, marketing costs or capital contributions. Therefore, the following version of valuation model is used as the basis for the empirical sections of this study:

$$p_t = \alpha_0 + \alpha_1 bv_t + \alpha_2 er_t + \alpha_3 div_t + bZ_t + u_t \qquad (11)$$

where Z is a vector of various control variables, which are detailed in subsequent empirical analysis chapters.

## 3.4 THE IMPACT OF CROSS-SECTIONAL DIFFERENCE IN SCALE

The process of model derivation and key theoretical properties of the model have been examined in Section 3.3. In the current section I examine the practical implications of applying the model to a cross-section of firms of different size.

Firms included in the sample used in this study differ cross-sectionally in terms of size. On average larger firms have larger values of variables in monetary terms: market capitalisation, book values, net assets, sales, earnings, etc. That is, these variables have an imbedded scale or size factor. I demonstrate below, that if no account is taken of differences in size, the estimated regression is most likely to produce spurious results, i.e. be plagued by econometric problems such as biased regression coefficients, heteroscedasticity-related problems, overstated coefficients of determination, etc. Although these problems have been recognised in the market based accounting literature, no universally accepted solution for these scale-related problems has been offered. Depending on the primary emphasis of a particular research question, different studies have dealt with scale effects in different ways.

This study requires drawing inferences from actual **values** of regression-estimated coefficients. More specifically, the purpose of this research is to reveal the actual patterns of value contributions associated with specific industrial and geographical segments. The employed test design identifies these patterns by examining the values of particular regression coefficients. It is critical, therefore, to ensure that coefficients are sufficiently unbiased and robust. It has been documented in the existing literature that scale-related effects have considerable influence on inferences drawn from the price-levels models. A considerable number of studies discuss approaches to mitigate the effects of scale on regression results [Bernard (1987), Kothari and Zimmerman (1995), Easton (2000), Barth and Clinch (2001), Easton and Sommers (2003)]. Unfortunately, all these studies characterise scale in different ways. It appears that scale is not a single and well-defined concept. For example, Easton and Sommers (2003) note that the nature of cross-sectional data is such that the results of a regression of market capitalisation on financial statement data are driven by a relatively small subset of the largest firms in the sample. They refer to this overwhelming influence of the largest firms as the 'scale effect'. It appears though, that the authors do not draw a fine line between different consequences of using size-wise heterogeneous cross-sectional data. They observe the presence of heteroscedasticity in the regression and call it a 'size effect'. They apply the same 'size effect' term to a situation where the relation between variables for larger firms differs from the relation for smaller firms (that is, large and small firms have different valuation multiples). Review of studies by Bernard (1987), Kothari and Zimmerman (1995), Easton (2000), Barth and Clinch (2001), Easton and Sommers (2003) points to a range of potential problems associated with cross-sectional scale differences that need to be addressed. Therefore, it is necessary to investigate potential influences that cross-sectional differences in scale might have on regression results.

It is unclear *a priori* which types of scale effects are present in our research context. To determine whether scale induces spurious inferences, one must either specify the nature of the scale effect and take specific steps to mitigate it, or ensure inferences are robust to estimating alternative specifications aimed at mitigating various types of scale effects. Therefore, diagnosing and mitigating scale effects requires specifying what scale is in the context of this research and how scale relates to the variables employed.

Barth and Clinch (2001) provide a useful framework for differentiating between various (four) types of scale-related problems:

1. **scale differences arising from the financing base** of a firm that is unrelated to the success or failure of the firm's operating and investing activities. That is, there is a difference between firms that are large because of capital infusion and firms that are large because of successful operating and investing activities. This results in an **additive scale** effect.

2. Scale differences arising at the formation of the firm. This results in a **multiplicative scale** effect.

3. Valuation parameters that **vary with scale** (Lee [1999]).

4. **Heteroscadasticity.**

The first three effects can result in coefficient bias, whereas the fourth can result in estimation inefficiency. There seem to be consensus in the literature that depending on the nature of the scale effect, different estimation specifications (models) might become effective at mitigating scale effects. In sections that follow I discuss the valuation implications of those four scale effects in the settings of our tests.

### 3.4.1 Additive scale effect

When scale differences across firms reflect differences in the investment base (an omitted variable), we have a scale effect of the first type. Among factors that may account for the differences in the financing base are: issues of new equity; repurchased stocks; asset revaluations; and interim and annual paid dividends. Consequently, if one firm is larger due to a larger financial base (e.g., when issuance of new equity increases MV and BV), then regression estimates could show a positive relation between MV and BV even if none would exist in scale-free settings. That is, differences in the investment base can result in additive scale effects. One should be able to control for such additive scale effects by adjusting the dependent variable and the independent variable which relates to the investment-base. For instance, stock buy-backs (or payment of dividends) reduce book value, and this should affect the market value approximately on a pound-for-pound basis[20]. Therefore, by adjusting market and book values to new stock issuance (or stock repurchases, paid dividends, etc.), one should, in theory, be able to overcome scale effects related to 'differences-in-investment-base'. In practice, however, such adjustments are problematic. Factors like asset revaluations also affect the investment base. The problem though is that asset revaluations that directly affect book value might not impact on the market value of equity on a pound-for-pound basis. Furthermore, the non-availability of necessary data (such as new share issuance, share redemption, asset revaluations, etc.) on our sample is also an impediment. Without this

[20] Issues such as taxation and information asymmetry might undermine the pound-for-pound relationship.

information it would be impossible to identify and quantify the additive scale effect (if there is one), associated with differences in the investment base[21].

### 3.4.2 Multiplicative scale effect

This relates to the situation when cross-sectional scale differences reflect differences arising at the formation of the firm or from the fact that firms are larger because of successful operating and investing activities (including such events as mergers and acquisitions). Generally speaking, the implication of this type of scale effect is as follows. Suppose, a 'unit-size' firm has the following values $mv_t$, $bv_t$, $er_t$, $div_t$, for equity market value, book value, earnings and dividends, respectively. Then for an otherwise identical firm, whose size is a multiple '*s*' of a unit-size factor '*s*', the corresponding values would be $s*mv_t$, $s*bv_t$, $s*er_t$, $s*div_t$ [22]. Therefore, if the value of the unit-size firm is expressed as:

$$mv_t * 1 = \alpha_0 * 1 + \alpha_1 * (bv_t * 1) + \alpha_2 * (er_t * 1) + a_3 * div_t + u_t,$$

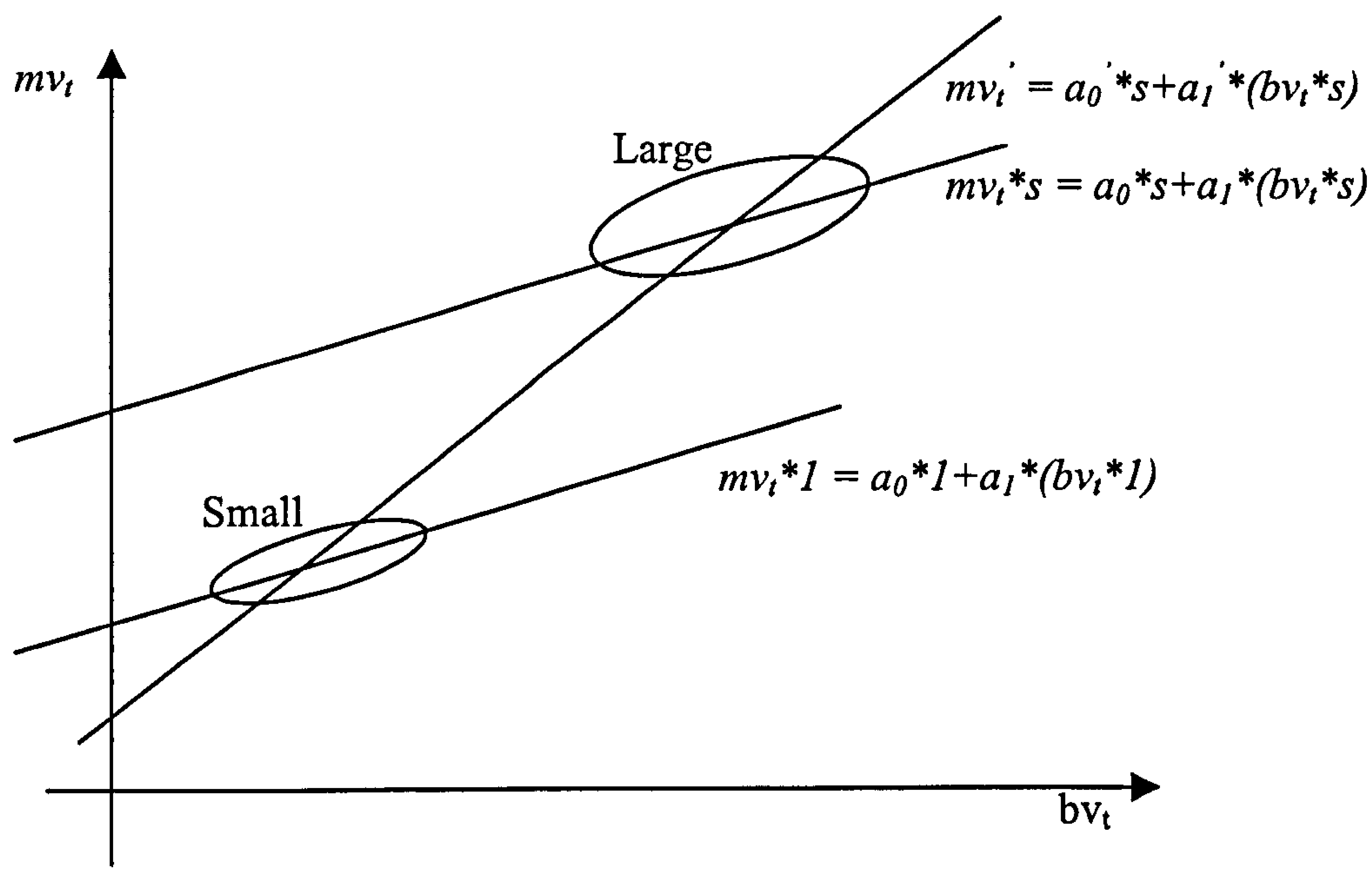
and there is no cross-sectional variation in valuation coefficients related to cross-sectional differences in scale, then the value of the 's'-size firm should be:

$$(mv_t * s) = \alpha_0 * s + \alpha_1 * (bv_t * s) + \alpha_2 * (er_t * s) + a_3 * div_t + \pi_t.$$

where $mv_t*s$, $bv_t*s$ and $er_t*s$ are the currently observed equity market value, book value and earnings of a firm which is '*s*' times proportionally larger than the 'unit-size' firm. In the above model we have **pure** multiplicative scale-effect, which assumes that no other scale-related valuation differences are at place. Note that the intercept $a_0*s$ is a function of size and increases in proportion to '*s*'.

[21] Later in this chapter it is argued that deflation by a scale proxy is likely to purge some of the additive scale effect.
[22] For a unit size firm s = 1.

Running the above regression for a cross-section of size-wise variant firms is likely to produce spurious results. This point can best be illustrated graphically. For simplicity of illustration assume that there is only one valuation factor, that is, book value.




On this graph there are two groups of firms: unit-size or 'Small' firms, and 'Large' firms that are proportionately larger by a factor of '*s*'. In other words, a simple multiplicative scale effect is assumed in the group of larger firms. In both size groups firms have the same valuation function, with identical book value coefficient. If two separate regressions [$mv_t*1 = a_0*1+a_1*(bv_t*1)$ and $mv_t*s = a_0*s+a_1*(bv_t*s)$] were estimated for the two size groups, **true** (unbiased) estimates the of book value coefficient $\alpha_1$ and the intercept $\alpha_0$ would have been obtained. The exhibit illustrates that when large and small firms are jointly included in single regression, the regression's estimated coefficients ($a_0'$ and $a_1'$) will be **biased**. Other regression characteristics, such as the Adjusted-$R^2$ will also be biased. This is because this single regression estimates the line [ $p'_t = \alpha'_0 + \alpha'_1 * bv_t$ ] that would go through both small and large firms' groups. It is important to emphasise that this line does not reflect the true economic relationships (between the dependent and independent variables) which are meant to be explored. Only by coincidence will these regression coefficients and parameters equal the true coefficients.

To sum up, when scale effect is multiplicative it induces spurious correlation between dependent and independent variables and also among the independent variables, and this biases regression results.

Two methods are commonly suggested in the literature to deal with this scale problem [e.g., Barth and Clinch (2001)]. The first is to include a proxy for scale as an explanatory variable in the basic model, which can be effective when the scale effect is multiplicative or additive. The second is to estimate the regression after deflating all variables by a scale proxy.

If scale is multiplicative, under some conditions, deflation is algebraically the same as the inclusion of a size proxy as an additional explanatory variable. However, the inclusion in regression of a scale proxy as an additional variable is likely to complicate the regression analysis and potentially bias the results. This is because scale is already present in all regression variables and, therefore, is correlated with both the dependent and independent variables. Its inclusion as an additional explanatory variable would induce spurious correlation between the scale variable and the dependent and independent variables, and might bias the results[23].

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[23] Results from my simulations provide empirical justification to this statement and prove that adding a scale variable is unlikely to solve the problem, while deflation directly eliminates the multiplicative scale effect. I first randomly simulate the *mv*, *bv* and *er* variables, in such a way that they would contain no additive scale factor and, at the same time, would mimic the average historical book to market and P/E ratios of my actual panel data. Then I regress *mv* on *bv* and *er* to estimate the 'true' coefficients. By multiplying every initial variable by a scale parameter new variables are being generated, which contain a multiplicative scale factor. Then I run a regression that includes these variables and one additional variable – the scale factor. Results from that regression are clearly different from those of the deflated regression (which are identical –by construction – to the initial scale-free regression).

Furthermore, in our settings (where intercept is modelled as a linear function of scale) there is *de facto* no need for inclusion of an additional scale variable. It is already subsumed in the intercept '$a_0$*$s$' of the undeflated model:

$$(mv_t * s) = \alpha_0 * s + \alpha_1 * (bv_t * s) + \alpha_2 * (er_t * s) + a_3 * div_t + \pi_t$$

However, as it has been illustrated in the above graph, running this model for a cross-section of firms with different size will produce spurious results. It is only deflation that purges the multiplicative scale effects. That is:

$$(mv_t * s)/s = \alpha_0 * s/s + \alpha_1 * (bv_t * s)/s + \alpha_2 * (er_t * s)/s + a_3 * div_t + \pi_t$$

is the same as

$$mv_t = \alpha_0 + \alpha_1 * bv_t + \alpha_2 * er_t + a_3 * div_t + u_t$$

where all variables are scale-deflated.

Therefore I use deflation as the means of scale control, and to bring the regression to 'unit-size' scale[24]. The choice of scaling factors is discussed in Section 3.4.5

### 3.4.3 Scale-varying valuation parameters

The finance literature suggests that cross-sectional variations in size may well explain differences in the firm's valuation. For example, Fama and French (1992) show that size helps explain a significant portion of the cross-sectional variation in stock returns. Furthermore, the existing empirical accounting literature that specifically utilises price-levels models (e.g., Easton and Sommers (2003), Marietta-Westberg and Sierra (2000)] suggests that regression-estimated valuation coefficients are not cross-sectional constants but can be scale-variant.

[24] As rightfully noted by Barth and Clinch (2001), deflation itself can induce spurious estimation effects if scale effects are not multiplicatively associated with all variables. However, the sample in this study is particularly diverse size-wise, which undoubtedly affects all firm-level accounting variables.

Tests presented in Chapter 4 (on consolidated analysis) provide some indication of the presence (in my sample) of scale-related non-linearity in estimated regression coefficients. Non-linearity means that the true coefficients are not cross-sectional constants, but vary with scale and scale is correlated with un-deflated explanatory variables[25]. In other words, coefficients are not linear but vary cross-sectionally. Failing to control for this effect might bias the regression-estimated coefficients relative to the cross-sectional mean of the true coefficients. Barth and Clinch (2001) argue that the only remedy for this type of scale effect is to permit the coefficients to differ for firms with different scale. Using simulation they show that when there is no scale effect or when the scale effect derives from scale-varying valuation parameters, the un-deflated market value of equity specification exhibits the least bias and mean squared error of the coefficients.

It is easy to demonstrate analytically why simple deflation by a scale proxy is unlikely to remove the scale effect. The following hypothetical example illustrates the case. Assume that the market value of equity of two independent firms, which are **identical in all respects**, can be represented in terms of the following simple valuation model:

$$mv_t = \alpha_0 + \alpha_1 * bv_t + \alpha_2 * er_t + a_3 * div_t + u_t$$

In conditions with no scale-related non-linearity in valuation parameters, a firm, which is a simple amalgamation of the two firms, can be expected to have the following valuation:

$$2 * mv_t = 2 * \alpha_0 + \alpha_1 * (bv_t * 2) + \alpha_2 * (er_t * 2) + a_3 * div_t + \varepsilon_t$$

[25] Here it is assumed that firm *size* is the main manifestation of *scale*, therefore terms 'scale' and 'size' are used interchangeably. Nevertheless, I recognise that scale might not necessarily only relate to size. For instance, true valuation coefficients may vary depending on other contextual variables, e.g. industries (i.e. industry becomes a scale proxy), or reflect differences in unrelated-to-size cross-sectional differences among firms. Given that my sample includes observations which are pooled over time for a cross-section of firms, the 'time' might also be a scale factor.

Similarly, valuation of a generic firm, which differs from the above firms only in size by factor '*s*', is:

$$(mv_t * s) = \alpha_0 * s + \alpha_1 * (bv_t * s) + \alpha_2 * (er_t * s) + a_3 * div_t + \pi_t$$

where '*s*' is scale or size proxy.

The intercept in the regression model for the 's'-size firm is a multiple of the factor '*s*' size and the unit-size intercept '$a_0$'. This means that when the sample includes a cross section of firms with different size, the regression would have no constant (term) intercept. In other words, the intercept *is* the scale, but not a constant.

It has been shown earlier that the use, in the regression, of a cross-section of firms with significant differences in size might induce spurious correlations between variables (producing biased estimates of coefficients), and heteroscedasticity in the error term (reducing the efficiency of estimated coefficients). If coefficients were not related to scale, deflation by scale factor would result in estimation of the underlying true scale-free model, i.e.:

$$(mv_t * s)/s = (\alpha_0 * s)/s + \alpha_1 * (bv_t * s)/s + \alpha_2 * (er_t * s)/s + a_3 * div_t + \pi_t$$

or, simply,

$$mv_t = \alpha_0 + \alpha_1 * bv_t + \alpha_2 * er_t + a_3 * div_t + u_t$$

where the dependent and independent variables are scale-deflated.

It is possible, however, that amalgamation of ***two*** otherwise identical firms, would produce some synergistic or other effects, causing the value of the larger firm to differ from the simple sum of individual values (value differential). Similarly, due to a number of factors identified in the literature, valuation of larger firms may differ from valuation of smaller firms. This implies that valuation coefficients might vary with scale. That is, for a firm of scale 's':

$$s * mv_t' + \xi_t(s) = \alpha_0(s) + \alpha_1(s) * [bv_t * s] + \alpha_2(s) * [er_t * s] + a_3 * div_t + \pi_t'$$

where $\xi_t(s)$ is the scale-induced firm value differential; $\alpha_i(s)$ is the function of coefficient $a_i$ on scale 's' [26]. In the above model, the dependent variable includes two parts. The first term is what would have been the value of the dependent variable if only the multiplicative scale effect existed. The second term is the result of scale-induced non-linearity in the relationship between the dependent and independent variables.

To the extent that a multiplicative scale effect is present in the data, deflation purges such problems as spurious correlations and heteroscedasticity, but it will not remove scale-related non-linearity in coefficients unless $\alpha_i(s) = a_i = const.$ After scaling we have:

$$mv_t' + \xi_t(s)/s = \alpha_0(s)/s + \alpha_1(s) * bv_t + \alpha_2(s) * er_t + a_3 * div_t + u_t \qquad (13)$$

where $mv_t' + \xi_t(s)/s = mv_t$ is the deflated market value of equity.

If one restricts coefficients in the above regression to constants, the resulting coefficient estimate will be the mean of the true coefficients if true coefficients vary across firms in a way that is uncorrelated with the explanatory variables[27]. However, as with any mean, extreme true coefficients can have a noticeable effect on the estimated coefficients in the model.

Ideally, the estimation procedure of the above regression should allow coefficients to vary with scale. This entails designing a model that is non-linear in coefficients. In practical terms this task is almost unachievable, because it requires knowing the exact functional form of scale-variant coefficients $\alpha_i(s)$, [$i=0,n$]. Furthermore, even if the 'true' functional form was known, depending on the type of

[26] Although the dependent variable is presented as a sum of two terms, these terms are not separately observable. It is only the sum of the two which is observed and constitutes the market value of equity.
[27] In the context of the above scale-deflated model, there is no *a priori* conjecture predicting any specific association or relation between deflated variables and the scale-related coefficients.

that function, it might not be possible to reduce this function to a regression-usable form. However, to gain at least some empirical summary about the general direction in the relationship between a coefficient of interest and scale, one can use a simple linear function to model the coefficient, i.e.:

$$\alpha_i(s) = a_{i,0} + a_{i,1} * s \quad (i=0,n)$$

Substitution of these functions into (13) gives:

$$p_t = a_{0,0} * (1/s) + a_{0,1} + a_{1,0} * bv_t + a_{1,1} * [s * bv_t] + a_{2,0} * er_t + a_{2,1} * [s * er_t] + a_{3,0} * div_t + u_t$$

This model estimates the central tendency of the coefficient for each value driver and also provides indication about the expected direction of scale-related change in the coefficients. In this form the model simultaneously employs scale-deflated variables ($mv_t$, $bv_t$, $er_t$) and un-deflated variables ($s*bv_t$, $s*er_t$) variables. To avoid the biasing effect on the regression of spurious correlations between un-deflated variables, in the empirical tests only one coefficient of interest (e.g., the book value multiple) is modelled at a time. For instance, to control for non-linearity of earnings coefficient only, the following regression will be estimated:

$$mv_t = a_{0,0} * (1/s) + a_{0,1} + a_1 * bv_t + a_{2,0} * er_t + a_{2,1} * [s * er_t] + a_{3,0} * div_t + u_t \qquad (14)$$

Alternatively, one could partially control for non-linearity by categorising regression variables into scale-related intervals (e.g. size-based quintiles), and then add dummies and interaction terms for each of the interval. This procedure, as noted by Lo and Lys (2000), is not an effective solution because if scale affects the entire sample, then it will also be present in each partition. Additionally, this procedure would inflate the number of regression parameters, particularly during the segment-level analysis, producing unreliable results.

### 3.4.4 Heteroscedasticity

Heteroscedastic regression error variances is another common form of scale effect present in data sets drawn from a cross-section of size-wise different firms. In empirical accounting literature, this problem is typically rectified by deflating regressions by a size proxy (Easton and Sommers (2003), Rees (1999), Barth and Clinch (2001), and others). For example, Rees (1999) suggests that when deflated by some measure of size, such as book value, the model is less likely to suffer from heteroscedasticity and from dependence between the error terms where the samples are pooled across cross-section and time-series. Different authors advocate the use of different variables as size proxies. Barth and Clinch (2001) suggest that when scale effects are associated either with omitted scale variables, related to external equity growth or initial investment, or with scale-related heteroscedasticity, the per-share deflation is the most effective of the alternative specifications. It can be argued, however, that per-share specification is unlikely to purge the scale effect, because the cross-section of firms is likely to include both penny stocks and stock with high value per share. In the section that follows I discuss the use of specific variables as scale-proxy.

### 3.4.5 What is the 'best' scale proxy?

Having examined the types of scale-related effects and their implications to valuation in cross-sectional settings, I have argued that scale-deflation and subsequent inclusion in the regression of an unscaled variable of interest is the most adequate treatment of scale in the settings of this study. Now the choice of specific variable(s) as scale proxy needs to be justified.

There is no agreement in the literature as to what variable is the 'best' deflator. A recent study by Akbar and Stark (2003) for UK-based firms, compared the effectiveness of deflation by alternative scale proxies: sales, number of shares, opening and closing market value, and closing book value. They conclude that none of the deflators are entirely successful in eliminating scale effects.

Current or lagged market or book value of equity, number of shares, group total assets or sales are among the frequently used size-proxies. Below I discuss theoretical and practical implications of using specific deflators.

**1. Number of shares:**

This deflator was employed in a number of studies [e.g. Barth *et al.,* (1992), Kothari and Zimmerman (1996), Garrod and Rees (1998), and Hand and Landsman (1999)]. For example, Barth and Clinch (2001) find some evidence that when scale effects are associated either with omitted scale variables related to external equity growth or initial equity investment, or with heteroscadasticity related to book value of equity, the share-deflated price specification is most effective at mitigating scale effects on coefficient estimation. However, Brown, Lo and Lys (1999) rightfully argue that the use of per share values might not adequately remove scale effects as shares come in different sizes: some shares are very large, while others are as small as penny stock. Easton (1998) notes that the magnitude of share-deflated dependent variable reflects no more than the choice by management of the number of shares outstanding, which will also affect the scale of the per share measure of many firm attributes, so that a regression of share price on the firm attributes will lead to coefficients that may capture no more than the fact that all variables have the same scale. In their empirical tests of alternative deflators in the UK settings Akbar and Stark (2003) find that neither OLS nor WLS regression, with number of shares as the deflator, appear to be effective in removing scale effects or heteroscedasticity.

**2. Closing market value of equity:**

Other authors argue in support of **closing market value** being the only theoretically justified deflator. Easton (1998) and Easton and Sommers (2003), for instance, argue that market value is more than just a possible scale proxy – rather it *is* scale. They define scale effect as the undue influence of firms with large market capitalisation and suggest that it should be considered as an appropriate deflator in price-levels regressions. Although Easton and Sommers's deflation appears to work in US data, Akbar and Stark (2003) replicate Easton and Sommers's tests for UK firms and conclude that market value is not superior, in comparison to other scale proxies, in reducing scale effects.

On a notional level one can also suggest arguments for and against the market value being able to represent the 'intrinsic' scale. Equity market value could have been the most desirable deflator as it is always positive (i.e., does not reduce the sample size due to only-positive values of the deflator) and, in efficient markets, is unaffected by the choice of accounting practices. There are, however, some problems as well. MV of equity is the **stock market**'s assessment of the value of the capital contributed by ordinary shareholders plus the capitalised expected abnormal earnings perceived by the market. One might argue that from the investors' perspective, scale or size is the actual value of the capital base contributed by shareholders and used by the firm for its operations. It is the fair value of the firm's net assets (and, therefore, the true measure of scale). MV is the sum-total of this fair value and the perceived present value of future growth opportunities (PVGO). The larger the proportion of PVGO in the MV, the more MV will deviate from the true value of the capital initially contributed by shareholders[28]. Furthermore, when the dependent variable in the un-deflated basic

[28] For instance, goodwill resulting from acquisitions – an example of PVGO – often accounts for a substantial portion of MV.

model is MV, deflation by MV results in a constant value (unity) of the dependent variable of the regression.

In addition, an error-in-variable, induced to the extent that on the measurement date MV will deviate from the intrinsic value of a firm (either because of stock price random fluctuation or more persistent market mis-pricing), will introduce noise to the deflated dependent and independent variables. While MV can be very volatile in the short-term, the 'intrinsic' size of the firms can hardly fluctuate at such a rate. This error in variable problem substantially undermines, in my opinion, the role of market value as the theoretically unequivocal scale proxy.

**3. Opening market value:**

As an alternative, one could use the beginning of period *mv*. This deflator is used, for example, by Christie (1987), Kothari and Zimmerman (1995) and Lo and Lys (2000). Deflation by this variable has all the deficiencies as deflation by current period *mv*. For instance, the distortion associated with MV capturing the effect of PVGO would still exist. In addition, this would reduce the sample size because the observations related to the first year of the sample period would be lost.

Furthermore, deflation by the lagged market value produces, in fact, a return model. In other words, the independent variables will now be explaining the cross-sectional variation in **market returns**, rather than cross-sectional variation in **market value**. And this, as has been discussed in Chapter 2, is a different research question.

**4. Opening book value:**

The beginning-of-period *bv* could have been the most theoretically justified deflator in the context of this study, as it is associated with initial capital contributed to the firm by its ordinary shareholders (owners). At the time of the inception of the firm, the beginning *bv* would reflect the fair value of net assets acquired, regardless of accounting methods used. If all firms in the sample had the same inception date, then by deflating the end-of-period accounting data by the beginning-of-period *bv* would fully control for cross-sectional variation of the initially contributed equity capital. The following period's beginning-of-the-period BV will then serve as the deflator for the following year's end-of-period data. However, this is the point when distortions begin. Unless the entire cross-section of firms adheres to mark-to-market accounting (for all future periods), the next period's beginning-of-period *bv* could no longer be expected to reflect the fair value of total capital contribution associated with ordinary shareholders. Therefore, by continuing to use this measure as a deflator, one can no longer guarantee that the scale factor is controlled for. It could, perhaps, have still been a suitable deflator if all firms had used other than mark-to-market yet identical accounting methods[29]. However, because firms exercise considerable discretion in selecting appropriate accounting practices, the distortion of *bv* from the fair value is likely to vary substantially in the cross-section of firms. The age difference of firms could also have its role in diminishing the suitability of *bv* as deflator. Of two firms that adhere to the historical cost method, the BV of the younger firm is likely to be closer to its fair value.

Beginning-of-period *bv* could have been appropriate if the sample firms were all of the same age, operated in a non-inflationary economy, and used mark-to-market or, at least, identical accounting methods. My panel data, however, spans over more than a decade, and covers firms of different age, operating in different sectors of the economy. Another complication in using lagged *bv* as deflator is that *bv* may often assume negative values. Deflation by negative values is meaningless and those cases would need to be eliminated from the sample. Additionally, the data requirement for the

[29] This would not safeguard against bias, but at least the bias would be identical for all firms in the sample.

availability and positive sign of the beginning-of-period *bv* reduces the sample by about 16%, and is fraught with inducing self-selection bias to the extent that deleted firm-years are qualitatively different from the rest of the sample. Sample reduction is highly undesirable given the *a priori* relatively small segment-disclosing firm-year sample.

**5. Closing book value:**

Although most of the points made above are also relevant to current period BV as deflator, this measure is a popular scale factor used in the literature [e.g., Green *et al.*, (1996), Easton (1998), Stark and Thomas (1998), Danbolt and Rees (2002)]. Easton (1998) note, for example, that since the ratios of market to book value are not affected by management's choice of the number of shares outstanding, the inferences from a regression where price-to-book is the dependent variable will not be due to spurious scale effects. He also suggests that the inferences might be affected by the inclusion of book value in the denominator of the dependent and independent variables, but this effect can be removed by including the inverse of book value as another explanatory variable[30].

Theoretically, this deflator is specifically relevant if one follows Ohlson's framework, where book value of equity is the perceived volume of shareholders' investment base. One of the possible arguments against the use of book value might be the substantial difference (which are reported in Chapter 4) in book value-deflated variables and regression parameters across different industries. Another technical limitation of this deflator is the requirement for the closing book value to be positive. This reduces my sample by about 4%. Finally, should scale encapsulate the notion of firm size, *bv* of equity (either lagged or contemporaneous) is no longer a better scale proxy than other firm-level size proxies.

[30] In fact, this is exactly what I do in relation to the scale-proxy(ies) used in this study.

**6. Total Assets:**

A substantial portion of capital that the firm uses to generate positive returns for ordinary shareholders might come from the incurred liabilities. Although debt financing is not a contribution of shareholders, the profits or losses in excess of interest payments flow to shareholders (leverage effect) and/or impact on the equity book value. Therefore, some size effects may be attributable to or originate from differences in the level of debt. Previously discussed size proxies ignore debt-induced differences in scale.

In contrast to BV and MV, **Total Assets** (TA) reflects the entire capital (liabilities plus equity) invested in the firm. On a positive side is the fact that TA encapsulates the book value of equity and, has no negative values, which saves data points. On the negative side, one may argue that ratios of book value or earnings to total assets (i.e., TA-deflated variables) might be affected by the economic sector of the firm.

**7. Sales:**

**Sales** has also been used in some studies as firm-size proxy [e.g., Hirshey (1985), Barth and Clinch (1998)]. It could be argued that because group sales is an 'outgrowth' of all sources of the firm's capital (i.e., is generated by employing the firm's entire asset base) sales mighty proxy for firm size. Sales-deflation expresses all variables as ratio, hence removes the 'per share' effect. As is the case with other scale factors, the sales-deflator has its shortcomings. Easton (1998), for instance, notes that both the sales-deflated variables and the regression parameters might be affected by such factor as the industrial affiliation of the firm.

Sales and TA might proxy for size, yet as any accounting number, both TA and Sales can be distorted. Nevertheless, these measures create less econometric problems and do not require elimination of observations. Due to the fact that total assets is more highly correlated with other measures of size (i.e., BV and MV) than sales, I choose TA as the primary deflator for tests carried out in Chapter 4 [31].

However, due to the lack of consensus on the issue of scaling in market based accounting literature, I perform crosschecks for sensitivity/robustness of the empirical results by using alternative scale proxies (total assets, group sales, one year lagged equity market value, and a composite scale deflator).

## 3.5. EXTENDING THE MODEL FOR SEGMENT-LEVEL ANALYSIS

Having developed the basic valuation model, it now has to be expanded for the segment-level use. As was noted before, of two identical firms, the one that has higher capitalised expected earnings will have higher market value. That is, in the basic valuation model, relative valuation of two firms is determined by comparing their capitalised expected earnings that proxy for the abnormal earnings[32]. One can follow this line of reasoning to compare valuations of two constituent segments of one firm. More specifically, one can consider the firm to be the sum-total of its constituent reported (domestic and foreign) geographical segments. Hence, the value of the entire firm might be thought of as the sum of values contributed or associated with each of its specific segments.

The notion of the value contribution of a segment to the market value of the entire firm requires some clarification. Two otherwise identical segments representing, say, different geographical regions or lines-of-business might be perceived by the market to have different relative capitalised abnormal earnings if these segments are believed to have different performance prospects. It is logical to assume that investors would attach a higher value to the segment which is associated with higher growth opportunities,

[31] For few observations the sales figure is missing, therefore the sales-deflated sample would be slightly smaller.

[32] Recall that the capitalized book values proxy for normal earnings and the base-value of firms.

profitability, lower risk and, in case of geographic segments, with favourable changes in the future exchange rates. Because of the above factors, the market might perceive different segments to create/contribute to the firm different values, in relative terms. This notion of different relative value contributions of segments is demonstrated below in analytical terms.

Starting from the EBO model, one can disaggregate the firm-level abnormal earnings component into the segment-level constituents:

$$p_t = bv_t + \sum_{\tau=1}^{\infty} \frac{E_t[er_{t+\tau} - r * bv_{t+\tau-1}]}{[1+r]^{\tau}} \qquad =>$$

$$p_t = bv_t + \sum_{i=1}^{n} \left[ \sum_{\tau=1}^{\infty} \frac{E_t[er_{t+\tau,i} - r_i * bv_{t+\tau-1,i}]}{[1+r_i]^{\tau}} \right]$$

where subscript $i$ indicates segment.

The above representation highlights the conjecture that any divergence of market value of equity from its book value reflects the capitalised abnormal earnings of the firm's constituent segments. Similar to the firm-level construct, a segment's capitalised abnormal earnings is the difference between the present value of the stream of the segment's **future expected earnings** and the present value of **future required earnings.**

Two points of clarification are in order. First, in **accounting terms,** the sum of segments' earnings or book values will always equal their consolidated counterparts. This is because all disaggregated numbers are associated with specific geographic or industrial segments, or 'instrumental' segments. An instrumental segment is, effectively, a balancing item, which might cover inter-segment operations, or a geographically or industry-wise unidentified segment. Instrumental segments shall be included in the segment-level model to maintain its equivalence with the consolidated model. However, in empirical tests, conclusions will be drawn on and concern only the valuation properties of specific geographical or business segments.

Second, some might put forward an argument that in **economic terms** the total may not equal the simple sum of this total's constituent parts. That is, agglomeration may be associated with non-zero synergies. This problem, however, does not arise in our settings. The notion of abnormal earnings associated with a specific segment is not used in the sense as if that segment was in itself a stand-alone independent firm. In our settings the abnormal earnings of each segment encapsulates its share in the total synergy resulting from uniting different segments under one firm's umbrella. In other words, our construct implies that the non-zero synergies are 'allocated' to all segments, therefore segments' abnormal earnings reflect their **'post-synergy'** contributions to the value of the entire firm. It is important to emphasise that this study is not trying to 'evaluate' a specific segment on a stand-alone basis, or what would have been the segment's implied valuation compared to a comparable single-segment firm. Rather, the focus here is on relative valuation associated with a specific segment when it already constitutes an integral part of a larger economic entity, the firm.

Separating capitalised segmental earnings from the required earnings will give:

$$p_t = bv_t + \sum_{i=1}^{n}\left[\sum_{\tau=1}^{\infty}\frac{E_t[er_{t+\tau,i}]}{[1+r_i]^{\tau}}\right] - \sum_{i=1}^{n}\left[\sum_{\tau=1}^{\infty}\frac{E_t[r_i * bv_{t+\tau-1,i}]}{[1+r_i]^{\tau}}\right] \qquad (15)$$

where the first (second) bracket represents the present value of future earnings (required earnings) for segment *i*, *(i =1,n)*.

The above analytical model can easily be operationalised into a regression form in the same way as it was done with the firm-level model. That is, by applying to segment-level earnings and book values either Ohlson's framework or Rees's assumptions, the above model can be reduced to a single period linear equity valuation model. The former approach implies:

$$p_t = \sum_{i=1}^{n_t}(1-k_i)bv_{t,i} + \sum_{i=1}^{n_t}k_i\varphi_i * er_{t,i} - kd_t + \delta_2 v_t \quad (16)$$

and the latter approach results in:

$$p_t = \sum_{i}^{n_t} bv_{t,i}\left(1-\frac{r_i}{r_i - g_{BV,i}}\right) + \sum_{i}^{n_t} er_{t,i}\left(\frac{1+g_{ER,i}}{r_i - g_{ER,i}}\right) \quad (17)$$

where subscript "$i$" denotes the $i^{th}$ segment, and '$n$' is the number of disclosed segment by the firm in time $t$.

A virtually identical operationalisation that allows testing the valuation of segments can be obtained by using Wysocki's (1998) model of firm value. Using a set of initial assumptions, he expresses the value of the firm as a function of earnings and managerial operating decisions[33]:

$$p_t = \sum_{i=1}^{N}\left(Max[er_{i,t}/(r - g_{ER,i}), A_{i,t}]\right) \quad (18)$$

where all subscripts are as before; $er_{i,t}/(r-g_{ER,i})$ is the (market) value of segment $i$, if the management exercises future expansion options; $A_{i,t}$ is the value of segment $i$, if the management 'adapts' the segment to an alternative use[34].

Wysocki's model suggests that the profit-maximising manager will continue to operate segment $i$ and exercise all future expansion options if the expansion value of segment $i$ exceeds its current adaptation value (i.e., $er_{i,t}/(r-g_{ER,i}) > A_{i,t}$). This implies

[33] The assumptions are: the firm is comprised of N independent segments; the firm's manager maximises total firm value; the manager has the flexibility to *adapt* or *expand* each segment; segment $i$ earnings, $er_{i,t}$, follow a random walk with drift, $g_{ER,i}$, per period if the manager optimally exercises future expansion options; the *adaptation* value of segment i, $A_{i,t}$, follows a random walk.
[34] Adaptation encompasses any real operating decision that changes the current use of an asset to a superior alternate use.

that for relatively high levels of current earnings from segment $i$, the association coefficient between firm value and segment $i$ earnings will approach $1/(r - g_{ER,i})$. If $er_{i,t}/(r - g_{ER,i}) < A_{i,t}$, then the adaptation value of segment $i$ exceeds its expansion value. If the book value of the firm (or segments) proxies for the firm's (or segment's) adaptation/abandonment value (i.e., $A_{i,t}=bv_{i,t}$) then the value of a firm can be presented as a weighed-average of the two options, expansion and adaptation[35]. For firm-level book value and earnings this implies:

$$p_t = \omega * bv_t + \frac{(1-\omega)}{(r - g_{ER})} er_t \tag{19}$$

or, when values are disaggregated into segmental counterparts:

$$p_t = \sum_i^{n_t} bv_{t,i} * \omega_i + \sum_i^{n_t} er_{t,i} \left( \frac{1-\omega_i}{r_i - g_{ER,i}} \right) \tag{20}$$

where $\omega$ and $\omega_i$ $(0 \leq \omega, \omega_i \leq 1)$ is the probability that the management will exercise the *adaptation* option to the entire firm or segment $i$.

This operationalisation, which draws on Wysocki's simple model, is virtually identical to the previously examined operationalisations that use Ohlosn's and Rees's frameworks.

**The above three operationalisations [equations (16), (17) and (20)] imply that all parameters $k$, $\varphi$, $r$, $g_{er}$, $g_{bv}$ $\omega$ attached to segment-level variables $bv_i$ and $er_i$ can vary across specific geographical and industrial segments, but remain constant within the cross-section of different firms and over time.**

In Rees's setting the earnings multiplier for segment $i$ is determined by that segment's earnings growth rate ($g_{er,i}$) and discount rate ($r_i$); in Ohlson's setting the segmental earnings multiplier is determined by the segment's parameters $k_i$, and $\varphi_i$.; in

[35] The *weigh(s)* reflect(s) the market's perception of the probability that the management will exercise either an expansion of adaptation option with regards to the firm's total assets or specific segment(s).

Wysocki's approach the segment's earnings coefficient is determined by that segment's earnings growth rate ($g_{er,i}$) and discount rate ($r$) and expansion option probability ($\omega$).

In summary, if across its various segments a firm has different relative growth options, degrees of earnings persistence and capitalisation rates, then earnings from these segments should be valued differently, contributing positively or negatively to the value of a firm.

In the above tree operationalisations, both earnings and book values are supposed to be disaggregated into their segmental counterparts. In this study, however, I argue that disaggregation of consolidated book values is **unnecessary** and **impractical.**

There are three practical problems that make book value disaggregation **impractical.**

First of all, book values are not (and cannot be) reported by firms on segmental level. Segmental book value cannot be defined in most real-life cases, because even the firm's management is unlikely to be able to determine in what proportion a specific segment's total assets are financed through equity vs. liabilities. Garrod and Rees (1998), however, disaggregate firm-level book value, but replace the model-required segment-level book values with segmental net assets. From the definition (or, more precisely, lack of precise definition) of segmental net assets in SSAP 25, it is obvious that segmental net assets, as an accounting item, is qualitatively different from that required by the theoretical model. Discretionary allocation of long and short-term liabilities, minority interests and contributions of non-ordinary equity shareholders to specific segments distort what would have been the 'true' segmental book values. This allocation works in a straightforward way at the consolidated level, where the firm's net assets are simply the difference between total assets and long and short-term liabilities. If the requirement of accounting standards were such that the firm's liabilities had to be allocated to segments on a pro-rata basis to their total assets, disaggregation would then make sense. However, financial statements liabilities are not reported with regards to specific segments. In the vast majority of firms' financial reports, it is impossible to identify or establish a relationship between reported segmental **net assets** and segmental **total assets** by studying financial statements. Furthermore, even when there is some degree of consistency in the definition of segmental net assets in one firm, the idiosyncrasy of what constitutes segmental net assets will necessarily arise in a sample that represents a cross-section of firms with very different characteristics.

Arguments similar to those offered above are also put forward by Wysocki (1998). He notes that a direct test of value relevance of segment-level book values is not possible because firms typically do not report liabilities for business segment, reflecting the fact that assigning specific liabilities to a segment may be difficult and does not reflect current reporting standards and practices[36].

Secondly, even when segmental net assets are accepted as proxies for book values, in practice firms report this item less frequently than the segmental earnings. This would reduce the sample by approximately 12%.

Thirdly, because segmental earnings and net assets appear to be strongly correlated (possibly due to uncontrollable segment-level scale effect) the regression results are likely to be biased due to multicollinearity[37].

It can further be argued that disaggregation of the book value is also **unnecessary** from an economic perspective.

The third term in equation (15) represents the sum of present values of all future *required* earnings from all segments. Book value of equity is the accounting

[36] Because the direct valuation of segmental book values is impossible, Wysocki hypothesises a directional relationship that might exist between the valuation of consolidated book value and performance of segments. He suggests that: the value relevance of total book value of equity should be increasing in the likelihood that a number of segment adaptation options (i.e., any real operating decision that changes the current use of an asset to a superior alternate use) will be exercised.

[37] The relevant descriptive statistics and the regression results of alternative model specifications are reported in chapters 5 and 6.

representation of the actual capital invested by owners of the firm during the entire life of the firm. Hence, investors would expect these assets to earn some *required* accounting rate of return or, in absolute terms, *required* earnings. It is a fact that investors, in general, have some expectations with regards to 'required' returns on their investment in a firm's equity capital, which should be commensurate with the perceived riskiness of the entire firm. Because equity investors commit their funds to the entire firm, rather than to a specific project/unit within the firm, it is logical to assume that it is the 'required' earnings of the entire firm that matters to investors. When investing into the equity of a multy-segment firm, investors, in fact, buy a 'portfolio' of different geographical and/or industrial assets/segments which comprise the firm. If one takes the view that equity investors act in spirit of the Markowitz mean-variance portfolio selection, then it is the risk-(required)return characteristics of this entire 'portfolio' (i.e., return which is relevant to firm-level 'systematic'/'undiversifiable' risk) rather than the risk-(required)return characteristics of particular segments comprising the 'portfolio' (i.e., return which would also compensate for segment-specific yet within-firm-diversifiable risks) that matters to investors.

This argument holds even if one refutes the mean-variance portfolio selection argument. Had the investor invested directly into the net asset base of a specific segment, and had her profits been tied up exclusively to the earnings generated from that particular segment, then she might have expected a specific required rate of return on these segmental assets. However, the decision on the geographical allocation of real assets is internal to the firm and reflects the discretion of its management.

Furthermore, the nature of assets might differ across different reported segments. Depending on the geographic allocation and lines-of-business of firm's operations, the composition of the firm's real assets will vary across geographic segments (assuming that different activities would require deployment of different asset classes). For example, a car manufacturer may position its R&D unit (and the assets attached to R&D) in country A, component manufacturing units (and the relevant assets) in country B, assembly lines in country C, etc. At the same time the company may sell cars (and report segmental profits) in all of these geographic locations. Thus, if one mechanically infers that profits from the segment "A" are attributable to the net assets employed in that geographic location (but in fact these assets do not relate to these segmental profits) when attempting to compute the abnormal earnings using the segment-level model, the results would be misleading. These assets may reflect different organisational functions and market analysts might not be able to "apply" the notion of required earnings in relation to these segmental assets. Hence, it is sensible to assume that investors would mainly be considering the required earnings for the net asset base of the entire firm. Even in the ideal case when the structure of assets maintained in different geographic segments is identical (this may be the case, for example, in the retail sector firms that operate similar stores in different regions), the management's discretion in allocating firm's liabilities might make segmental net assets figures meaningless.

Therefore, in contrast to the approach taken by Garrod and Rees (1998), I do not disaggregate the consolidated book value.

Therefore, by appending equations (16) and (17) with the adjustments discussed in Sections 3.4.2 and 3.4.3, the following operationalised segment-level model can be derived:

$$\begin{aligned} mv_t / s_t = {} & a_{0,0} * (1/s) + a_{0,1} + a_{1,0} * (bv_t / s_t) + a_{1,1} * [s_t * (bv_t / s_t)] + \\ & + \sum_{i=1}^{n} a_{2,0,i} * (er_{t,i} / s_t) + \sum_{i=1}^{n} a_{2,1,i} * [s_t * (er_t / s_t)] + b * Z + u_t \end{aligned} \quad (21)$$

It should be mentioned that similar models have already been applied in segment valuation literature. Wysocki (1998) employs essentially the same segment-level earnings disaggregation approach, but without proper control for scale and scale-related nonlinearities, dividends and other contextual variables. Garrod and Rees (1998) disaggregate earnings and, additionally, the book values (which, I argue, is impractical and unnecessary), yet do not control properly for scale and scale-related nonlinearities, and other value affecting contexts.

The section that follows provides further particulars regarding the expected sign(s) and magnitude of coefficients of interest in model (21), their variation depending on contexts, as well as properties of some variables of interest.

## 3.6 INTERPRETATION OF COEFFICIENTS, INFERENCES AND HYPOTHESES

Having outlined the theoretical valuation framework and the subsequent operationalised version of the model for both consolidated and segment-level analysis, in this section I explain the economic meaning of the models' coefficients, hypothesise on their magnitude, sign, interactions and context-specific variations. A concise review of expectations/hypotheses regarding the model's coefficients is presented in the sections that follow.

### 3.6.1 The intercept

The literature is terse in theorising the role of an intercept and why it should (not) be included in the deflated or undeflated regression models of market value on accounting variables. I argue that in its undeflated form the model has to be estimated with an intercept. Theoretically, an un-deflated model shall be estimated without intercept (i.e., intercept is strictly **zero)** if the following three **conditions** hold simultaneously:

1. the RIV model is a reliable and unbiased tool for deriving the 'intrinsic' value of the firm;

2. there is no mispricing or the market is informationally semi-strong efficient; and

3. the simple price-levels regression is a legitimate statistical counterpart/representation of a rather complex theoretical RIV model.

Only if all of the above conditions are met will there be no apparent role for a non-zero average unexplained cross-sectional variation in market capitalisation in the basic un-deflated model. Although the analytical RIV model leaves no role to be played by the intercept, a regression-estimated value of the intercept (if statistically different from zero) would reflect possible misspecifications existing in the theoretical model and/or the market's mispricing. Inclusion of an intercept will at least partially mitigate the consequences of violation of the above three conditions. Furthermore, if the **un-deflated** model is to reflect the reality closer, then even in its theoretical form the intercept is unlikely to be zero. For example, even when the non-dividend paying firm's book value of equity drops to near-to-zero levels or (in some unusual circumstances) becomes negative, and, at the same time, the current period's reported net income is near-to-zero, the firm would still be trading at above-**zero** price. In fact, the market capitalisation of the firm may still be relatively high if the current period's reported 'near-to-zero' BV and earnings are perceived to be transitory, and the market expects them to improve/reverse in future periods. In other words, the theory must permit an average effect that is not explained by a linear combination of the chosen financial statement data.

Furthermore, in Section 3.4.2 and 3.4.3 it has been argued that a non-zero intercept is unlikely to be constant across firms of different scale. Therefore the intercept has been modelled as a simple linear function of scale. Effectively, this means including an intercept and a reciprocal of the scale variable in the deflated model. The estimated coefficient on the inverse of the deflator should be interpreted as the estimate of the 'constant' portion of a scale-related linearly modelled intercept in the un-deflated regression.

A point of interest in the deflated regression will be the level of statistical significance of the coefficient on the deflator's reciprocal, and the sign of the intercept: (1) a positive (negative) sign of this intercept would indicate that the intercept in the un-deflated model is not a size-unrelated cross-sectional constant, but is positively (negatively) correlated with the size of the firm; and (2) a statistically significant coefficient of a deflator's reciprocal would suggest that in the undeflated model there is a non-zero average effect that is not explained by the chosen value drivers.

For the completeness of the analysis of the intercept, one potential difficulty is worth mentioning. When the intercept in the undeflated model is modelled as a linear function of scale, a variable that is selected to proxy for scale might simultaneously be an additional value driver in its own right. In this situation it would be virtually impossible to disentangle its role as an indicator of scale vs. an additional valid value driver. If, for instance, one believes that total assets belong in the **un-deflated** model as an additional value driver and also the same variable has to be a scale proxy, then the value of the intercept in the total **assets-deflated** regression would produce a 'blended estimate' of the un-deflated model's two theoretically separate coefficients on: (i) total assets variable being an additional value driver; and (ii) total assets in a linearly modelled intercept. On the other hand, if total assets do not belong in the un-deflated model as a legitimate value driver, the value of an intercept in the deflated regression would only relate to a linearly modelled intercept in the original un-deflated model. However, to the best of my knowledge, such variables as group sales or total assets have not been considered by the literature as important value drivers even on a theoretical level. Therefore, in the empirical analysis chapters I will not be interpreting the intercept as being a 'blended estimate'.

### 3.6.2 The book value coefficient

Because this coefficient is an estimate of the first bracket in equations (6) and (9.1), its theoretical value has a limit of unity. Theoretically, its lowest value depends on what framework is used to operationalise the model. If we follow Ohlson's line in operationalising the model, then this coefficient has the lower limit of zero. This reflects the theorisation that book value enters the model twice: first, on a stand-alone basis, being the proxy for the base value and, second, in a capitalised form, being a proxy for the required/normal returns. When Rees's framework of hypothesis is taken, the book value coefficient still reflects the dual role of the book value[38]. Contrary to Ohlson's approach, however, here this coefficient might assume a negative value. From the theoretical model, it will only have a positive value when the assumed long-term book value growth rate is negative or exceeds the cost of capital '$r$'. For economically sensible book value growth rates (i.e., $g_{BV} < r$) the theoretically expected book value coefficient is negative [see equation (9.1)]. A negative sign of the book value coefficient, when regressed on market value, is rather contraintuitive.

In the empirical tests, I expect to find a significant association of book value with market value, which would be suggestive of book value being a major value driver. The sign of this coefficient is expected to be positive and, normally, have a value below unity. Consistently downwards biased book values might result in book value coefficient to exceed the upper limit of unity[39].

### 3.6.3 Firm-level and segmental earnings coefficients

Earnings coefficients are of central importance to this research because valuation differences associated with segments are inferred from differences between valuation

[38] This is because both approaches originate from the residual income valuation model.
[39] Proof of this is available from the author.

multiples associated with earnings from specific segments. In all examined operationalisations (i.e., Ohlson's, Rees's and Wysocki's valuation frameworks), the earnings coefficient has an expected positive value. Because the operationalisation used in this study equally well reflects all three frameworks, the regression-estimated earnings coefficients would, to some extent, subsume factors that determine theoretical coefficients in all three frameworks.

Thus, the firm-level earnings multiple will 'summarise' investors perceptions regarding the following factors: the level of persistence of earnings, the discount rate (risk-adjusted cost of capital), and the expected long-term earnings growth rate. Similarly, the actual value of the coefficient on earnings from a specific segment, e.g., the 'America' geographic segment, would be a summary measure of investors' perception about the persistence of earnings reported from the 'America' segment, risks attached to this segment and reflected in the discount rate, and the expected long-term rate of growth of 'American' earnings. In other words, the earnings valuation coefficient is the capitalisation rate attached by the market to current period earnings from a specific segment, which summarises investors' perceptions regarding the firm/segment long-term growth rate, required rate of return and degree of earnings persistence. It is this overall assessment of the earnings capitalisation rate that is of key interest in this study, as it allows comparison of value contributions associated with specific segments. The issue of what factors are responsible for identified differences between segments' earnings multiples is of secondary importance and is addressed by further appending the model by additional signalling variables.

Another important issue is the stability of earnings coefficients. The existing literature [e.g., Hayn (1995), Basu (1997), Barth, *et al.*, (1998), Collins *et al.*, (1999) and others] demonstrates that the capitalisation of earnings (i.e., earnings coefficients) is a function of the sign of reported earnings (i.e., profits vs. losses), and/or normality (abnormality) of earnings. In these and other empirical studies, the coefficient on negative (or abnormally high/low) earnings is usually found to be much smaller in absolute terms and often statistically not significant. A transitory quality of losses (or unusual level of reported earnings) is put forward as a common interpretation for this finding. Whatever is the explanation, it is a well-documented fact that the sign of earnings affects the way the market perceives and capitalises earnings into the share price[40]. Results presented in the empirical Chapters 4 through 6 confirm the existence, in my data set, of this sign-related effect for both firm and segment-level earnings. These results also provide further context-related particulars with reference to valuation of negative earnings and general regression properties.

### 3.6.4 Coefficient on dividends

It has been argued, in Section 3.3.1, that dividends needs to be added in the model as an additional value driver. What can be expected from the valuation of dividends is less obvious than is the case with book value and earnings. From the Modigliani and Miller's (1958) dividend displacement theory, it follows that the payment of dividends shall be negatively related to the value of the firm and replace the firm value on a pound-for-pound basis. This theory would predict a negative coefficient on dividends in our operationalised model. In Ohlson's theoretical framework, dividends closely reflect the dividend displacement theory and enter the model with a negative coefficient. However, extensive accounting literature both in the UK and the US (with test design similar to the one employed here) tend to find a positive valuation role for dividends, and put forward various rationalisations for such results. As this issue and the expectations regarding the role of dividends in the valuation model employed in this study has already been analysed, it suffice to note that dividends coefficient is expected

[40] The economics of this effect is outside the scope or current research.

to have a positive sign. Having said that, the value of the dividends coefficient is expected to vary, being affected by such contexts as: loss vs. profit firms; segment-disclosing vs. non-disclosing firms; firms of different industrial affiliation; and different time periods (macroeconomic growth vs. stagnation). Results reported in the empirical chapters confirm this expected sensitivity of dividends valuation to be substantially contextual.

## 3.7. CONCLUDING COMMENTS

The aim of this chapter has been to discuss and justify the choice of specific methodological approaches, which underpin the test design(s) employed in the empirical Chapters 4 through 6. Specifically, the chapter demonstrates how the RIV model can be adapted to allow both firm-level and segment-level analysis. The chapter also discussed the problems and the choices made to resolve them, associated with scaling and choice of size-proxy when utilising price-level data for cross-sectional sample estimates. The chapter also examined some of the important properties of the developed valuation framework and hypothesises regarding the expected links between the market value of equity and the value drivers of interest.

# CHAPTER 4

# CONSOLIDATED FIRM-LEVEL ANALYSIS

## 4.1 INTRODUCTION

The purpose of this chapter is to assess the general valuation properties of the operationalised valuation model, introduced in Chapter 3, by using the firm-level data. Among the main objectives of this chapter is to identify exogenous and endogenous factors that significantly influence firm-level valuation inferences. These factors will constitute the 'contexts', which are necessary to control for in the subsequent segment-level empirical analysis chapters.

The chapter is structured as follows. **Section 4.2** describes the process of data collection, explains variables used in the analysis, examines the data and sample's properties and reports the descriptive statistics. **Section 4.3** reports the firm-level regressions, carries out the empirical investigation of the contexts/factors that impact on the firm-level valuation results, and analyses the obtained results. **Section 4.4** provides further empirical testing of the sensitivity of the results to such potentially influential factors as the use of an alternative deflator, or the definition and treatment of the extreme observations. **Section 4.5** concludes.

## 4.2 DATA, VARIABLES, SAMPLES AND DESCRIPTIVE STATISTICS

### 4.2.1 Data collection and variables

This section provides details on data sources, data selection methodology, types of data and variables selected for performing the firm-level analysis, and relevant descriptive statistics.

The data is collected from the Extel Financial Company Analysis service, unless otherwise specified. I select all UK based, non-financial, 'dead' and 'live' quoted companies with annual financial statement and market data available from the Extel database. In Extel this information is available beginning from year 1986. The initial sample covers the period from January 1986 to November 2002 (date of data collection).

The reason for selecting Extel Financial Company Analysis as the primary source of data is because it is the only database available to me that provides segment-level financial statement data for UK multi-segment firms.

In the process of data collection, the following Extel company selection criteria have been used:

Country: UK

Currency: Pound Sterling (amounts are expressed in thousands)

Industry (according to FTSE Global Classification System):

1. Resources
2. Basic Industries
3. General Industries
4. Cyclical Consumer Goods
5. Non-Cyclical Consumer Goods
6. Cyclical Services
7. Non-Cyclical Services
8. Utilities
9. Information Technology

Status: not selected (i.e., all live and dead firms are selected)

Data/variables requested: see **Appendix 4.1**

Classification of companies into specific economic sectors (industries) can be done on the basis of different systems of industrial classification. The definitions of industries and economic sectors of business activities vary depending on the choice of industry classification system. Although some big investment houses (e.g., Merrill Lynch) use their own systems of industrial classification, the FTSE Global Classification System (FTSE) and the US Standard Industrial Classification System (SIC) are perhaps the dominant systems in the UK. There are significant structural differences between these two systems (this issue is analysed in more details in Chapter 6).

Because of these differences, non-selection of firms classified as financials by the FTSE system does not guarantee non-selection of firms which would be classified as financials by the SIC system. I use the FTSE system as the basis for selecting firms from Extel.

During the sample period some firms changed their principal industrial affiliation. For this reason some financial firm-years appear in the initial sample. In the empirical analysis, when necessary, these observations are eliminated.

As of the date of final data collection (01.11.2002) there were 3,615 (live and dead) companies meeting the above selection criteria. Corresponding to these firms there are 35,214 firm-year observations. This means that in this initial sample, on average, 9.7 years of financial statements are available per company in the Extel database.

To minimise losses in data points, where possible, the missing value of equity market capitalisation has been imputed by multiplying the share price at the balance sheet date and the number of ordinary shares outstanding. However, some 15,906 firm-year observations have been deleted due to missing market capitalisation data. I also delete observations with missing values for book value of ordinary equity (ordinary shareholders' equity) and firm-level profit before tax. With respect to other variables of interest, where possible, the missing values are retrieved from other sections of the Extel database[1]. At this stage, I do not impose additional segmental data availability restrictions on this initial sample because segment-level information is not used for the consolidated-level analysis of this chapter.

Extremely thinly-trading and non-trading firm-years are also identified and deleted from the sample. The firm is identified as non-trading if in two or more

[1] For example, Sales are reported both in Extel's "Segmental Analysis" and "Earnings" sections. When the value is missing from "Segmental Analysis" it may sometimes be found in the "Earnings" section. In total there are 28 such cases. The same applies to PBT, as this component can also be found in two different data sections of Extel.

consecutive years it reports identical market value of equity, or there is no change in the share price and number of shares for two consecutive years.

The above eliminations reduce the number of firms in the sample to 2,390 and number of corresponding firm-year observations to 19,213. That is, on average, 8 years of financial statement data is available per company.

### 4.2.2 Industrial and yearly sample characteristics

As a starting point for the empirical analysis it is important to explore yearly and industrial characteristics of the initial sample. The Extel database reports the economic sector affiliation of firms based on both FTSE Global classification system and the Standard Industrial Classification system. It is, *a priory*, unknown which of these two systems of categorisation of a firm's industrial affiliation more adequately reflects the principal area of the firm's operations. More importantly, though, is to know which of these two systems are being commonly used in the UK by the investment community (i.e., informed investors, market analysts, fund managers, etc.) to relate a firm's activities/performance to its peer group. It is likely that different members of the investment community use different classification systems. Furthermore, it is known that large investment houses use their own 'in-house' classification for economic sectors and industries. As there is no reliable indication regarding the type of classification system that is being commonly used by the market, I analyse the sample firms in terms of two widely used industrial classification systems. **Appendix 4.2** provides the summary of the industrial and yearly properties of the initial sample.

I first analyse the 'industry-year matrix' of distribution of firms-years, when industrial affiliation of firms is identified according to the FTSE Global Classification system.

The *Cyclical-Services* comprises the largest industrial category of firms, accounting for 34.4% of the total number of cases. This economic group includes retailers, leisure, hotel, media and entertainment companies, business support and transportation firms. The number of firms in this industry showed an increase through the years 1987-1997, and stabilised in the years 1998-2001.

The second-largest economic group, *General Industrials*, accounts for 15% of total sample and includes aerospace and defence companies, and firms that manufacture machinery, engineering products, electronics and electrical equipment. The yearly number of firms in this group was stable throughout 1998-1996, but showed a substantial downward sloping trend in later years.

The third-largest economic group, *Non-Cyclical Consumer Goods*, contributes 12% to the total sample and represents firms producing food, beverages, tobacco, drug and household products. The number of companies in this economic group had an increasing trend until the mid-1990s, but have been declining steadily thereafter.

*Basic Industries* firms comprise 11.5% of the total sample and are engaged in chemicals, building materials, timber and metals manufacturing, as well as construction. The yearly number of firms in this group was stable throughout the 1989-96 period, but showed a pronounced declining trend thereafter.

The *Cyclical Consumer Goods* group accounts for 9.6% of the sample in firm-years and includes automobile manufacturers and household goods and textiles producing firms. In its pattern of the yearly firms numbers, this group is virtually identical to *Non-Cyclical Consumer Goods.*

The *Information Technology* economic group (which includes IT hardware and software manufacturers and service providers) contributes 8% to the total sample. However, there has been a substantial growth in the number of firms in this group over the entire sample period. For example, in 1990, IT firms comprised 4.9% of that year's total sample, while in years 1995, 1999 and 2001 these figures grew to 6.1%, 10.6% and 15.4% respectively!

Firms in the *Resources* economic group, which operate in mining and oil and gas industries, account for only 3.4% of the entire sample and the yearly numbers show no apparent trends.

The *Utilities* economic group firms and *Non-Cyclical Services* (food and drug retailers and telecommunication) firms contribute less than 3% each to the number of firm-years in the sample. The number of *Utilities* firms, in the entire sample, has been steadily declining from year 1995 onwards, yet the yearly numbers of *Non-Cyclical Services* firms showed a steady increase over the entire sample period.

Although detailed analysis of industrial trends and their economic determinants is outside the scope of this study, and without an in-depth examination it would be difficult to ascertain what produces those trends, some general overview is still necessary. The observed above 'in-sample' patterns might not be totally descriptive of the entire population, yet are indicative of the general trends in economic sectors because the sample includes all major quoted public limited companies (in a given industry) available from the Extel database.

There are industries, in particular the two Services sectors and Information Technology sector, that tend to expand (in terms of number of firms per year) over the entire sample period. Virtually all manufacturing industries (such as *Basic* and *General Industries*, and *Cyclical* and *Non-Cyclical Consumer Goods*) and the *Utilities* 'downsized' in terms of the number of firms over the second half of 1990s and early 2000s, while the *Resources* has been the most stable sector[2]. These patterns reflect, perhaps, shifts in the industrial composition of the UK economy and changing relevant importance of particular industries.

[2] Consolidation within these industries could, perhaps, partially explain the observed downward trends in the late 1990s and early 2000s, but this is unlikely as the global economic downturn of that period substantially depressed mergers and acquisitions activities.

Similar trends are observable when the sample is partitioned yearly and analysed across **SIC classification-based** industrial categories.

The *Services* division is the largest economic group and accounts for 22.7% of the entire sample. Furthermore, its proportion in the yearly samples has been constantly increasing over the entire sample period. Thus in the early-1990s *Services* firms comprised about 18% of yearly samples, in mid-1990s the share of this economic sector went up to about 22%, and in late-1990s and early 2000s this percentage topped 30%. This pattern is virtually identical to that of the two *Services* sectors in FTSE-based sector classification.

The second and third largest economic sectors are *Manufacturing* (22%) and *Food, Textile, Paper and Chemicals* (17%)[3]. Both sectors expanded steadily until 1996, but after that exhibited a substantial downsizing trend.

*Retail Trade* sector comprises 10% of the total sample, and steadily expanded over the 1990s only to drop in year 2001.

The *Wholesale Trade* sector firms contribute 9% to the total sample. This sector had no particular trend up until the late 1990s, but then decreased notably.

The *Transportation, Communications, Electric, Gas, and Sanitary services* sector, comprising 8% of the entire sample, showed a sharp increase in the first half of 1990s, but had no particular trend thereafter.

The *Construction* sector contributes 5% to the sample and has a notably declining trend in the late 1990s and early 2000s.

The *Mining* sector contributes 3.3% and is the most stable throughout the sample period. This pattern is virtually identical to that of the FTSE's *Resources* sector.

The *Agriculture, Forestry and Fishing* is the smallest economic sector, and shows no particular trend.

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[3] It should be noted that these two sectors are created artificially, by splitting the SIC's single Manufacturing Division into two parts. That is, I separate heavy industries from consumer goods manufacturers, as these two groups might have different valuation characteristics.

As one could expect, there is a great deal of similarity between the FTSE and SIC-defined economic sectors that relate to similar types of business activities. Thus Services-related industries both in the FTSE and SIC classifications exhibit similar trends and increasingly comprise the largest share of the total sample. Similarly, identical trends can be observed in: the *Manufacturing* sectors of SIC system and *General* and *Basic Industries* of FTSE system; and *Mining* sector of SIC system and *Resources* economic group of FTSE system. This evidence suggests that FTSE and SIC systems of industrial classification are similar in nature.

In terms of both the FTSE and SIC classifications, yearly samples are of similar size, within 1000-1450 cases, apart from the first and last year of the sample period, where yearly samples contain about 400 and 700 cases, respectively[4].

**4.2.3 Variables-related sample characteristics**

Having examined the yearly and industrial composition of the total sample, I now turn to the analysis of the characteristics of the key value-relevant financial statement variables in the industrial and yearly sub-samples. The objective is to identify those economic sectors that are most similar/dissimilar to each other in terms of key financial statement variables. This information would provide more insight during the process of drawing inferences about the valuation of firm's business segments. This may also reveal industrial sectors, and hence business segments, which are qualitatively similar and, therefore, could be agglomerated without loss of integrity. Similar/dissimilar sectors are identified by comparing descriptive statistics of a number of accounting and market variables of firms from different industrial sectors.

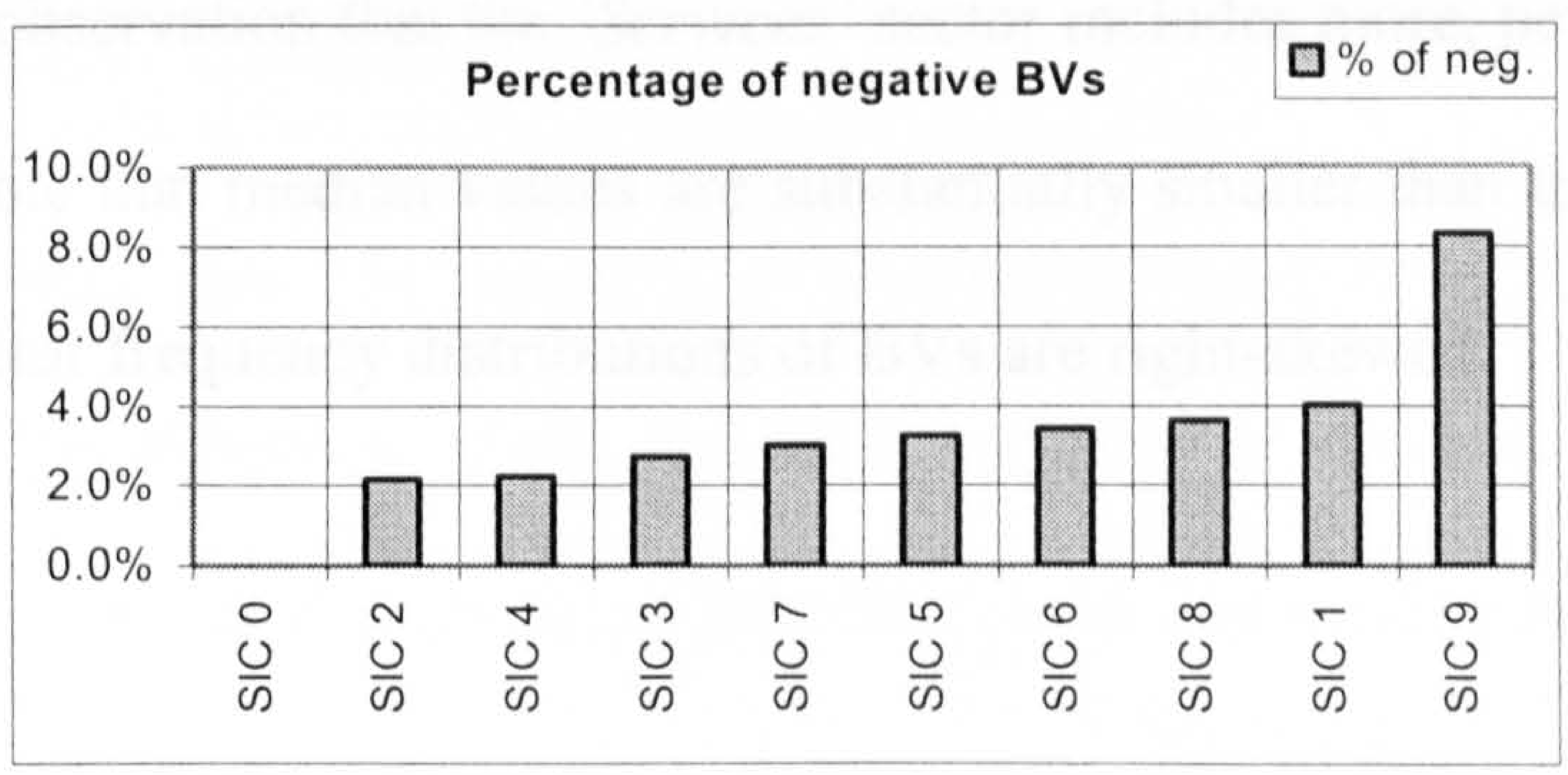
[4] This is because the data collection was completed in November 2002. With regards to the low number of observations in the first year, 1987, of the sample period, at that time Extel database was still in the process of expanding its coverage.

#### 4.2.3.1 Book value of equity

First, I examine the frequency of firm-years with negative equity book values across different economic sectors. The sign of the book value of equity is an indication of the financial health of a company. When compared across industries, the frequency of negative BVs could provide some insight into the relative financial health of different industries. The figure below ranks industries by number of firm-years with reported negative book values.

**Figure 4.1**

| Industry * | Total | Neg. BV | % of neg. |
|---|---|---|---|
| SIC 0 | 145 | 0 | 0.0% |
| SIC 2 | 923 | 20 | 2.2% |
| SIC 4 | 4202 | 94 | 2.2% |
| SIC 3 | 3304 | 91 | 2.8% |
| SIC 7 | 1906 | 58 | 3.0% |
| SIC 5 | 1523 | 50 | 3.3% |
| SIC 6 | 1685 | 58 | 3.4% |
| SIC 8 | 491 | 18 | 3.7% |
| SIC 1 | 644 | 26 | 4.0% |
| SIC 9 | 4347 | 361 | 8.3% |



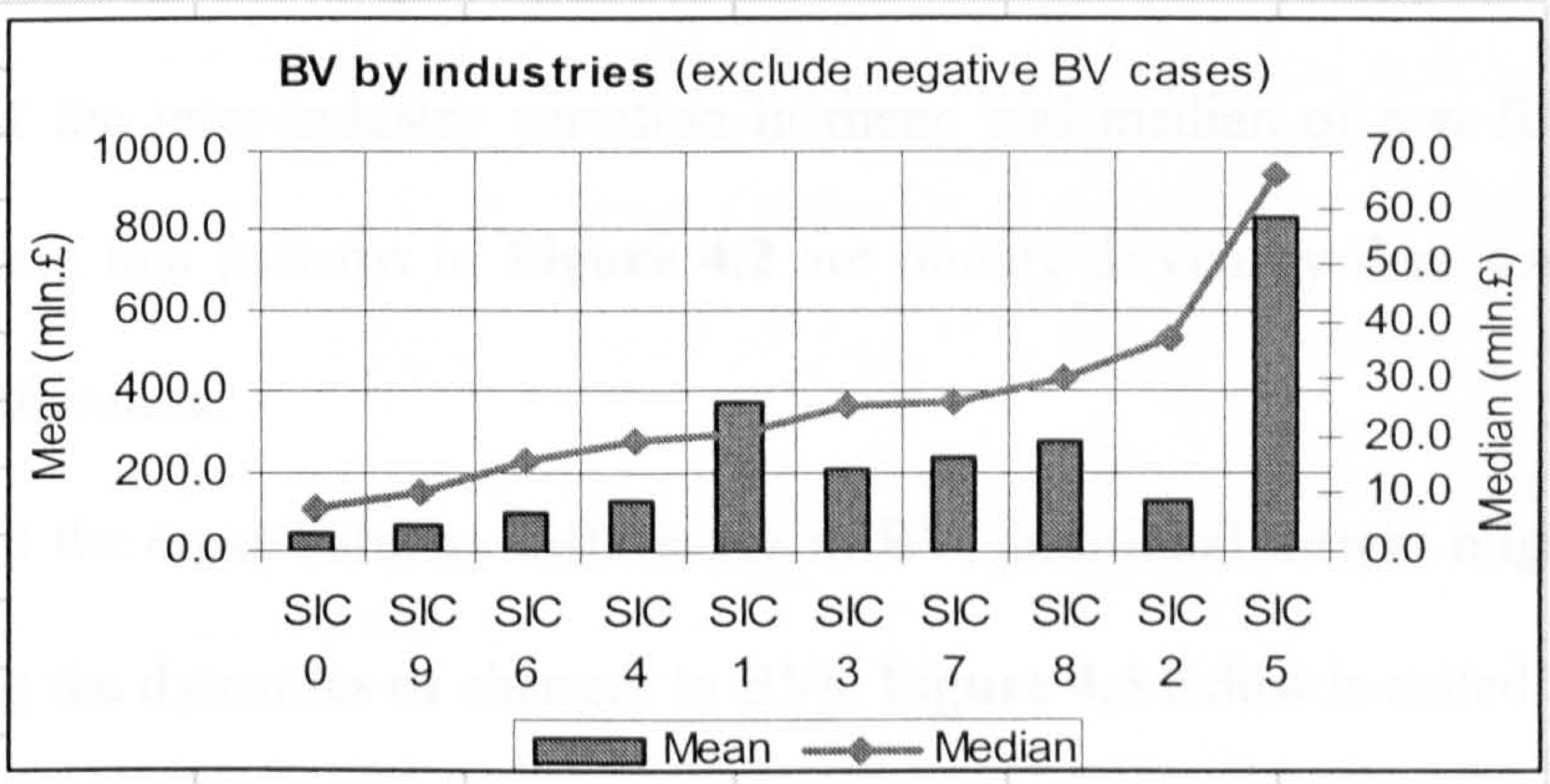

* The employed industry SIC abbreviations are as follows: SIC0 = Agriculture, Forestry and Fishing; SIC1 = Mining; SIC2 = Construction; SIC3 = Food, textile, paper and chemical products (i.e., two-digit SIC codes of 20 through 29); SIC4 = Manufacturing (i.e., two-digit SIC codes of 20 through 29); SIC5 = Transportation, Communications, Electric, Gas, And Sanctuary Services; SIC6 = Wholesale Trade; SIC7 = Retail trade; SIC8 = Finance, Insurance, and Real Estate; SIC9 = Services.

The figure shows that the percentage of firm-years with negative BVs varies within the range of 2-4% for 8 out of 10 industries. There is only one industry, *Services* (SIC9), with unusually high proportion of firm-year observations with negative book values. The analysis of this industry across the sample period (see the previous section) suggests that this is a rapidly growing sector with more new firms entering the market each consecutive year. Therefore, the observed high level of negative BV cases in the *Services* industry, may be due to new firms being more likely to report negative financial results in the initial stage of their life cycle. Therefore a special consideration should be given to the valuation model's results with regards to *Services* industries.

The cross-sectional mean and median values of the *unscaled* BVs, when compared across different sectors, might be indicative of differences in the average size of firms that belong in different industries. However, when drawing such conclusions one should remember that some of the differences might stem from possible inter-industry differences of the accounting nature, i.e., what accounting treatment is given to certain categories of assets, expenses and transactions or events. **Figure 4.2** provides this summary[5]. This figure indicates that *'Transportation, Communications, Electric, Gas, and Sanitary Services'* sector firms are, on average, larger than other firms in the sample, while *'Services'* sector firms are among the smallest firms in the sample. The latter agrees with our previous observation that the *'Services'* sector includes more, new growing firms. One can also note that median values are substantially smaller than the means, suggesting that intra-sector frequency distributions of BVs are right-skewed.

**Figure 4.2**

| Industry* | Mean | Median |
|---|---|---|
| *SIC 0* | 50.6 | 7.5 |
| *SIC 9* | 70.1 | 10.1 |
| *SIC 6* | 99.2 | 15.8 |
| *SIC 4* | 128.7 | 19.0 |
| *SIC 1* | 371.0 | 20.7 |
| *SIC 3* | 207.6 | 25.6 |
| *SIC 7* | 237.9 | 26.4 |
| *SIC 8* | 270.2 | 30.0 |
| *SIC 2* | 127.3 | 37.0 |
| *SIC 5* | 837.3 | 66.0 |




* The employed industry SIC abbreviations are as follows: SIC0 = Agriculture, Forestry and Fishing; SIC1 = Mining; SIC2 = Construction; SIC3 = Food, textile, paper and chemical products (i.e., two-digit SIC codes of 20 through 29); SIC4 = Manufacturing (i.e., two-digit SIC codes of 20 through 29); SIC5 = Transportation, Communications, Electric, Gas, And Sanctuary Services; SIC6 = Wholesale Trade; SIC7 = Retail trade; SIC8 = Finance, Insurance, and Real Estate; SIC9 = Services.

**Figure 4.2** is based on the undeflated BV. In the regression analysis, however, all employed variables are deflated by the scale proxy. Therefore it would be

[5] Although the Median and Mean values in the table are computed only for firm-years with positive book values, the patterns remain identical when negative BV cases are also included.

informative to examine the industrial characteristics of the deflated BV (see **Figure 4.2.1**)[6].

**Figure 4.2.1**

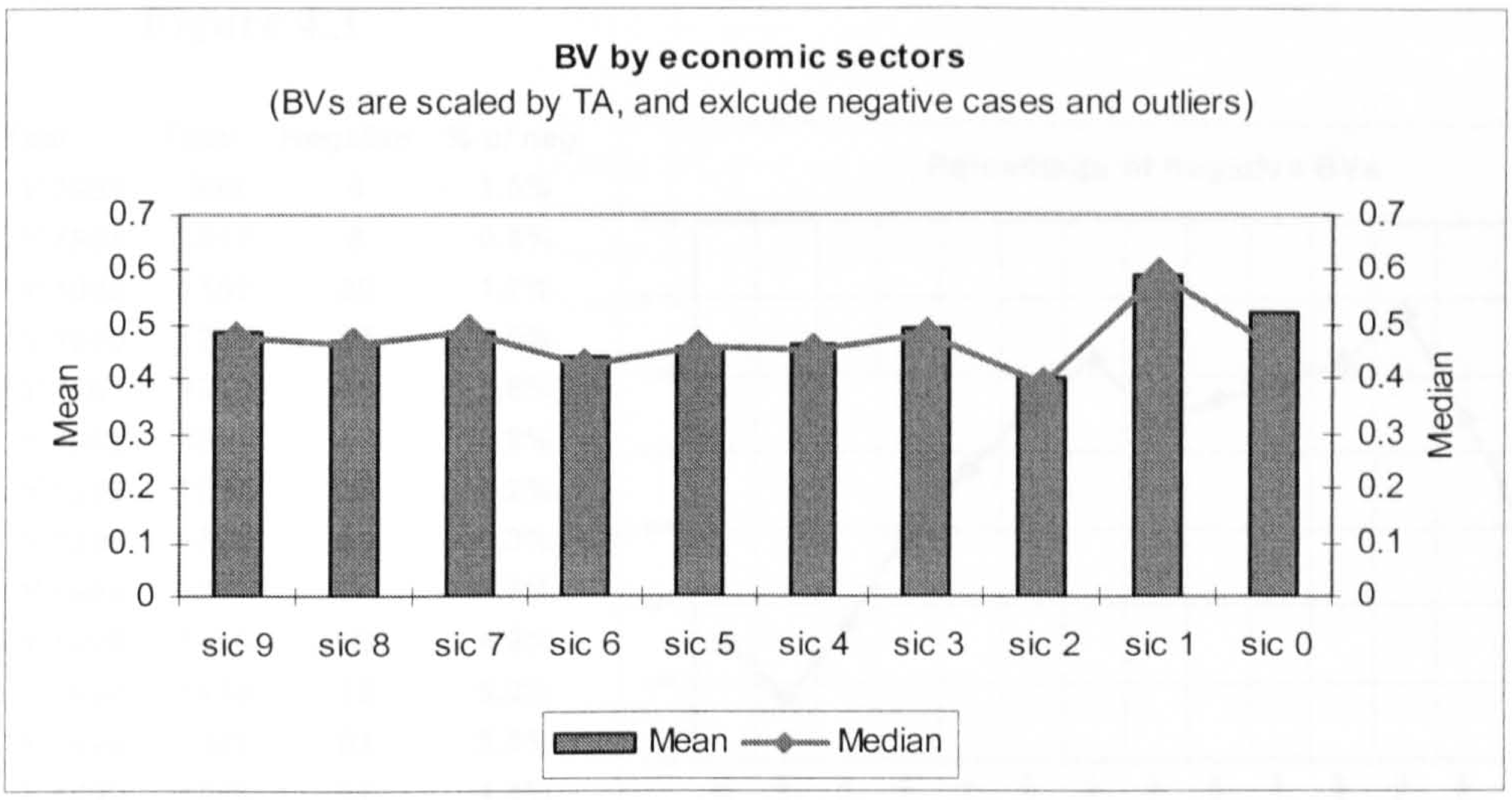



**Figure 4.2.1** demonstrates that the mean and median deflated BVs are remarkably stable in 8 out of 10 industries[7]. Only the *Mining* (SIC1) [*Construction* (SIC2)] industry firms appear to have a *slightly* larger [smaller] mean and median BV than the rest of industries. By and large, **Figure 4.2.1** demonstrates that deflation by scale eliminates most of the inter-industry variation in mean and median of raw BV. Therefore, it could be said that patterns in **Figure 4.2** are mostly driven by firm size-related inter-industry differences.

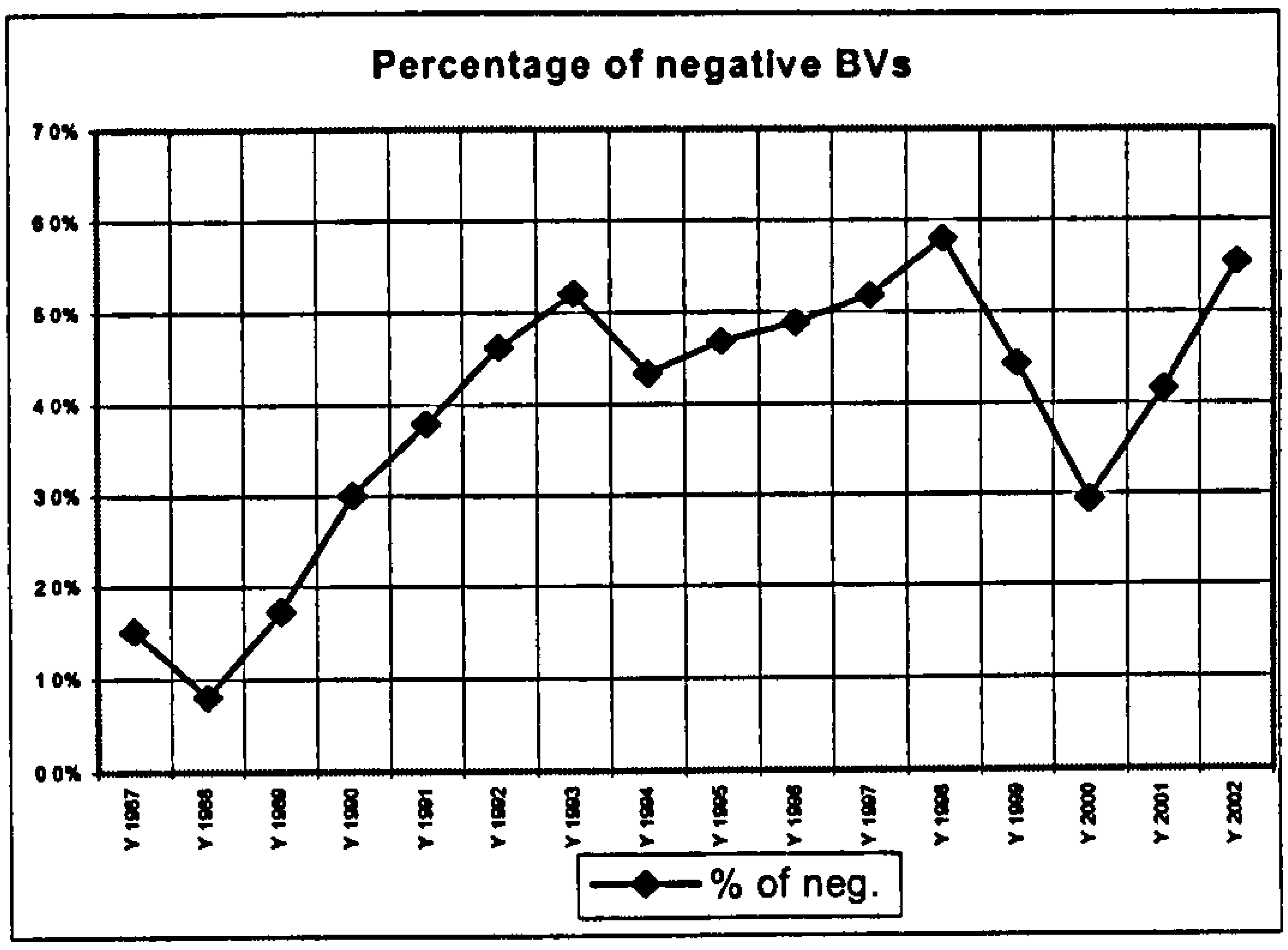
Having examined the cross-industry differences in BV, additional insight might be gained from exploring the dynamics of changes in BVs. **Figure 4.3** below is called to expose yearly patterns in the sign of BVs. The figure reveals a pronounced upward sloping trend, throughout the decade 1988-1998, in the percentage of firms, in the entire sample, that report negative book values. This trend is somewhat surprising, as that decade corresponds to a period of relatively strong performance of the UK economy.

[6] Here and in the follow-up figures that report deflated yearly and industrial BV, PBT and MV, total assets are used as the scale proxy. However, deflation by alternative scale-proxies, such as sales, lagged MV, or composite deflator, does not change the observed patterns.
[7] Because book values are deflated by total assets, the reported means and medians also reflect the industry-average capital structure.

Contrary to intuition, in the period of the 1999-2001 economic slowdown the frequency of reported negative book values was lower than in periods of strong economic growth.

**Figure 4.3**

| Year | Total | Negative | *% of neg.* |
|---|---|---|---|
| *Y 1987* | 393 | 6 | 1.5% |
| *Y 1988* | 1012 | 8 | 0.8% |
| *Y 1989* | 1152 | 20 | 1.7% |
| *Y 1990* | 1235 | 37 | 3.0% |
| *Y 1991* | 1269 | 48 | 3.8% |
| *Y 1992* | 1234 | 57 | 4.6% |
| *Y 1993* | 1286 | 67 | 5.2% |
| *Y 1994* | 1364 | 59 | 4.3% |
| *Y 1995* | 1367 | 64 | 4.7% |
| *Y 1996* | 1414 | 69 | 4.9% |
| *Y 1997* | 1448 | 75 | 5.2% |
| *Y 1998* | 1395 | 81 | 5.8% |
| *Y 1999* | 1286 | 57 | 4.4% |
| *Y 2000* | 1329 | 39 | 2.9% |
| *Y 2001* | 1327 | 55 | 4.1% |
| *Y 2002* | 702 | 39 | 5.6% |



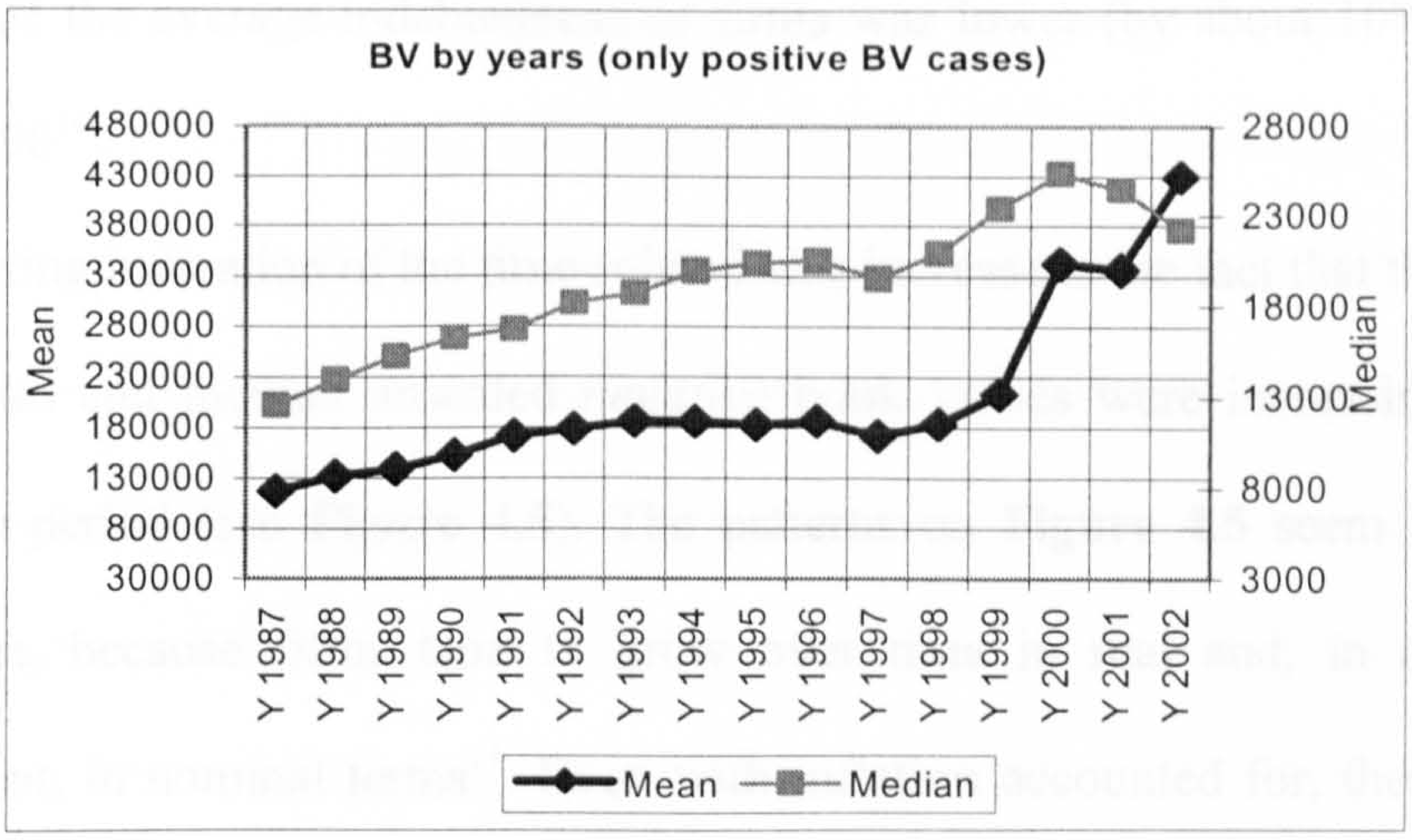

Analysis of specific industries (not reported here) also reveals that this pattern is not caused by a specific industry[8]. In the context of the RIV mode, which underpins the operationalised model developed in Chapter 3, and employed in the empirical ananlysis throughout chapters 4 to 6, negative book values cannot be a meaningful valuation factor. The phenomenon of the growing frequency of reporting negative book values might ultimately undermine the value relevance of that accounting variable in the context of residual income valuation models.

As has been discussed in Chapter 3, BV is often used in the literature as a proxy for firm size. The chronological analysis of firms' average BVs, presented in **Figure 4.4**, suggests that firms were growing in size for almost the entire sample period, with the exception of last two years (2001 and 2002)[9].

[8] An in-depth investigation of what might cause this phenomenon (e.g. goodwill write offs) would, perhaps, be an interesting exercise, yet it is outside the scope of this study.
[9] Although reported in the table average numbers exclude cases with reported negative BVs, inclusion of such cases does not change the pattern.

**Figure 4.4**

| Year | Mean | Median |
|---|---|---|
| Y 1987 | 117114 | 12588 |
| Y 1988 | 132154 | 13934 |
| Y 1989 | 138974 | 15207 |
| Y 1990 | 152111 | 16217 |
| Y 1991 | 171499 | 16684 |
| Y 1992 | 178404 | 18161 |
| Y 1993 | 185608 | 18725 |
| Y 1994 | 186047 | 19943 |
| Y 1995 | 182412 | 20342 |
| Y 1996 | 186606 | 20485 |
| Y 1997 | 171478 | 19515 |
| Y 1998 | 183483 | 20909 |
| Y 1999 | 213643 | 23410 |
| Y 2000 | 342255 | 25400 |
| Y 2001 | 336281 | 24481 |
| Y 2002 | 429526 | 22222 |




To examine whether this upward sloping trend is a size-driven phenomenon, I compute yearly mean and median total assets-scaled BV (see **Figure 4.4.1**).

**Figure 4.4.1**

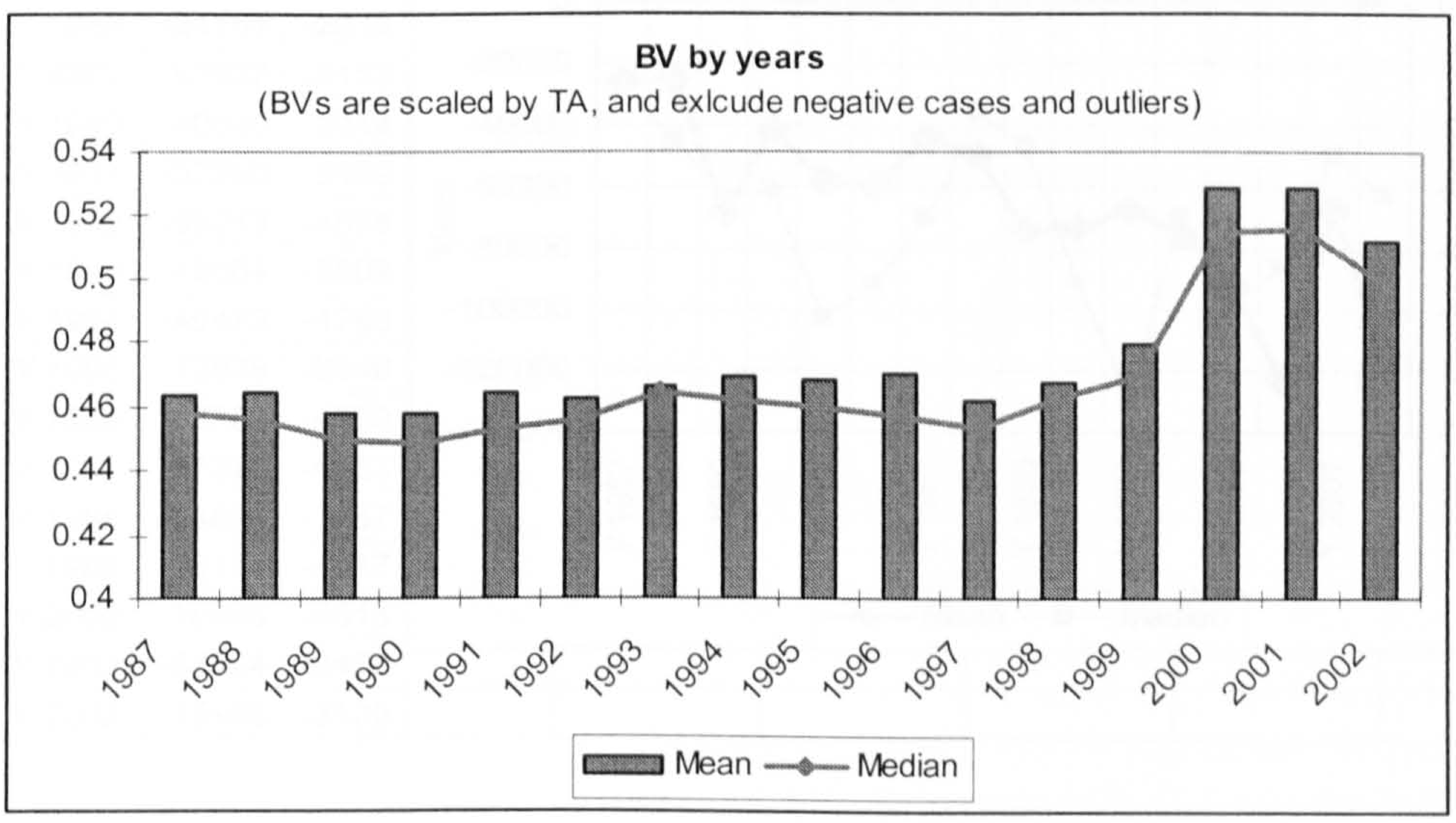


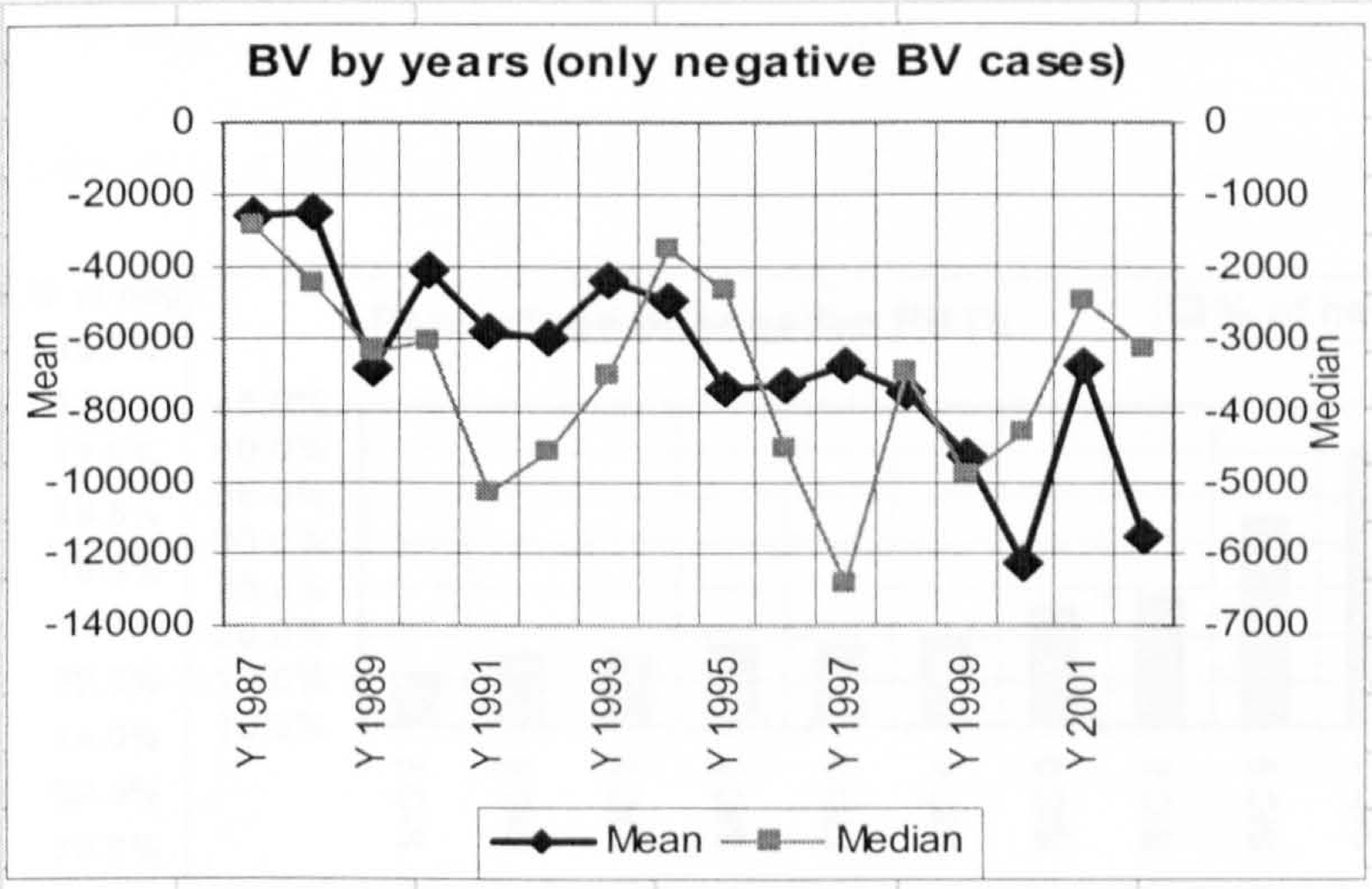

**Figure 4.4.1** demonstrates that during first 13 years of the sample period the yearly mean and median *scaled* BV had been virtually constant, while in the case of the *unscaled* yearly BV (see **Figure 4.4**) there had been a strong upward trend. This indicates that the size of sample firms was growing in that period. Figure 4.1.1 shows that there was a sharp yet, in percentage terms, small increase of the mean and median

value of scaled BV in year 2000. This seems to suggest that in the period of economic slowdown of 1999-2002 the average indebtedness of firms was lower (by about 10%) than in period 1987-1998[10].

Another supporting indication of the time-related size increase is the fact that the absolute values of mean and median unscaled *negative* book values were increasing throughout the sample period (see **Figure 4.5**). The patterns on **Figure 4.5** seem to conform with intuition, because firms tend to grow over time in real and, in an inflationary environment, in nominal terms[11]. Even with inflation accounted for, there still exists an upward trend in yearly BVs, suggesting that firms have been growing in real terms over the sample period.

**Figure 4.5**

| Years | Mean | Median |
|---|---|---|
| *Y 1987* | -25577 | -1409 |
| *Y 1988* | -24161 | -2212 |
| *Y 1989* | -67932 | -3153 |
| *Y 1990* | -40640 | -3044 |
| *Y 1991* | -57250 | -5169 |
| *Y 1992* | -59213 | -4578 |
| *Y 1993* | -43504 | -3502 |
| *Y 1994* | -49475 | -1763 |
| *Y 1995* | -73839 | -2340 |
| *Y 1996* | -72732 | -4550 |
| *Y 1997* | -67228 | -6453 |
| *Y 1998* | -74898 | -3437 |
| *Y 1999* | -93151 | -4917 |
| *Y 2000* | -1E+05 | -4316 |
| *Y 2001* | -67124 | -2453 |
| *Y 2002* | -1E+05 | -3129 |




### 4.2.3.2 Profit Before Tax (PBT)

Having examined the in-sample 'behaviour' of book value of equity, I now explore, perhaps, the most important value driver, earnings. In theory, we shall be talking about 'earnings for ordinary equityholders', as this is the variable required by

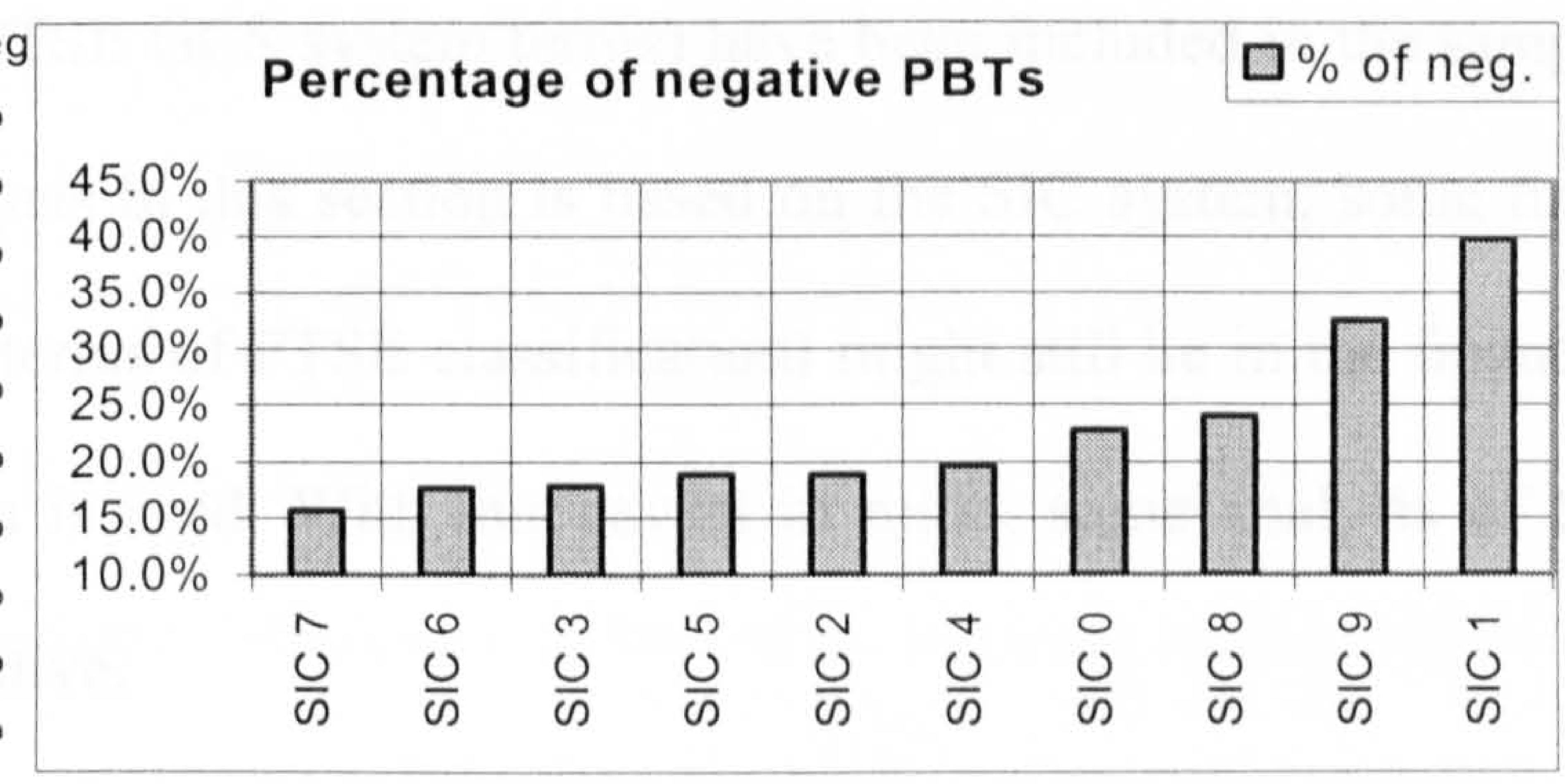
[10] Examination of factors that caused this shift in capital structure is outside the scope of this study.
[11] Note that nominal monetary numbers are used to calculate mean and median values in the table.

the opeartionalised model. Because the ultimate purpose of this study is the valuation of business and geographical segments, and segmental results are only reported in PBT terms, I use the PBT variable for the firm-level analysis. The major component of the difference between PBT and earnings for ordinary shareholders is the net taxes. Other components include: after tax items and extraordinary items, and the difference between total and ordinary dividends. Normally, PBT is larger than earnings for ordinary shareholder, reflecting the net taxes and the difference of the total and ordinary dividends. To maintain the equivalence of models that use PBT with the operationalised model (which is based on ordinary earnings), I follow Garrod and Rees (1998) and append it with an adjustment term (Adj.ER = Earnings for ordinary – PBT).

Following the same path as with the BV analysis, I first analyse the industrial distribution of loss-making firms. **Figure 4.6** ranks industries by the percentage of loss-making firms.

**Figure 4.6**

| Industry* | Total | Negative | % of neg |
|---|---|---|---|
| *SIC 7* | 1906 | 299 | 15.7% |
| *SIC 6* | 1685 | 297 | 17.6% |
| *SIC 3* | 3304 | 591 | 17.9% |
| *SIC 5* | 1523 | 287 | 18.8% |
| *SIC 2* | 923 | 174 | 18.9% |
| *SIC 4* | 4204 | 827 | 19.7% |
| *SIC 0* | 145 | 33 | 22.8% |
| *SIC 8* | 491 | 118 | 24.0% |
| *SIC 9* | 4347 | 1411 | 32.5% |
| *SIC 1* | 644 | 256 | 39.8% |




* The employed industry SIC abbreviations are as follows: SIC0 = Agriculture, Forestry and Fishing; SIC1 = Mining; SIC2 = Construction; SIC3 = Food, textile, paper and chemical products (i.e., two-digit SIC codes of 20 through 29); SIC4 = Manufacturing (i.e., two-digit SIC codes of 20 through 29); SIC5 = Transportation, Communications, Electric, Gas, And Sanctuary Services; SIC6 = Wholesasle Trade; SIC7 = Retale trade; SIC8 = Finance, Insurance, and Real Estate; SIC9 = Services.

The difference in the performance of firms across industries is striking. Nearly 40% of firm-years in the *'Mining'* sector report losses. A yearly analysis of firms' profitability in this sector (not reported here) indicates that this level of losses was sustained throughout most years of the sample period. This, combined with the fact that

*Mining* is the stalest industry in terms of the number of firms comprising it, suggests that this sector lacks growth opportunities and is the least profitable. Therefore one can expect/hypothesise Mining business operations, reported by multi-segment firms, to receive low valuation in segment-level analysis.

The next, least profitable industry is *Services*, as about 32% of firm-years in this sector report losses. This conforms to our earlier observation that most of the firms in this sector are newcomers, which are at the initial stage of their life cycle. However, because the number of firms in this sector was rapidly and constantly increasing throughout the sample period, it could be hypothesised that the business community believes in high growth potential of this sector. If this is the case, then we can expect the reported 'Services' segments of multi-segment firms to have a relatively high valuation.

Another surprising observation is the relatively high proportion of loss-making firms in the *Finance, Insurance and Real Estate* sector. It shall be emphasised, however, that these firms constitute only a fraction of the total number of firms in this sector, as only non-finance firms (in FTSE GCS system terms) have been included in the sample. Therefore, because the analysis in this section is based on the SIC system, some firms (which are non-financial in terms of FTSE classification) might still be in the financial sector when the SIC system is used. With this caveat in mind, some analysis of this sector would still be informative.

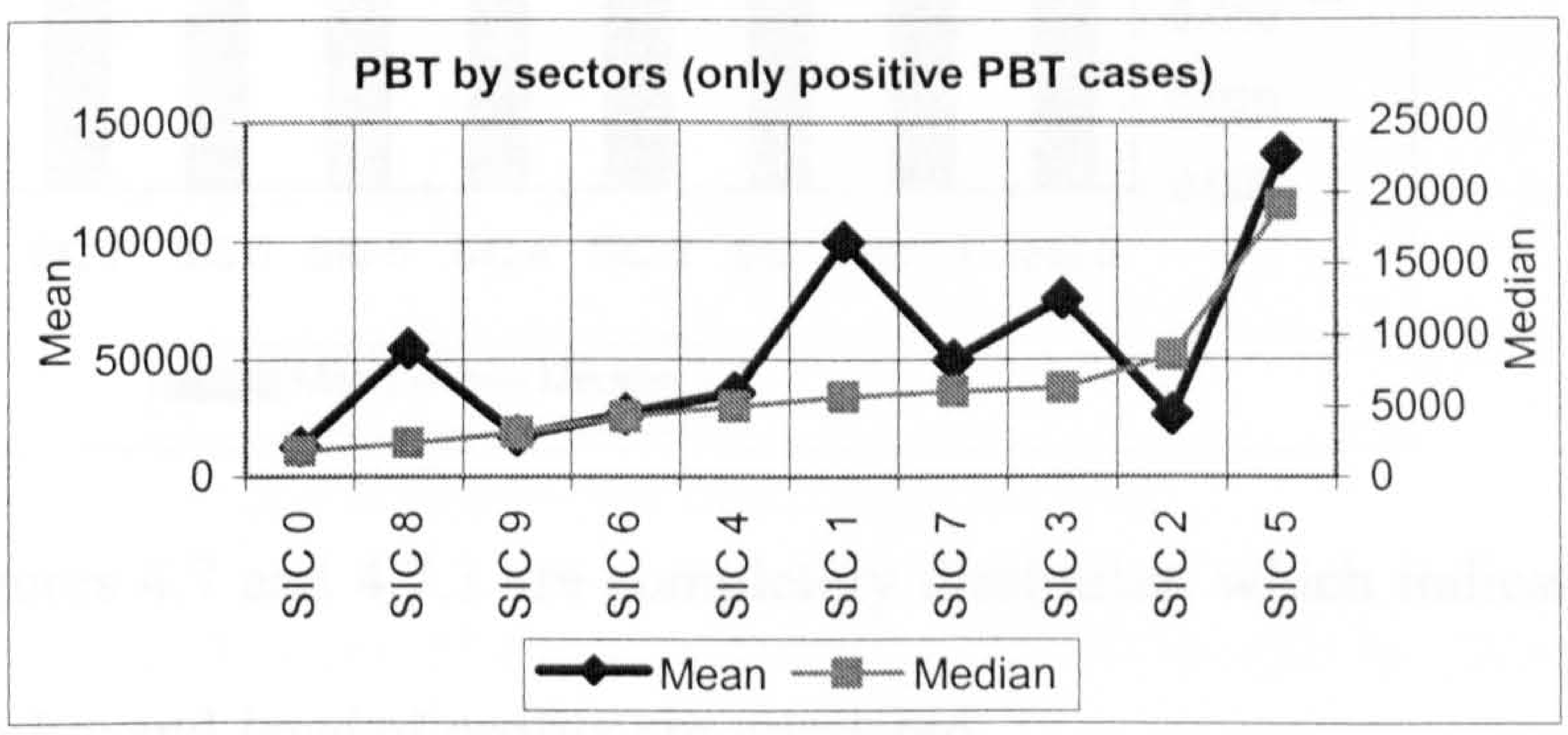
The number of firms in this sample of financial firms had been increasing up until year 1995 (when the average loss-making cases accounted for 22.5% of that period's sub-sample), but steadily declined thereafter (with the proportion of loss making firm-years increasing to 26.7%). This suggests that finance-related business activities held low growth opportunities, particularly in the second half of 1990s, which might result in lower relative valuation of financial firms in general, and in low valuation of reported financial operations of multi-segment firms.

With regard to the remaining sectors, Figure 4.6 suggests that the *Construction*, *Manufacturing* and trade-related sectors are similar in terms of frequency of reported losses (within a range of 15.7-19.7%).

The analysis of profits by economic sectors, also reveals some interesting features (see **Figure 4.7**). Similar to the case with BVs, the mean and median values of PBTs indicate that the *'Transportation, Communications, Electric, Gas, and Sanitary Services'* sector firms report the largest profits.

**Figure 4.7**

| *Industry** | Mean | Median |
|---|---|---|
| *SIC 0* | 13018 | 1855 |
| *SIC 8* | 54766 | 2442 |
| *SIC 9* | 17670 | 3215 |
| *SIC 6* | 27013 | 4294 |
| *SIC 4* | 36087 | 5015 |
| *SIC 1* | 99789 | 5674 |
| *SIC 7* | 49829 | 6082 |
| *SIC 3* | 75569 | 6306 |
| *SIC 2* | 26814 | 8600 |
| *SIC 5* | 136415 | 19119 |

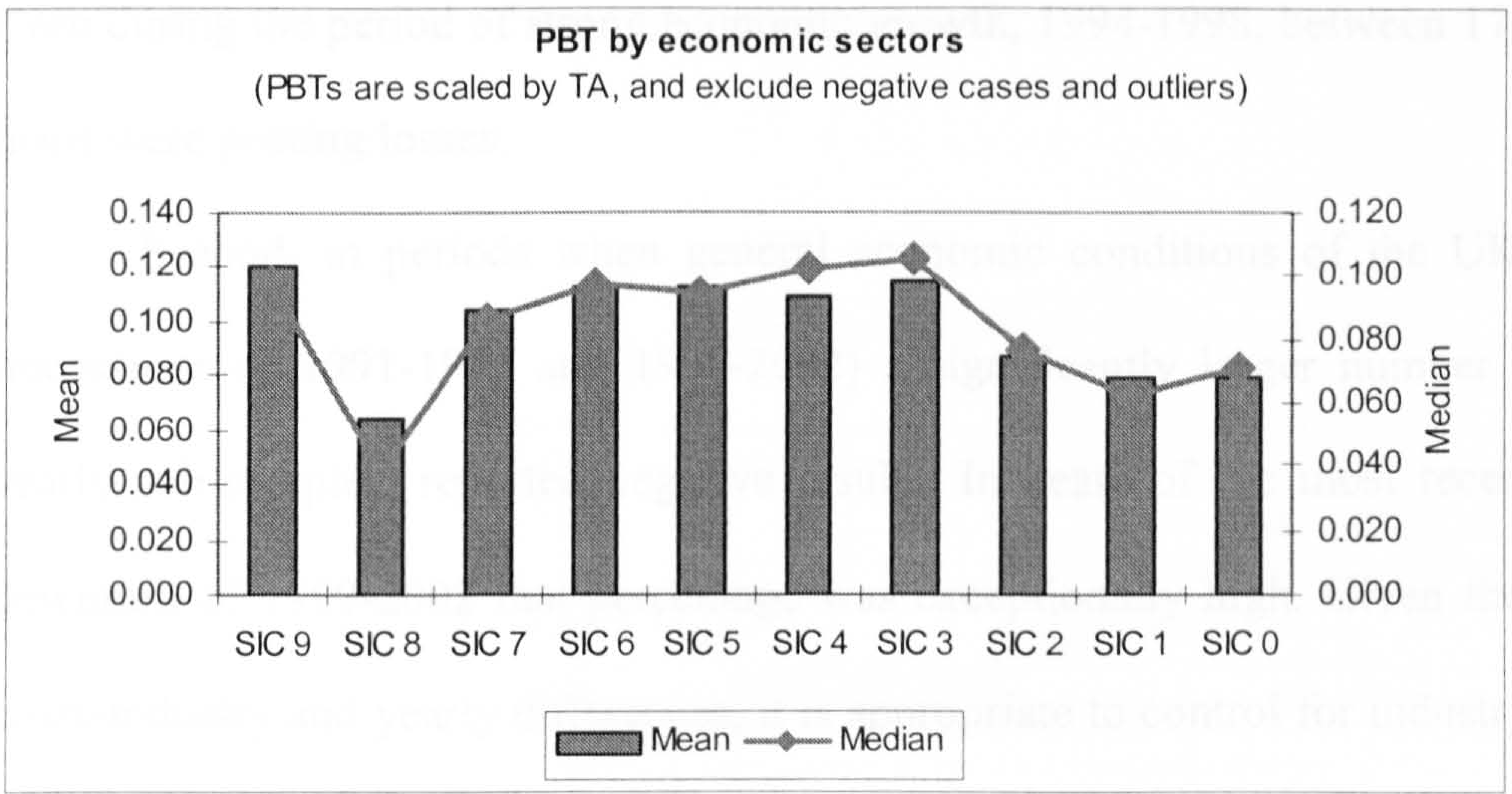



* The employed industry SIC abbreviations are as follows: SIC0 = Agriculture, Forestry and Fishing; SIC1 = Mining; SIC2 = Construction; SIC3 = Food, textile, paper and chemical products (i.e., two-digit SIC codes of 20 through 29); SIC4 = Manufacturing (i.e., two-digit SIC codes of 20 through 29); SIC5 = Transportation, Communications, Electric, Gas, And Sanctuary Services; SIC6 = Wholesasle Trade; SIC7 = Retale trade; SIC8 = Finance, Insurance, and Real Estate; SIC9 = Services.

The inter-industry differences of raw PBTs, reported in **Figure 4.7**, might merely reflect the industry-related differences in firm size. Because actual regressions are based on the scale-deflated variables, it would be more insightful to examine the scale-deflated industrial PBT, which, when deflated by total assets, would be a variant of returns on asset (ROA).

As is evident from **Figure 4.7.1**, the mean (median) ROA varies, across different industries, within the range of 6.5% to 12% (4% to 10.5%). The most profitable industry is *Services* (SIC9), where mean ROA is 12%, while in the *Finance* (SIC8) sector the mean ROA is only 6.5%. *Agriculture*, *Mining* and *Construction* industries (i.e., SIC0, SIC1 and SIC2) appear in the lower profitability band, with ROA in the range of 8% to 8.7%, while *Manufacturing*, *Trade*-related, and *Transportation and Communication Services*-related industries are in the higher profitability band, with ROA being within 10.5% to 11.5%.

**Table 4.7.1**




Patterns in Figures 4.7 and 4.7.1 are completely dissimilar, which indicates that inter-industry *profitability* and *level* of profits are unrelated.

Some interesting characteristics emerge from the analysis of loss-making cases in yearly sub-samples.

**Figure 4.8**

| Years | Total | Negative | % of neg. |
|---|---|---|---|
| *Y 1987* | 395 | 36 | 9.1% |
| *Y 1988* | 1011 | 56 | 5.5% |
| *Y 1989* | 1153 | 88 | 7.6% |
| *Y 1990* | 1236 | 181 | 14.6% |
| *Y 1991* | 1269 | 303 | 23.9% |
| *Y 1992* | 1234 | 334 | 27.1% |
| *Y 1993* | 1286 | 308 | 24.0% |
| *Y 1994* | 1365 | 232 | 17.0% |
| *Y 1995* | 1368 | 236 | 17.3% |
| *Y 1996* | 1415 | 259 | 18.3% |
| *Y 1997* | 1449 | 280 | 19.3% |
| *Y 1998* | 1394 | 315 | 22.6% |
| *Y 1999* | 1286 | 318 | 24.7% |
| *Y 2000* | 1330 | 451 | 33.9% |
| *Y 2001* | 1329 | 589 | 44.3% |
| *Y 2002* | 703 | 329 | 46.8% |

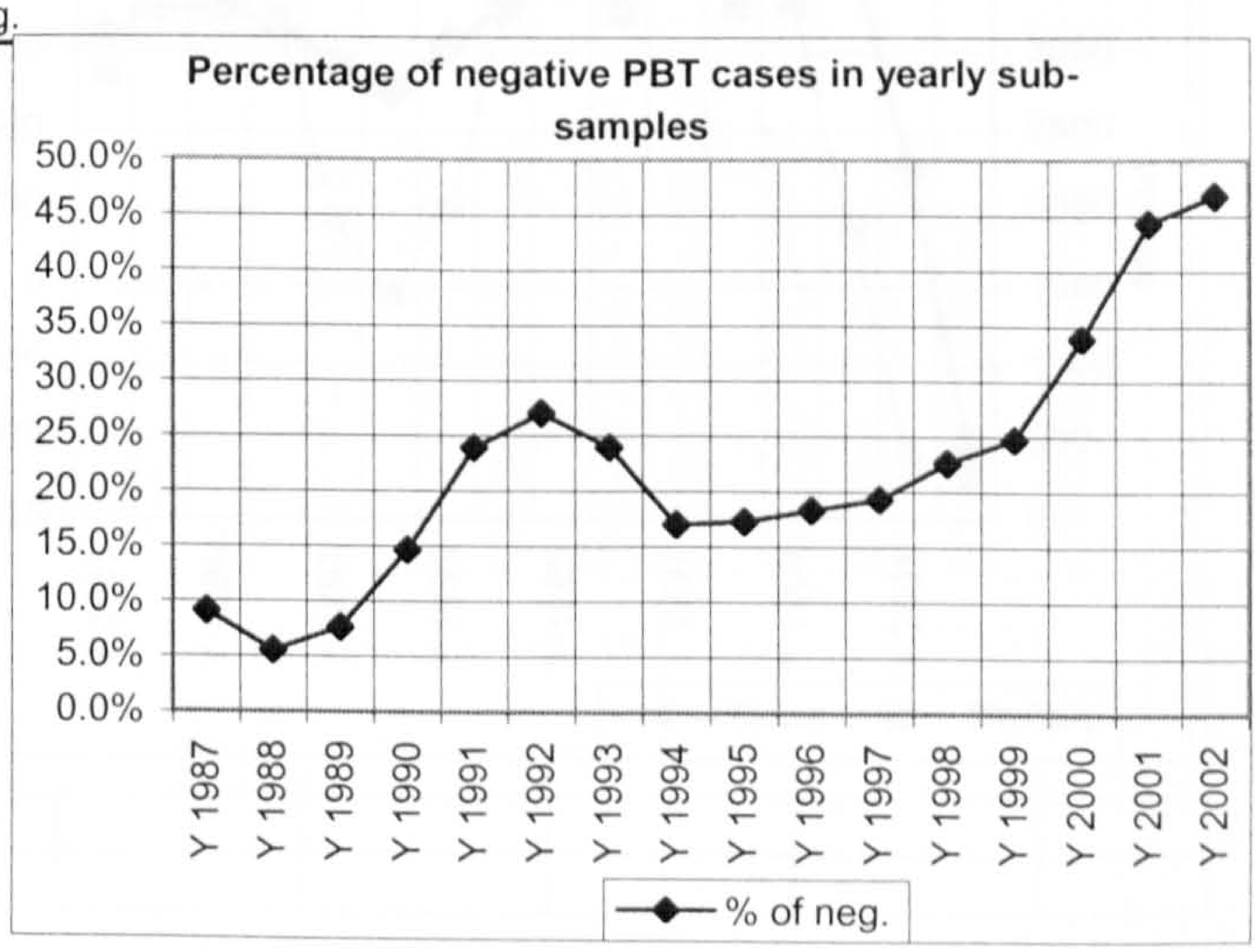


**Figure 4.8** reports the percentages of loss-making firms in yearly sub-samples. Two obvious observations can be made from this table. First, throughout nearly the entire sample period (12 out of 15 yearly periods) the percentage of loss-reporting firms showed a sharply increasing trend. Thus in late 1980s less than 10% of firms were reporting losses, while in the early 2000s more than 30% of firms were reporting losses. Even during the period of strong economic growth, 1994-1998, between 17 and 25% of firms were posting losses.

Second, in periods when general economic conditions of the UK were poor (recessions of 1991-1993 and 1999-2002) a significantly larger number of firms, in yearly sub-samples, reported negative results. In years of the most recent economic downturn of 1999-2002 that percentage was exceptionally high. Given these apparent cross-industry and yearly differences, it is appropriate to control for industry and yearly effects when working with the pooled cross-sectional total sample.

Some additional confirmation of the previous generalisations can be found when average measures of yearly PBTs are plotted against time.

**Figure 4.9**

| Years | Total sample | |
|---|---|---|
| Years | Mean | Median |
| Y 1987 | 31776 | 2834 |
| Y 1988 | 35826 | 3678 |
| Y 1989 | 35516 | 3582 |
| Y 1990 | 32986 | 3219 |
| Y 1991 | 28648 | 1943 |
| Y 1992 | 25131 | 1451 |
| Y 1993 | 30762 | 2005 |
| Y 1994 | 36099 | 3249 |
| Y 1995 | 39462 | 3638 |
| Y 1996 | 38621 | 3235 |
| Y 1997 | 41182 | 3580 |
| Y 1998 | 43480 | 3273 |
| Y 1999 | 42893 | 3290 |
| Y 2000 | 43655 | 1845 |
| Y 2001 | 15184 | 390 |
| Y 2002 | -20317 | 264 |

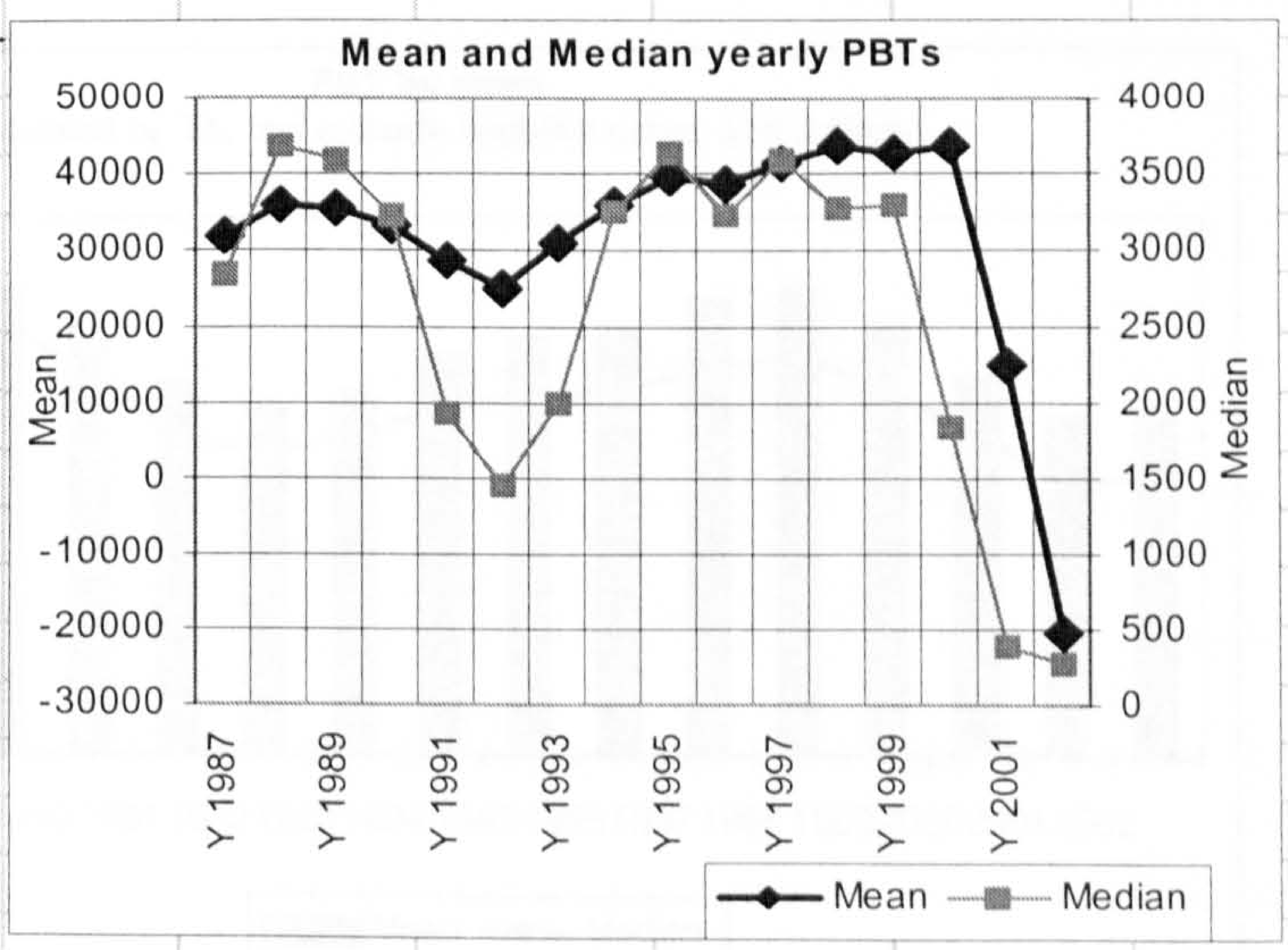


**Figure 4.9** explicitly demonstrates how closely the average (i.e., mean or median) reported yearly profits reflect the cyclic patterns of the British economy. When the same measures of central tendency are separately computed and plotted for profit and loss firms (**Figure 4.10** and **4.11**), there is a clear upward trend for the former, and downward trend for the latter.

**Figure 4.10**

| Years | Mean | Median |
|---|---|---|
| *Y 1987* | 35555 | 3445 |
| *Y 1988* | 38016 | 4099 |
| *Y 1989* | 39327 | 4258 |
| *Y 1990* | 40061 | 4514 |
| *Y 1991* | 42035 | 4043 |
| *Y 1992* | 43141 | 4007 |
| *Y 1993* | 44275 | 4311 |
| *Y 1994* | 46647 | 5060 |
| *Y 1995* | 51318 | 5728 |
| *Y 1996* | 50857 | 5386 |
| *Y 1997* | 53961 | 6062 |
| *Y 1998* | 60138 | 6609 |
| *Y 1999* | 61988 | 7208 |
| *Y 2000* | 75163 | 6619 |
| *Y 2001* | 60809 | 7228 |
| *Y 2002* | 56380 | 6583 |

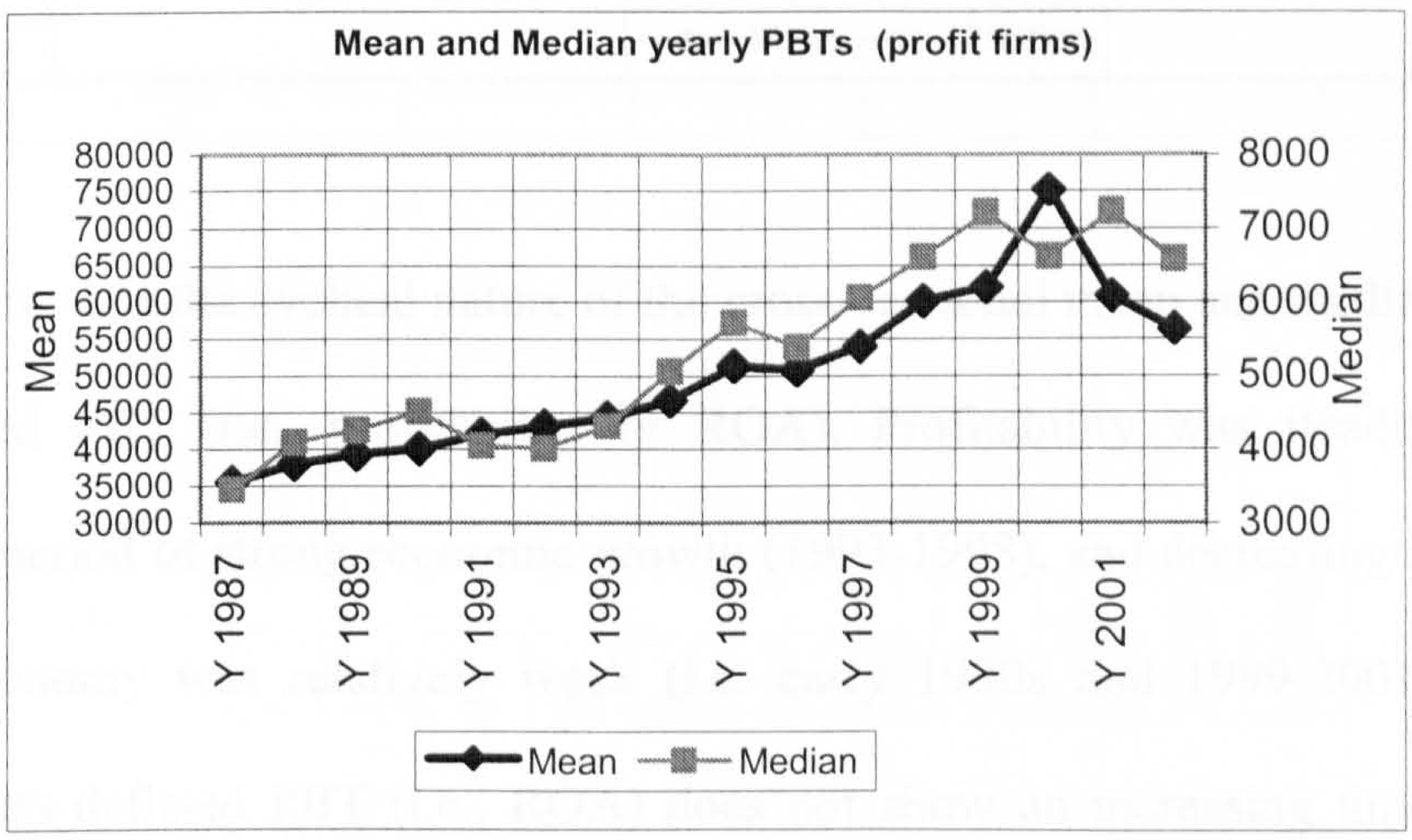



**Figure 4.10.1**

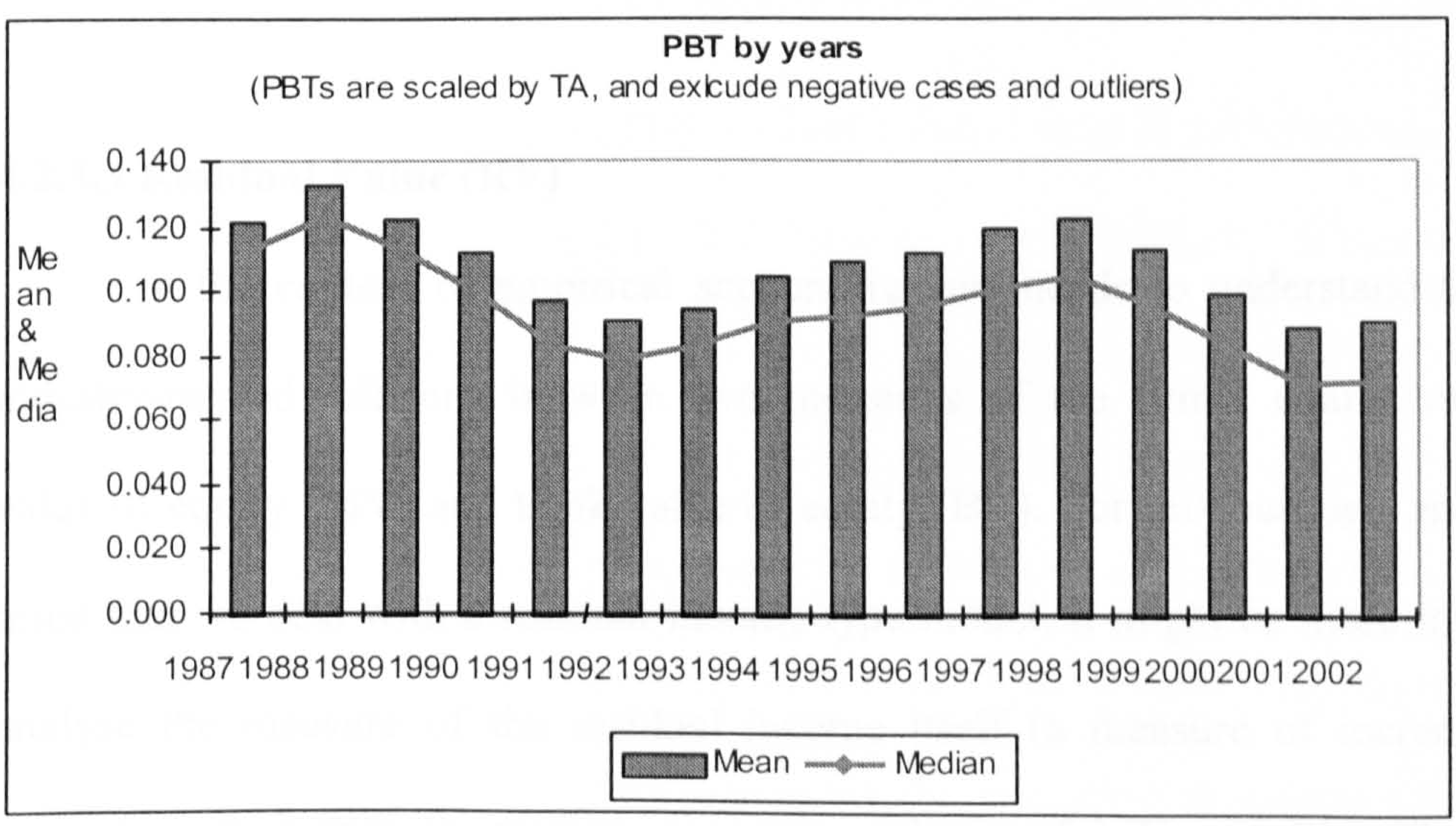


**Figure 4.11**

| Years | Mean | Median |
|---|---|---|
| Y 1987 | -5909 | -698 |
| Y 1988 | -1517 | -638 |
| Y 1989 | -10607 | -912 |
| Y 1990 | -8250 | -1014 |
| Y 1991 | -14033 | -1561 |
| Y 1992 | -23400 | -1955 |
| Y 1993 | -12147 | -2109 |
| Y 1994 | -15411 | -1609 |
| Y 1995 | -17407 | -1999 |
| Y 1996 | -15993 | -2672 |
| Y 1997 | -12174 | -1852 |
| Y 1998 | -13580 | -2652 |
| Y 1999 | -15233 | -2228 |
| Y 2000 | -17753 | -3321 |
| Y 2001 | -42138 | -3621 |
| Y 2002 | -1.E+05 | -3300 |

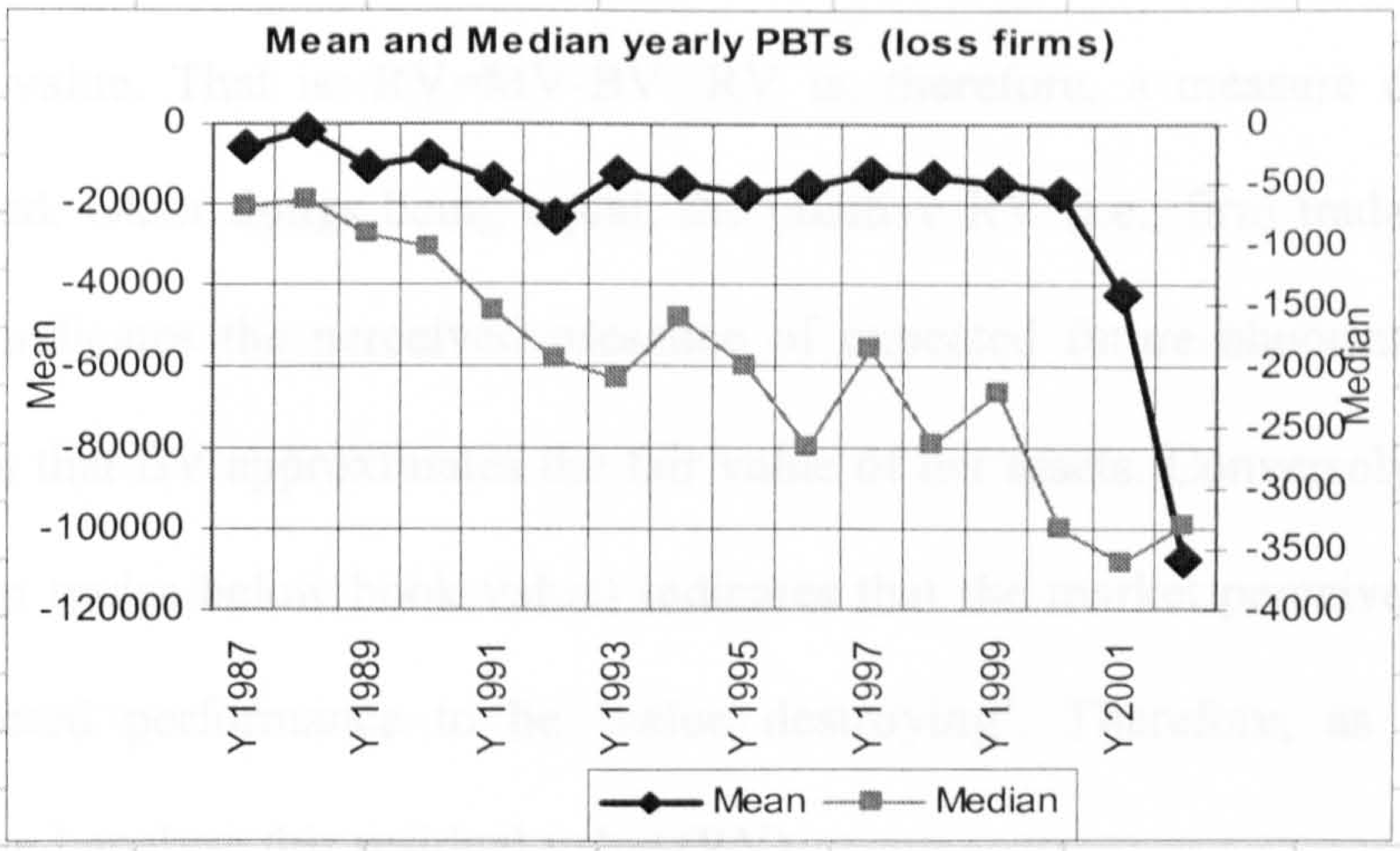


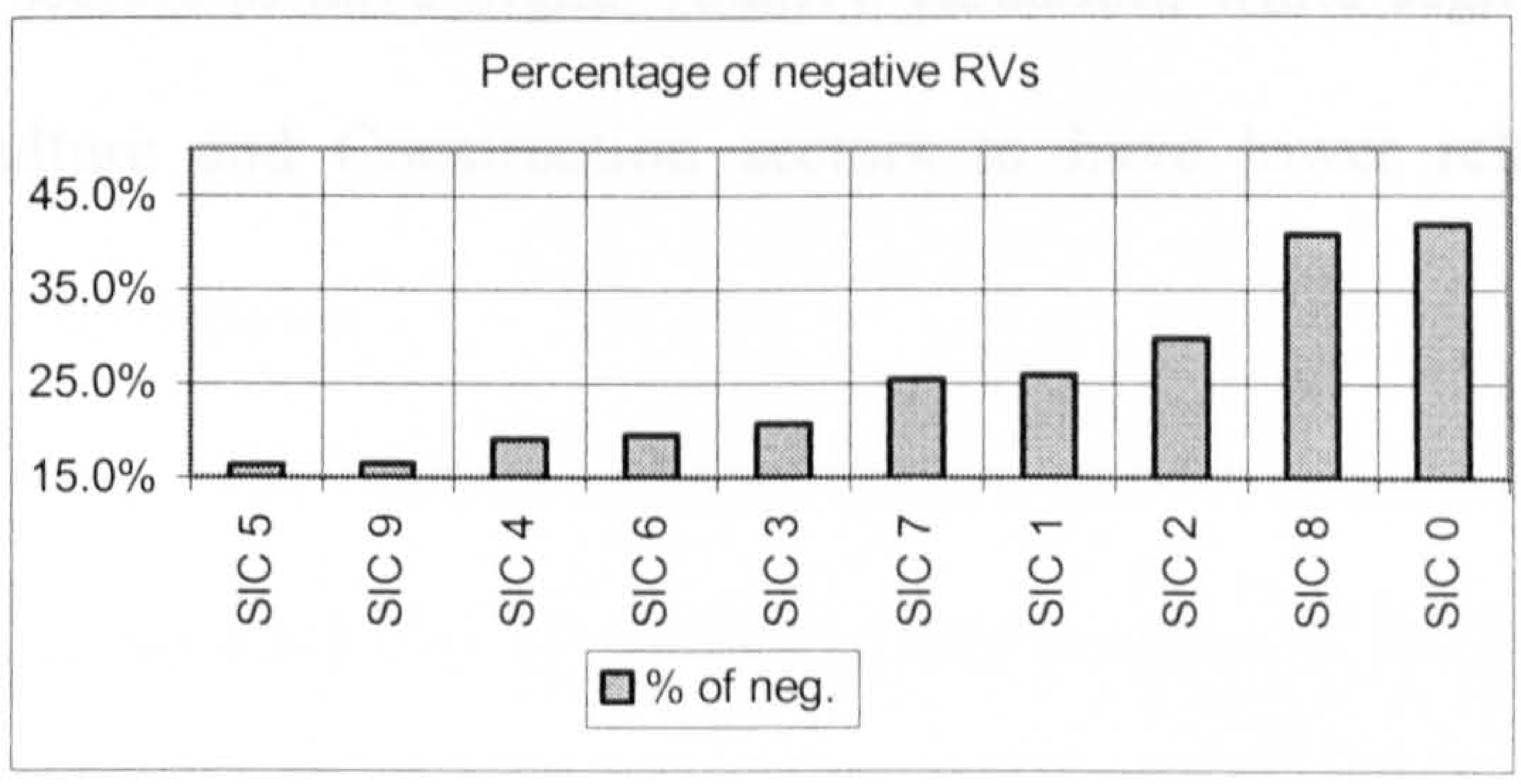

**Figure 4.10.1** reveals the cyclical nature of the cross-sectional mean and median of total-assets deflated PBT (i.e., profitability or ROA). Profitability was steadily increasing during the period of strong economic growth (1993-1998), and decreasing in periods when the economy was relatively weak (i.e. early 1990s and 1999-2001). Because the total assets-deflated PBT (i.e., ROA) does not show an increasing time-related trend over the *entire* sample period (see **Figure 4.10.1**), the yearly increasing pattern of the level PBTs (on **Figure 4.10**) is likely to be the result of time-related growth in firm size.

### 4.2.3.3 Residual Value (RV)

In the context of empirical accounting, one needs to understand the time and industry-related relations between two measures of the firm's equity value: market value of equity (MV) and book value of equity (BV). For this purpose, and bearing in mind that we deal with a residual income-type model, it might be more informative to analyse the measure of the residual income itself (a measure of incremental value created), rather than to perform separate analyses of MV and BV. The theoretical residual income model, discussed in Chapter 3, holds that in expectation residual income shall account for any excess (shortfall) of market value of equity over (from) its book value. In other words, the difference between the market and book value represents the residual value. That is: RV=MV-BV. RV is, therefore, a measure of incremental value created. Other things being equal, the positive RV (i.e., firm trades above its book value) indicates the perceived presence of expected future abnormal earnings, if one assumes that BV approximates the fair value of net assets. Conversely, a negative RV (i.e., firm trades below book value) indicates that the market perceives the firm's future expected performance to be 'value destroying'. Therefore, as a measure of value creation I analyse this residual value (RV).

**Figure 4.12**

| Industry* | Total | Neg. RV | % of neg. |
|---|---|---|---|
| SIC 5 | 1523 | 250 | 16.4% |
| SIC 9 | 4350 | 719 | 16.5% |
| SIC 4 | 4204 | 802 | 19.1% |
| SIC 6 | 1685 | 328 | 19.5% |
| SIC 3 | 3304 | 685 | 20.7% |
| SIC 7 | 1906 | 485 | 25.4% |
| SIC 1 | 644 | 167 | 25.9% |
| SIC 2 | 923 | 276 | 29.9% |
| SIC 8 | 491 | 201 | 40.9% |
| SIC 0 | 145 | 61 | 42.1% |




* The employed industry SIC abbreviations are as follows: SIC0 = Agriculture, Forestry and Fishing; SIC1 = Mining; SIC2 = Construction; SIC3 = Food, textile, paper and chemical products (i.e., two-digit SIC codes of 20 through 29); SIC4 = Manufacturing (i.e., two-digit SIC codes of 20 through 29); SIC5 = Transportation, Communications, Electric, Gas, And Sanctuary Services; SIC6 = Wholesasle Trade; SIC7 = Retale trade; SIC8 = Finance, Insurance, and Real Estate; SIC9 = Services.

**Figure 4.12** ranks industries by their relative market performance, measured in terms of the frequency of negative RV firms in a given industry. It appears that more than 40% of *Agriculture, Forestry and Fishing*, along with *Finance, Insurance and Real Estate* sector firm-years are traded below book value, that is, perceived by the market to have the worst value creating prospects[12]. *Construction* companies are also at the bottom end of value creation prospects, with some 30% of firm-years reporting negative RV. The best performers, in these terms, are the two services sectors ('*Services*', and

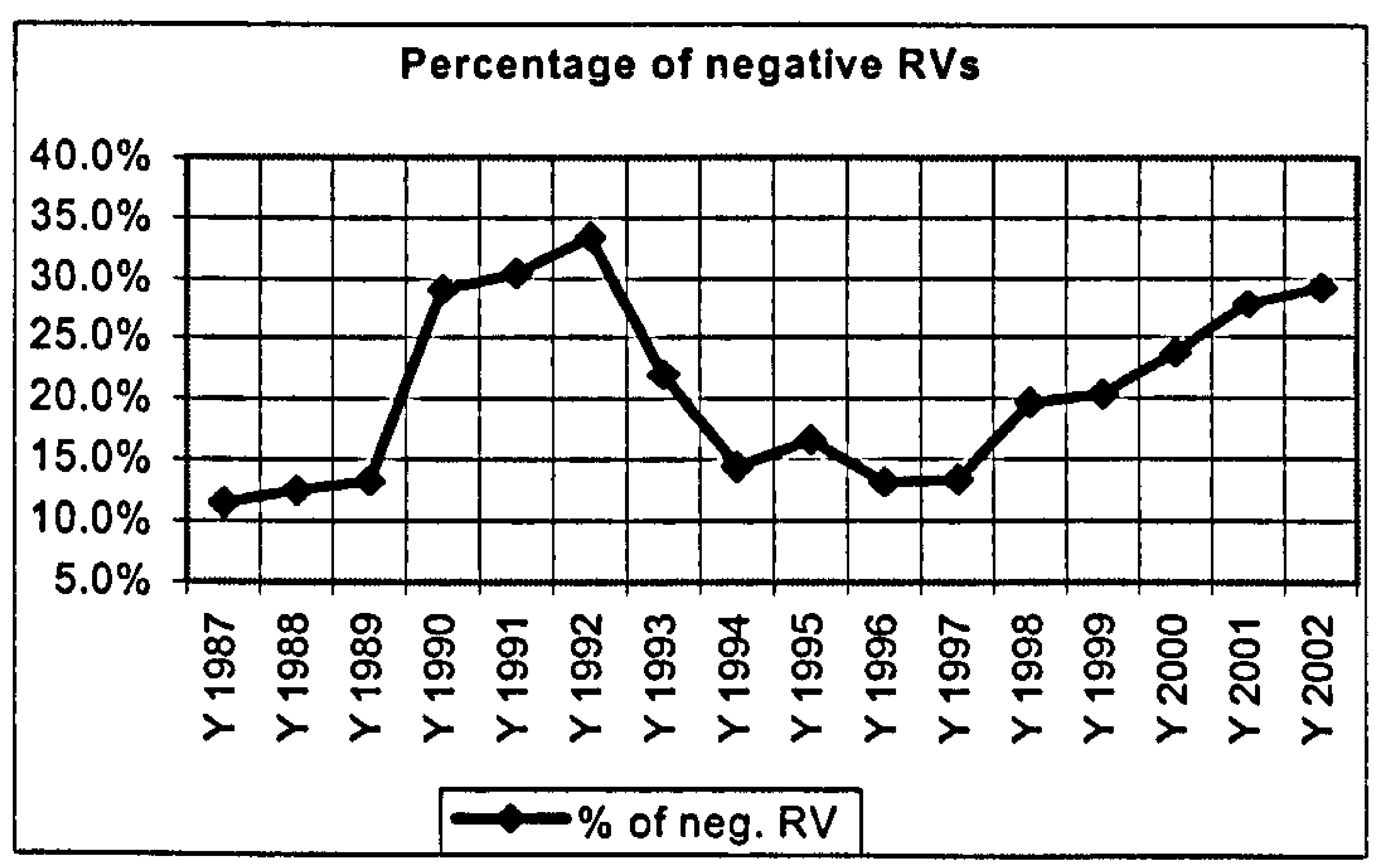
[12] This interpretation, however, comes with a caveat, as explained in section 4.2.3.2.

*'Communication, Transportation, Electric, Gas and Sanitary Services'*) with only up to 17% of firm-years having negative RVs. Although not reported here, these patterns generally hold when computations are performed on a yearly basis. It should be mentioned that if general accounting practices differ among different industries, than the identified cross-industry divergences in RV might, in part, reflect the cross-industry heterogeneity in accounting practices. For example, if the balance sheet items are more often carried at *fair value* in construction firms, and at cost in the manufacturing sectors than, *ceteris paribus*, BV (RV) might be lower (higher) in manufacturing firms[13].

If the investors' perceptions of industrial performance are transferable onto the perceived valuation of firm's business segments, then one can expect the business segments in the two services sectors to have higher relative valuation, while segments operating in Finance, Agriculture and Construction sectors to have lower relative valuation.

**Figure 4.13**

| Year | Total | Neg. RV | % of neg. RV |
|---|---|---|---|
| *Y 1987* | 395 | 45 | 11.4% |
| *Y 1988* | 1011 | 125 | 12.4% |
| *Y 1989* | 1153 | 152 | 13.2% |
| *Y 1990* | 1236 | 360 | 29.1% |
| *Y 1991* | 1268 | 385 | 30.4% |
| *Y 1992* | 1234 | 412 | 33.4% |
| *Y 1993* | 1286 | 281 | 21.9% |
| *Y 1994* | 1365 | 196 | 14.4% |
| *Y 1995* | 1368 | 226 | 16.5% |
| *Y 1996* | 1415 | 185 | 13.1% |
| *Y 1997* | 1449 | 192 | 13.3% |
| *Y 1998* | 1394 | 273 | 19.6% |
| *Y 1999* | 1286 | 261 | 20.3% |
| *Y 2000* | 1330 | 315 | 23.7% |
| *Y 2001* | 1329 | 370 | 27.8% |




[13] I acknowledge this fact, however controlling for cross-industry heterogeneity in accounting practices is impracticable in the context of this study.

**Figure 4.13,** which reports the yearly dynamics of the RV, indicates substantial time-related variability of the proportion of firms trading below book value, yet one distinctive feature of the pattern stands out.

The figure suggests that ears with a higher percentage of negative RVs correspond to periods when the UK economy was weak (1990-1992 and 1999-2002), while in strong economic growth periods (late 1980s and mid-1990s) the percentage of firms trading below BV was substantially lower.

Yearly changes in the percentages of negative RV reflect the joint effect of changes in MV relative to changes in BV. It is virtually impossible to take the analysis of the changing pattern of the RV further and decipher relative contributions of each of these sources[14].

### 4.2.3.4 Market Value of Ordinary Equity

Finally, it is necessary to have some insight of yearly and industry-related variability of the market value of equity (MV). MV is one of the measures of the firm's size.

The sector-related difference in firms' size is striking. As is evident from **Figure 4.14,** the *Agriculture, Forestry and Fishing* sector firms are on average 16 times smaller than firms from the *Communications, Transportation, Electric and Gas services* sector, which is also statistically larger than all other sectors. This is primarily due to the fact that this sector includes UK's largest firms (e.g., BT, BAA, British Airways, British Energy, Vodafone, Granada, British Sky, Cable and Wireless, etc).

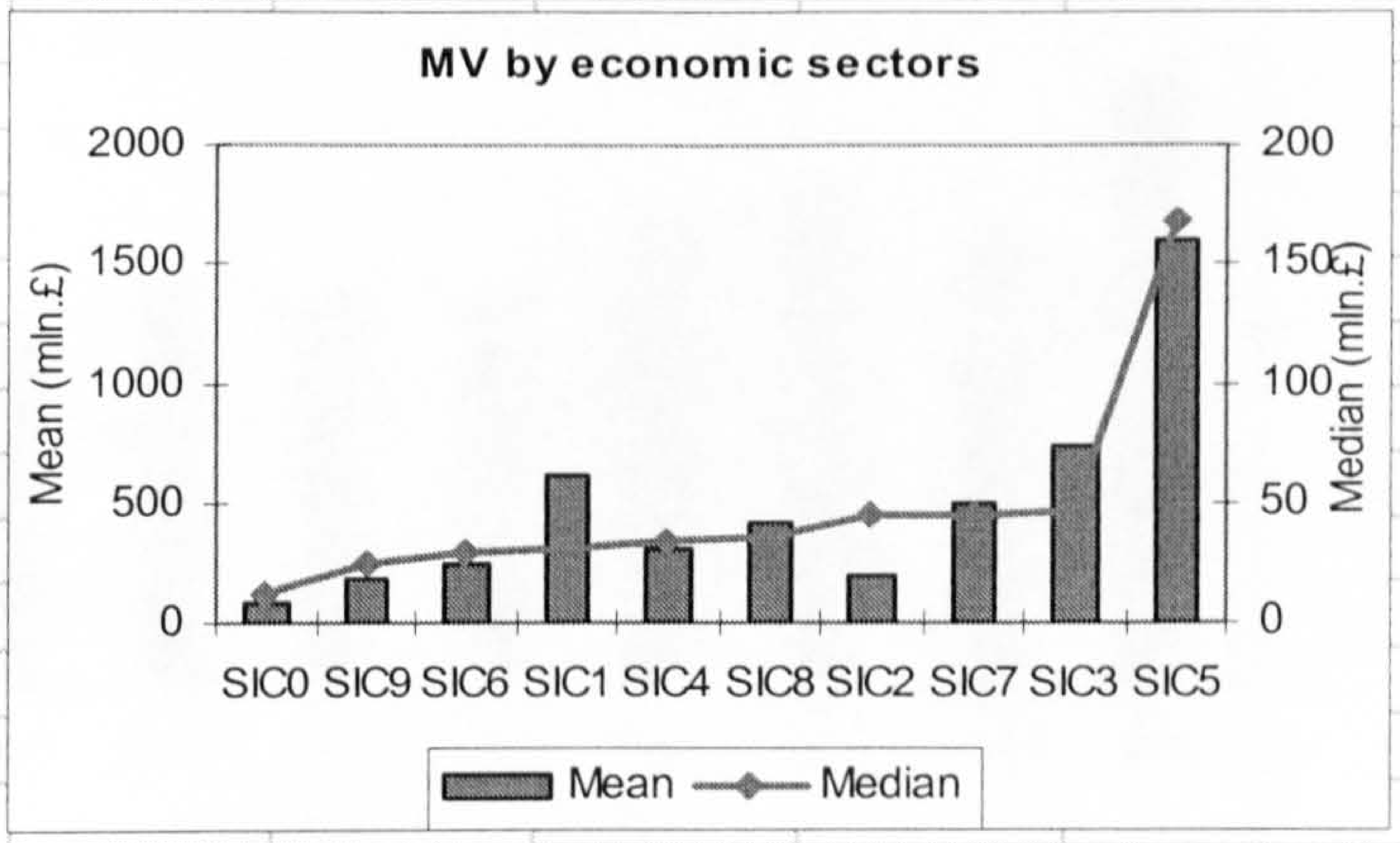
*Leisure, Personal, Health & Business services* sector is the next smallest firms industry, though statistically significantly larger than the *Agricluture, Forestry and Fishing*. Although the SIC Division D (Manufacturing) has been subjectively split into

[14] The time series pattern of MV is analysed in section 4.2.3.4.

two sectors (i.e., *'Food, Textile, paper & chemical product manufacturers'* and *'Manufacturing'*), on average, *Manufacturing* firms are statistically smaller than *Food, Textile, Paper & Chemical Product Manufacturers.*

**Figure 4.14**

| Industry* | Mean | Median |
|---|---|---|
| *SIC0* | 82 | 11 |
| *SIC9* | 178 | 24 |
| *SIC6* | 240 | 29 |
| *SIC1* | 615 | 31 |
| *SIC4* | 309 | 34 |
| *SIC8* | 424 | 34 |
| *SIC2* | 184 | 44 |
| *SIC7* | 499 | 46 |
| *SIC3* | 735 | 46 |
| *SIC5* | 1602 | 168 |

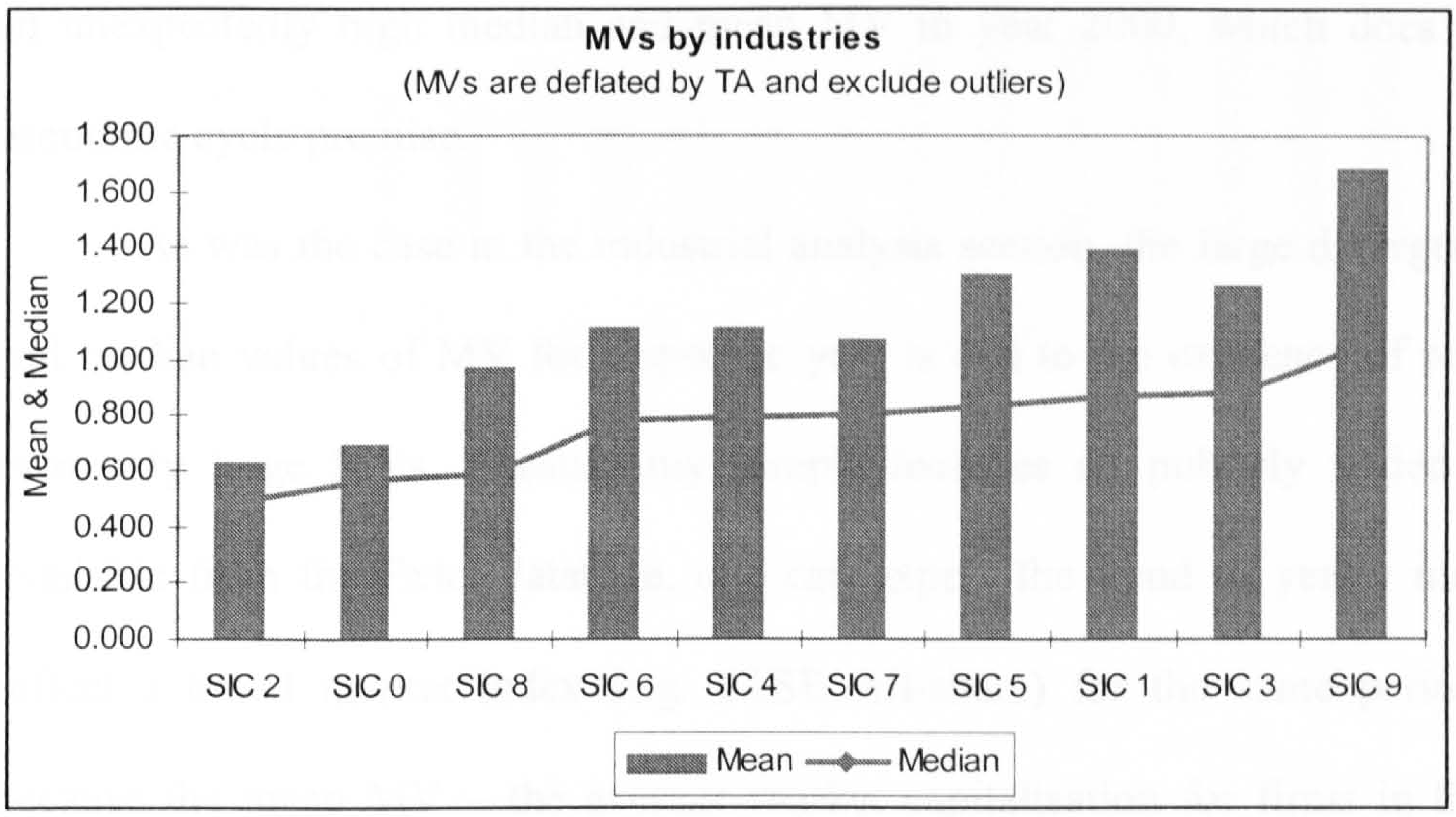



* The employed industry SIC abbreviations are as follows: SIC0 = Agriculture, Forestry and Fishing; SIC1 = Mining; SIC2 = Construction; SIC3 = Food, textile, paper and chemical products (i.e., two-digit SIC codes of 20 through 29); SIC4 = Manufacturing (i.e., two-digit SIC codes of 20 through 29); SIC5 = Transportation, Communications, Electric, Gas, And Sanctuary Services; SIC6 = Wholesasle Trade; SIC7 = Retale trade; SIC8 = Finance, Insurance, and Real Estate; SIC9 = Services.

Also is noteworthy that *'Wholesale trade'* companies are statistically smaller than the *'Retail trade'* firms. Another characteristic of our sample is that inferences are sometimes sensitive to the choice of a measure of central tendency (mean vs. median). This is due to the existence of a few extremely large firms, which cause the frequency distributions of industry-related MVs to have very long right tails.

**Figure 4.14** demonstrates the differences in the average size of firms operating in different industries. **Figure 4.14.1** provides some insight into the industry-related characteristics of the scaled MV. It suggests that TA-scaled MV differ notably across industries. Provided that (i) capital structure (the ratio of equity book value to total assets) is constant across industries, and (ii) there are no inter-industry accounting differences then, when compared across industries, the mean/median TA-scaled MV would reflect the market's perception of relative growth opportunities associated with different industries. However, if the above two assumptions do not hold, it would be difficult to interpret the patterns in **Figure 4.14.1**.

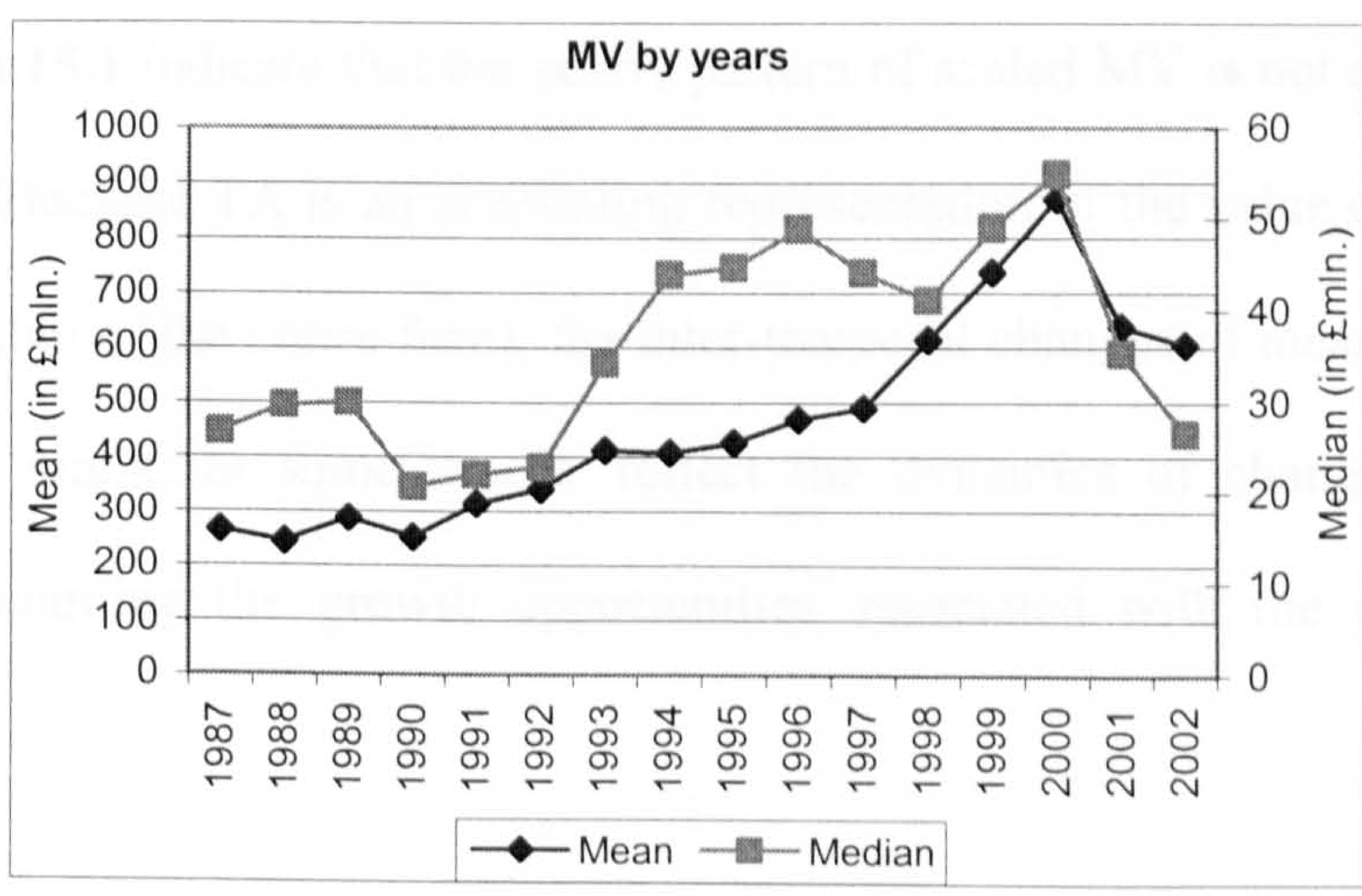
**Figure 4.14.1**




It is also important to examine the dynamics of average size of sample firms throughout the sample period. The median yearly market capitalisations, plotted in **Figure 4.15**, show some periodicity.

**Figure 4.15**

| Years | Mean | Median |
|---|---|---|
| 1987 | 265 | 27 |
| 1988 | 244 | 30 |
| 1989 | 286 | 30 |
| 1990 | 252 | 21 |
| 1991 | 313 | 22 |
| 1992 | 340 | 23 |
| 1993 | 412 | 34 |
| 1994 | 408 | 44 |
| 1995 | 426 | 45 |
| 1996 | 468 | 49 |
| 1997 | 490 | 44 |
| 1998 | 615 | 41 |
| 1999 | 738 | 49 |
| 2000 | 869 | 55 |
| 2001 | 638 | 35 |
| 2002 | 606 | 27 |



Overall, the cross-sectional mean and median MV lines have an increasing trend over the sample period. However, MV seems to be lower in the periods of 1990-92 and 2001-02, when the economy was weak. These patterns bear some similarity to those of the residual values. There is, however, one significant drop of median MV in 1998 and an unexpectedly high median and mean MV in year 2000, which does not 'fit' the economic cycle premise.

As was the case in the industrial analysis section, the large divergence of mean and median values of MV for a specific year is due to the existence of relatively few extremely large MVs. Because my sample includes all publicly traded companies, available from the Extel database, one can expect the trend of yearly mean MVs to reflect a broad market index (e.g. FTSE All-share) for the same period[15]. This is because the mean MV – the average market capitalisation for firms in the sample – turns into a value weighted market index when scaled by a devisor, e.g. mean MV of 1987.

As is the case with a FTSE market index, mean MVs are influenced by a few large capitalisation companies, whereas median MVs are unaffected by large capitalisation firms included in the sample. The median is, therefore, a better measure of the time-related size properties of firms comprising the sample.

Finally, **Figure 4.15.1** indicate that the yearly pattern of scaled MV is not stable over the sample period. Because TA is an accounting representation of the value of the entire firm (i.e., book value of the entire firm), the inter-temporal changes of mean and median TA-scaled MV might, to some extent, reflect the dynamics of changes in investors' perception regarding the growth opportunities associated with the entire sample of firms[16].

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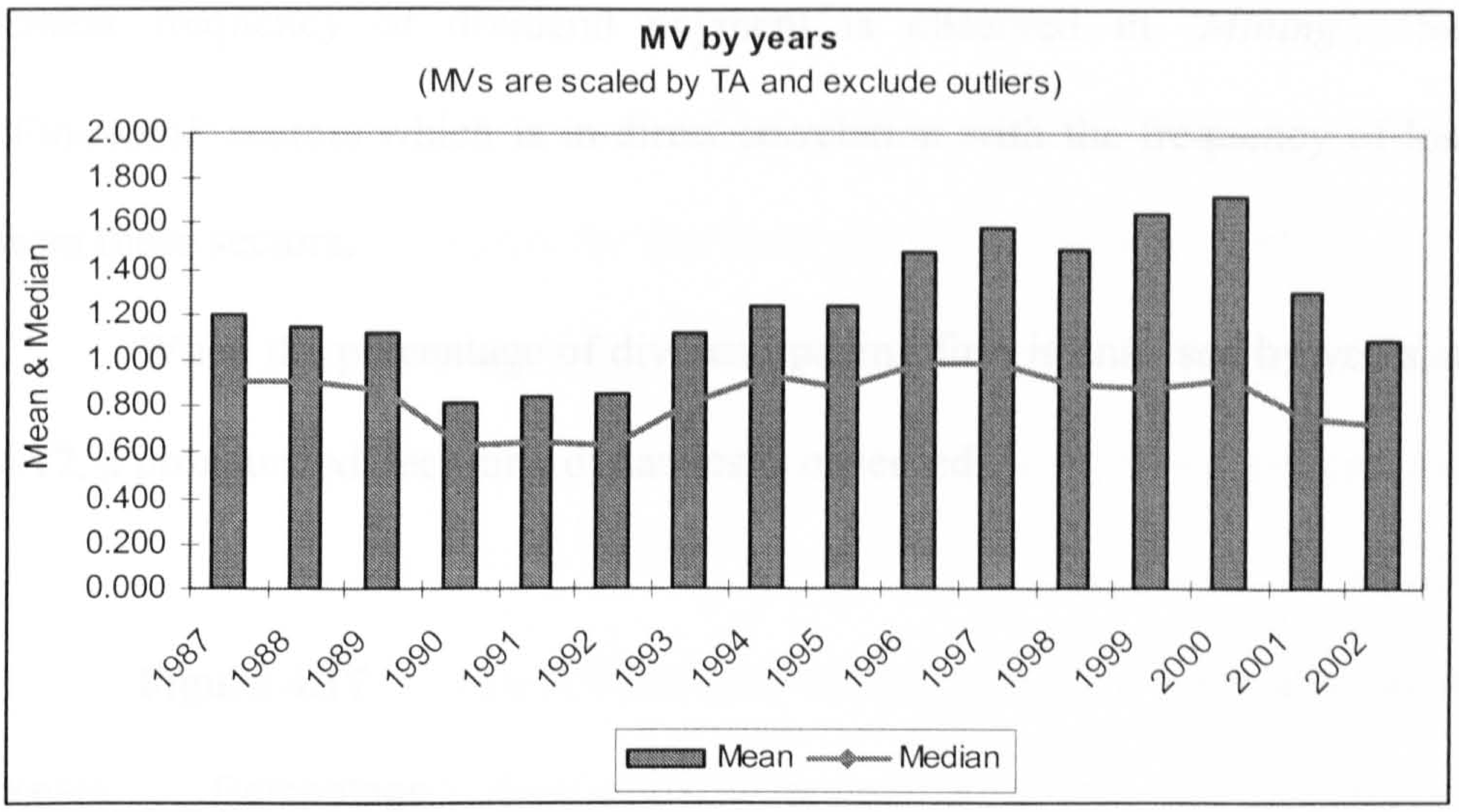
[15] However, the sample might slightly miss-represent the entire market because most financial firms are excluded from the sample.
[16] This conjecture is correct if capital structure remains constant over the sample period, so that the dynamics of MV/TA and MV/BV would be similar.

**Figure 4.15.1**

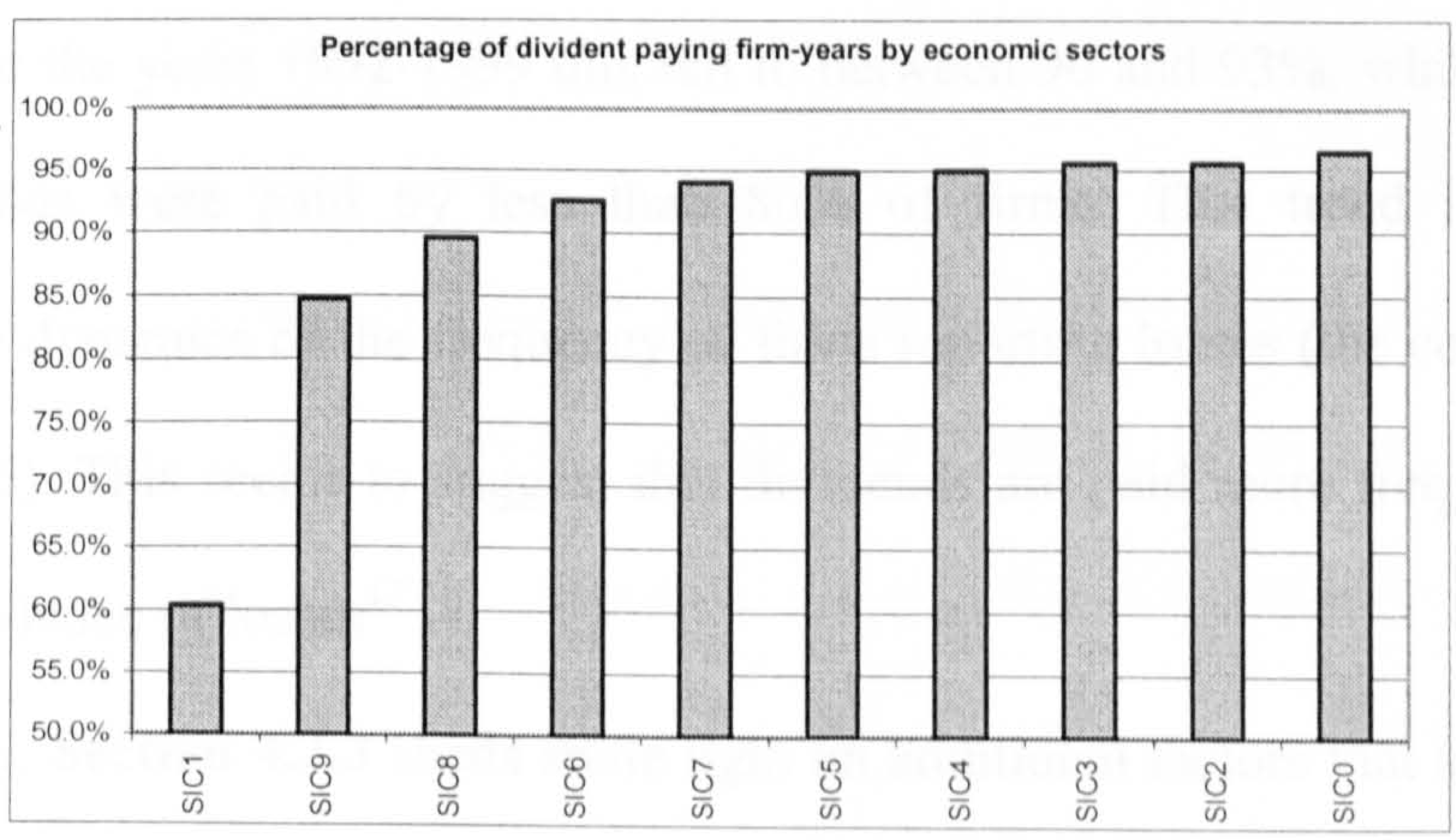



### 4.2.3.5 Dividends for Ordinary Shareholders

An interesting pattern is observed in relation to dividend payments. There are substantial differences in the 'popularity' of this method of distributing value to investors both across economic sectors and years. **Figure 4.16** demonstrates this point.

**Figure 4.16**

| Industry* | Div. Payment |
|---|---|
| SIC1 | 60.4% |
| SIC9 | 84.7% |
| SIC8 | 89.6% |
| SIC6 | 92.6% |
| SIC7 | 94.1% |
| SIC5 | 94.9% |
| SIC4 | 95.0% |
| SIC3 | 95.6% |
| SIC2 | 95.6% |
| SIC0 | 96.4% |



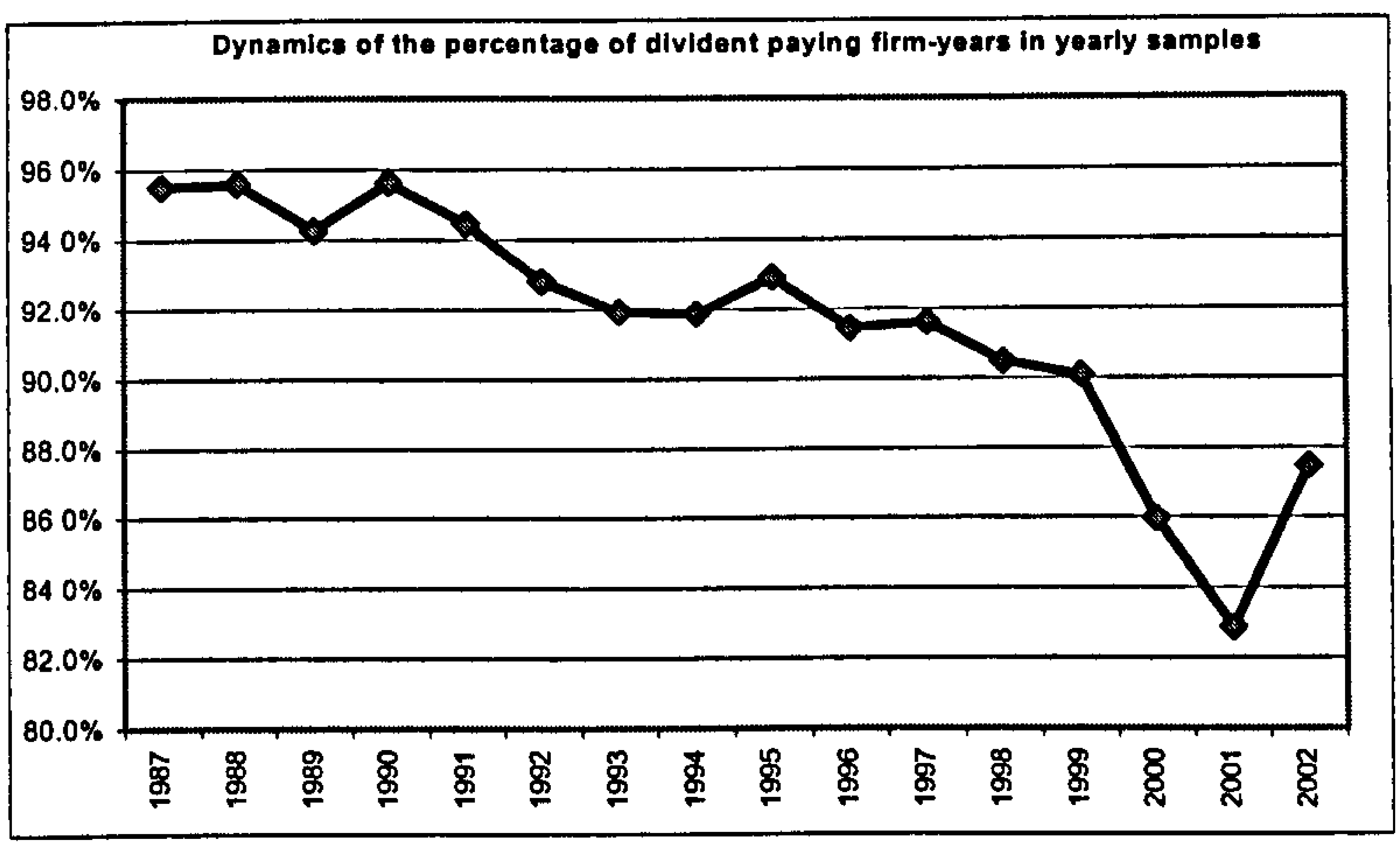

* The employed industry SIC abbreviations are as follows: SIC0 = Agriculture, Forestry and Fishing; SIC1 = Mining; SIC2 = Construction; SIC3 = Food, textile, paper and chemical products (i.e., two-digit SIC codes of 20 through 29); SIC4 = Manufacturing (i.e., two-digit SIC codes of 20 through 29); SIC5 = Transportation, Communications, Electric, Gas, And Sanctuary Services; SIC6 = Wholesasle Trade; SIC7 = Retale trade; SIC8 = Finance, Insurance, and Real Estate; SIC9 = Services.

In the majority of industries more than 90% of firm-years pay dividends. The lowest frequency of dividend payment is observed in *'Mining'*, 'Services' and *'Financial'* sectors which is in direct correlation with the frequency of losses reported from these sectors.

When the percentage of dividend paying firm is analysed by years, as on **Figure 4.17,** a pronounced declining dynamics is observed.

**Figure 4.17**

| Years | Percentage |
|---|---|
| 1987 | 95.5% |
| 1988 | 95.6% |
| 1989 | 94.3% |
| 1990 | 95.6% |
| 1991 | 94.5% |
| 1992 | 92.8% |
| 1993 | 91.9% |
| 1994 | 91.9% |
| 1995 | 92.9% |
| 1996 | 91.5% |
| 1997 | 91.6% |
| 1998 | 90.5% |
| 1999 | 90.1% |
| 2000 | 86.0% |
| 2001 | 82.9% |
| 2002 | 87.5% |




On average, more that 94% of the firms were paying dividends in years 1987-1991. However, for the years 1992-1999 this fell to between 90 and 93%, while during 2000-2002 dividends were paid by less than 86% of firms. This trend is highly correlated with the dynamics of the frequency of firms reporting losses (the correlation coefficient is –0.86). This seems to suggest that dividends are paid more frequently in years with low incidence of losses[17].

In summary, **Section 4.2.3** sheds some light on additional factors that should be considered in the process of subsequent empirical analyses. Because similar **yearly**

[17] There may also have been shifts in the forms of distributions over time from dividends to, e.g., share repurchases, which might explain the patterns. However, an analysis of share repurchases is beyond the scope of this dissertation.

patterns were observed for both financial statements variables (PBTs, BVs, and Dividends) and market-related variable (RV), it is likely that in 'good' and 'bad' economic periods the market values firms differently. Therefore, in the empirical tests it might be necessary to control for the 'time' or 'economic period' effect.

Furthermore, some of the revealed cross-industry differences might appropriate the use of, for instance, fixed industry effects in our panel data regressions.

### 4.2.4 Descriptive statistics of firm-level variables used in regression analysis

In this section I report general descriptive statistics for firm-level independent and dependent variables used in further regression analyses. All analysed variables (i.e., MV, BV, PBT and DIV) are deflated by Total Assets, unless otherwise specified. To lessen the effect of extreme values affecting descriptive statistics and subsequent regression results, I follow the convention and eliminate the top and bottom 0.5% of cases of each scale-deflated value drivers (i.e., PBT, BV and DIV) and scale-deflated dependent variable (i.e., MV). A separate section of this chapter deals in more detailed fashion with the issue of outliers and/or influential observations. Because the time and industry-related characteristics of scale-deflated variables have already been analysed in section 4.2.3, descriptives reported in the current section relate to samples where the cross-sectional data is pooled over time.

The discussions in Chapters 2 and 3 have suggested that positive and negative earnings can be expected to have different valuation properties. Therefore variables' descriptive statistics shall be examined separately for positive and negative PBT sub-samples.

Several points should be mentioned with regards to variable descriptive statistics. As is evident from **Panels A** and **B** of **Appendix 4.3**, even after the elimination of extreme values, the frequency distributions of MV have long right-tails in both profit-making and loss-making sub-samples. The degree of variability of MV, measured by the coefficient of variation (Standard Deviation / Mean), is substantially smaller in the profit-making sample. In the profit-making sample the ratio of the mean (median) MV of ordinary equity to TA is slightly higher (lower) than unity, while in the loss-making sample this divergence is much larger. Considering that frequency distributions of most variables reported in Panel A and B are substantially skewed, the median values might be more appropriate for comparing the variables' central tendencies. By and large, one could conclude that deflated MVs are more stable cross-sectionally and over time, when firms report profits. In addition, judging by median values, profit-making firms have larger MVs[18].

The analysis of the profit sign-related variability of the deflated BVs and PBTs renders similar conclusions. That is, BV and PBT of profit-making firms are more stable. Because BV and PBT are deflated by TA, they can be viewed as a gearing ratio and return on asset (ROA), respectively. This provides further insight into the characteristics of the sample firms. Thus, the mean and median BV suggest that in the capital structure of the profit-making firms 46% of financing comes from ordinary shareholders. With regard to ROA, assets of the profit making-firms return, on average, 10%. However, for loss-making firms the absolute value of this percentage exceeds 12%.

The cross-sectional mean and median values of firm size-deflated dividends indicate that profit-making firms pay higher dividends than loss-making firms.

Correlation coefficients reported in Panel A and B provide further details on the relations between equity market value and accounting fundamentals, subject to the profitability of firms. In the profit-firms sub-sample, MV is highly correlated with profits, 60%, followed by dividends, 22%, while the correlation with book value is 9%.

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[18] Using the means results in opposite conclusions.

In the loss-firms sub-sample market value has the highest correlation (– 24%) with earnings, which are negative. The fact that this correlation coefficient is negative is counter-intuitive. This negative correlation seems to suggests that, *ceteris paribus*, firms with larger scaled losses have larger scaled equity market values.[19] In the loss-making sample correlations of dividends and book value with equity market value is similar to those observed in the profit-making firms. That is, MV has the second-larges correlation with dividends, 22%, and third-largest with BV, about 8%.

### 4.3 FIRM-LEVEL REGRESSION ANALYSIS

In this and following sections I test the operationalised model, developed in the Chapter 3. This involves estimating ordinary least squares (OLS) regressions that reflect the theoretical valuation model. The operationalised model explains the cross-sectional variation in equity market value by three key value drivers: profits, book value and dividends. For reasons of keeping firm-level and segment-level regression results compatible, I replace the earnings for ordinary variable, in the operationalised model, with *profit before tax* variable, and add a balancing item, the adjusted earnings (AdjER = ER - PBT). The scale-deflated model, therefore, is:

$$mv_t / s = a_{0,0} * (1/s) + a_{0,1} + a_1 * (bv_t / s) + a_{2,0} * (pbt_t / s) +$$
$$+ a_{2,1} * [s * (pbt_t / s)] + a_3 * (div / s) + a_4 * (AdjER / s) + u_t \qquad (21)$$

where the dependent and all independent variables (*mv, bv, pbt, div, AdjER*) are deflated by a scale proxy 's'. Coefficient $a_{0,0}$ is the constant part of the would-be intercept in an un-deflated model, and $a_{0,1}$ allows for scale-related non-linearity in the would-be

[19] Further investigation into possible causes of this result suggests that the negative correlation effect is likely to be caused by scaling. That is, when the value of the deflator approaches zero, scaling of MV and negative PBT would produce very large (in absolute terms) values, inducing spurious positive correlation.

intercept in an un-deflated model[20]; $a_1$ is the book value valuation multiple[21]; $a_{2,0}$ is the profits capitalisation coefficient, and $a_{2,1}$ is similar in nature to $a_{0.1}$ and captures a possible scale-related non-linearity of the profit coefficient $a_{2,0}$; $a_3$ is the dividend capitalisation coefficient; and $a_4$ is attached to the earnings balancing item and has no prior conceptualisation of its value relevance.

### 4.3.1 Valuation of positive vs. negative PBTs and BVs

In this section I examine the issue of value relevance of negative earnings and book values in the context of the operationalised model (21). The reason for specifically addressing negative values is based on a fact well documented in the literature, that negative earnings have different valuation characteristics [e.g., Collins *et al.* (1999)]. Specifically, negative earnings have been found to have weaker association with value. Common explanation found in the literature is that reported losses are perceived by investors as temporary [Hayn (1995)], and are, therefore, more weakly associated with equity returns than profits. According to this literature, losses are likely to be considered temporary because shareholders can always liquidate the firm, rather than suffer from indefinite losses. In other words, equity holders have a put option on the future cash flows of the firm whereby they can sell their shares at a price commensurate with the market value of the net assets of the firm. By and large, the value of the firm's equity is the higher of the present value of its expected earnings and its liquidation value. Consequently, when a loss is reported, the value of the firm shall not drop below the liquidation value nor decline proportionally to the change in earnings. Because of the

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[20] A statistically significant coefficient would suggest that the intercept in an un-deflated model is not a cross-sectional constant, and is likely to vary with scale. A positive (negative) sign of $a_{0,1}$ would indicate that regressions with larger firms have, on average, larger intercept.

[21] Although the complete version of this model allows for scale-related non-linearity of all value driver coefficients, when used in regressions this will create spurious correlation problem. Therefore, this non-linear structure is only imposed on the coefficient of the main variable of interest, PBT.

perceived low persistence of negative earnings, the inclusion of loss firm-years in the sample is likely to dampen the regression estimated earnings coefficient and the level of its statistical significance. For the loss-making firms the book value coefficient is likely to become a statistically more significant value driver.

In light of these arguments in the empirical analysis that follows I partition the sample according to the sign of earnings[22]. **Table 4.1** summarises regression results of model (21) when it is tested for such contexts as the sign of the firm's financial results (i.e., profit vs. loss firms) within differently defined samples.

Differences in the regression results between the profit and loss sub-samples are self-evident. First of all, the explanatory power of the model is substantially lower for the loss-making sub-sample. The absolute value of the PBT coefficient is much higher in the sub-sample of profitable firms. Unexpectedly though, the PBT coefficient for loss-making firms is negative and statistically significant, which implies that *ceteris paribus* higher losses are associated with higher value. Book value capitalisation, however, is substantially higher in loss-making firms, which conforms to the view (and other literature) that in situations close to financial distress, book value represents an exit option value.

When comparing models 4 and 8, dividend payments appear to be value-irrelevant for profitable firms, while in loss-making firms, they are statistically significant at the 1% level and are positively related to the firm value. Furthermore, negative PBT become no longer statistically significant when the analysis is restricted to dividend paying firms.

[22] Given the evidence [e.g., Hayn (1995)] that firms whose earnings are expected to fall just below the zero earnings point engage in earnings manipulations to help them cross the 'loss' barrier, it might be reasonable to treat marginally small positive earnings similar to losses. However, what shall be considered as marginally small profits involves subjective judgement, and also is unlikely to add value to the core investigation.

## Table 4.1 Valuation impact of the sign of earnings and book values

$$mv_t / TA_t = a_{0,0} * (1/TA_t) + a_{0,1} + a_1 * (BV_t / TA_t) + a_{2,0} * (PBT_t / TA_t) +$$
$$+ a_{2,1} * [f(TA) * (PBT_t / TA_t)] + +a_3 * (DIV / TA_t) + a_4 * (AdjER / TA_t) + u_t$$

**PANEL A: Profit reporting firms**

| | Model 1 | *p-value* | Model 2 * | *p-value* | Model 3 * | *p-value* | Model 4 * | *p-value* |
|---|---|---|---|---|---|---|---|---|
| Intercept | 0.128 | | 0.113 | | 0.063 | | 0.077 | |
| *t-ratio* | 5.970 | 0.000 | 5.184 | 0.000 | 2.876 | 0.004 | 3.549 | 0.000 |
| 1/TA | 573.270 | | 690.170 | | 789.132 | | 278.223 | |
| *t-ratio* | 4.883 | 0.000 | 5.032 | 0.000 | 5.970 | 0.000 | 2.256 | 0.024 |
| BV | 0.251 | | 0.257 | | 0.348 | | 0.146 | |
| *t-ratio* | 5.707 | 0.000 | 5.887 | 0.000 | 7.719 | 0.000 | 3.614 | 0.000 |
| PBT | 7.836 | | 7.211 | | 7.128 | | 7.804 | |
| *t-ratio* | 42.026 | 0.000 | 27.799 | 0.000 | 26.806 | 0.000 | 27.524 | 0.000 |
| PBT*f(TA) | 1.20E-07 | | 0.077 | | 0.080 | | 0.070 | |
| *t-ratio* | 2.270 | 0.023 | 3.396 | 0.001 | 3.573 | 0.000 | 3.129 | 0.002 |
| DIV | 0.342 | | 0.339 | | 0.305 | | 0.588 | |
| *t-ratio* | 0.717 | 0.473 | 0.717 | 0.474 | 0.677 | 0.498 | 0.857 | 0.391 |
| Adj.ER | -0.010 | | 0.004 | | -0.085 | | 0.080 | |
| *t-ratio* | -0.052 | 0.958 | 0.020 | 0.984 | -0.351 | 0.726 | 0.294 | 0.769 |
| Adj.R-Square | 36.5% | | 36.5% | | 37.0% | | 42.9% | |
| No.of Cases | 14487 | | 14487 | | 14251 | | 13209 | |

**PANEL B: Loss reporting firms**

| | Model 5 | *p-value* | Model 6 * | *p-value* | Model 7 * | *p-value* | Model 8 * | *p-value* |
|---|---|---|---|---|---|---|---|---|
| Intercept | 0.922 | | 0.985 | | 0.025 | | 0.205 | |
| *t-ratio* | 10.256 | 0.000 | 11.526 | 0.000 | 0.285 | 0.776 | 3.602 | 0.000 |
| 1/TA | 1336.160 | | 1191.020 | | 1272.830 | | 1270.370 | |
| *t-ratio* | 4.573 | 0.000 | 3.877 | 0.000 | 4.570 | 0.000 | 5.081 | 0.000 |
| BV | 0.894 | | 0.894 | | 2.698 | | 0.532 | |
| *t-ratio* | 6.523 | 0.000 | 6.500 | 0.000 | 12.923 | 0.000 | 3.743 | 0.000 |
| PBT | -0.863 | | -1.542 | | -2.189 | | -0.793 | |
| *t-ratio* | -5.692 | 0.000 | -3.669 | 0.000 | -3.356 | 0.001 | -1.336 | 0.182 |
| PBT*f(TA) | 1.99E-07 | | 0.130 | | 0.213 | | 0.062 | |
| *t-ratio* | 2.614 | 0.009 | 2.292 | 0.022 | 2.592 | 0.010 | 1.124 | 0.261 |
| DIV | -15.808 | | -15.517 | | -10.586 | | 7.510 | |
| *t-ratio* | -5.525 | 0.000 | -5.164 | 0.000 | -4.216 | 0.000 | 3.524 | 0.000 |
| Adj.ER | 0.097 | | 0.117 | | -0.078 | | -0.165 | |
| *t-ratio* | 0.332 | 0.740 | 0.399 | 0.690 | -0.186 | 0.853 | -1.144 | 0.253 |
| Adj.R-Square | 14.4% | | 14.5% | | 17.0% | | 10.6% | |
| No.of Cases | 4202 | | 4202 | | 3791 | | 1159 | |

All variables in the reported models are scaled by total assets, a size proxy. In all models top and bottom 0.5% of values of MV, PBT, BV and non-zero DIV are deleted as outliers. PBT*f(TA) is the unscaled row PBT, where unscaling is done by multiplying the scale-deflated PBT by the scale factor. This implies that true regression coefficient on PBT is a simple linear function of the unscaled PBT.

* In these models *PBT*f(TA)* is computed by multiplying the scale-deflated PBT by the 5th order root of the scale factor. This mitigates the effect of extreme values of the un-deflated row PBT, and also allows for non-linearity in the functional form of the scale PBT coefficient.

Model 1 is estimated for only positive firm-year PBT cases. Model 2 differs from Model 1 only in definition of PBT*Sales. Model 3 is estimated for only positive firm-year PBT and positive firm-year BV cases. Model 4 is identical to Model 3, apart from that the sample excludes non-dividend firms. Models 5, 6, 7 and 8 are the same as Models 1, 2, 3 and 4 respectively, but are estimated for negative PBT firm-year cases only. Estimated coefficients' White-adjusted t-ratios are reported below coefficients, and the level of significance (p-value) is reported next to the t-ratios.

As hypothesised earlier, the balancing item AdjER is totally irrelevant to value, as its coefficient is not statistically significant in any of the regressions.

High levels of statistical significance, in all models, of coefficients on the reciprocal of the scale proxy (i.e., total assets) imply the existence of a non-zero intercept in the un-deflated model. Furthermore, the positive and statistically significant intercepts (as is in all models except Model 7) in scale-deflated regressions suggest that the intercept in un-deflated model increases with scale. In other words, larger companies tend to have larger intercepts.

The PBT coefficient is also not a cross-sectional constant and, as indicated by positive and statistically significant value of the coefficient on *PBT*f(TA)*, is positively related to scale. In other words, earnings from larger firms are likely to have a higher capitalisation rate. In models 1 and 5 the PBT coefficient in an un-deflated model is hypothesised as a simple linear function of a constant and firm size proxy ($a_{0,0} + a_{0,1} * s$). This construct might be susceptible to extremely large (in absolute terms) un-scaled PBT values. Therefore, in models 2-4 and 6-8 this PBT coefficient is modeled as a linear function of a constant and a 'depressed' scale ($a_{0,0} + a_{0,1} * \sqrt[5]{s}$)[23]. The Basic regression results are qualitatively similar in both cases.

Models 1, 2, 4 and 5 are estimated for samples that include positive and negative book values. It has been argued earlier that negative book value should be value-irrelevant, at least in the theoretical model. A negative book value (i.e., the total balance sheet liabilities exceed total assets) might be the result of accounting treatments (e.g., when goodwill is written off against the reserves in the equity section of the balance sheet) or indicate that the firm is in temporary financial distress or the firm is in the initial stage of its life cycle. Nevertheless, I do not exclude such firms from the samples

[23] The choice of the second term in the formula for this coefficient is arbitrary. The use of alternative functional forms, e.g., logarithmic or exponential, does not affect empirical results. However, the 5[th] root is chosen because the log function is not determined for negative values (i.e., can not be used for negative PBTs).

as negative book value will not necessarily result in the firm filing for bankruptcy[24]. However, to test the sensitivity of estimated coefficients to negative book value cases, regressions 3, 4, 7 and 8 are estimated with these cases being eliminated.

This exclusion does not affect the PBT and dividend coefficients in positive PBT sub-samples in any significant manner (Model 2 vs. Model 3). However, in the negative PBT sub-samples (Model 6 vs. Model 7) all key valuation coefficients are changed substantially. This is because negative BVs are more closely associated with the loss-making sub-sample: 10% of cases in the negative PBT sub-sample have negative BVs, while only 1.6% of positive PBT sub-sample cases have negative BVs.

An expected effect of the exclusion of negative (and theoretically irrelevant to valuation) BV cases is the increased valuation of positive BVs and an improved explanatory power of regressions in both the positive PBT (to a smaller extent) and negative PBT (to a larger extent) sub-samples.

With regard to the valuation of dividends one shall note that not all firm-years in the sample pay dividends. Regression-estimated dividend coefficients might be biased if no account is taken of the dividend-paying status of the firm. Therefore, in Models 4 and 8 I exclude all non-dividend paying firms[25]. Elimination of these firm-years reduces the positive PBT sample by 7.3% and does not change the valuation of dividends.

In the negative PBT sample, however, this elimination reduces the sample by 69.4% and completely changes the valuation of dividends. Here, dividends are positively associated with firm value and are statistically significant at the 1% level, while the value of the BV coefficient drops notably and the PBT coefficient is no longer

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[24] The firm might continue its operations if debt is not immediately due or could be rescheduled, and/or there are prospects of future reversal in the performance.

[25] These results should be red with a caveat that the elimination of the non-dividend observations impacts upon the yearly and industrial structure of the sample. Thus the *Mining* sector would be relatively under-represented in the new samples, because only 60% of firms in this sector pay dividends (see **Figure 4.16**). Similarly, because there has been a pronounced decline in dividend paying firms over the sample period (see **Figure 4.17**), the new samples will include less observations from the more recent years of the sample period.

statistically significant. This suggests that in loss-making dividend-paying firms, dividend is, perhaps, the major value driver.

### 4.3.2 The effect of time on value relevance of major value drivers

This section analyses the characteristics of the yearly regression results, as reported in **Table 4.2**.

**Table 4.2**

$$mv_t / TA_t = a_{0,0} * (1/TA_t) + a_{0,1} + a_1 * (BV_t / TA_t) + a_{2,0} * (PBT_t / TA_t) + a_{2,1} * [f(TA) * (PBT_t / TA_t)] + + a_3 * (DIV / TA_t) + a_4 * (AdjER / TA_t) + u_t$$

| Year | Intercept | 1/TA | BV | PBT | PBT x f(TA) | DIV | Adj.ER | No. of cases | Adj. R-Square |
|---|---|---|---|---|---|---|---|---|---|
| 1987 | -0.015 | 1463.9 | 0.539 | 4.804 | 0.124 | -0.825 | -1.859 | 349 | 37.30% |
| *t-ratio* | *-0.106* | *3.132* | *2.031* | *3.210* | *0.908* | *-0.209* | *-1.166* | | |
| *P-value* | *0.916* | *0.002* | *0.043* | *0.001* | *0.364* | *0.835* | *0.245* | | |
| 1988 | 0.076 | 833.3 | 0.252 | 6.426 | -0.068 | 0.873 | -0.876 | 932 | 56.60% |
| *t-ratio* | *1.504* | *2.443* | *2.519* | *11.342* | *-1.672* | *0.519* | *-1.889* | | |
| *P-value* | *0.133* | *0.015* | *0.012* | *0.000* | *0.095* | *0.604* | *0.059* | | |
| 1989 | 0.183 | 395.2 | 0.195 | 5.760 | -0.039 | 2.045 | -0.595 | 1036 | 43.00% |
| *t-ratio* | *3.117* | *1.615* | *1.781* | *9.738* | *-0.796* | *1.105* | *-1.908* | | |
| *P-value* | *0.002* | *0.106* | *0.075* | *0.000* | *0.426* | *0.269* | *0.056* | | |
| 1990 | 0.011 | 395.7 | 0.367 | 4.414 | 0.090 | -0.143 | -0.029 | 1025 | 48.00% |
| *t-ratio* | *0.266* | *1.493* | *5.060* | *11.056* | *2.388* | *-11.690* | *-0.115* | | |
| *P-value* | *0.791* | *0.135* | *0.000* | *0.000* | *0.017* | *0.000* | *0.908* | | |
| 1991 | 0.085 | 323.6 | 0.187 | 3.707 | 0.121 | 7.239 | -0.143 | 940 | 49.50% |
| *t-ratio* | *1.758* | *1.059* | *2.263* | *6.385* | *2.086* | *4.401* | *-0.454* | | |
| *P-value* | *0.079* | *0.290* | *0.024* | *0.000* | *0.037* | *0.000* | *0.650* | | |
| 1992 | 0.146 | -91.6 | 0.091 | 6.660 | 0.065 | 2.735 | 0.097 | 878 | 55.20% |
| *t-ratio* | *2.797* | *-0.299* | *0.869* | *9.068* | *1.088* | *1.213* | *0.631* | | |
| *P-value* | *0.005* | *0.765* | *0.385* | *0.000* | *0.277* | *0.225* | *0.528* | | |
| 1993 | 0.242 | 57.1 | -0.076 | 8.144 | -0.005 | 6.412 | 0.294 | 952 | 53.00% |
| *t-ratio* | *3.078* | *0.147* | *-0.480* | *7.561* | *-0.093* | *3.295* | *0.152* | | |
| *P-value* | *0.002* | *0.883* | *0.631* | *0.000* | *0.926* | *0.001* | *0.879* | | |
| 1994 | 0.124 | 457.5 | 0.180 | 5.658 | -0.007 | 7.908 | -3.881 | 1102 | 58.90% |
| *t-ratio* | *2.413* | *1.191* | *1.798* | *5.561* | *-0.120* | *3.819* | *-2.116* | | |
| *P-value* | *0.016* | *0.234* | *0.072* | *0.000* | *0.904* | *0.000* | *0.034* | | |
| 1995 | 0.053 | 737.3 | 0.147 | 5.774 | 0.055 | 5.158 | -3.570 | 1105 | 61.70% |
| *t-ratio* | *1.171* | *2.206* | *1.700* | *7.528* | *1.105* | *2.898* | *-2.630* | | |
| *P-value* | *0.242* | *0.027* | *0.089* | *0.000* | *0.269* | *0.004* | *0.009* | | |
| 1996 | 0.015 | 1868.5 | 0.241 | 10.169 | 0.022 | 1.596 | 2.476 | 1130 | 46.00% |
| *t-ratio* | *0.172* | *2.726* | *1.357* | *8.943* | *0.340* | *0.560* | *3.315* | | |
| *P-value* | *0.863* | *0.006* | *0.175* | *0.000* | *0.734* | *0.576* | *0.001* | | |
| 1997 | 0.057 | 1669.1 | 0.172 | 8.092 | -0.003 | 3.809 | -1.824 | 1139 | 43.30% |
| *t-ratio* | *0.602* | *2.517* | *0.984* | *6.168* | *-0.036* | *1.182* | *-0.931* | | |
| *P-value* | *0.547* | *0.012* | *0.325* | *0.000* | *0.971* | *0.237* | *0.352* | | |
| 1998 | 0.144 | 1301.5 | -0.183 | 7.293 | 0.222 | 4.735 | 1.512 | 1051 | 31.90% |
| *t-ratio* | *1.271* | *2.271* | *-0.871* | *4.512* | *1.994* | *0.940* | *2.226* | | |
| *P-value* | *0.204* | *0.023* | *0.384* | *0.000* | *0.046* | *0.347* | *0.026* | | |

(table is continued on the next page)

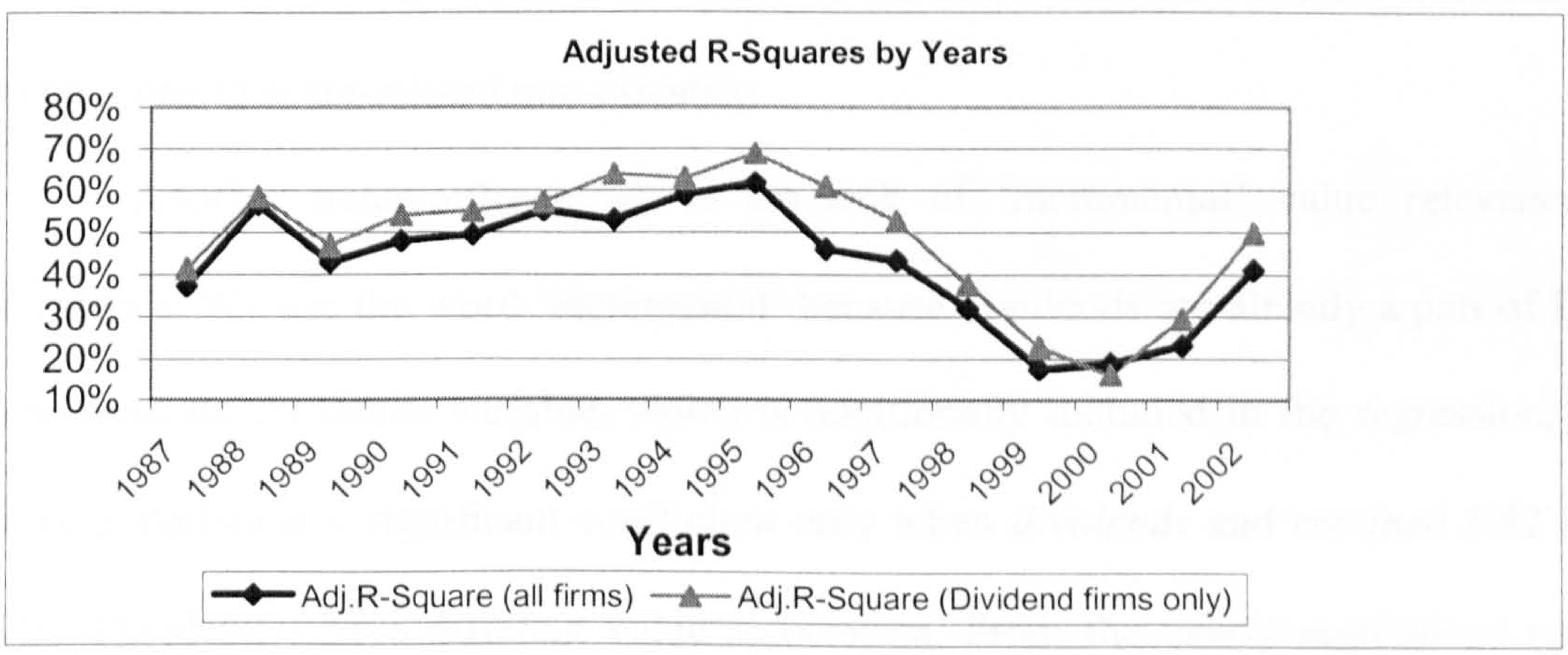
**Table 4.2** (continued from the previous page)

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1999 | 0.308 | 1483.3 | 0.087 | 6.159 | 0.340 | -3.189 | -1.508 | 943 | 17.70% |
| *t-ratio* | *1.869* | *2.228* | *0.202* | *4.020* | *2.575* | *-0.827* | *-1.241* | | |
| *P-value* | *0.062* | *0.026* | *0.840* | *0.000* | *0.010* | *0.408* | *0.215* | | |
| 2000 | 0.169 | 4885.3 | 0.925 | 9.335 | 0.010 | -6.967 | 1.527 | 855 | 19.00% |
| *t-ratio* | *0.973* | *4.338* | *2.367* | *3.549* | *0.071* | *-1.673* | *0.943* | | |
| *P-value* | *0.331* | *0.000* | *0.018* | *0.000* | *0.943* | *0.094* | *0.346* | | |
| 2001 | 0.031 | 1379.6 | 0.832 | 4.226 | 0.151 | -2.394 | -5.194 | 717 | 23.10% |
| *t-ratio* | *0.310* | *2.959* | *4.022* | *2.101* | *1.299* | *-0.845* | *-1.277* | | |
| *P-value* | *0.756* | *0.003* | *0.000* | *0.036* | *0.194* | *0.398* | *0.202* | | |
| 2002 | 0.162 | 899.1 | 0.381 | 4.526 | 0.136 | 3.163 | 1.478 | 366 | 41.10% |
| *t-ratio* | *2.215* | *4.243* | *3.017* | *3.784* | *1.787* | *1.293* | *0.807* | | |
| *P-value* | *0.027* | *0.000* | *0.003* | *0.000* | *0.075* | *0.197* | *0.420* | | |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported below the regression coefficients. Yearly regressions are scaled by TA, estimated for profit-making firms and exclude the outliers. PBT*f(TA) is the unscaled PBT, where unscaling is computed by multiplying the scale-deflated PBT by the 5th order root of the scale factor. This mitigates the effect of extreme values of the un-deflated raw PBT, and also allows for non-linearity in the functional form of the scaled PBT coefficient. Coefficients which are statistically significant at the 5% level or higher are highlighted.

Some general observations are in order. The explanatory power of the basic model has a particular pattern (**Figure 4.18**).

**Figure 4.18**




In the years 1988-1995, the valuation factors comprising the model explained more than 40% of the variation in equity market value, and this explanatory power had a pronounced increasing trend. In later years (1996-2002), however, the model's ability to explain the equity market value was substantially lower and had a declining trend in 1996-1999. Overall, this suggests that the cumulative value relevance of such accounting-based value drivers as PBT, dividends and BV is changing through time.

A rather unexpected finding is the level of value association of equity book value. In 10 out of the 16 years, the BV coefficient is not statistically significant, yet when significant it has the theoretically expected positive sign. In the regressions reported in **Table 4.2** above I do not exclude cases with negative BVs, as on average only 3% of cases in yearly samples have negative BV. Repeating the tests with negative BV cases being excluded (results are not reported) partially 'rectifies' the situation, yet still does not produce statistically significant book values in 5 out of 16 years, and repeating the tests with negative BVs set to zero produces statistically insignificant BV coefficients in 7 out of 16 years. This effect can be easily controlled for, when necessary, by appending the model with a negative BV-related dummy and a negative BV interaction terms.

PBT appears to be the most robust value driver, as the PBT coefficients are positive and statistically significant at 1% level in all years. The values of the yearly PBT coefficients do not exhibit trend and vary substantially in magnitude. The coefficients on PBT*f(TA) indicate that in 11 out of 16 years PBT coefficients seem not to be prone to scale-related non-linearity.

Another noteworthy result is the lack of 'incremental' value relevance of dividends. We use the word 'incremental' because dividends are already a part of PBT. The separate *dividends* variable, which is additionally included in the regression, will have a statistically significant coefficient only when *dividends* and *retained PBT* (i.e., PBT-Dividends) have different value association. From the yearly regressions results one could infer that *dividends* and *retained earnings* have statistically similar value association in 11 out of 16 years.

In the above regressions the dividend-paying and non-dividend observations have been pooled, which might lower both the value of estimated BV coefficient and the level of its statistical significance. Therefore, I re-run the yearly regressions for only dividend-paying firms (see **Table 2 in Appendix 4.6**). Although the pair-wise yearly correlations between dividends and the equity market value are higher in *'only dividend-paying'* yearly samples, dividends' valuation is largely unaffected (except that the dividends coefficient in year the 1996 becomes statistically significant), as in 10 out of 16 years dividends, in dividend-paying firms, do not have incremental value association. One surprising result is observable in respect of the dividend-paying yearly samples: the explanatory power of each of the 16 yearly regressions is higher, on average, by 5 percentage points.

To control for the revealed yearly dynamics of the combined value relevance of the accounting fundamentals and other time-related effects, regressions on pooled data shall be estimated with yearly fixed effects.

### 4.3.3 Firms' industrial affiliation and the value relevance of major value drivers

To examine the performance of the operationalised model across different industries, I partition the entire sample into ten SIC-based industrial sub-samples and run ten separate regressions.

Results in **Table 4.3** indicate that there is a sharp divergence among the various economic sectors in terms of regression explanatory power. The model appears to work better for such economic sectors as *'Finance, Insurance and Real Estate'*, and *'Retail Trade'*, with the Adjusted $R^2$ being above 57%, while in the *Services* sector the financial statement variables explain only 27% of the cross-sectional variation in equity market value. The apparent cross-industry variation in the models ability to explain value might necessitate the inclusion of industry-related fixed effects in the pooled total sample.

**Table 4.3**

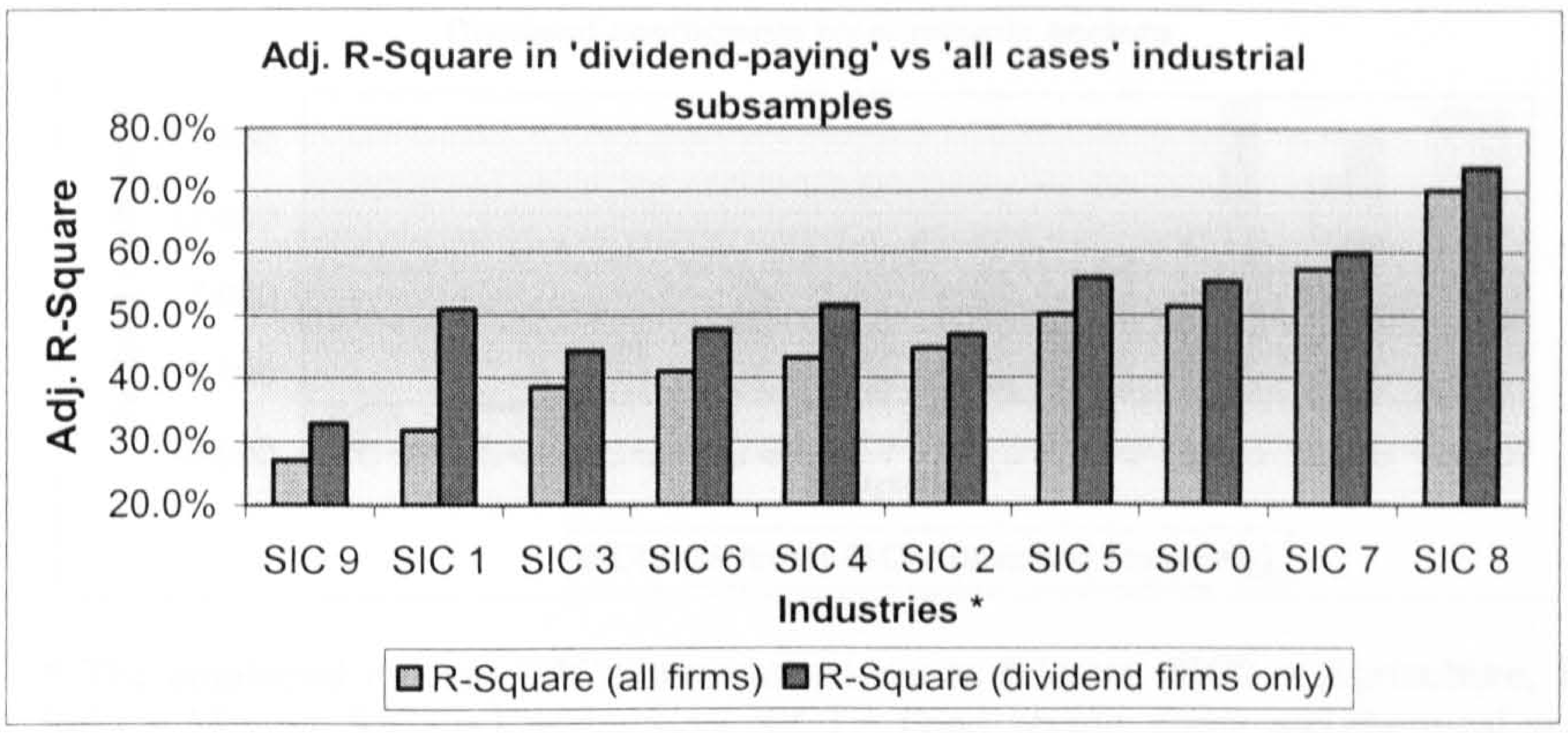
$$mv_t / TA_t = a_{0,0} * (1/TA_t) + a_{0,1} + a_1 * (BV_t / TA_t) + a_{2,0} * (PBT_t / TA_t) + a_{2,1} * [f(TA) * (PBT_t / TA_t)] + + a_3 * (DIV / TA_t) + a_4 * (AdjER / TA_t) + u_t$$

| Industry* | Intercept | 1/TA | BV | PBT | PBT x f(TA) | DIV | Adj.ER | No. of cases | Adj. R-Square |
|---|---|---|---|---|---|---|---|---|---|
| SIC 0 | 0.154 | 2170.2 | -0.029 | 0.556 | -0.175 | 19.187 | -1.668 | 107 | 51.40% |
| *t-ratio* | *2.091* | *4.302* | *-0.177* | *0.495* | *-1.602* | *6.878* | *-2.734* | | |
| *p-value* | *0.039* | *0.000* | *0.860* | *0.622* | *0.112* | *0.000* | *0.007* | | |
| SIC 1 | 0.338 | 2185.8 | 0.577 | 4.617 | -0.232 | 11.131 | -0.048 | 376 | 31.80% |
| *t-ratio* | *2.432* | *3.373* | *2.502* | *5.405* | *-4.586* | *4.187* | *-0.414* | | |
| *p-value* | *0.015* | *0.001* | *0.013* | *0.000* | *0.000* | *0.000* | *0.679* | | |
| SIC 2 | 0.075 | 1389.7 | 0.365 | 2.189 | 0.000 | 8.438 | -0.184 | 733 | 44.80% |
| *t-ratio* | *2.203* | *5.578* | *3.050* | *3.265* | *0.004* | *5.011* | *-0.177* | | |
| *p-value* | *0.028* | *0.000* | *0.002* | *0.001* | *0.997* | *0.000* | *0.860* | | |
| SIC 3 | -0.003 | 350.1 | 0.323 | 4.689 | 0.170 | 7.286 | 0.396 | 2647 | 38.50% |
| *t-ratio* | *-0.051* | *1.662* | *3.385* | *7.289* | *4.596* | *3.503* | *0.647* | | |
| *p-value* | *0.959* | *0.096* | *0.001* | *0.000* | *0.000* | *0.000* | *0.518* | | |
| SIC 4 | 0.063 | 596.2 | 0.249 | 6.181 | 0.027 | 4.220 | -0.079 | 3299 | 43.20% |
| *t-ratio* | *1.825* | *1.912* | *2.517* | *14.789* | *0.918* | *3.111* | *-0.167* | | |
| *p-value* | *0.068* | *0.056* | *0.012* | *0.000* | *0.358* | *0.002* | *0.867* | | |
| SIC 5 | 0.147 | 1951.3 | -0.461 | 5.686 | 0.082 | 14.651 | 0.823 | 1204 | 50.10% |
| *t-ratio* | *2.222* | *1.940* | *-2.767* | *4.786* | *1.338* | *5.228* | *1.804* | | |
| *p-value* | *0.026* | *0.052* | *0.006* | *0.000* | *0.181* | *0.000* | *0.071* | | |
| SIC 6 | 0.162 | 557.1 | 0.078 | 6.225 | 0.091 | 1.432 | 0.011 | 1352 | 41.00% |
| *t-ratio* | *3.128* | *4.077* | *0.596* | *9.619* | *1.565* | *0.826* | *0.016* | | |
| *p-value* | *0.002* | *0.000* | *0.551* | *0.000* | *0.118* | *0.409* | *0.987* | | |
| SIC 7 | 0.050 | 869.2 | 0.185 | 7.252 | 0.053 | 4.923 | 0.726 | 1563 | 57.20% |
| *t-ratio* | *0.971* | *2.500* | *1.993* | *11.745* | *1.560* | *4.009* | *1.746* | | |
| *p-value* | *0.332* | *0.012* | *0.046* | *0.000* | *0.119* | *0.000* | *0.081* | | |
| SIC 8 | 0.015 | 3023.2 | 0.445 | 2.697 | 0.205 | -0.143 | -1.630 | 361 | 70.20% |
| *t-ratio* | *0.398* | *8.202* | *6.648* | *1.709* | *1.920* | *-5.172* | *-0.620* | | |
| *p-value* | *0.691* | *0.000* | *0.000* | *0.088* | *0.056* | *0.000* | *0.536* | | |
| SIC 9 | 0.250 | 679.7 | 0.407 | 5.468 | 0.471 | -2.708 | -0.120 | 2880 | 27.10% |
| *t-ratio* | *4.264* | *2.716* | *3.913* | *6.412* | *4.603* | *-2.138* | *-0.358* | | |
| *p-value* | *0.000* | *0.007* | *0.000* | *0.000* | *0.000* | *0.033* | *0.720* | | |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported next to the regression coefficients. Industrial regressions are scaled by TA, estimated for profit-making firms and exclude the outliers. PBT*f(TA) is the unscaled PBT, where unscaling is computed by multiplying the scale-deflated PBT by the 5th order root of the scale factor. This mitigates the effect of extreme values of the un-deflated raw PBT, and also allows for non-linearity in the functional form of the scaled PBT coefficient. Coefficients which are statistically significant at the 5% level or higher are highlighted.
* The employed industry SIC abbreviations are as follows: SIC0 = Agriculture, Forestry and Fishing; SIC1 = Mining; SIC2 = Construction; SIC3 = Food, textile, paper and chemical products (i.e., two-digit SIC codes of 20 through 29); SIC4 = Manufacturing (i.e., two-digit SIC codes of 20 through 29); SIC5 = Transportation, Communications, Electric, Gas, And Sanctuary Services; SIC6 = Wholesasle Trade; SIC7 = Retale trade; SIC8 = Finance, Insurance, and Real Estate; SIC9 = Services.

**Figure 4.19** demonstrates that across **all** ten industries the elimination of non-dividend firm-years increases the explanatory power of the regressions, with the average increase being about 6%. Recall that a similar effect was observed in the yearly regressions.

**Figure 4.19**




* The employed industry SIC abbreviations are as follows: SIC0 = Agriculture, Forestry and Fishing; SIC1 = Mining; SIC2 = Construction; SIC3 = Food, textile, paper and chemical products (i.e., two-digit SIC codes of 20 through 29); SIC4 = Manufacturing (i.e., two-digit SIC codes of 20 through 29); SIC5 = Transportation, Communications, Electric, Gas, And Sanctuary Services; SIC6 = Wholesasle Trade; SIC7 = Retale trade; SIC8 = Finance, Insurance, and Real Estate; SIC9 = Services.

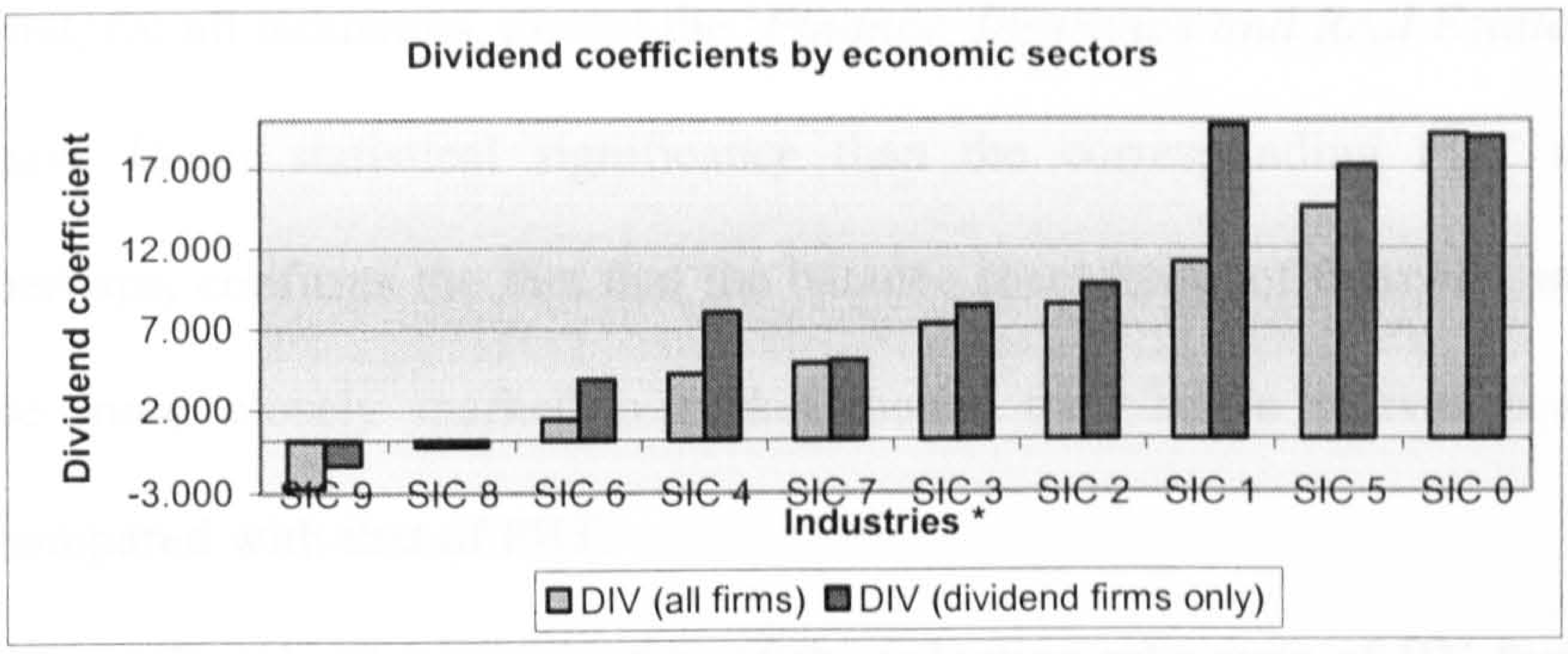
With regards to the major valuation factors, the dividend coefficients are statistically significant in 9 out of 10 industries. However, in two out of these 9 industries (*Services* and *Finance, Insurance and Real Estate*), dividends have negative association with value. This pattern persists when the tests are repeated for dividend-paying firms only (**Figure 4.20**).

The absolute value of the dividend coefficients varies substantially across the different economic sectors, and increases in all sectors when samples exclude non-dividend firms.

In two sectors (*Agriculture, Forestry and Fishing*, and *Finance, Insurance and Real Estate*) the PBT coefficients are not statistically significant, irrespective of whether or not the non-dividend firms are excluded from the samples.

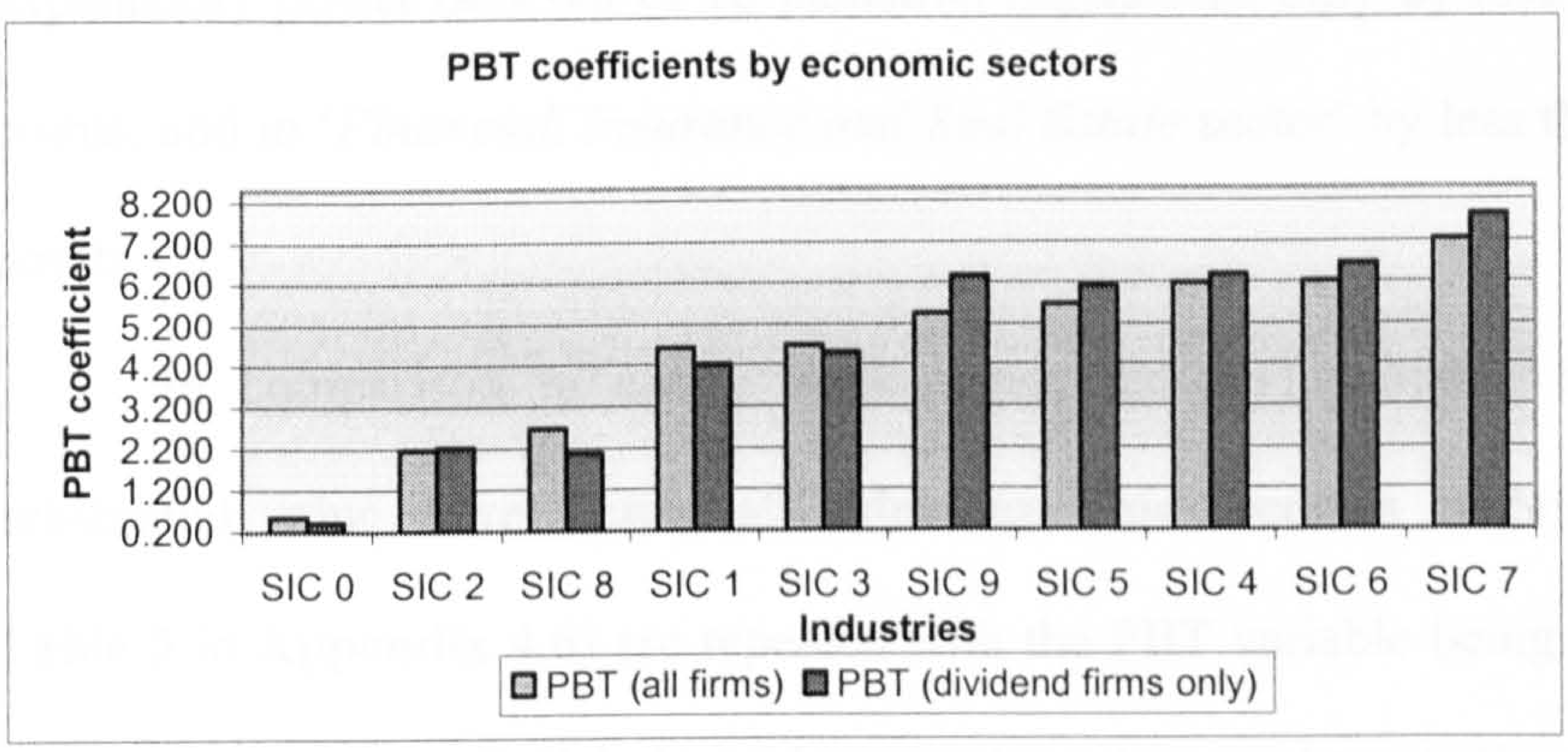
The substantial cross-industry difference in the valuation of PBTs is evident from **Figure 4.21**, with profits having higher capitalisation in the trade, manufacturing and services sectors. This might be a point of reference when comparing the market's perception of values, associated with specific business segments, with the valuation of firm-level PBT coefficients in specific industries.

**Figure 4.20**




* The employed industry SIC abbreviations are as follows: SIC0 = Agriculture, Forestry and Fishing; SIC1 = Mining; SIC2 = Construction; SIC3 = Food, textile, paper and chemical products (i.e., two-digit SIC codes of 20 through 29); SIC4 = Manufacturing (i.e., two-digit SIC codes of 20 through 29); SIC5 = Transportation, Communications, Electric, Gas, And Sanctuary Services; SIC6 = Wholesasle Trade; SIC7 = Retale trade; SIC8 = Finance, Insurance, and Real Estate; SIC9 = Services.

**Figure 4.21**




* The employed industry SIC abbreviations are as follows: SIC0 = Agriculture, Forestry and Fishing; SIC1 = Mining; SIC2 = Construction; SIC3 = Food, textile, paper and chemical products (i.e., two-digit SIC codes of 20 through 29); SIC4 = Manufacturing (i.e., two-digit SIC codes of 20 through 29); SIC5 = Transportation, Communications, Electric, Gas, And Sanctuary Services; SIC6 = Wholesasle Trade; SIC7 = Retale trade; SIC8 = Finance, Insurance, and Real Estate; SIC9 = Services.

As has been suggested in Chapter 3, the theoretical book value coefficient may have a positive, as well as negative sign[26]. The book value coefficient is not statistically significant in 2 out of 10 industries. This appears to be the case for one industry

[26] From the theoretical models that underlie our regressions, it is difficult to hypothesise about the sign and magnitude of the book value coefficient. As Chapter 3 demonstrates, the theoretical book value coefficient is the sum of two terms: unity and a negative term that represents the present value factor of all future expected required returns on ordinary equity. Because we are unaware of the expected magnitude of the second term (it might take up a value which is larger or smaller than unity), the theoretical book value coefficient in our model can have any sign. Therefore, the fact that in some yearly or industrial regressions book value coefficients appear statistically not significant, does not mean that in those years' or industries' book values were value irrelevant.

('*Transportation, Communications, etc. Services*') in our tests. One can also observe that, for all industries, except the '*Finance, Insurance and Real Estate*', BV coefficients have lower statistical significance than the corresponding PBT coefficients. This, perhaps, confirms the fact that the balance sheet items of financial sector firms tend to be more closely marked-to-market, hence their value relevance is relatively high compared with that of PBT.

To take the examination of the valuation relevance of BV further, I estimate all industrial regressions with the BV variable being omitted. Results (see **Table 4** in **Appendix 4.6**) indicate that the BV variable plays a marginally low role in valuation across all industries. Omitting the BV variable from the regressions reduces the explanatory power of 9 out of 10 industrial regressions only by less than 2 percentage points, and in '*Financial, Insurance and Real Estate* sector' by less than 4.5 percentage points.

In comparison to equity book value, the PBT variable is clearly a more substantial value driver across all industries. This becomes evident when tests (see **Table 5** in **Appendix 4.6**) are repeated with the PBT variable being omitted. Here, the explanatory power of all industrial regressions drops substantially, on average by 10 percentage points, yet the BV and dividends coefficients remain generally unaffected.

Finally, the dividend variable has an industry-variant valuation role. Exclusion of the dividends variable from regressions in the '*Agriculture, Forestry and Fishing*' and '*Construction*' sectors depresses the explanatory power of the regressions by 20.7% and 6.2% respectively, and this reduction is statistically significant. In the remaining industries, dividends seem to be a less important value driver, as its exclusion reduces the explanatory power of the regressions by less than 1.6%, on average, and this reduction is not statistically significant.

Industrial sub-samples in the preceding tests did not exclude firms that do not pay dividends. Therefore, I repeat these tests and once again examine the valuation role of dividends for only dividend-paying-firms sub-samples. The results (see **Table 4** in **Appendix 4.6**) are virtually unchanged for most of the industries, except for the '*Mining*' sector where the exclusion of dividends causes a statistically significant reduction in the explanatory power of the regression.

In summary, it is evident that there are cross-industry differences in investors' perception of the valuation role of various financial statements variables. The cumulative value association of these variables is also industry-specific. With regards to the segmental analysis, the above findings appear to oblige the researcher to, at least, control for industry fixed effects. Furthermore, across all industries, firm-level profits prove to be the 'strongest' value driver, whereas equity book value is the 'weakest' valuation factor. This finding supports my argument, put forward in Chapter 3, that PBT coefficients should be the main reference point when comparing relative valuation of specific segments.

### 4.3.4 Market-to-book ratio and value relevance of major value drivers

The entire notion of the RIV model is to explain the divergence between the equity market value and the book value. According to the residual income valuation model, the excess of market value over book value implies the existence of positive perceived growth opportunities, while the opposite is true when market value is below book value. The fact that one firm might trade above book value while another might trade at a discount to its book value points to the existence of a divergence between these firms' valuation. It follows that these firms are most likely to differ in terms of value association of key accounting value drivers (BV, PBT, DIV). To prove or disprove this point I run separate basic model regressions for two sub-samples of firms:

(i) where the market-to-book ratio (MB) is greater than unity (i.e., firms that trade above BV), and (ii) where the MB is below unity (i.e., firms that trade at a discount to BV).

All models reported in **Table 4.4** exclude negative profit cases, and negative BVs are set to zero. A general review of results suggests the following:

1. In the total sample, there are about 4.6 times more firms that trade *above* book value than firms trading *below* book value;

2. The explanatory power of the regressions are always larger for firms that trade at a *discount* to book value, regardless of the treatment of dividend non-dividend firms and fixed effects;

3. The inclusion of industry and yearly fixed effects always increases the explanatory power of the regressions, and this increase is more pronounced for firms that trade at **premium** to book value.

Some interesting patterns emerge when comparing the valuation properties of MB>1 firms with MB≤1 firms. Thus, in all pairs of corresponding regressions (that is: Model 1 vs. Model 3; Model 2 vs. Model 4; Model 5 vs. Model 7; Model 6 vs. Model 8) the magnitude of the PBT coefficients for MB>1 firms are substantially higher and statistically more significant than those of firms with MB≤1.

Furthermore, among the MB≤1 models, there is only one (Model 3) where the PBT coefficient is statistically significant at the 4% level, while in the remaining MB≤1 models the PBT coefficients are not significant at the 10% level.

Overall, these results are persistent in all the tested model specifications (with and without industry and yearly effects) and sub-samples (total sample vs. only dividend-paying firms), which suggest that earnings do not play a significant role in the valuation of firms trading below book value.

Another robust result is the differential valuation role played by dividends. First of all, dividends are always value relevant and are highly significant in statistical terms.

Furthermore, when the dividend coefficients are compared in Model 1 vs. 3, Model 2 vs. 4, Model 5 vs. 7, and Model 6 vs. 8, it appears that dividends are *positively* (*negatively*) associated with firm value when firms trade *above* (*below*) book value.

**Table 4.4**

$$mv_t / TA_t = a_{0,0} * (1/TA_t) + a_{0,1} + a_1 * (BV_t / TA_t) + a_{2,0} * (PBT_t / TA_t) + a_{2,1} * [f(TA) * (PBT_t / TA_t)] + a_3 * (DIV / TA_t) + a_4 * (AdjER / TA_t) + u_t$$

| | Dividend paying profit-making firms only | | | | Dividend and non-Dividend profit-making firms | | | |
|---|---|---|---|---|---|---|---|---|
| | Market-to-Book >1 | | Market-to-Book<1 | | Market-to-Book >2 | | Market-to-Book<2 | |
| | Model 1 | Model 2** | Model 3 | Model 4** | Model 5 | Model 6** | Model 7 | Model 8** |
| Intercept* | 0.052 | -0.048 | 0.027 | -0.04 | 0.082 | -0.115 | 0.02 | -0.035 |
| t-stat | *2.118* | *-0.552* | *3.18* | *-1.213* | *3.347* | *-1.349* | *2.57* | *-1.098* |
| *p-value* | *0.034* | *0.581* | *0.001* | *0.225* | *0.001* | *0.177* | *0.010* | *0.272* |
| 1/TA | 301.9 | 294.5 | -53.6 | -75.3 | 731 | 662.7 | -1.806 | -15.4 |
| t-stat | *2.319* | *2.226* | *-0.768* | *-1.058* | *4.803* | *4.835* | *-0.033* | *-0.276* |
| *p-value* | *0.020* | *0.026* | *0.443* | *0.290* | *0.000* | *0.000* | *0.974* | *0.782* |
| BV | 0.339 | 0.369 | 0.621 | 0.626 | 0.617 | 0.614 | 0.625 | 0.631 |
| t-stat | *6.689* | *7.448* | *33.475* | *34.636* | *11.075* | *11.451* | *34.739* | *36.045* |
| *p-value* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* |
| PBT | 6.657 | 6.689 | 0.254 | 0.208 | 6.432 | 6.425 | 0.161 | 0.087 |
| t-stat | *22.212* | *21.408* | *2.058* | *1.627* | *21.969* | *21.39* | *1.359* | *0.706* |
| *p-value* | *0.000* | *0.000* | *0.040* | *0.104* | *0.000* | *0.000* | *0.174* | *0.480* |
| PBT x f(ta) | 0.052 | 0.059 | 0.028 | 0.038 | 0.049 | 0.054 | 0.037 | 0.047 |
| t-stat | *2.29* | *2.575* | *2.698* | *3.411* | *2.06* | *2.305* | *3.725* | *4.384* |
| *p-value* | *0.022* | *0.010* | *0.007* | *0.001* | *0.039* | *0.021* | *0.000* | *0.000* |
| Div | 5.916 | 4.914 | -0.083 | -0.085 | 2.784 | 2.636 | -0.08 | -0.08 |
| t-stat | *7.046* | *5.673* | *-2.897* | *-2.87* | *3.786* | *3.442* | *-2.534* | *-2.508* |
| *p-value* | *0.000* | *0.000* | *0.004* | *0.004* | *0.000* | *0.001* | *0.011* | *0.012* |
| Adj.ER | 0.404 | 0.236 | 0.002 | 0.009 | 0.105 | -0.064 | -0.033 | -0.033 |
| t-stat | *1.616* | *0.914* | *0.014* | *0.083* | *0.574* | *-0.344* | *-0.302* | *-0.295* |
| *p-value* | *0.106* | *0.360* | *0.989* | *0.933* | *0.566* | *0.731* | *0.763* | *0.768* |
| Adj. R-Square | 40.26% | 45.13% | 47.39% | 49.30% | 33.60% | 39.26% | 47.73% | 49.06% |
| No. of cases | 11019 | 11019 | 2352 | 2352 | 11894 | 11894 | 2593 | 2593 |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported below each regression coefficient. Models are scaled by TA, estimated for profit-making firms and exclude the outliers. PBT*f(TA) is the unscaled PBT, where unscaling is computed by multiplying the scale-deflated PBT by the 5th order root of the scale factor. This mitigates the effect of extreme values of the un-deflated raw PBT, and allows for non-linearity in the functional form of the scaled PBT coefficient. Coefficients which are statistically significant at the 5% level or higher are highlighted.

** These models are estimated with industrial and yearly fixed effects. For brevity, the regression coefficients of yearly and industrial dummies are not reported in the table. However, statistically significant yearly and industrial coefficients are discussed in the text.

*In these models negative BVs are set to zero.

Models 1 through 4 are estimated for only dividend-paying firms. Models 5 through 8 include both dividend paying and non-dividend firms. Models 1, 3, 5 and 7 are estimated without yearly and industry fixed effects, while Models 2, 4, 6 and 8 include yearly and industrial dummies. Models 1, 2, 5 and 6 only include firms with market-to-book ratio greater than 1 (i.e., trade above book value). Models 3, 4, 7 and 8 only include firms with market-to-book ratio below 1 (i.e., trade at a discount to book value).

This finding of dividends' differential valuation is surprising yet robust, as neither it is influenced by the inclusion of fixed industry and yearly effects, nor does it change when we eliminate dividend non-dividend firms.

The analysis of the level of statistical significance of the BV coefficients (see **Table 4.4**) suggests that whether or not one controls for industry and yearly effects, BV's value relevance is higher when firms trade below market value. The analysis of BV coefficients in Model 1 vs. 3, and Model 2 vs. 4, indicates the existence of higher capitalisation of the BV variable in firms with MB≤1. A similar pattern exists when this analysis is performed for only dividend-paying firms (i.e., Model 5 vs 7, and Model 6 vs. 8), yet statistically this difference is less robust. This result might have the following economic interpretation: when the firm's market value falls below its book value, book value is likely to become the major indicator of the fair value of an alternative use of a firm's net assets. In other words, shareholders might demand the 'liquidation' of the firm to 'receive' the fair value of their assets (if, of course, BV reflects fair value).

To reaffirm this valuation importance of book values when MB<1, compared to profits and dividends, I analyse the changes in the explanatory power of regressions when a specific variable (BV or PBT and Dividend) is dropped out from the regression. Results (see **Table 3 in Appendix 4.6**) confirm prior indications of BV valuation. Specifically, omitting the BV from Models 4 and 8 reduces these regressions' explanatory power from 49.3% and 49.1% to 13.6% and 12.6% respectively, while jointly omitting the PBT and Dividend variables causes only about 1% fall in the explanatory power. Furthermore, omitting the BV from Models 2 and 6 (i.e., where MB>1) only marginally reduces these regressions' explanatory power, from 45.13% and 39.2% to 44.7% and 38.12% respectively, while dropping out PBT and Dividend variables causes at least 8.5% loss in the explanatory power.

In summary, BV is more value relevant and have larger valuation multiples for firms that trade below BV. Furthermore, for these firms BV is a more important value driver than PBT and dividends, while for firms with MB>1 the situation is exactly the opposite.

Finally, the estimated coefficients on industrial and yearly dummies provide some indication of the relative valuation of firms in specific economic sectors and over time, as the directions of relative valuation of specific industries (and years) appear to be contextual to the MB ratio. Detailed analysis of this issue is outside the scope of this study.

## 4.4 SENSITIVITY ANALYSIS OF THE RESULTS

The objective of this section is to extend the analysis of the firm-level empirical results by repeating the major tests in new settings. Firstly, I examine the robustness of the previous results to the use of alternative scale proxies (i.e., deflators): (1) one-year-lagged equity market value; (2) group sales; (3) and a composite scale factor.

Secondly, I explore further the implications of the adopted 'conventional' view to eliminating cases with the largest and smallest 0.5% of values for MV, PBT and BV, by comparing changes in the regression results if different thresholds for the elimination of extreme values were used (e.g., 0.2%, 0.4%, 0.6%, 0.8%, 1% and 1.2%). The effect of using different thresholds for trimming the extreme observations is analysed separately for each of the key variables (MV, PBT, BV and Dividends) in order to identify variables that are more likely to influence regression results with their extreme values. I also emphasise and argue that one should distinguish between 'extreme' and 'influential' observations, and discuss some of the pertinent empirical implications.

### 4.4.1 Using the one-year-lagged MV as deflator

Before proceeding to the empirical results, it is important to note that by scaling the basic model with lagged MV we, in fact, transform the price-levels model into a return model. As discussed in Chapter 3, the economic interpretation of parameters in return models is different from those of price-levels models. The dependent variable in the lagged MV-deflated model is a sort of 'dirty' one-year return, because: (i) it captures one-year change of the firm's share price; (ii) it reflects changes in the firm's equity capital which are due to issuance of new shares of share buy-backs; and (iii) it ignores the redistribution of value through dividend payment.

Deflation by lagged MV substantially reduces the total sample size as it shortens the sample period by one year, that is we loose the earliest year 1987. Some more observations are also lost because the firm composition of yearly sub-samples changes each year, that is, the firm might exist in year 1995 sub-sample, but be missing from the year 1994 sample, making the lagged deflation impossible. Overall, deflation reduces the sample from the initial 19,213 firm-year observations to 16,828 cases (i.e., a 12.4% reduction)[27]. As before, in the process of analysis I partition this sample according to the sign of PBT and analyse the two sub-sample results separately. The positive PBT sub-sample contains 13,045 cases, while losses are reported by 3,783 firm-years (i.e., 22.5% of total sample is loss-reporting firms).

#### 4.4.1.1 General properties

Some commentary on the specifics of the profit and loss sub-samples is in order. First, the frequency of dividend-paying firms is substantially lower in the loss-making sub-sample, where only 30.6% of firm-years are dividend paying, compared to 92% in the profit sub-sample.

[27] The reported numbers do not exclude the outliers.

Second, in 11.4% of the loss-making firm-years, the reported BVs are negative, which is substantially higher than the frequency of negative reported BVs, 2.3%, in the profit sub-sample. Our data indicates that loss-making firms with negative BVs are less likely to pay dividends, as elimination of non-dividend paying firms from the loss sub-sample reduces the proportion of negative BVs to as low as 2%. In other words, there is a close association between the sign of BV and the dividend status of the firm.

The comparative analysis of variable correlation matrixes in two sub-samples reveals some further particulars (see **Appendix 4.4**). The comparison of quadrants Q1 and Q3 indicates that PBT of profit firms has the highest correlation with MV, while in loss-reporting firms the correlation coefficient of PBT and MV has the lowest in absolute terms value, and is negative. The negative sign of this correlation coefficient is rather unexpected as it seems to suggest that higher losses are associated with higher gains in the firm's value. Dividends in profit firms have the second-highest correlation coefficient with MV, and have the highest correlation coefficient in the loss firm sub-sample.

BV has a stronger correlation with MV in loss-making firms then in profit firms, and setting negative BVs equal to zero does not influence its correlation with MV and other variables (see quarter Q1 vs. Q3).

In the regression analysis that follows I use the same approach as in the TA-deflated case and eliminate top and bottom 0.5% of extreme values for the following regression variables: lagged-MV-deflated MV, lagged-MV-deflated BV, and lagged-MV-deflated PBT, lagged MV-deflated dividends.

The difference between lagged MV and TA-deflated models is self-evident. The lag-MV deflated regressions (**Table 4.5**) have notably lower explanatory power and profits (PBT) multiples than TA-deflated regressions.

**Table 4.5**

$$mv_t / mv_{t-1} = a_{0,0} * (1/mv_{t-1}) + a_{0,1} + a_1 * (BV_t / mv_{t-1}) + a_{2,0} * (PBT_t / mv_{t-1}) +$$
$$+ a_{2,1} * [f(mv_{t-1}) * (PBT_t / mv_{t-1})] + a_3 * (DIV / mv_{t-1}) + a_4 * (AdjER / mv_{t-1}) + u_t$$

| | Profit making firms | | | Loss making firms | | |
|---|---|---|---|---|---|---|
| | Dividend and non-Dividend firms | | Dividend firms | Dividend and non-Dividend firms | | Dividend firms |
| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
| Intercept | 0.886 | 0.884 | 0.824 | 0.646 | 0.584 | 0.395 |
| *t-stat* | *43.015* | *42.756* | *32.086* | *12.682* | *11.422* | *3.881* |
| *p-value* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* |
| 1/MV | -123.228 | -125.673 | -268.525 | 1264.74 | 1032.28 | 1788.68 |
| *t-stat* | *-1.936* | *-1.977* | *-3.851* | *4.85* | *3.784* | *1.965* |
| *p-value* | *0.053* | *0.048* | *0.000* | *0.000* | *0.000* | *0.049* |
| BV | 0.091 | 0.095 | 0.041 | 0.35 | 0.504 | 0.13 |
| *t-stat* | *4.528* | *4.651* | *1.95* | *6.773* | *7.507* | *2.777* |
| *p-value* | *0.000* | *0.000* | *0.051* | *0.000* | *0.000* | *0.005* |
| PBT | 2.198 | 2.186 | 2.639 | -0.527 | -0.519 | -0.304 |
| *t-stat* | *11.211* | *11.131* | *11.973* | *-3.054* | *-2.978* | *-0.636* |
| *p-value* | *0.000* | *0.000* | *0.000* | *0.002* | *0.003* | *0.525* |
| PBT*Scale | -0.052 | -0.052 | -0.053 | 0.043 | 0.055 | 0.02 |
| *t-stat* | *-4.216* | *-4.178* | *-4.416* | *1.862* | *2.329* | *0.428* |
| *p-value* | *0.000* | *0.000* | *0.000* | *0.063* | *0.020* | *0.668* |
| DIV | 1.473 | 1.465 | 2.823 | 0.239 | -0.78 | 8.439 |
| *t-stat* | *2.408* | *2.394* | *3.222* | *0.148* | *-0.469* | *3.851* |
| *p-value* | *0.016* | *0.017* | *0.001* | *0.882* | *0.639* | *0.000* |
| Adj.ER | 0.181 | 0.175 | 0.683 | -0.337 | -0.265 | 0.106 |
| *t-stat* | *1.428* | *1.375* | *3.223* | *-2.602* | *-2.197* | *0.615* |
| *p-value* | *0.153* | *0.169* | *0.001* | *0.009* | *0.028* | *0.539* |
| No.of cases | 12737 | 12737 | 11824 | 3691 | 3691 | 1143 |
| Adj. R-Square | 12.90% | 12.90% | 16.00% | 11.70% | 13.30% | 25.20% |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported below the regression coefficients. Models are scaled by one-year-lagged equity market value, is estimated for profit-making firms, and exclude the outliers. PBT* $f(mv_{t-1})$ is the unscaled PBT, where unscaling is computed by multiplying the scale-deflated PBT by the 5th order root of the scale factor. This mitigates the effect of extreme values of the un-deflated raw PBT, and also allows for non-linearity in the functional form of the scaled PBT coefficient. Coefficients which are statistically significant at the 5% level or higher are highlighted.
Models 1 through 3 relate to profit firm sub-samples. Models 4 through 6 relate to loss firms sub-samples. Models 1, 2, 4 and 5 include dividend paying and non-dividend firm-years, while models 3 and 6 are estimated for dividend-paying firms only. In Models 2, 3, 5 and 6 negative BVs are set to zero.

However, similar to the TA-deflated model, PBT coefficients for loss firms are negative, have smaller absolute values, and statistically less significant than profit firms' PBT coefficients.

Furthermore, similar to the TA-deflated tests, the book value coefficients for loss-making firms have higher values and statistical significance.

Low regression explanatory power and small in absolute value 'earnings response coefficients', when the model has a 'returns-earnings' specification, are well known phenomena in empirical accounting literature. 'Pure' returns-earnings models are usually estimated on per share basis in order to capture the pure market performance only. Because the dependent variable in my model is the firm's current market capitalisation scaled by one year lagged market capitalisation, it captures both the pure market performance effect and the change-in-the-scale effect (e.g., issuance or repurchase of shares), and therefore the model has less straightforward interpretation.

Recall, that setting negative BVs to zero would imply that negative BVs should have a valuation coefficient equal to zero, or, in other words, negative BVs have no valuation role. This conjecture is tested by means of running basic regressions with an additional dummy variable (dummy=1 if $BV \leq 0$, and dummy=0 otherwise) and a BV interaction term ($BV_{int}=BV$ if $BV \leq 0$, and $BV_{int}=0$ otherwise) both for the profit-firm sub-sample, and the loss-firm sub-sample. Results (Wald p-values are reported in **Table 1** of **Appendix 4.6**) indicate that in both the profit and loss-firm sub-samples, the coefficient on negative BV is not statistically different from zero. Consequently, setting negative BVs to zero is justified. This point gains further support when comparing Model 1 vs. Model 2, and Model 4 vs. Model 5. Thus, Models 1 and 2 parameters are virtually identical, and so are those of Models 4 and 5.

For firms that pay dividends, dividends are positively and statistically significantly associated with the change in market capitalisation both in profit and loss sub-samples.

#### 4.4.1.2 Yearly and economic sector regression characteristics

In this section I examine the yearly and economic sector-related characteristics of lagged MV-scaled model. Before analysing yearly regressions, it is important to emphasise again that because of deflation by the lagged MV, the nature of the model is changed and it is now a 'mixture' of price-levels and returns-earnings model. Therefore regression parameters might be expected to resemble those reported in literatures that use returns-based regressions.

Recall that in the *undeflated* model the intercept is modelled as a linear function of scale (see Chapter 3), that is, $Intercept_t = a_0 + a_0^{'} * scale_t$. When lagged MV is the scale, the intercept of the undeflated model is: $Intercept_t = a_0 + a_0^{'} * mv_{t-1}$. Consequently, the regression intercept in the *deflated* model would be the estimate of $a_0^{'}$. Noting that the dependent variable is $mv_t$, the inclusion of this intercept into the undeflated model would partially turn it into a 'random walk with drift' model. That is:

$$mv_t = a_0 + a_0^{'} * mv_{t-1} + \sum_i a_i * x_i + u_t$$

where $x_i$ and $a_i$ are vectors of valuation factors and the attached coefficients respectively.

The $mv_{t-1}$ variable is somewhat different from the rest of possible deflators, because not only it does proxy for scale, but it is also a variable which is used as a regressor in the time-series regressions of market value. Although this fact might complicate the interpretation of the regression-estimated (in the deflated model) intercept $a_0^{'}$, one can expect it to be positive and statistically significant because of the valuation role of $mv_{t-1}$ in time-series regressions of equity market value.

Yearly regressions (**Table 4.6**) prove some of the above general theorisations. First of all, the explanatory power of yearly lagged MV-scaled regressions is lower than when TA is used as deflator. Nevertheless, the yearly patterns of the explanatory power in lag MV-scaled tests closely reflect those of the TA-scaled regressions.

Secondly, in all 15 yearly regressions the intercept appears with a positive sign, is substantially stable across all years (with average value of 0.85), and is always statistically significant at least at the 0.1% level.

**Table 4.6**

$$mv_t / mv_{t-1} = a_{0,0} * (1/mv_{t-1}) + a_{0,1} + a_1 * (BV_t / mv_{t-1}) + a_{2,0} * (PBT_t / mv_{t-1}) +$$
$$+ a_{2,1} * [f(mv_{t-1}) * (PBT_t / mv_{t-1})] + a_3 * (DIV / mv_{t-1}) + a_4 * (AdjER / mv_{t-1}) + u_t$$

| | Intercept | 1/MV | BV | PBT | PBT x f(mv) | DIV | Adj.ER | No.of Cases | Adj. R-square |
|---|---|---|---|---|---|---|---|---|---|
| 1988 | 0.783 | 537.8 | -0.003 | 1.764 | -0.125 | 9.939 | 1.073 | 366 | 26.40% |
| *t-ratio* | *6.538* | *1.182* | *-0.030* | *2.204* | *-2.168* | *2.449* | *3.913* | | |
| *p-value* | *0.000* | *0.238* | *0.976* | *0.028* | *0.031* | *0.015* | *0.000* | | |
| 1989 | 0.894 | -181.9 | 0.216 | 1.284 | 0.015 | 0.455 | -0.044 | 903 | 11.30% |
| *t-ratio* | *11.596* | *-1.239* | *2.047* | *2.145* | *0.471* | *0.240* | *-0.109* | | |
| *p-value* | *0.000* | *0.215* | *0.041* | *0.032* | *0.637* | *0.810* | *0.913* | | |
| 1990 | 0.702 | -44.2 | 0.021 | 1.048 | 0.065 | -0.393 | 0.964 | 940 | 14.50% |
| *t-ratio* | *22.526* | *-1.718* | *0.691* | *2.559* | *3.462* | *-0.774* | *2.732* | | |
| *p-value* | *0.000* | *0.086* | *0.489* | *0.011* | *0.001* | *0.439* | *0.006* | | |
| 1991 | 0.710 | -147.9 | -0.011 | 1.842 | 0.001 | 5.548 | -0.499 | 908 | 29.50% |
| *t-ratio* | *12.566* | *-0.614* | *-0.179* | *4.338* | *0.024* | *4.696* | *-3.044* | | |
| *p-value* | *0.000* | *0.539* | *0.858* | *0.000* | *0.981* | *0.000* | *0.002* | | |
| 1992 | 0.896 | -382.5 | 0.000 | 3.830 | -0.102 | -0.819 | 0.022 | 853 | 20.10% |
| *t-ratio* | *16.349* | *-2.157* | *0.007* | *5.904* | *-2.432* | *-0.687* | *1.468* | | |
| *p-value* | *0.000* | *0.031* | *0.994* | *0.000* | *0.015* | *0.492* | *0.142* | | |
| 1993 | 0.859 | -611.2 | 0.189 | 3.516 | -0.114 | 7.794 | 2.818 | 895 | 27.40% |
| *t-ratio* | *12.216* | *-3.005* | *4.209* | *3.522* | *-2.426* | *4.719* | *1.876* | | |
| *p-value* | *0.000* | *0.003* | *0.000* | *0.000* | *0.015* | *0.000* | *0.061* | | |
| 1994 | 0.882 | -184.8 | 0.072 | 4.659 | -0.234 | 2.782 | 0.352 | 1011 | 31.40% |
| *t-ratio* | *13.517* | *-1.095* | *1.244* | *5.359* | *-5.908* | *1.308* | *0.224* | | |
| *p-value* | *0.000* | *0.273* | *0.214* | *0.000* | *0.000* | *0.191* | *0.823* | | |
| 1995 | 0.842 | -302.5 | -0.042 | 2.069 | -0.065 | 4.699 | -0.432 | 1050 | 18.50% |
| *t-ratio* | *15.440* | *-1.679* | *-0.864* | *3.507* | *-2.352* | *2.902* | *-0.306* | | |
| *p-value* | *0.000* | *0.093* | *0.387* | *0.000* | *0.019* | *0.004* | *0.759* | | |
| 1996 | 0.937 | -176.5 | 0.039 | 3.145 | -0.056 | 2.276 | 1.129 | 1042 | 14.50% |
| *t-ratio* | *16.604* | *-0.761* | *0.536* | *4.510* | *-1.728* | *1.353* | *2.321* | | |
| *p-value* | *0.000* | *0.447* | *0.592* | *0.000* | *0.084* | *0.176* | *0.020* | | |
| 1997 | 0.841 | 187.3 | -0.012 | 2.798 | -0.084 | 3.835 | 1.144 | 1028 | 12.50% |
| *t-ratio* | *13.635* | *0.694* | *-0.236* | *3.698* | *-2.546* | *1.267* | *2.130* | | |
| *p-value* | *0.000* | *0.488* | *0.813* | *0.000* | *0.011* | *0.205* | *0.033* | | |
| 1998 | 0.819 | 853.4 | -0.125 | 2.406 | 0.104 | -1.013 | 1.311 | 993 | 16.30% |
| *t-ratio* | *11.232* | *2.093* | *-2.379* | *3.043* | *1.754* | *-0.599* | *3.142* | | |
| *p-value* | *0.000* | *0.036* | *0.017* | *0.002* | *0.079* | *0.549* | *0.002* | | |
| 1999 | 0.978 | 759.0 | 0.230 | 0.824 | 0.033 | -1.776 | -0.149 | 911 | 10.20% |
| *t-ratio* | *12.213* | *1.805* | *2.601* | *1.033* | *0.461* | *-0.854* | *-0.154* | | |
| *p-value* | *0.000* | *0.071* | *0.009* | *0.302* | *0.645* | *0.393* | *0.877* | | |
| 2000 | 1.183 | 551.9 | 0.235 | 2.491 | -0.146 | -5.298 | 0.950 | 800 | 7.60% |
| *t-ratio* | *16.065* | *1.080* | *2.427* | *3.065* | *-3.084* | *-3.189* | *1.142* | | |
| *p-value* | *0.000* | *0.280* | *0.015* | *0.002* | *0.002* | *0.001* | *0.253* | | |
| 2001 | 0.736 | 25.4 | 0.097 | 0.600 | 0.072 | 3.023 | 0.290 | 684 | 20.00% |
| *t-ratio* | *20.754* | *0.264* | *2.676* | *1.401* | *1.993* | *3.051* | *0.359* | | |
| *p-value* | *0.000* | *0.792* | *0.007* | *0.161* | *0.046* | *0.002* | *0.720* | | |
| 2002 | 0.664 | 238.1 | 0.126 | 0.336 | 0.177 | 2.581 | 0.456 | 350 | 32.50% |
| *t-ratio* | *13.624* | *0.821* | *2.947* | *0.422* | *3.112* | *2.379* | *0.727* | | |
| *p-value* | *0.000* | *0.412* | *0.003* | *0.674* | *0.002* | *0.018* | *0.468* | | |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported below each regression coefficient. Coefficients which are statistically significant at the 5% level or higher are highlighted. Yearly regressions are scaled by one year lagged MV and are estimated for yearly samples that exclude negative PBT cases and outliers. Negative BVs are set to zero. PBT* $f(mv_{t-1})$ is the unscaled PBT, where unscaling is computed by multiplying the scale-deflated PBT by the 5th order root of the scale factor. This mitigates the effect of extreme values of the un-deflated raw PBT, and also allows for non-linearity in the functional form of the scaled PBT coefficient.

In these regressions intercept appears to be by far the most robust (and significant) regression parameter, and this fact demonstrates the 'special' role that the lagged MV would play in the *undeflated* model[28].

With regards to the valuation factors included in the deflated model, none of them is an 'apparent leader' in terms of value relevance. Thus, in the years 1988-1998 PBT had positive and statistically significant multiples, but became not significant statistically in years 1999, 2001 and 2002. Furthermore, these coefficients are substantially smaller in value than the corresponding coefficients from the TA-deflated yearly regressions. This reflects the fact that in the lagged MV-deflated model, PBT coefficients are closer to the returns-model's earnings response coefficients (ERC). A relatively lower ERC in returns-earnings models is a well-documented fact in the literature.

With regard to equity book value and dividends, it is difficult to conjecture about these variables' theoretical role in the current model specification. Empirically, BV has clearly a weaker association with the dependent variable, and is statistically significant only in 7 out of 15 years. However, it is statistically significant in the years (last years of the sample period, 1998 through 2002) when PBT is not. Dividends are similarly 'weak' in explaining the lagged MV-scaled MV, and are statistically significant in 7 years.

The R-square values also show a similar trend to the TA-deflated models.

In general terms, the industry specific regressions, reported in **Table 4.7,** exhibit similar characteristics. The lagged MV-scaled regressions' explanatory powers are distinctly lower than those for the TA-deflated industrial regressions, and so is the value of estimated PBT coefficients.

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[28] One would be keen to examine the share of the explanatory power 'contributed' by this intercept and compare it with that of the model's other explanatory variables. This, however, would require estimating the deflated yearly regressions without intercept, creating the econometric problems of R-squares from no-intercept models being incomparable to R-squares from models that include intercept.

**Table 4.7**

$$mv_t / mv_{t-1} = a_{0,0} * (1/mv_{t-1}) + a_{0,1} + a_1 * (BV_t / mv_{t-1}) + a_{2,0} * (PBT_t / mv_{t-1}) +$$
$$+ a_{2,1} * [f(mv_{t-1}) * (PBT_t / mv_{t-1})] + a_3 * (DIV / mv_{t-1}) + a_4 * (AdjER / mv_{t-1}) + u_t$$

| Industry * | Intercept | 1/MV | BV | PBT | PBT x f(mv) | DIV | Adj.ER | No.of Cases | Adj.R-Square |
|---|---|---|---|---|---|---|---|---|---|
| SIC 0 | 0.525 | 353.4 | 0.026 | 3.646 | -0.356 | 10.950 | 0.533 | 98 | 33.30% |
| *t-ratio* | *4.341* | *0.883* | *0.308* | *2.184* | *-3.249* | *3.914* | *0.301* | | |
| *p-value* | *0.000* | *0.379* | *0.759* | *0.032* | *0.002* | *0.000* | *0.764* | | |
| SIC 1 | 0.939 | 849.3 | 0.346 | -0.665 | 0.077 | -1.645 | -0.026 | 332 | 19.90% |
| *t-ratio* | *14.662* | *1.871* | *4.075* | *-1.293* | *1.753* | *-0.716* | *-0.785* | | |
| *p-value* | *0.000* | *0.062* | *0.000* | *0.197* | *0.081* | *0.474* | *0.433* | | |
| SIC 2 | 0.598 | 1186.0 | 0.271 | 0.405 | 0.047 | 4.681 | 0.789 | 646 | 20.90% |
| *t-ratio* | *9.651* | *2.359* | *3.422* | *0.754* | *1.142* | *3.212* | *1.287* | | |
| *p-value* | *0.000* | *0.018* | *0.001* | *0.451* | *0.254* | *0.001* | *0.198* | | |
| SIC 3 | 0.827 | -30.9 | 0.034 | 1.728 | -0.006 | 3.832 | 1.214 | 2322 | 11.70% |
| *t-ratio* | *24.727* | *-0.725* | *1.056* | *4.035* | *-0.333* | *3.902* | *1.984* | | |
| *p-value* | *0.000* | *0.468* | *0.291* | *0.000* | *0.739* | *0.000* | *0.047* | | |
| SIC 4 | 0.762 | 330.9 | 0.046 | 3.278 | -0.020 | -0.612 | 0.646 | 2960 | 20.70% |
| *t-ratio* | *21.467* | *1.854* | *1.200* | *8.590* | *-0.829* | *-0.623* | *2.338* | | |
| *p-value* | *0.000* | *0.064* | *0.230* | *0.000* | *0.407* | *0.533* | *0.019* | | |
| SIC 5 | 0.772 | 418.3 | -0.019 | 2.360 | -0.039 | 5.594 | -0.172 | 1052 | 18.30% |
| *t-ratio* | *10.920* | *1.729* | *-0.289* | *3.847* | *-1.240* | *2.675* | *-0.434* | | |
| *p-value* | *0.000* | *0.084* | *0.773* | *0.000* | *0.215* | *0.007* | *0.665* | | |
| SIC 6 | 0.715 | 252.3 | 0.015 | 3.284 | -0.095 | 3.592 | 0.428 | 1216 | 21.10% |
| *t-ratio* | *11.098* | *1.802* | *0.298* | *4.385* | *-1.512* | *2.134* | *0.849* | | |
| *p-value* | *0.000* | *0.072* | *0.766* | *0.000* | *0.130* | *0.033* | *0.396* | | |
| SIC 7 | 0.712 | 611.0 | 0.141 | 1.396 | 0.119 | 3.521 | 1.703 | 1397 | 18.50% |
| *t-ratio* | *10.635* | *1.682* | *3.352* | *1.910* | *2.669* | *1.864* | *6.364* | | |
| *p-value* | *0.000* | *0.092* | *0.001* | *0.056* | *0.008* | *0.062* | *0.000* | | |
| SIC 8 | 0.888 | 378.3 | 0.155 | 1.080 | -0.015 | 1.785 | 1.791 | 283 | 6.70% |
| *t-ratio* | *7.943* | *0.977* | *2.120* | *1.400* | *-0.267* | *0.948* | *2.687* | | |
| *p-value* | *0.000* | *0.329* | *0.035* | *0.163* | *0.790* | *0.344* | *0.008* | | |
| SIC 9 | 1.019 | -453.1 | 0.130 | 2.950 | -0.148 | 0.539 | -0.312 | 2408 | 13.20% |
| *t-ratio* | *26.552* | *-5.712* | *2.548* | *5.996* | *-3.300* | *0.488* | *-0.692* | | |
| *p-value* | *0.000* | *0.000* | *0.011* | *0.000* | *0.001* | *0.626* | *0.489* | | |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported below the regression coefficients. Coefficients which are statistically significant at the 5% level or higher are highlighted. Industrial regressions are scaled by one year lagged MV, and exclude negative PBT cases and outliers. Negative BVs are set to zero. PBT* f($mv_{t-1}$) is the unscaled PBT, where unscaling is computed by multiplying the scale-deflated PBT by the 5th order root of the scale factor. This mitigates the effect of extreme values of the un-deflated raw PBT, and also allows for non-linearity in the functional form of the scaled PBT coefficient.

* The employed industry SIC abbreviations are as follows: SIC0 = Agriculture, Forestry and Fishing; SIC1 = Mining; SIC2 = Construction; SIC3 = Food, textile, paper and chemical products (i.e., two-digit SIC codes of 20 through 29); SIC4 = Manufacturing (i.e., two-digit SIC codes of 20 through 29); SIC5 = Transportation, Communications, Electric, Gas, And Sanctuary Services; SIC6 = Wholesasle Trade; SIC7 = Retale trade; SIC8 = Finance, Insurance, and Real Estate; SIC9 = Services.

Furthermore, as in the case of the yearly regressions, the only robust parameter in terms of its value and statistical significance across all industries is the intercept, while the other valuation factors are less so. Thus PBT is statistically significant (at the 5% level) in only 6 out of 10 industries, BV is significant in 5 out of 10, and DIV is significant in 5 out of 10 industries. The comparison of the TA and lagged MV-deflated industrial regressions reveals no consistency in the corresponding regression parameters and general results.

In light of the results presented in this section and the theoretical difficulties associated with lagged MV deflated model specifications, I conclude that deflation by lagged MV creates unresolved ambiguities in terms of the deflated model's theoretical implications and hampers the interpretation of the empirical results. Therefore, I will not be reporting the results of the lagged MV-deflation in the empirical chapters on segment valuation.

### 4.4.2 Using group sales as the deflator

Group sales numbers are missing for 459 observations, reducing the sample to 18,754 cases (before the elimination of outliers). When the remaining sample is split into industrial sub-samples, for the purposes of industrial analysis, some 39 observations are further excluded due to missing information relating to the industrial classification of the firm.

Two important facts should be underlined before the analysis of yearly and industrial valuation pattern. First, unlike lagged MV deflation, deflation by sales does not alter the model specification. Second, deflation by sales implicitly assumes that: (1) sales is the market's/investors' 'universal' perception of what constitutes the notion of firm size; (2) there is no cross-sectional difference among sample firms with different characteristics (e.g., industrial affiliation, financial and operating structure, stage of life cycle, etc) in terms of the relationships between group sales and the firm's financial statement and market data. The second point implies that the relationships between sales and PBT (e.g., profit margin), sales and BV, sales and equity market value, etc., is similar across firms operating in different industries or firms that differ in some other respect. Realistically though, this assumption cannot hold in practice.

Similarly, the first assumption might not be realistic either, as the whole notion of scale/size remains a controversial issue in the literature. Therefore, one should be careful when interpreting the sales-deflated regression results.

**Panel A** of **Table 4.8** reports regression results for ten SIC-based industries, and **Panel B** reports results for 16 yearly sub-samples. The industrial regression results demonstrate how different the industries are in terms of the pricing of specific financial statement information and the combined value relevance of all accounting variables. Book values, earnings and dividends are substantially differently priced across different industries. In addition, the role of specific accounting fundamentals vary notably across different industries.

**Table 4.8**

**Panel A: Industry-based regressions**

| Industry** | Intercept | 1/Sales | BV* | PBT | PBT x f(sales) | DIV | Adj.ER | No. of cases | Adj. R-Square |
|---|---|---|---|---|---|---|---|---|---|
| sic0 | 0.291 | 194.6 | 1.221 | 2.953 | -0.842 | -12.606 | -5.379 | 92 | 90.1% |
| *t-ratio* | *2.452* | *0.292* | *5.665* | *0.959* | *-2.379* | *-1.074* | *-1.910* | | |
| *P-value* | *0.016* | *0.771* | *0.000* | *0.341* | *0.020* | *0.286* | *0.060* | | |
| sic1 | -0.248 | 2424.3 | 1.229 | 5.655 | -0.139 | 7.785 | 1.181 | 336 | 56.8% |
| *t-ratio* | *-1.029* | *3.165* | *8.385* | *2.643* | *-1.201* | *1.648* | *0.813* | | |
| *P-value* | *0.304* | *0.002* | *0.000* | *0.009* | *0.231* | *0.100* | *0.417* | | |
| sic2 | 0.027 | 2345.1 | 0.445 | 1.594 | -0.048 | 10.392 | -3.093 | 736 | 52.7% |
| *t-ratio* | *0.850* | *2.766* | *2.675* | *1.369* | *-0.742* | *4.231* | *-2.221* | | |
| *P-value* | *0.395* | *0.006* | *0.007* | *0.171* | *0.458* | *0.000* | *0.026* | | |
| sic3 | -0.352 | -20.5 | 1.185 | 7.097 | 0.045 | 6.616 | 1.008 | 2589 | 46.6% |
| *t-ratio* | *-5.047* | *-0.048* | *6.224* | *4.081* | *0.634* | *1.987* | *0.502* | | |
| *P-value* | *0.000* | *0.961* | *0.000* | *0.000* | *0.526* | *0.047* | *0.616* | | |
| sic4 | -0.104 | 563.7 | 0.954 | 6.803 | 0.010 | -2.269 | -1.469 | 3325 | 42.5% |
| *t-ratio* | *-2.672* | *1.118* | *5.129* | *8.800* | *0.244* | *-0.818* | *-1.184* | | |
| *P-value* | *0.008* | *0.264* | *0.000* | *0.000* | *0.807* | *0.413* | *0.237* | | |
| sic5 | 0.246 | 4829.8 | 0.064 | 4.337 | 0.120 | 3.960 | -2.246 | 1197 | 42.0% |
| *t-ratio* | *4.730* | *3.200* | *0.706* | *3.459* | *1.600* | *1.128* | *-1.131* | | |
| *P-value* | *0.000* | *0.001* | *0.480* | *0.001* | *0.110* | *0.259* | *0.258* | | |
| sic6 | 0.024 | 415.8 | 0.942 | 3.663 | -0.023 | 3.639 | -3.319 | 1371 | 37.3% |
| *t-ratio* | *0.317* | *1.068* | *3.818* | *2.429* | *-0.209* | *0.386* | *-1.092* | | |
| *P-value* | *0.751* | *0.286* | *0.000* | *0.015* | *0.834* | *0.699* | *0.275* | | |

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| | Intercept | 1/Sales | BV* | PBT | PBT x f(sales) | DIV | Adj.ER | No.of cases | Adj.R-Square |
|---|---|---|---|---|---|---|---|---|---|
| sic7 | -0.007 | 2115.1 | 0.234 | 8.782 | 0.038 | 1.918 | 0.789 | 1566 | 69.2% |
| *t-ratio* | *-0.332* | *7.421* | *4.148* | *9.931* | *0.889* | *1.055* | *1.284* | | |
| *P-value* | *0.740* | *0.000* | *0.000* | *0.000* | *0.374* | *0.291* | *0.199* | | |
| sic8 | 0.275 | 3213.4 | -0.073 | 3.026 | 0.064 | 12.292 | 1.073 | 203 | 66.9% |
| *t-ratio* | *2.413* | *5.235* | *-0.681* | *1.595* | *0.575* | *4.424* | *0.581* | | |
| *P-value* | *0.017* | *0.000* | *0.497* | *0.112* | *0.566* | *0.000* | *0.562* | | |
| sic9 | 0.283 | 949.7 | 0.708 | 6.603 | 0.249 | -8.603 | -0.542 | 2812 | 31.7% |
| *t-ratio* | *5.574* | *2.058* | *7.544* | *5.429* | *1.920* | *-4.217* | *-0.800* | | |
| *P-value* | *0.000* | *0.040* | *0.000* | *0.000* | *0.055* | *0.000* | *0.424* | | |

**Panel B: Yearly regressions.**

| | Intercept | 1/Sales | BV* | PBT | PBT x f(sales) | DIV | Adj.ER | No.of cases | Adj.R-Square |
|---|---|---|---|---|---|---|---|---|---|
| 1987 | -0.306 | 3890.7 | 0.597 | 6.167 | 0.063 | 16.500 | 4.513 | 354 | 55.4% |
| *t-ratio* | *-1.852* | *2.095* | *3.475* | *2.346* | *0.245* | *1.622* | *0.897* | | |
| *P-value* | *0.065* | *0.037* | *0.001* | *0.020* | *0.806* | *0.106* | *0.370* | | |
| 1988 | -0.152 | 1829.0 | 0.957 | 4.889 | -0.097 | 8.007 | 0.232 | 933 | 62.0% |
| *t-ratio* | *-2.238* | *2.441* | *4.081* | *2.953* | *-1.136* | *1.948* | *0.289* | | |
| *P-value* | *0.025* | *0.015* | *0.000* | *0.003* | *0.256* | *0.051* | *0.773* | | |
| 1989 | -0.159 | 347.7 | 1.090 | 5.570 | 0.055 | -4.972 | -3.125 | 1018 | 64.6% |
| *t-ratio* | *-2.195* | *0.813* | *6.833* | *2.978* | *0.641* | *-0.817* | *-1.202* | | |
| *P-value* | *0.028* | *0.416* | *0.000* | *0.003* | *0.522* | *0.414* | *0.229* | | |
| 1990 | -0.133 | 1419.3 | 0.414 | 6.192 | 0.116 | -2.556 | 0.475 | 999 | 52.7% |
| *t-ratio* | *-2.045* | *2.437* | *2.779* | *2.390* | *1.233* | *-0.344* | *1.073* | | |
| *P-value* | *0.041* | *0.015* | *0.005* | *0.017* | *0.217* | *0.731* | *0.283* | | |
| 1991 | -0.010 | 903.2 | 0.525 | 3.803 | 0.070 | 4.586 | -1.283 | 915 | 63.0% |
| *t-ratio* | *-0.214* | *2.403* | *5.021* | *2.338* | *0.740* | *1.424* | *-1.222* | | |
| *P-value* | *0.830* | *0.016* | *0.000* | *0.019* | *0.459* | *0.154* | *0.222* | | |
| 1992 | 0.092 | 192.8 | 0.181 | 6.981 | 0.006 | 1.298 | -2.321 | 848 | 58.0% |
| *t-ratio* | *2.130* | *0.378* | *1.614* | *4.104* | *0.068* | *0.385* | *-0.988* | | |
| *P-value* | *0.033* | *0.706* | *0.107* | *0.000* | *0.946* | *0.701* | *0.323* | | |
| 1993 | 0.133 | 260.5 | 0.394 | 6.891 | -0.099 | 6.104 | -2.811 | 918 | 54.1% |
| *t-ratio* | *2.906* | *0.627* | *3.175* | *3.148* | *-1.366* | *1.546* | *-0.833* | | |
| *P-value* | *0.004* | *0.531* | *0.001* | *0.002* | *0.172* | *0.122* | *0.405* | | |
| 1994 | 0.030 | 610.0 | 0.792 | 7.312 | -0.214 | 4.390 | -1.887 | 1074 | 60.6% |
| *t-ratio* | *0.578* | *1.000* | *3.589* | *4.242* | *-2.835* | *1.224* | *-0.615* | | |
| *P-value* | *0.563* | *0.317* | *0.000* | *0.000* | *0.005* | *0.221* | *0.538* | | |
| 1995 | -0.015 | 1528.0 | 0.539 | 6.748 | -0.061 | -0.864 | -5.446 | 1074 | 63.6% |
| *t-ratio* | *-0.286* | *3.939* | *3.144* | *4.323* | *-0.811* | *-0.162* | *-1.355* | | |
| *P-value* | *0.775* | *0.000* | *0.002* | *0.000* | *0.417* | *0.871* | *0.175* | | |
| 1996 | 0.100 | 2547.6 | 0.431 | 9.631 | -0.030 | -2.576 | 1.868 | 1100 | 58.0% |
| *t-ratio* | *1.954* | *3.353* | *3.342* | *5.480* | *-0.381* | *-0.681* | *2.338* | | |
| *P-value* | *0.051* | *0.001* | *0.001* | *0.000* | *0.704* | *0.496* | *0.019* | | |
| 1997 | 0.075 | 1505.0 | 0.866 | 7.474 | -0.071 | -4.089 | -3.828 | 1137 | 42.9% |
| *t-ratio* | *1.048* | *1.632* | *3.826* | *4.191* | *-0.584* | *-1.061* | *-1.429* | | |
| *P-value* | *0.295* | *0.103* | *0.000* | *0.000* | *0.559* | *0.289* | *0.153* | | |
| 1998 | 0.051 | 1630.0 | 0.425 | 8.762 | 0.218 | -6.275 | 1.482 | 1047 | 33.3% |
| *t-ratio* | *0.700* | *1.643* | *3.201* | *4.163* | *1.716* | *-1.473* | *1.083* | | |
| *P-value* | *0.484* | *0.100* | *0.001* | *0.000* | *0.086* | *0.141* | *0.279* | | |
| 1999 | 0.158 | 1956.0 | 0.564 | 6.874 | 0.197 | -3.068 | -1.869 | 930 | 26.0% |
| *t-ratio* | *1.510* | *1.607* | *3.427* | *3.165* | *1.377* | *-0.428* | *-0.696* | | |
| *P-value* | *0.131* | *0.108* | *0.001* | *0.002* | *0.169* | *0.669* | *0.487* | | |
| 2000 | 0.221 | 2087.6 | 1.671 | 4.451 | -0.018 | -10.26 | -3.704 | 825 | 41.2% |
| *t-ratio* | *2.116* | *2.245* | *8.316* | *2.074* | *-0.124* | *-2.015* | *-1.163* | | |
| *P-value* | *0.034* | *0.025* | *0.000* | *0.038* | *0.901* | *0.044* | *0.245* | | |

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|---|---|---|---|---|---|---|---|---|---|
| 2001 | 0.208 | 1912.9 | 0.895 | 3.493 | -0.020 | -3.578 | -7.184 | 713 | 46.6% |
| *t-ratio* | *2.331* | *2.379* | *4.715* | *1.477* | *-0.138* | *-0.994* | *-1.076* | | |
| *P-value* | *0.020* | *0.017* | *0.000* | *0.140* | *0.890* | *0.320* | *0.282* | | |
| 2002 | 0.142 | 1411.6 | 0.491 | 4.789 | 0.085 | 4.033 | 2.691 | 360 | 47.3% |
| *t-ratio* | *2.956* | *3.408* | *4.241* | *1.556* | *0.748* | *1.370* | *0.705* | | |
| *P-value* | *0.003* | *0.001* | *0.000* | *0.121* | *0.455* | *0.172* | *0.481* | | |
| Entire period | 0.060 | 1337.4 | 0.711 | 6.427 | 0.031 | -1.785 | -0.836 | 14245 | 43.3% |
| *t-ratio* | *3.066* | *6.369* | *13.155* | *12.414* | *1.019* | *-1.355* | *-1.122* | | |
| *P-value* | *0.002* | *0.000* | *0.000* | *0.000* | *0.308* | *0.176* | *0.262* | | |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported below the regression coefficients. Coefficients which are statistically significant at the 5% level are highlighted. Industrial and yearly samples only include the profit-making firms and exclude the outliers. Outliers are identified on the basis of the entire period sample, and are defined as top and bottom 0.5% of sale-deflated MV, PBT, BV and Div.

*Negative BVs are set to zero.

** The employed industry SIC abbreviations are as follows: SIC0 = Agriculture, Forestry and Fishing; SIC1 = Mining; SIC2 = Construction; SIC3 = Food, textile, paper and chemical products (i.e., two-digit SIC codes of 20 through 29); SIC4 = Manufacturing (i.e., two-digit SIC codes of 20 through 29); SIC5 = Transportation, Communications, Electric, Gas, And Sanctuary Services; SIC6 = Wholesasle Trade; SIC7 = Retale trade; SIC8 = Finance, Insurance, and Real Estate; SIC9 = Services.

Statistically, there are three industries where earnings have no valuation role: Agriculture, Forestry and Fishing (SIC0), Finance (SIC8), and Construction (SIC2). Recall, that these are the industries with the highest proportion of firms trading below book value (see **Figure 4.12**), implying that the market perceives these industries to have the lowest future expected abnormal earnings. Bearing in mind that, in the context of the basic valuation model, earnings proxy for the future abnormal earnings, the lack of valuation relevance of earnings in the three industries should not be a surprising result. The remaining financial statements value drivers (i.e., dividends and book value) and the control variables also have very different pricing between industries.

Industry-related differences in the explanatory power of the regressions are even more dramatic. In the *Agriculture, Forestry and Fishing* industry, the basic financial statement variables appear to explain 90% of the cross-sectional variation of the market value of equity, while in the *Services* industry the Adjusted-$R^2$ is only 31.7%.

The dynamics of value relevance of financial statement numbers (**Panel B** of **Table 4.8**) is, in essence, similar to that found in the TA and lagged MV-deflated yearly regressions. The sales-deflated results confirm the previous finding that in the late

1990s there has been a substantial decline in the value relevance of financial statement numbers. In addition, the BV and PBT remain the two primary value drivers, being statistically significant in 15 and 14 out of 16 years, respectively.

By and large, the sales-deflated regressions reported in **Table 4.8** generate somewhat wider divergence in the results (across the yearly and industry-related sub-samples) than what has been found in the TA-deflated regressions.

### 4.4.3 Using a composite scale factor as a deflator

The analysis in the preceding sections demonstrates that empirical results can be substantially influenced by our choice of the scale proxy. Additional tests indicate that outliers (variables' extreme values) are also excessively influential because all scaled variables appear to have extremely peaked and right-skewed frequency distributions, engendering spurious correlations between variables. The analysis suggests that this situation is a scaling-driven phenomenon, in that extremely large (small) values of deflated variables are the result of extremely small (large) values of the size proxy. This is particularly true with regards to deflation by 'sales', because sales might be *disproportionately* high/low in some firm-years. Because all variables are sales-deflated, regression variables are, in fact, ratios. For this reason there must exist some notional interval within which the ratios could be considered to have 'normal' values. For example, it would be rather out of the ordinary for the MV-to-sales or PBT-to-Sales ratio (i.e., deflated MV or deflated PBT, respectively) to equal to 500, or 0.05.

Deflation, however, does produce numbers of this degree of divergence. Furthermore, in a bad year, for instance, a large firm might report extremely low sales and very large PBT resulting from disposals, asset sales, etc. Note that in this case not only the un-deflated PBT but also the un-defalted equity book value would go up, so that scaling by low sales will 'inflate' both PBT and BV. In this case, *sales* is not representative of the *true* size of the firm.

Elimination of extreme values (top and bottom 0.5% ) of scaled variables might trim the long tail(s) yet this only slightly 'normalises' frequency distributions and makes deflated variables look more proportional, as discussed above. This scale-driven problem in data appears to exist whichever scale-proxy is used, though in the TA-deflated model specification this problem is less severe.

I will refer to the above problem as *spurious scaling*. In general, spurious scaling arises when the scale-proxy fails to manifest fairly the true scale of the firm. The empirical analysis demonstrates that whichever specific accounting or market variable is used as a deflator, it would necessarily generate a certain percentage of spuriously scaled firm-years. The good news is that one observation cannot be spuriously scaled across all alternative scale proxies. In other words, if TA is a spurious scale proxy for a given firm-year, it is likely that Sales or MV will do a better job of reflecting that firm-year's fair scale.

This prompts the creation of a composite scale proxy, which will partially diversify away scaling deficiencies inherent in a particular scale proxy. I create a composite scale proxy by equally weighting and summing up three alternative scale proxies: MV, TA and Sales. The blended scale proxy is therefore: scale = (MV +TA +Sales)/3. It is implicit to this blended scale proxy, that every constituent variable equally merits for being regarded as a scale proxy.

The benefits of using this blended scale proxy are:

1. It recognises the complementary roles of various variables in reflecting the true size of the firm;

2. It accounts for three broad alternative perceptions of what firm size is, i.e., (i) the stock market based perception of size (MV), a balance sheet based perception of size (TA), and a product market based perception of size (Sales);

3. It substantially diversifies away spurious scaling idiosyncrasies specific to a single variable-based deflator (see **Appendix 4.5** for histograms of frequency distributions of the alternatively scaled regression variables); and

4. It is measured in the same (monetary) units as the un-scaled variables, and also serves as a 'numeraire' for firm size.

Sections that follow examine the properties of composite-scaled regressions, for positive and negative PBT sub-samples, and yearly and industrial valuation patterns.

**Table 4.9** compares regression results between different sub-samples of profit and loss firms. A comparison of model 1 vs. 2, and model 4 vs. 5 indicates that setting negative BVs to zero does not change any of the regression parameters in the profit firms sub-sample, and only marginally affects the BV coefficient (making it even more value relevant), yet leaving unaffected the remaining regression parameters, in the loss firms sub-sample. In contrast to the results from the entire sample of profit firms in models 1 and 2, model 3 reveals that in dividend-paying profitable firms, dividends are positively associated with value and are highly statistically significant, while the BV coefficient is lower and statistically less significant.

When firms report **losses**, the PBT coefficient has a much lower absolute value and level of statistical significance than in the case of **profitable** firms. This is a fairly common finding in the literature. However, this coefficient has a negative sign, which is rather unexpected, as this would suggest that the larger the loss, the higher is the firm value! Recall, that the same result was found in TA, lagged MV and Sales-deflated regressions. For dividend-paying loss-making firms (model 6) the negative PBTs are no longer in association with firm value, yet dividends appear to be statistically highly significant and positively associated with value.

### Table 4.9

$$mv_t / s = a_{0,0} * (1/s) + a_{0,1} + a_1 * (BV_t / s) + a_{2,0} * (PBT_t / s) +$$
$$+ a_{2,1} * [f(s) * (PBT_t / s)] + a_3 * (DIV / s) + a_4 * (AdjER / s) + u_t$$

| | Profit making firms | | | Loss making firms | | |
|---|---|---|---|---|---|---|
| | Dividend and non-Dividend firms | | Dividend firms | Dividend and non-Dividend firms | | Dividend firms |
| | Model1 | Model2 | Model3 | Model4 | Model5 | Model6 |
| Intercept | 0.640 | 0.637 | 0.587 | 1.040 | 0.976 | 0.467 |
| *t-ratio* | *60.414* | *60.102* | *54.874* | *48.868* | *44.083* | *16.548* |
| *p-value* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* |
| Dummy | -0.509 | -0.512 | -0.447 | -0.897 | -0.930 | -0.483 |
| *t-ratio* | *-73.597* | *-74.501* | *-63.485* | *-57.582* | *-65.831* | *-27.456* |
| *p-value* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* |
| 1/Scale | 188.2 | 181.7 | 75.5 | 351.5 | 300.6 | 622.5 |
| *t-ratio* | *2.655* | *2.543* | *1.206* | *7.288* | *6.935* | *4.440* |
| *p-value* | *0.008* | *0.011* | *0.228* | *0.000* | *0.000* | *0.000* |
| BV | 0.257 | 0.267 | 0.149 | 0.497 | 0.672 | 0.537 |
| *t-ratio* | *16.636* | *17.276* | *9.391* | *20.797* | *27.364* | *14.508* |
| *p-value* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* |
| PBT | 2.031 | 2.026 | 2.390 | -0.242 | -0.193 | -0.062 |
| *t-ratio* | *16.916* | *16.811* | *20.473* | *-3.377* | *-2.966* | *-0.596* |
| *p-value* | *0.000* | *0.000* | *0.000* | *0.001* | *0.003* | *0.551* |
| PBT*f(s) | 0.041 | 0.041 | 0.039 | 0.043 | 0.047 | -0.002 |
| *t-ratio* | *4.604* | *4.531* | *4.595* | *4.425* | *5.055* | *-0.207* |
| *p-value* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.836* |
| DIV | 0.391 | 0.385 | 2.586 | -11.865 | -11.769 | 2.523 |
| *t-ratio* | *1.400* | *1.377* | *8.564* | *-15.828* | *-16.215* | *3.416* |
| *p-value* | *0.161* | *0.168* | *0.000* | *0.000* | *0.000* | *0.001* |
| Adj.ER | 0.212 | 0.206 | 0.569 | 0.208 | 0.237 | 0.171 |
| *t-ratio* | *1.686* | *1.596* | *5.366* | *1.737* | *1.960* | *2.774* |
| *p-value* | *0.092* | *0.111* | *0.000* | *0.082* | *0.050* | *0.006* |
| No.of cases | 14213 | 14213 | 13146 | 3964 | 3964 | 1161 |
| Adj.R-Square | 27.5% | 27.5% | 30.1% | 32.9% | 33.2% | 37.4% |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported below each regression coefficient. Coefficients which are statistically significant at the 5% level or higher are highlighted. Models are scaled by the composite scale factor, which is computed as: scale = (MV+TA+Sales)/3. Models are estimated for profit-making firms and exclude the outliers. PBT* f(scale) is the unscaled PBT, where unscaling is computed by multiplying the scale-deflated PBT by the 5th order root of the scale factor. This mitigates the effect of extreme values of the un-deflated raw PBT, and also allows for non-linearity in the functional form of the scaled PBT coefficient. Dummy=1 if market-to-book ratio is greater than unity, and *zero* otherwise. Models 1 through 3 relate to profit firm sub-samples. Models 4 through 6 relate to loss firms sub-samples. Models 1, 2, 4 and 5 include dividend paying and non-dividend firm-years, while models 3 and 6 are estimated for dividend-paying firms only. In Models 2, 3, 5 and 6 negative BVs are set to zero.

In the loss-firms sub-samples it is the BV variable that has the largest statistical significance and positive association with firm value, suggesting that BV (followed by dividends in dividend-paying loss making firms) is the major value driver. In profit-firms sub-samples, whether dividend-paying or not, it is the PBT which is the major valuation factor, while BV and dividends are of second and third-order importance.

Some other general conclusions can also be drawn irrespective of the firms' financial results. Firstly, all results strongly support the theoretical construct, developed in Chapter 3, that a positive relation exists between the value of the intercept in an un-deflated model and the scale of the firm. The indication of this is the positive value and high statistical significance of the intercept in all of the six scale-deflated models above.

Secondly, regardless of the sign of financial results, the PBT coefficient is not a cross-scale constant, but is scale-variant. That is, the PBT coefficient, as indicated by the value and level of statistical significance of the PBT*f(s) variable, tends to have larger absolute value for firms of larger scale. Thirdly, firms that trade below BV have lower valuation than what my model would predict if not account was taken of this premium/discount. This is indicated by highly statistically significant negative values of the dummy variable.

The above results are still observable when the entire sample is split into 16 yearly sub-samples. However, in the yearly regressions, as reported in **Table 4.10**, some additional features become apparent.

Among the three value drivers (BV, PBT, Div) PBT appears to be the dominant valuation factor, with BV and Dividends 'lagging' behind. Furthermore, the yearly 'dynamics' of the PBT valuation seems to reflect the general economic performance of the UK economy: high in good years, and low in bad years.

**Table 4.10**

$$mv_t / s = a_{0,0} * (1/s) + a_{0,1} + a_1 * (BV_t / s) + a_{2,0} * (PBT_t / s) +$$
$$+ a_{2,1} * [f(s) * (PBT_t / s)] + a_3 * (DIV / s) + a_4 * (AdjER / s) + u_t$$

| Industry * | Intercept | Dummy | 1/scale | bvx | pbt | pbt* f(s) | div | Adj.ER | No.of cases | Adj. R-Square |
|---|---|---|---|---|---|---|---|---|---|---|
| 1987 | 0.557 | -0.456 | 710 | 0.138 | 2.845 | 0.006 | 0.394 | 0.561 | 340 | 22.2% |
| *t-ratio* | *6.976* | *-9.305* | *2.592* | *1.179* | *3.450* | *0.113* | *0.173* | *1.002* | | |
| *P-value* | *0.000* | *0.000* | *0.010* | *0.239* | *0.001* | *0.910* | *0.863* | *0.317* | | |
| 1988 | 0.462 | -0.379 | 216 | 0.211 | 3.976 | -0.090 | 1.228 | 0.130 | 900 | 30.2% |
| *t-ratio* | *10.331* | *-11.241* | *0.647* | *3.111* | *8.622* | *-2.873* | *0.958* | *0.423* | | |
| *P-value* | *0.000* | *0.000* | *0.517* | *0.002* | *0.000* | *0.004* | *0.338* | *0.672* | | |
| 1989 | 0.473 | -0.404 | 390 | 0.230 | 2.279 | -0.024 | 4.689 | -0.061 | 971 | 29.5% |
| *t-ratio* | *11.968* | *-13.666* | *1.020* | *3.951* | *5.582* | *-0.755* | *3.101* | *-0.305* | | |
| *P-value* | *0.000* | *0.000* | *0.308* | *0.000* | *0.000* | *0.451* | *0.002* | *0.760* | | |
| 1990 | 0.327 | -0.365 | 253 | 0.402 | 1.985 | 0.060 | 1.511 | 0.384 | 966 | 43.2% |
| *t-ratio* | *9.671* | *-16.438* | *0.936* | *9.041* | *5.451* | *2.078* | *1.303* | *2.118* | | |
| *P-value* | *0.000* | *0.000* | *0.349* | *0.000* | *0.000* | *0.038* | *0.193* | *0.034* | | |
| 1991 | 0.382 | -0.377 | -58 | 0.350 | 1.947 | 0.087 | 4.096 | 0.838 | 874 | 46.6% |
| *t-ratio* | *12.958* | *-16.528* | *-0.311* | *7.127* | *4.773* | *2.584* | *4.457* | *3.196* | | |
| *P-value* | *0.000* | *0.000* | *0.756* | *0.000* | *0.000* | *0.010* | *0.000* | *0.001* | | |
| 1992 | 0.444 | -0.392 | -379 | 0.222 | 3.107 | 0.034 | 3.563 | 0.280 | 789 | 47.3% |
| *t-ratio* | *13.341* | *-13.970* | *-2.366* | *3.811* | *6.395* | *0.954* | *3.423* | *0.496* | | |
| *P-value* | *0.000* | *0.000* | *0.018* | *0.000* | *0.000* | *0.340* | *0.001* | *0.620* | | |
| 1993 | 0.510 | -0.381 | -549 | 0.085 | 3.787 | 0.008 | 6.056 | 0.230 | 861 | 43.8% |
| *t-ratio* | *13.317* | *-12.370* | *-2.661* | *1.385* | *6.821* | *0.297* | *4.822* | *0.272* | | |
| *P-value* | *0.000* | *0.000* | *0.008* | *0.166* | *0.000* | *0.766* | *0.000* | *0.786* | | |
| 1994 | 0.416 | -0.356 | -282 | 0.155 | 4.622 | -0.021 | 6.017 | 0.926 | 1000 | 45.3% |
| *t-ratio* | *14.019* | *-13.304* | *-1.197* | *2.997* | *9.755* | *-0.803* | *5.712* | *1.262* | | |
| *P-value* | *0.000* | *0.000* | *0.231* | *0.003* | *0.000* | *0.422* | *0.000* | *0.207* | | |
| 1995 | 0.365 | -0.307 | -250 | 0.080 | 4.135 | -0.021 | 5.794 | -1.476 | 1014 | 44.6% |
| *t-ratio* | *11.347* | *-11.302* | *-0.865* | *1.566* | *7.790* | *-0.770* | *5.700* | *-1.331* | | |
| *P-value* | *0.000* | *0.000* | *0.387* | *0.117* | *0.000* | *0.441* | *0.000* | *0.183* | | |
| 1996 | 0.530 | -0.334 | -46 | 0.002 | 4.408 | 0.028 | 2.777 | 1.008 | 1023 | 34.3% |
| *t-ratio* | *15.607* | *-11.019* | *-0.255* | *0.037* | *9.828* | *0.846* | *2.305* | *3.894* | | |
| *P-value* | *0.000* | *0.000* | *0.798* | *0.970* | *0.000* | *0.397* | *0.021* | *0.000* | | |
| 1997 | 0.667 | -0.424 | 206 | -0.072 | 3.440 | 0.047 | 1.197 | 0.997 | 1047 | 25.9% |
| *t-ratio* | *16.915* | *-13.499* | *0.967* | *-1.196* | *7.411* | *1.359* | *0.991* | *2.416* | | |
| *P-value* | *0.000* | *0.000* | *0.333* | *0.232* | *0.000* | *0.174* | *0.321* | *0.016* | | |
| 1998 | 0.770 | -0.473 | 442 | -0.086 | 1.428 | 0.100 | 1.873 | 0.879 | 950 | 26.7% |
| *t-ratio* | *16.744* | *-17.741* | *2.506* | *-1.454* | *3.363* | *3.174* | *1.587* | *3.070* | | |
| *P-value* | *0.000* | *0.000* | *0.012* | *0.146* | *0.001* | *0.002* | *0.113* | *0.002* | | |
| 1999 | 0.884 | -0.545 | 213 | 0.017 | 0.596 | 0.093 | -0.347 | -0.173 | 839 | 21.5% |
| *t-ratio* | *16.349* | *-17.215* | *1.151* | *0.253* | *1.175* | *2.674* | *-0.294* | *-0.201* | | |
| *P-value* | *0.000* | *0.000* | *0.250* | *0.800* | *0.240* | *0.007* | *0.769* | *0.841* | | |
| 2000 | 1.053 | -0.682 | -125 | 0.216 | 0.931 | 0.016 | -4.603 | 0.670 | 715 | 27.4% |
| *t-ratio* | *18.899* | *-23.226* | *-0.716* | *3.078* | *1.673* | *0.443* | *-3.561* | *2.031* | | |
| *P-value* | *0.000* | *0.000* | *0.474* | *0.002* | *0.094* | *0.657* | *0.000* | *0.042* | | |

(table is continued on the next page)

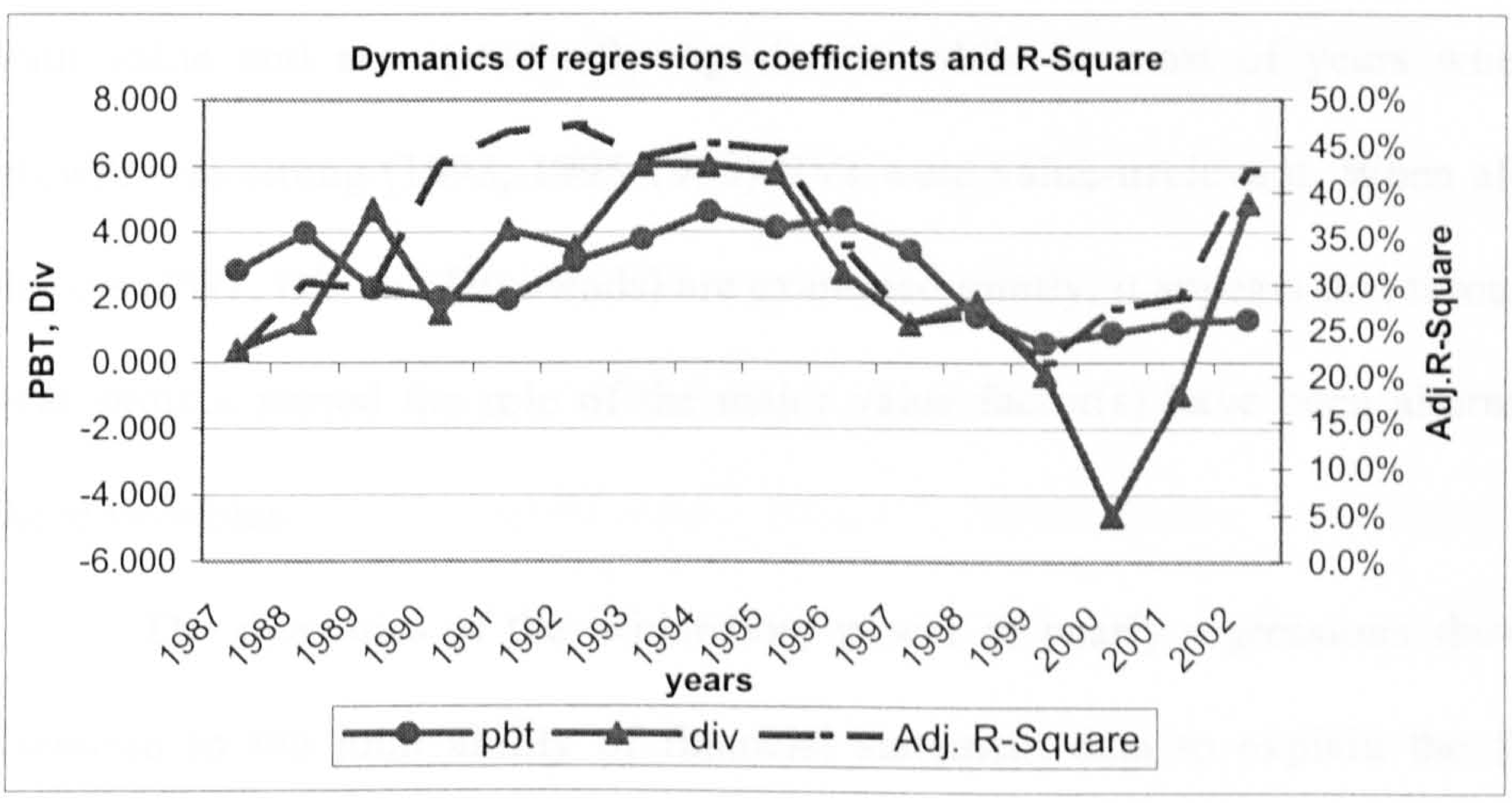
(continued from the previous page)

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 2001 | 0.711 | -0.561 | 212 | 0.268 | 1.257 | 0.066 | -0.951 | 0.073 | 595 | 28.6% |
| *t-ratio* | *14.261* | *-20.132* | *1.150* | *4.106* | *1.723* | *1.626* | *-0.778* | *0.049* | | |
| *P-value* | *0.000* | *0.000* | *0.250* | *0.000* | *0.085* | *0.104* | *0.437* | *0.961* | | |
| 2002 | 0.477 | -0.411 | 776 | 0.253 | 1.329 | 0.095 | 4.858 | 0.374 | 316 | 42.4% |
| *t-ratio* | *9.031* | *-12.510* | *1.851* | *3.634* | *2.157* | *2.167* | *3.360* | *0.407* | | |
| *P-value* | *0.000* | *0.000* | *0.065* | *0.000* | *0.032* | *0.031* | *0.001* | *0.685* | | |

Heterosckedasticity-robust (White-adjusted) t-ratios are reported below coefficients. Coefficients which are statistically significant at the 5% level or higher are highlighted.
All variables in the reported models are deflated by the composite scale proxy, which is computed as: scale = (MV+TA+Sales)/3. Observations with missing values for TA or Sales are excluded. Top and bottom 0.5% of all variables are excluded as outliers. Outliers are identified for the entire pooled sample. PBT*Scale is an *unscaled* raw PBT, and is included in regression to indicate whether the regression coefficient on PBT in the un-deflated model is a function of scale. PBT*Scale is computed by multiplying the scale-deflated PBT by the 5$^{th}$ order root of the scale factor. The 5$^{th}$ order root of the scale is used, instead of the raw scale, in order to mitigates the possible overinfluential effect of extreme values of unscaled PBT, and to allow for non-linearity in the functional form of the scales PBT coefficient.
Dummy=1 if market-to-book ratio is greater than unity, and *zero* otherwise. All yearly regressions include only dividend-paying profit firms (positive PBT), and negative BVs are set to zero.

**Figure 4.22** demonstrates that capitalisation of earnings was low in periods of economic distress (1990-91 and 1999-2002) and high in years of strong economic growth (1993-1997).

**Figure 4.22**




Furthermore, during the period 1999-2001, the most recent period of economic downturn, earnings seem to entirely have lost their valuation role, as PBT coefficients in these years are not statistically significant at the 5% level. Association of dividends with firm value is also time-variant, but the link with the UK general economic performance is less obvious. Dividends are highly statistically significant and positively associated with value in years 1991-1996, while in more recent years dividends are generally not statistically significant, and for the year 2000 dividends show statistically significant and negative association with value. Unlike the straightforward valuation role that the literature assigns to earnings (this was discussed in Chapter 3), there is no consensus in the literature about dividends' valuation role. My empirical evidence indicates that not only the degree of association with firm value, but in a more broader cense the role of dividends in equity valuation is changing through time. Further theoretical and empirical exploration of this issue might be a useful exercise, yet it is beyond the scope of this study.

While PBT is statistically significant in 13 out of 16 years, BV is significantly associated with value only in 9 years. Furthermore, the better the general economic outlook of the country, the less value relevant is BV. In other words, the results show that in 'bad' economic years (1990-1992 and 2000-2002), BVs are positively associated with value and are statistically significant, while in most of years when economic growth was strong (1993, 1995-1998) BVs were value-irrelevant. When all three value drivers (PBT, BV and Dividends) are examined jointly, it appears that throughout the 16 year sample period the role of the major value factor(s) have been alternating among these variables.

The dynamics of the explanatory power of yearly regressions shows a distinct variation in the joint ability of financial statement data to explain the firm's equity market value. In the fist half of the 1990s the explanatory power is substantially higher than in the second half of 1990s. This result persists throughout all our model specifications and deflation methods, and is also in line with findings of Core *et al.* (2003) regarding the relative importance of financial statement data to firm valuation in the periods of 'old' and 'new' economy. Qualitatively identical results in respect of the regression explanatory power, as well as PBT, BV and dividend valuation are observed in TA-deflated and Sales-deflated regressions.

The yearly regression results support the general valuation characteristics observed in the total sample. That is, as it was in the entire sample, all yearly results indicate that a positive relation exists between the value of the intercept in an un-deflated model and the scale of the firm. The indication of this is the positive value and high statistical significance of the intercept in all 16 years. Furthermore, firms that trade below BV have lower valuation than what the model would predict if no account was taken of this premium/discount. This is indicated by highly statistically significant negative values of the dummy variable in all yearly regressions.

Finally I investigate valuation differences across industries. **Figure 4.23**, which is based on the results reported in **Table 4.11**, presents clear evidence of sharp differences existing across industries in how accounting information maps into the firm's value. The overall ability of our scale-deflated accounting-based valuation model to explain cross-sectional variation in the firm's value varies substantially across industries, and these patters are similar to TA-deflated regressions.

Relative valuation of PBTs and dividends varies substantially across different industries. Thus earnings have lower capitalisation in such 'basic' industries as *'Agriculture, Forestry and Fishing'*, *'Mining'*, *'Construction'* and, surprisingly, in the *'Finance, Insurance and Real Estate'* sector. PBTs from the *'Wholesale Trade'*, *'Retail Trade'* and *'Transportation, Communications, Electric, etc'* sectors have the highest capitalisation.

Results in **Table 4.11** and **Figure 4.23** are remarkably similar to those where a different scale factor, total assets, was used. This reconfirms the robustness of the differences in how investors perceive and capitalise earnings of firms operating in different industries. The cross-industry differential pricing of earnings might provide an explanation with regard to the valuation of specific business segment operations[29].

**Table 4.11**

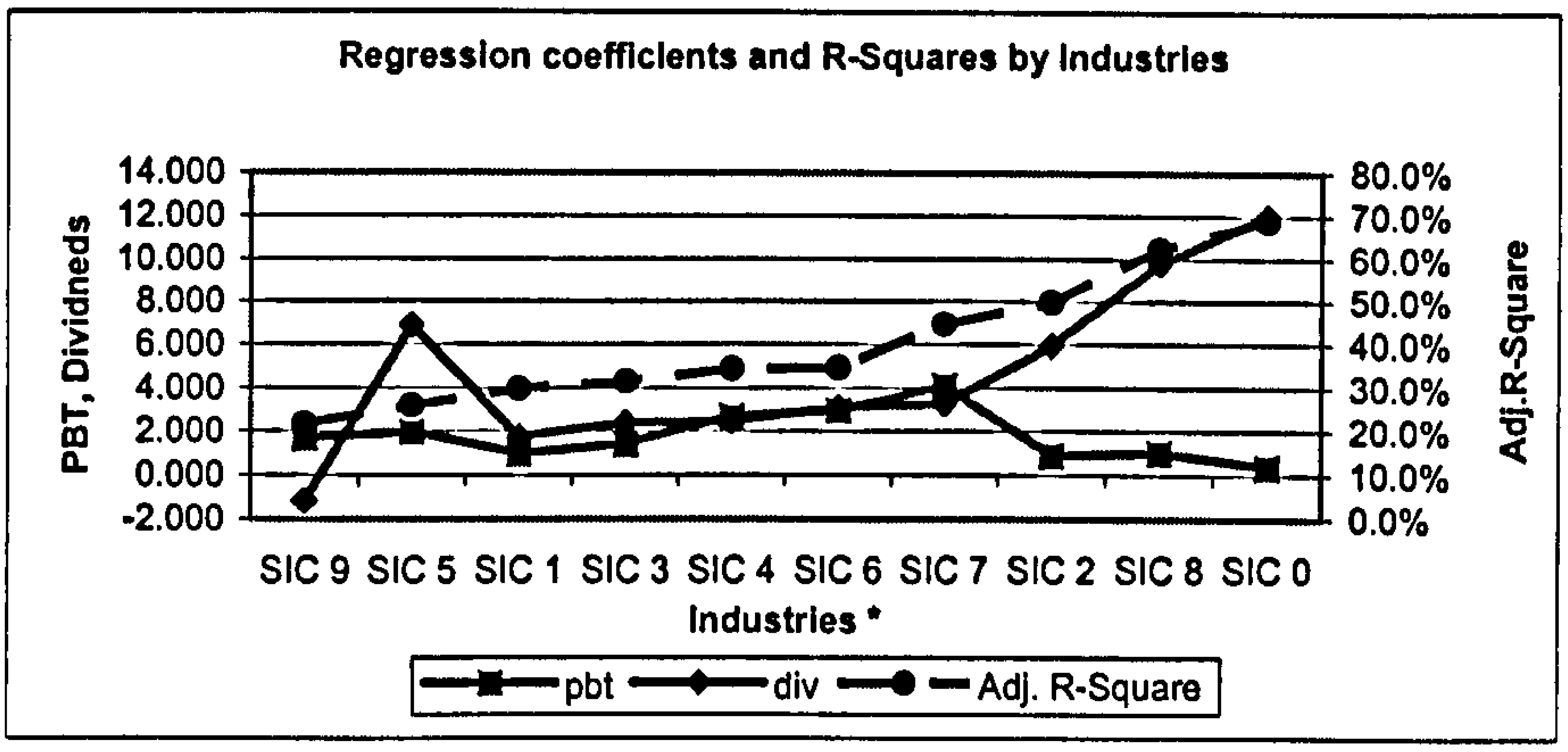
$$mv_t / s = a_{0,0} * (1/s) + a_{0,1} + a_1 * (BV_t / s) + a_{2,0} * (PBT_t / s) +$$
$$+ a_{2,1} * [f(s) * (PBT_t / s)] + a_3 * (DIV / s) + a_4 * (AdjER / s) + u_t$$

| Industry * | Intercept | Dummy | 1/scale | bvx | pbt | pbt* f(s) | div | Adj.ER | No.of cases | Adj. R-Square |
|---|---|---|---|---|---|---|---|---|---|---|
| SIC 0 | 0.362 | -0.465 | 402 | 0.622 | 0.395 | -0.284 | 12.034 | -1.101 | 101 | 68.9% |
| *t-ratio* | *5.354* | *-9.787* | *1.187* | *5.843* | *0.581* | *-2.418* | *3.529* | *-1.143* | | |
| *P-value* | *0.000* | *0.000* | *0.238* | *0.000* | *0.563* | *0.018* | *0.001* | *0.256* | | |
| SIC 1 | 1.132 | -0.637 | 1429 | -0.001 | 0.999 | -0.061 | 1.730 | 1.440 | 217 | 29.9% |
| *t-ratio* | *7.760* | *-10.484* | *1.898* | *-0.011* | *1.401* | *-1.803* | *0.661* | *2.048* | | |
| *P-value* | *0.000* | *0.000* | *0.059* | *0.992* | *0.163* | *0.073* | *0.509* | *0.042* | | |
| SIC 2 | 0.258 | -0.331 | 485 | 0.558 | 0.891 | -0.002 | 5.955 | 0.043 | 707 | 49.9% |
| *t-ratio* | *8.527* | *-18.532* | *1.472* | *7.093* | *2.048* | *-0.056* | *5.169* | *0.070* | | |
| *P-value* | *0.000* | *0.000* | *0.141* | *0.000* | *0.041* | *0.955* | *0.000* | *0.945* | | |
| SIC 3 | 0.677 | -0.441 | 463 | -0.004 | 1.426 | 0.106 | 2.381 | 0.970 | 2507 | 31.6% |
| *t-ratio* | *22.809* | *-25.485* | *3.058* | *-0.080* | *5.262* | *5.626* | *3.385* | *3.036* | | |
| *P-value* | *0.000* | *0.000* | *0.002* | *0.936* | *0.000* | *0.000* | *0.001* | *0.002* | | |
| SIC 4 | 0.602 | -0.358 | -53 | -0.034 | 2.703 | 0.023 | 2.471 | 0.564 | 3170 | 34.5% |
| *t-ratio* | *27.548* | *-28.302* | *-0.476* | *-0.861* | *12.310* | *1.416* | *3.919* | *2.792* | | |
| *P-value* | *0.000* | *0.000* | *0.634* | *0.389* | *0.000* | *0.157* | *0.000* | *0.005* | | |
| SIC 5 | 0.620 | -0.370 | 796 | -0.066 | 1.964 | 0.031 | 6.880 | 0.371 | 1129 | 26.0% |
| *t-ratio* | *17.305* | *-12.866* | *2.321* | *-1.134* | *5.203* | *1.566* | *6.803* | *1.705* | | |
| *P-value* | *0.000* | *0.000* | *0.020* | *0.257* | *0.000* | *0.117* | *0.000* | *0.088* | | |
| SIC 6 | 0.411 | -0.334 | 258 | 0.080 | 2.977 | 0.077 | 3.115 | 0.838 | 1279 | 34.8% |
| *t-ratio* | *16.683* | *-14.378* | *3.252* | *1.574* | *7.461* | *2.521* | *2.783* | *2.011* | | |
| *P-value* | *0.000* | *0.000* | *0.001* | *0.116* | *0.000* | *0.012* | *0.005* | *0.044* | | |
| SIC 7 | 0.381 | -0.419 | 143 | 0.310 | 4.110 | 0.017 | 3.299 | 0.632 | 1478 | 44.7% |
| *t-ratio* | *15.537* | *-24.116* | *0.731* | *9.076* | *10.852* | *0.774* | *3.754* | *2.410* | | |
| *P-value* | *0.000* | *0.000* | *0.465* | *0.000* | *0.000* | *0.439* | *0.000* | *0.016* | | |
| SIC 8 | 0.216 | -0.377 | 2222 | 0.248 | 1.013 | 0.119 | 9.805 | -1.178 | 183 | 62.4% |
| *t-ratio* | *4.445* | *-6.296* | *6.019* | *2.842* | *1.124* | *1.835* | *4.563* | *-1.381* | | |
| *P-value* | *0.000* | *0.000* | *0.000* | *0.005* | *0.262* | *0.068* | *0.000* | *0.169* | | |
| SIC 9 | 0.856 | -0.564 | -243 | 0.176 | 1.672 | 0.109 | -1.152 | 0.486 | 2415 | 21.7% |
| *t-ratio* | *28.960* | *-30.140* | *-2.709* | *5.268* | *4.449* | *2.561* | *-1.815* | *1.385* | | |
| *P-value* | *0.000* | *0.000* | *0.007* | *0.000* | *0.000* | *0.010* | *0.070* | *0.166* | | |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported below each regression coefficient. Coefficients which are statistically significant at the 5% level or higher are highlighted. Industrial models are scaled by the composite scale factor, which is computed as: scale = (MV+TA+Sales)/3. All models are estimated for profit-making firms and exclude the outliers. PBT* f(scale) is the unscaled PBT, where unscaling is computed by multiplying the scale-deflated PBT by the 5th order root of the scale factor. This mitigates the effect of extreme values of the un-deflated raw PBT, and also allows for non-linearity in the functional form of the scaled PBT coefficient. All regressions include only dividend-paying profit firms (positive PBT), and negative BVs are set to zero.
* The employed industry SIC abbreviations are as follows: SIC0 = Agriculture, Forestry and Fishing; SIC1 = Mining; SIC2 = Construction; SIC3 = Food, textile, paper and chemical products (i.e., two-digit SIC codes of 20 through 29); SIC4 = Manufacturing (i.e., two-digit SIC codes of 20 through 29); SIC5 = Transportation, Communications, Electric, Gas, And Sanctuary Services; SIC6 = Wholesasle Trade; SIC7 = Retale trade; SIC8 = Finance, Insurance, and Real Estate; SIC9 = Services.

[29] Valuation of line-of-business segments is addressed in chapter 6.

Figure 4.23




* The employed industry SIC abbreviations are as follows: SIC0 = Agriculture, Forestry and Fishing; SIC1 = Mining; SIC2 = Construction; SIC3 = Food, textile, paper and chemical products (i.e., two-digit SIC codes of 20 through 29); SIC4 = Manufacturing (i.e., two-digit SIC codes of 20 through 29); SIC5 = Transportation, Communications, Electric, Gas, And Sanctuary Services; SIC6 = Wholesasle Trade; SIC7 = Retale trade; SIC8 = Finance, Insurance, and Real Estate; SIC9 = Services.

Dividends appear to be the 'strongest' valuation factor, as its coefficients are highly statistically significant in 8 out of 10 industries, compared to 7 our of 10 statistically significant industrial earnings coefficients. Furthermore, all statistically significant dividend coefficients are positively associated with firm value. Both in TA-deflated and in the current model specification dividends paid by *'Services'* firms appear at the lowest end of association with firm value. Furthermore, although not statistically significant, dividends coefficient in this sector appears with a negative sign. In contrast to the *'Services'* sector, dividends paid by *'Agriculture, Forestry and Fishing'* firms have the highest valuation (i.e., highest dividend multiplier), while earnings multiplier in this sector is not statistically significant. Further statistical analysis (not reported) provide some indication that across the majority of industries dividends (in the dividend-paying samples) are at least as value relevant as earnings, while book values are less relevant in most of the industries. The dividend-paying condition is emphasised because this result is no longer observable when regressions are estimated on industrial samples that pool both dividend-paying and non-dividend firms. In the latter case, it is the earnings that become the major value driver.

The ability of our simple accounting numbers-based model to explain the cross-sectional variation in firm value also varies substantially across industries. In some economic sectors it appears to explain nearly 70% of the variation in dependent variable, while in others the adjusted R-Square is less than 30%. Thus the accounting-based valuation model works consistently (across alternative ways of scaling) better for *'Agriculture, Forestry and Fishing'* and *'Finance, Insurance and Real Estate'* sectors, and worse for the *'Services'* sector. This evidence, perhaps, provides a summary measure of the reliability of asset numbers, and/or the quality and permanence of earnings numbers across different industries.

Finally, as was the case in the yearly regressions, the positive sign and high statistical significance of intercepts in all scale-deflated industrial regressions indicate that the intercept in an un-deflated model is not a cross-scale constant, but varies with the firm's scale. Industrial regression analysis also reconfirms the previous finding that firms trading below BV have lower valuation than what our model would predict if no account was taken of this premium/discount. This is indicated by highly statistically significant negative values of the dummy variable in all yearly regressions.

### 4.4.4 Testing the impact of the outliers and the variables' extreme values

Across all alternative scale-proxies, deflation by the 'blended scale' proxy produces the most robust regression parameters when different levels of variables' extreme values are marked and eliminated as outliers. Because it is the actual values of segment-level earnings coefficients that we will be comparing (to draw segment valuation inferences) during the segment-level analysis, the robustness of regression parameters, to the researcher's discretion over the choice of a threshold for identifying and eliminating outliers, is of vital importance. The 'blended scale' proxy is the only deflator that produces results which are by far less sensitive to the elimination of different percentages of extreme observations than any other deflator.

**Table 4.12** reports basic regression results where different percentages of extreme observations are being eliminated from the sample.

**Table 4.12**

$$mv_t / s = a_{0,0} * (1/s) + a_{0,1} + a_1 * (BV_t / s) + a_{2,0} * (PBT_t / s) +$$
$$+ a_{2,1} * [f(s) * (PBT_t / s)] + a_3 * (DIV / s) + a_4 * (AdjER / s) + u_t$$

| | Percentage of Variables' Extreme Values Eliminated as Outliers | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 0.0% | 0.2% | 0.4% | 0.5% | 0.6% | 0.8% | 1.0% | 1.2% |
| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 | Model 7 | Model 8 |
| Intercept | 0.679 | 0.615 | 0.595 | 0.587 | 0.582 | 0.571 | 0.556 | 0.556 |
| *t-ratio* | *42.403* | *55.300* | *55.219* | *54.874* | *54.541* | *53.736* | *53.481* | *52.894* |
| *p-value* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* |
| Dummy | -0.490 | -0.454 | -0.449 | -0.447 | -0.445 | -0.442 | -0.439 | -0.437 |
| *t-ratio* | *-50.9* | *-64.3* | *-63.6* | *-63.5* | *-63.3* | *-63.0* | *-63.485* | *-62.723* |
| *p-value* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* |
| 1/Scale | 140.10 | 107.70 | 88.60 | 75.50 | 77.20 | 55.50 | 38.10 | 52.10 |
| *t-ratio* | *2.212* | *1.747* | *1.418* | *1.206* | *1.222* | *0.880* | *0.602* | *0.828* |
| *p-value* | *0.027* | *0.081* | *0.156* | *0.228* | *0.222* | *0.379* | *0.547* | *0.408* |
| BV | 0.157 | 0.133 | 0.143 | 0.149 | 0.152 | 0.163 | 0.183 | 0.179 |
| *t-ratio* | *8.299* | *8.419* | *9.054* | *9.391* | *9.476* | *10.066* | *11.471* | *11.014* |
| *p-value* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* |
| PBT | 1.684 | 2.063 | 2.269 | 2.390 | 2.458 | 2.583 | 2.672 | 2.708 |
| *t-ratio* | *10.912* | *17.158* | *19.303* | *20.473* | *21.019* | *22.175* | *23.104* | *23.136* |
| *p-value* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* |
| PBT*f(s) | 0.047 | 0.045 | 0.042 | 0.039 | 0.040 | 0.038 | 0.034 | 0.035 |
| *t-ratio* | *4.014* | *5.276* | *4.951* | *4.595* | *4.749* | *4.529* | *4.144* | *4.246* |
| *p-value* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* |
| Dividends | 1.009 | 2.816 | 2.728 | 2.586 | 2.457 | 2.238 | 2.073 | 1.897 |
| *t-ratio* | *1.411* | *9.315* | *8.939* | *8.564* | *8.114* | *7.458* | *7.028* | *6.326* |
| *p-value* | *0.158* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* |
| Adj.ER | 0.183 | 0.539 | 0.565 | 0.569 | 0.584 | 0.582 | 0.519 | 0.486 |
| *t-ratio* | *1.160* | *4.806* | *5.255* | *5.366* | *5.490* | *5.655* | *4.957* | *4.479* |
| *p-value* | *0.246* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* |
| No.of cases | 13432 | 13324 | 13212 | 13146 | 13076 | 12952 | 12793 | 12672 |
| Adj.$R^2$ | 26.9% | 28.7% | 29.8% | 30.1% | 30.3% | 30.6% | 31.3% | 31.0% |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported below each regression coefficient. Coefficients which are statistically significant at the 5% level or higher are highlighted. All regressions are scaled by the composite scale factor. Model 1 includes all observations, i.e., no cases are excluded. Model 2 excludes cases with top and bottom 0.2% extreme values of MV, PBT, BV and non-zero Dividends. Model 3 does so for the extreme 0.4% of these variables' values, etc.
All regressions include only dividend-paying profit-making firms, and negative BVs are set to zero.

The eight models of **Table 4.12** demonstrate that the biggest 'jump' in regression parameters occurs when the top and bottom 0.2% of firm-years are eliminated as outliers, while the effect of subsequent eliminations on regression parameters diminishes gradually. There is a slightly increasing (decreasing), yet at a diminishing rate, trend of the value of PBT (Dividend) coefficients, when more of extreme cases are eliminated. However, this change is more likely to reflect certain valuation characteristics of accounting numbers, rather than being an econometric phenomenon[30]. For reasons of comparability with results reported in other studies, all tests reported in the further empirical analysis chapters are done with the 0.5% trimming.

## 4.5 CONCLUSIONS

The primary objective of this chapter has been to examine the general characteristics of the properties of the operationalised valuation model, when applied to firm-level accounting value drivers. In the process of this investigation, a wide range of hypotheses and contexts have been empirically tested in order to identify those which impact on the empirical relationship between the equity market values and financial statement variables.

Prior to addressing the main objective, I have extensively reviewed and analysed (i) the yearly and industry-specific characteristics of the sample employed in this study, and (ii) the descriptive statistics of variables used in subsequent regression analysis. This descriptive analysis has revealed some important contexts, which substantiate the subsequent empirical results related to the primary objective of this chapter.

[30] The existing literature [e.g., Hayn (1995), Collins *et al.* (1997)] holds that value relevance and pricing of earnings is linked to the level of their (*ab*)*normality*. That is, the capitalisation and value relevance of earnings is higher when earnings are more *normal*. The elimination of a larger percentage of outliers, which include *abnormally* high/low earnings, increases the proportion of *normal* earnings left in the sample, and, therefore, increases the pricing and value relevance of earnings. Because dividends are more informative when other value drivers are perceived to be of a lower persistence (e.g., *abnormally* high or low earnings), the decrease of the value relevance and pricing of dividends can be expected when more *normal* earnings constitute the sample.

The final sections of the chapter have dealt with issues of robustness of the empirical results, such as, the results' sensitivity to the choice of alternative scale-deflators, and/or threshold applied for eliminating the outliers.

The empirical analysis (and the results) in this chapter is fundamental for taking the investigation further on to the segmental level. The results, in its own right, appear to tell an interesting story about the contexts affecting the value relevance of specific accounting variables. Below I provide a brief summary of the empirical tests' results.

With regard to the explanatory power of the regression (the Adjusted R-Square), results suggest that the operationalised model performs differently across different economic sectors and periods. For instance, the explanatory power for the financial sector firms is more than twice as high as that of the mining sector. Results also reveal a peculiar historical pattern of the R-Square: it had a steadily increasing trend before 1995, and a sharply declining trend in the second half of the 1990s. The model also explains more of the cross-sectional variation in equity market value when (i) firms trade at a discount to book value, (ii) firms pay dividends, and (iii) when the reported PBTs are positive.

The value relevance of PBT depends on its sign. The reported losses appear not to be value relevant, yet when the PBT is positive, it has a robustly positive and statistically significant value association. In addition, when the reported PBT is positive, the magnitude of the PBT coefficient appears to be positively related to the size of the firm. The capitalisation of the PBT varies substantially across different economic sectors, being particularly large in the services and trade-related sectors, and notably small in the finance, construction and agriculture related sectors. The capitalisation of the PBT has also varied substantially throughout the sample period, yet without a particular trend. Results also indicate that the PBT tends to have little or no valuation role when the firm trades below its book value.

Book value of equity is, in general, a value relevant factor, but the extent of its value association (valuation importance) varies considerably across the industries and the sample years. It becomes the major value driver when the firm reports losses, and/or trades below the book value. However, negative book values have no association with value.

By and large, results indicate that dividends are a key value driver and, in the majority of situations, are positively associated with the firm equity value. Dividends display a higher association with firm value when firms report negative BVs and/or PBTs. However, there are circumstances when dividends appear to play contrasting valuation roles: they are positively (negatively) related to the firm value when firms trade at a premium (discount) to book value. Finally, results indicate that the role played by dividends in equity valuation (or the value association of dividends) varies sharply both across the ten industry groups and different years of the sample period.

## APPENDIX 4.1

The following Extel reference details, financial statement and market data is collected for each company:

**1. Extel reference details**

Extel Number

Company Name

Former Name

Year Final

Industry (according to FTSE Global Classification System)

SIC Industry (according to Standard Industrial Classification System)

Status (dead or live)

**2. Financial Statement Data**

**2.1. Firm-level data:**

Sales (i.e. group sales)

Profit Before Tax (group profit before tax)

Net Assets (group net assets)

Total Assets (group total assets)

Debt (group total debt)

Total Shareholders' Equity

Ordinary Shareholders' Equity

Net Income

Dividends for the year

Ordinary Dividends

Sales Growth

**2.2. Segment-level data**

2.2.1. Profit Before Tax (PBT) by geographical origin of profits:

PBT – UK

PBT – Europe (excluding UK)

PBT – America

PBT – Asia

PBT – Middle East and Africa

PBT – Rest (this is a balancing item that includes intra-group profits, discontinued operations, unidentified geographical locations, central cost allocatioin, exceptional charges, etc., and equates group PBT and the sum of segment-level PBTs)

2.2.2. Sales by geographical origin of sales:

SALES – UK

SALES – Europe (excluding UK)

SALES – America

SALES – Asia

SALES – Middle East and Africa

SALES – Rest (this is a balancing item that accounts for intra-group sales, discontinued operations, sales from unidentified geographical locations, etc., and equates group sales and the sum of segment-level sales)

2.2.3. Net Assets (NA) by geographical location of assets:

NA – UK

NA – Europe (excluding UK)

NA – America

NA – Asia

NA – Middle East and Africa

NA – Rest (this is a balancing item that reflect intra-group net assets, discontinued operations, unidentified geographical locations, unallocated net assets, etc., and equates group NA and the sum of segment-level NAs)

**3. Firm-level data:**

Share Price at Period End

Number of Shares at Balance Sheet date

Market Capitalization at Balance Sheet date

## APPENDIX 4.2

## Initial sample: Number of firm-years by years and industries in a matrix format

**Panel A**

| Years | Industrial affiliation according to the FTSE Global Classification System | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Resources (0) | Basic Industries (1) | General Industrials (2) | Cyclical Consumer Goods (3) | Non-Cyclical Consumer Goods (4) | Cyclical Services (5) | Non-Cyclical Services (6) | Utilities (7) | Financials (8) | Information Technology (9) | Total no. of cases by years |
| 1987 | 15 | 71 | 72 | 45 | 45 | 114 | 7 | 5 | 0 | 19 | 393 |
| 1988 | 35 | 135 | 203 | 109 | 128 | 304 | 24 | 21 | 0 | 53 | 1012 |
| 1989 | 40 | 153 | 214 | 124 | 144 | 365 | 24 | 27 | 3 | 58 | 1152 |
| 1990 | 47 | 161 | 221 | 130 | 150 | 392 | 25 | 39 | 9 | 61 | 1235 |
| 1991 | 48 | 157 | 217 | 132 | 159 | 397 | 31 | 55 | 9 | 64 | 1269 |
| 1992 | 43 | 152 | 212 | 129 | 150 | 394 | 31 | 54 | 9 | 60 | 1234 |
| 1993 | 40 | 153 | 228 | 136 | 170 | 399 | 30 | 55 | 11 | 64 | 1286 |
| 1994 | 45 | 165 | 219 | 139 | 187 | 428 | 34 | 57 | 13 | 77 | 1364 |
| 1995 | 49 | 162 | 219 | 139 | 183 | 436 | 36 | 47 | 12 | 84 | 1367 |
| 1996 | 52 | 167 | 216 | 145 | 180 | 475 | 34 | 36 | 8 | 101 | 1414 |
| 1997 | 53 | 160 | 189 | 140 | 174 | 536 | 37 | 37 | 3 | 119 | 1448 |
| 1998 | 49 | 154 | 168 | 124 | 166 | 534 | 42 | 30 | 0 | 128 | 1395 |
| 1999 | 44 | 134 | 150 | 110 | 152 | 495 | 40 | 25 | 0 | 136 | 1286 |
| 2000 | 40 | 120 | 143 | 102 | 139 | 523 | 48 | 23 | 0 | 191 | 1329 |
| 2001 | 47 | 112 | 140 | 94 | 135 | 524 | 48 | 22 | 0 | 205 | 1327 |
| 2002 * | 16 | 49 | 73 | 53 | 70 | 296 | 33 | 14 | 0 | 98 | 702 |
| Total number of cases | 663 | 2205 | 2884 | 1851 | 2332 | 6612 | 524 | 547 | 77 | 1518 | 19213 ** |

* only first half of that year's data is included in the sample.
** total no. of cases in the pooled cross-sectional sample

**Panel B**

| years | Agriculture, Forestry and Fishing (0) | Mining (1) | Construction (2) | Food, textile, paper and chemical products (3) *** | Manufacturing (4) **** | Transportation, Communications, Electric, Gas, And Sanctuary Services (5) | Wholesale Trade (6) | Retail trade (7) | Finance, Insurance, and Real Estate (8) | Services (9) | total no. of cases by years |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Industrial affiliation according to Standard Industrial Classification (SIC) system | | | | | | | | | | |
| 1987 | 3 | 15 | 29 | 77 | 110 | 31 | 36 | 26 | 7 | 60 | 394 |
| 1988 | 4 | 34 | 58 | 198 | 265 | 60 | 99 | 95 | 25 | 170 | 1008 |
| 1989 | 10 | 44 | 68 | 215 | 283 | 73 | 114 | 111 | 33 | 199 | 1150 |
| 1990 | 11 | 48 | 69 | 222 | 295 | 79 | 121 | 119 | 45 | 224 | 1233 |
| 1991 | 14 | 48 | 66 | 229 | 294 | 99 | 118 | 121 | 48 | 229 | 1266 |
| 1992 | 10 | 44 | 64 | 221 | 289 | 99 | 111 | 122 | 47 | 224 | 1231 |
| 1993 | 11 | 44 | 61 | 235 | 300 | 100 | 119 | 127 | 52 | 233 | 1282 |
| 1994 | 12 | 45 | 67 | 252 | 306 | 112 | 126 | 129 | 54 | 257 | 1360 |
| 1995 | 9 | 44 | 63 | 249 | 315 | 113 | 124 | 132 | 42 | 272 | 1363 |
| 1996 | 9 | 47 | 65 | 257 | 317 | 114 | 121 | 135 | 31 | 316 | 1412 |
| 1997 | 11 | 47 | 65 | 252 | 303 | 118 | 124 | 144 | 29 | 352 | 1445 |
| 1998 | 11 | 44 | 62 | 238 | 281 | 117 | 118 | 144 | 19 | 358 | 1392 |
| 1999 | 10 | 42 | 61 | 206 | 253 | 107 | 103 | 138 | 16 | 348 | 1284 |
| 2000 | 10 | 39 | 55 | 186 | 238 | 118 | 102 | 140 | 17 | 421 | 1326 |
| 2001 | 8 | 44 | 49 | 171 | 232 | 116 | 101 | 129 | 18 | 456 | 1324 |
| 2002 * | 2 | 15 | 21 | 96 | 121 | 67 | 48 | 94 | 8 | 228 | 700 |
| Total no. of cases | 145 | 644 | 923 | 3304 | 4202 | 1523 | 1685 | 1906 | 491 | 4347 | 19170 ^ |

^ SIC codes for 43 firm-years are missing, resulting in smaller total no. of cases
* only first half of that year's data is included in the sample
** total no. of cases in the pooled cross-sectional sample
*** includes firms with two-digit SIC codes in between 20 to 29.
**** includes firms with two-digit SIC codes being within 30 to 39.

## APPENDIX 4.3

### Panel A

**Descriptive statistics on key regression variables when only profit firm-years, when total sample is restricted only to profit firm-years.**

Only positive PBT cases, and excluding outliers *

| | *MV/TA* | *BV/TA* | *PBT/TA* | *PBT* | *1/TA* | *DIV/TA*** |
|---|---|---|---|---|---|---|
| Mean | 1.139 | 0.458 | 0.109 | 50585.284 | 4.86E-05 | 0.032 |
| Median | 0.859 | 0.460 | 0.095 | 5232 | 1.84E-05 | 0.027 |
| Standard Deviation | 0.990 | 0.196 | 0.074 | 197018.1 | 0.0001 | 0.052 |
| Kurtosis | 11.854 | 1.627 | 2.677 | 175.232 | 166.903 | 8874.419 |
| Skewness | 2.855 | -0.490 | 1.348 | 10.704 | 9.401502 | 85.261 |
| Minimum | 0.023 | -0.667 | 0.001 | 3 | 6.52E-09 | 8.35E-05 |
| Maximum | 8.985 | 0.955 | 0.490 | 6029000 | 0.003 | 5.413 |
| Count | 14496 | 14496 | 14496 | 14496 | 14496 | 13379 |

* outliers are defined as top and bottom 0.5% of MV/TA, BV/TA and PBT/TA values
** only dividend-paying firm years are included

**Pearson Correlation matrix**

| | *MV/TA* | *BV/TA* | *PBT/TA* | *PBT* | *1/TA* |
|---|---|---|---|---|---|
| MV/TA | 1 | | | | |
| BV/TA | 0.090 | 1 | | | |
| PBT/TA | 0.597 | 0.059 | 1 | | |
| PBT | 0.052 | -0.073 | 0.064 | 1 | |
| 1/TA | 0.110 | 0.112 | 0.079 | -0.113 | 1 |
| DIV/TA * | 0.217 | 0.048 | 0.284 | 0.033 | 0.045 |

* coefficients are computed for only dividend-paying firms

## Panel B

### Descriptive statistics on key regression variables when only profit firm-years, when total sample is restricted only to loss firm-years.

Only negative PBT cases, and excluding outliers *

| | *MV/TA* | *BV/TA* | *PBT/TA* | *PBT* | *1/TA* | *DIV/TA*** |
|---|---|---|---|---|---|---|
| Mean | 1.702 | 0.369 | -0.307 | -25927 | 0.0002 | 0.017 |
| Median | 0.659 | 0.421 | -0.127 | -2325 | 5.58E-05 | 0.012 |
| Standard Deviation | 3.094 | 0.569 | 0.605 | 280341 | 0.0006 | 0.019 |
| Kurtosis | 32.381 | 51.886 | 59.918 | 1504 | 380.056 | 65.711 |
| Skewness | 4.837 | -5.528 | -6.439 | -36 | 15.329 | 6.188 |
| Minimum | 0.016 | -7.576 | -8.987 | -1.4E+07 | 5.8E-09 | 2.63E-05 |
| Maximum | 37.446 | 0.984 | -0.001 | -5 | 0.020 | 0.272 |
| Count | 4207 | 4207 | 4207 | 4207 | 4207 | 1182 |

* outliers are defined as top and bottom 0.5% of MV/TA, BV/TA and PBT/TA values.
** only dividend-paying firm years are included

**Pearson Correlation matrix**

| | *MV/TA* | *BV/TA* | *PBT/TA* | *PBT* | *1/TA* |
|---|---|---|---|---|---|
| MV/TA | 1 | | | | |
| BV/TA | 0.077 | 1 | | | |
| PBT/TA | -0.236 | 0.232 | 1 | | |
| PBT | 0.026 | 0.002 | 0.009 | 1 | |
| 1/TA | 0.307 | -0.188 | -0.402 | 0.028 | 1 |
| DIV/TA * | 0.216 | 0.011 | -0.187 | 0.012 | 0.017 |

* coefficients are computed for only dividend-paying firms

## Panel C

### Test of significance of difference between variables' mean values in Panels A and B.

Statistical difference between means of two sub-samples *

| | *MV/TA* | *BV/TA* | *PBT/TA* | *PBT* | *1/TA* | *DIV/TA* |
|---|---|---|---|---|---|---|
| Z-score | -11.627^ | 9.945 ^ | 44.382 ^ | 16.555 ^ | -15.389 ^ | 21.098 ^ |

* the significance of difference between the means of two independent large sample is infurred by using the two-tailed z-test to test the following null hypothesis:
H0: mean (variable 1) - mean (variable 2) = 0
^ the null hypothesis is rejected at 1% level.

## APPENDIX 4.4

**Pearson correlation matrixes for the one year lagged MV-deflated variables.**

Q 1

| | MV | BV | BVX * | PBT | Div | 1/MV |
|---|---|---|---|---|---|---|
| BV | 0.219 | 1 | | | | |
| BVX * | 0.222 | ... | 1 | | | |
| PBT | 0.339 | 0.397 | 0.401 | 1 | | |
| Div | 0.207 | 0.292 | 0.292 | 0.447 | 1 | |
| 1/MV | 0.084 | 0.288 | 0.294 | 0.265 | 0.083 | 1 |
| Adj.ER | -0.091 | -0.127 | -0.121 | -0.334 | -0.185 | -0.083 |

Q 2

| MV | BVX * | PBT | Div | 1/MV |
|---|---|---|---|---|
| ... | ... | ... | ... | ... |
| 0.206 | 1 | | | |
| 0.376 | 0.420 | 1 | | |
| 0.279 | 0.374 | 0.516 | 1 | |
| 0.081 | 0.344 | 0.325 | 0.197 | 1 |
| -0.179 | -0.192 | -0.580 | -0.329 | -0.189 |

Q 3

| | MV | BV | BVX * | PBT | Div | 1/MV |
|---|---|---|---|---|---|---|
| BV | 0.216 | 1 | | | | |
| BVX | 0.292 | ... | 1 | | | |
| PBT | -0.124 | 0.108 | -0.034 | 1 | | |
| Div | 0.006 | 0.189 | 0.189 | 0.089 | 1 | |
| 1/MV | 0.242 | 0.010 | 0.149 | -0.222 | -0.141 | 1 |
| Adj.ER | -0.039 | 0.112 | 0.047 | -0.003 | 0.002 | -0.018 |

Q 4

| MV | BVX * | PBT | Div | 1/MV |
|---|---|---|---|---|
| ... | ... | ... | ... | ... |
| 0.323 | 1 | | | |
| -0.139 | -0.139 | 1 | | |
| 0.363 | 0.294 | -0.155 | 1 | |
| 0.334 | 0.356 | -0.082 | 0.011 | 1 |
| 0.043 | 0.116 | -0.072 | -0.023 | 0.063 |

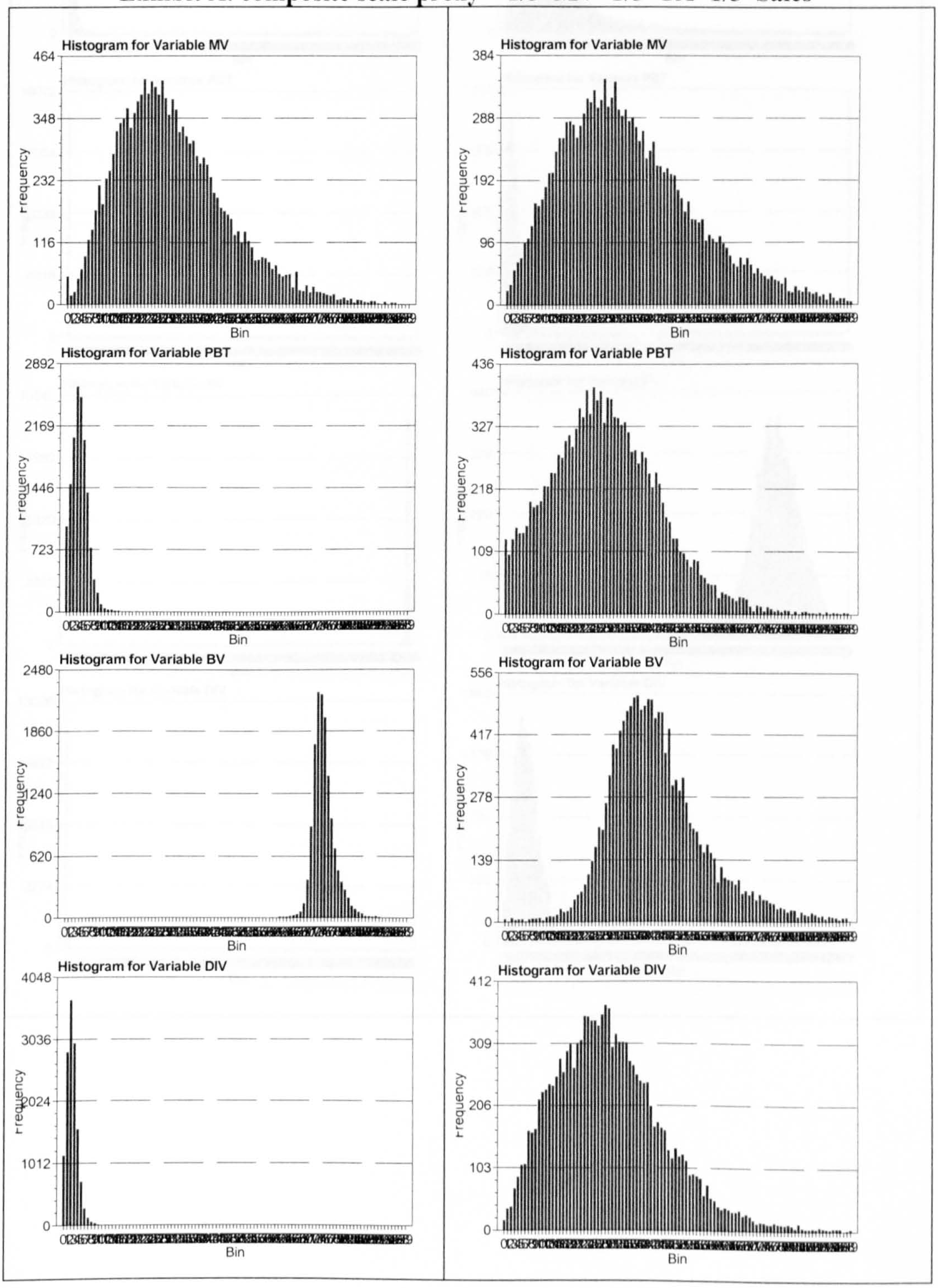
BVX is equal to BV if BV>0, and is set to zero if BV<=0.
Quadrants Q1 and Q2 report variable correlations for profit sub-samples, where Q1 includes dividend paying and non-paying firms, and Q2 excludes dividend non-paying firms.
Quadrants Q3 and Q4 present the variable correlation matrixes for loss sub-samples, where Q3 includes dividend paying and non-paying firms, and Q4 excludes dividend non-paying firms.

APPENDIX 4.5

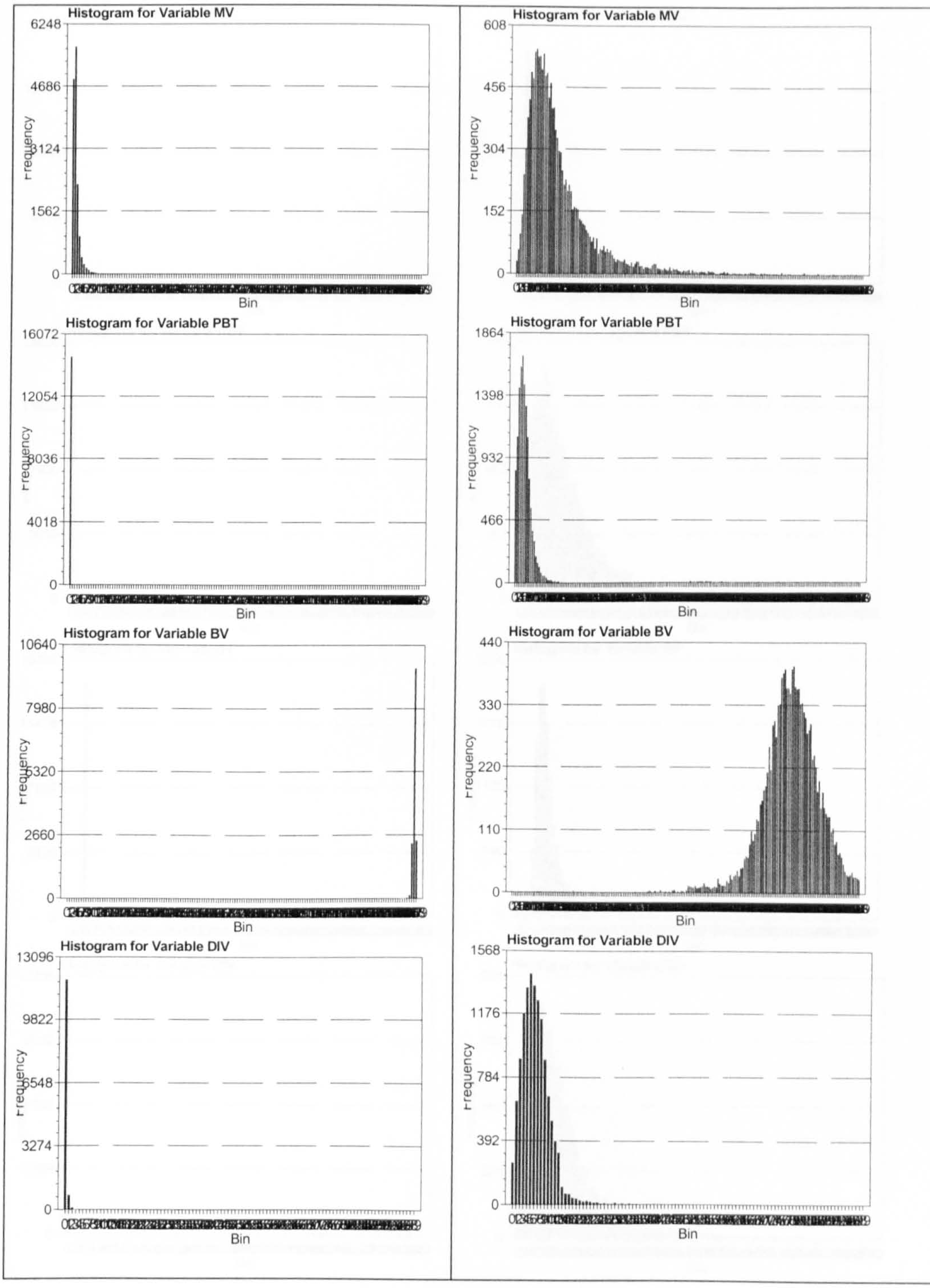
## Frequency distribution of deflated MV, PBT, BV and DIV variables

In the graphs that follow the left hand side panels show the scale-deflated variables' frequency distributions before the elimination of outliers. The right hand side panels show the frequencies after the outliers, the top and bottom 0.5% of cases, have been eliminated.

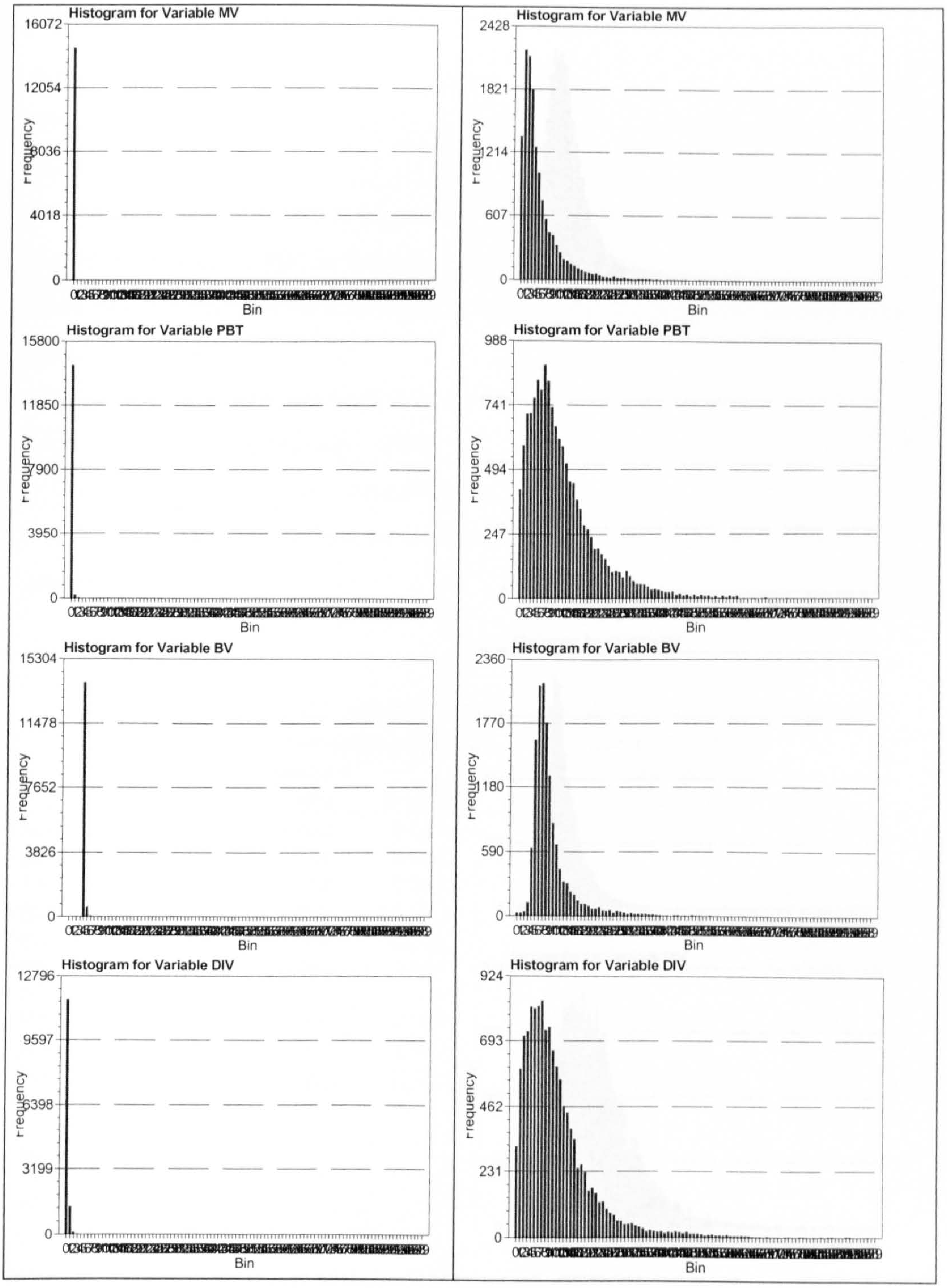
### Exhibit A. composite scale proxy = 1/3*MV+1/3*TA+1/3*Sales



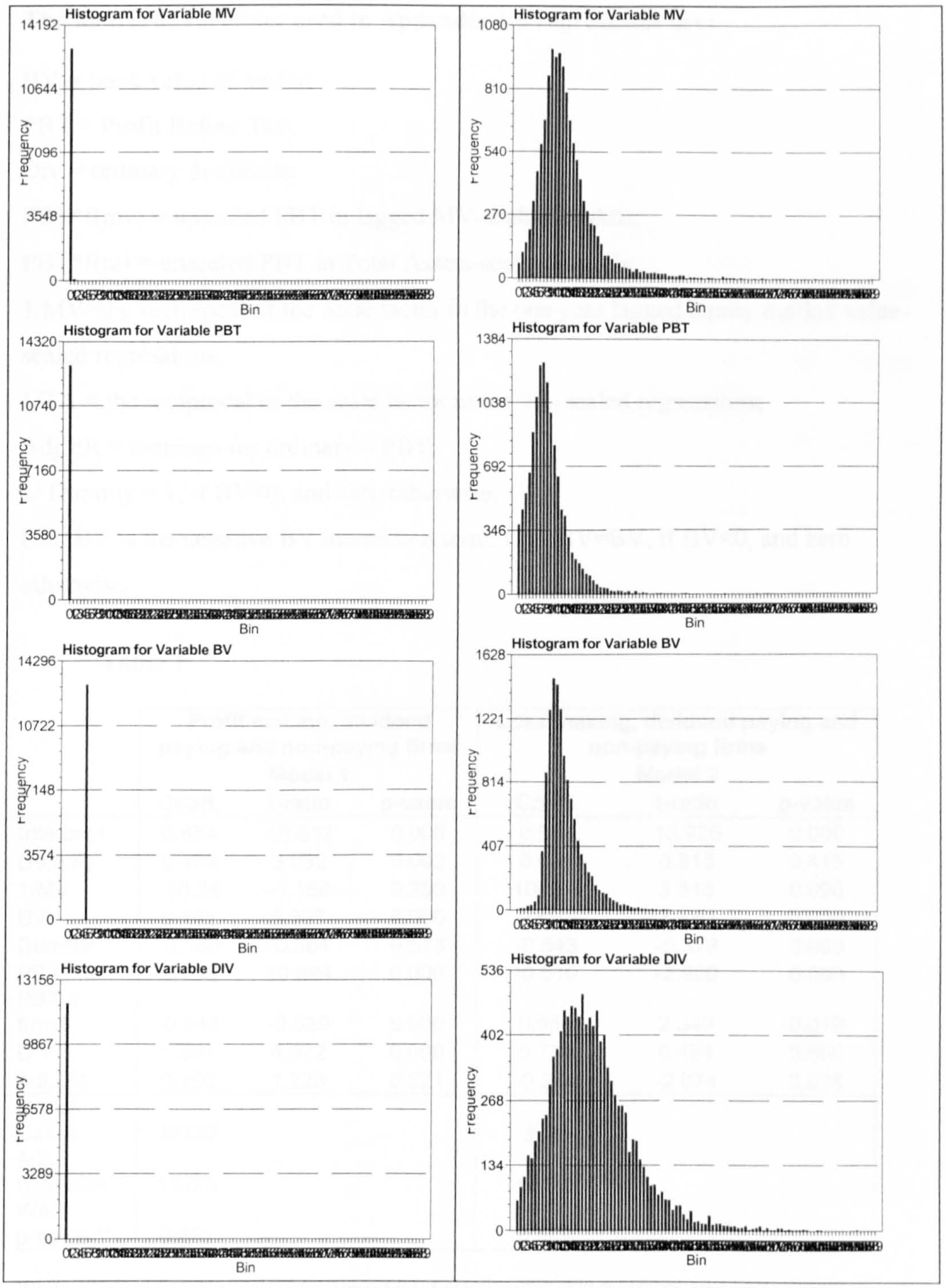
## Exhibit B: scale proxy = Group Total Assets



# Exhibit C: scale proxy = Group Sales



## Exhibit D: scale proxy = one year lagged equity MV



## APPENDIX 4.6

**The names of variables used in Appendix 4.6 regressions are:**

BV = book value of equity;

PBT = Profit Before Tax;

Div = ordinary dividends;

PBT*f(mv) = unscaled PBT in lagged MV-scaled models;

PBT*f(ta) = unscaled PBT in Total Assets-scaled models;

1/MV=the reciprocal of the scale factor in the one year lagged equity market value-scaled regressions;

1/TA = the reciprocal of the scale factor in the TA-scaled regressions;

Adj.ER = earnings for ordinary – PBT;

1/ Dummy = 1, if BV<0, and zero otherwise;

DumBV is the negative BV interaction term: DumBV=BV, if BV<0, and zero otherwise.

**Table 1**

| | Profit making, dividend paying and non-paying firms Model 1 | | | Loss making, dividend paying and non-paying firms Model 2 | | |
|---|---|---|---|---|---|---|
| | Coeff. | t-ratio | p-value | Coeff. | t-ratio | p-value |
| Intercept | 0.854 | 46.632 | 0.000 | 0.576 | 10.926 | 0.000 |
| Dummy | 0.196 | 3.032 | 0.002 | 0.066 | 0.815 | 0.415 |
| 1/MV | -80.38 | -1.150 | 0.250 | 1005.1 | 3.516 | 0.000 |
| BV | 0.101 | 5.327 | 0.000 | 0.404 | 7.180 | 0.000 |
| DumBV | -0.160 | -0.564 | 0.573 | -0.543 | -5.378 | 0.000 |
| PBT | 2.103 | 10.894 | 0.000 | -0.510 | -2.920 | 0.003 |
| PBT x f(mv) | -0.048 | -3.939 | 0.000 | 0.056 | 2.349 | 0.019 |
| DIV | 1.587 | 4.022 | 0.000 | 0.754 | 0.454 | 0.650 |
| Adj.ER | 0.166 | 1.223 | 0.221 | -0.254 | -2.074 | 0.038 |
| No. of Cases | 12737 | | | 3691 | | |
| Adj. R-square | 13.0% | | | 13.3% | | |
| Wald p-value ** | 0.861 | | | 0.669 | | |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported next to each regression coefficient.
BV = book value of equity; PBT = Profit Before Tax; Div = ordinary dividends; PBT*f(mv) = unscaled PB; 1/MV=the reciprocal of the scale factor (i.e., one year lagged equity market value); Adj.ER = earnings for ordinary – PBT; 1/. Dummy = 1, if BV<0, and zero otherwise. DumBV is the negative BV interaction term: DumBV=BV, if BV<0, and zero otherwise.
** Wald p-value shows the level of statistical significance of the sum of the BV and DumBV coefficients. Note, that the sum of these two represents the regression estimated coefficient on negative BV.

## Table 2

## Yearly regressions

| Year | Intercept | 1/TA | BV | PBT | PBT x f(TA) | DIV | Adj.ER | No. of obs. | Adj. R-Square |
|---|---|---|---|---|---|---|---|---|---|
| 1987 | -0.067 | 1258.1 | 0.484 | 5.663 | 0.101 | 0.763 | -0.716 | 335 | 41.4% |
| t-ratio | -0.492 | 2.988 | 1.753 | 4.191 | 0.749 | 0.181 | -0.545 | | |
| p-value | 0.623 | 0.003 | 0.080 | 0.000 | 0.454 | 0.856 | 0.586 | | |
| 1988 | 0.058 | 963.0 | 0.200 | 6.682 | -0.056 | 0.534 | -0.647 | 897 | 58.7% |
| t-ratio | 1.135 | 2.515 | 1.950 | 11.490 | -1.340 | 0.302 | -1.263 | | |
| p-value | 0.256 | 0.012 | 0.051 | 0.000 | 0.180 | 0.763 | 0.206 | | |
| 1989 | 0.151 | 1047.1 | 0.085 | 5.508 | 0.029 | 2.222 | -0.179 | 980 | 46.9% |
| t-ratio | 2.475 | 2.131 | 0.772 | 8.644 | 0.505 | 1.029 | -0.472 | | |
| p-value | 0.013 | 0.033 | 0.440 | 0.000 | 0.614 | 0.303 | 0.637 | | |
| 1990 | -0.007 | 827.2 | 0.272 | 4.426 | 0.135 | -0.129 | 0.466 | 985 | 54.0% |
| t-ratio | -0.181 | 2.174 | 4.044 | 9.985 | 3.371 | -11.306 | 1.797 | | |
| p-value | 0.856 | 0.030 | 0.000 | 0.000 | 0.001 | 0.000 | 0.072 | | |
| 1991 | 0.045 | 9.9 | 0.173 | 3.724 | 0.117 | 9.044 | 0.115 | 891 | 55.0% |
| t-ratio | 0.920 | 0.034 | 2.214 | 5.927 | 2.060 | 5.221 | 0.238 | | |
| p-value | 0.358 | 0.973 | 0.027 | 0.000 | 0.039 | 0.000 | 0.812 | | |
| 1992 | 0.097 | -718.8 | 0.166 | 6.930 | 0.034 | 3.938 | 0.396 | 816 | 57.3% |
| t-ratio | 1.532 | -2.697 | 1.569 | 7.232 | 0.558 | 1.441 | 0.322 | | |
| p-value | 0.126 | 0.007 | 0.117 | 0.000 | 0.577 | 0.150 | 0.747 | | |
| 1993 | 0.121 | -1255.7 | 0.038 | 7.947 | -0.068 | 9.717 | -1.733 | 881 | 64.0% |
| t-ratio | 2.283 | -4.369 | 0.418 | 7.830 | -1.279 | 5.213 | -1.063 | | |
| p-value | 0.022 | 0.000 | 0.676 | 0.000 | 0.201 | 0.000 | 0.288 | | |
| 1994 | 0.047 | 151.8 | 0.208 | 5.690 | 0.001 | 9.402 | -3.683 | 1016 | 62.9% |
| t-ratio | 0.886 | 0.346 | 2.001 | 5.045 | 0.017 | 3.963 | -1.836 | | |
| p-value | 0.376 | 0.729 | 0.045 | 0.000 | 0.987 | 0.000 | 0.066 | | |
| 1995 | 0.008 | 77.5 | 0.080 | 6.413 | 0.030 | 6.537 | -3.130 | 1029 | 68.9% |
| t-ratio | 0.176 | 0.205 | 0.925 | 8.186 | 0.621 | 3.448 | -2.437 | | |
| p-value | 0.860 | 0.837 | 0.355 | 0.000 | 0.535 | 0.001 | 0.015 | | |
| 1996 | 0.069 | -60.1 | -0.091 | 9.239 | -0.026 | 8.713 | 1.894 | 1037 | 60.8% |
| t-ratio | 1.012 | -0.184 | -0.711 | 9.814 | -0.453 | 3.550 | 3.217 | | |
| p-value | 0.311 | 0.854 | 0.477 | 0.000 | 0.651 | 0.000 | 0.001 | | |
| 1997 | -0.042 | 438.3 | 0.047 | 9.317 | -0.057 | 6.460 | -1.082 | 1047 | 52.6% |
| t-ratio | -0.452 | 0.909 | 0.289 | 7.259 | -0.661 | 1.838 | -0.579 | | |
| p-value | 0.651 | 0.363 | 0.773 | 0.000 | 0.509 | 0.066 | 0.562 | | |
| 1998 | 0.018 | 622.1 | -0.299 | 7.909 | 0.209 | 6.976 | 1.673 | 953 | 37.6% |
| t-ratio | 0.158 | 1.363 | -1.394 | 4.426 | 1.898 | 1.233 | 2.418 | | |
| p-value | 0.874 | 0.173 | 0.163 | 0.000 | 0.058 | 0.218 | 0.016 | | |
| 1999 | 0.248 | 77.7 | -0.153 | 7.011 | 0.309 | 0.367 | -0.731 | 852 | 22.9% |
| t-ratio | 1.413 | 0.160 | -0.339 | 4.173 | 2.362 | 0.084 | -0.641 | | |
| p-value | 0.158 | 0.873 | 0.735 | 0.000 | 0.018 | 0.933 | 0.521 | | |
| 2000 | 0.238 | 549.9 | 0.365 | 11.111 | -0.099 | -3.135 | 0.192 | 732 | 16.4% |
| t-ratio | 1.424 | 0.725 | 1.064 | 4.899 | -0.752 | -0.818 | 0.238 | | |
| p-value | 0.155 | 0.469 | 0.287 | 0.000 | 0.452 | 0.413 | 0.812 | | |
| 2001 | 0.057 | 122.1 | 0.451 | 4.147 | 0.157 | 3.459 | -3.662 | 602 | 29.4% |
| t-ratio | 0.611 | 0.333 | 2.458 | 2.342 | 1.474 | 1.273 | -1.354 | | |
| p-value | 0.541 | 0.739 | 0.014 | 0.019 | 0.141 | 0.203 | 0.176 | | |
| 2002 | 0.193 | -11.6 | 0.171 | 4.816 | 0.098 | 3.186 | -1.448 | 321 | 49.7% |
| t-ratio | 2.458 | -0.013 | 1.348 | 4.351 | 1.401 | 1.306 | -0.663 | | |
| p-value | 0.015 | 0.989 | 0.179 | 0.000 | 0.162 | 0.192 | 0.508 | | |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported below each regression coefficient. Only profit-making dividend firms are included in yearly sample.

Table 3

| | Dividend paying firms only | | | | All firms | | | |
|---|---|---|---|---|---|---|---|---|
| | Market-to-Book > 1 | | Market-t-Book < 1 | | Market-to-Book > 1 | | Market-t-Book < 1 | |
| | **Model 2.1 *** | **Model 2.2 **** | **Model 4.1 *** | **Model 4.2 **** | **Model 6.1 *** | **Model 6.2 **** | **Model 8.1 *** | **Model 8.2 **** |
| intercept | 0.029 | -0.113 | 0.248 | -0.021 | 0.067 | -0.137 | 0.265 | -0.017 |
| t-ratio | 0.350 | -1.409 | 8.741 | -1.067 | 0.832 | -1.743 | 9.339 | -0.880 |
| P-value | 0.726 | 0.159 | 0.000 | 0.286 | 0.406 | 0.081 | 0.000 | 0.379 |
| 1/TA | 388.6 | 1860.7 | 146.7 | -50.7 | 757.3 | 1477.5 | 189.3 | -6.421 |
| t-ratio | 2.955 | 11.214 | 1.406 | -0.759 | 5.132 | 7.556 | 2.387 | -0.120 |
| P-value | 0.003 | 0.000 | 0.160 | 0.448 | 0.000 | 0.000 | 0.017 | 0.904 |
| BV *** | ... | 0.706 | ... | 0.628 | ... | 0.924 | ... | 0.630 |
| t-ratio | ... | 13.900 | ... | 34.329 | ... | 16.474 | ... | 36.124 |
| P-value | ... | 0.000 | ... | 0.000 | ... | 0.000 | ... | 0.000 |
| PBT | 6.936 | ... | 1.158 | ... | 6.843 | ... | 1.028 | ... |
| t-ratio | 22.438 | ... | 6.351 | ... | 22.584 | ... | 6.064 | ... |
| P-value | 0.000 | ... | 0.000 | ... | 0.000 | ... | 0.000 | ... |
| PBT*Scale | 0.050 | 0.510 | 0.034 | 0.052 | 0.035 | 0.500 | 0.039 | 0.052 |
| t-ratio | 2.203 | 24.862 | 2.139 | 6.878 | 1.477 | 24.228 | 2.594 | 7.131 |
| P-value | 0.028 | 0.000 | 0.032 | 0.000 | 0.140 | 0.000 | 0.009 | 0.000 |
| DIV | 5.055 | ... | -0.043 | ... | 2.880 | ... | -0.035 | ... |
| t-ratio | 5.804 | ... | -0.953 | ... | 3.729 | ... | -0.681 | ... |
| P-value | 0.000 | ... | 0.341 | ... | 0.000 | ... | 0.496 | ... |
| Adj.ER | 0.424 | -3.815 | 0.652 | -0.061 | 0.150 | -2.564 | 0.609 | -0.064 |
| t-ratio | 1.707 | -6.750 | 4.042 | -0.539 | 0.817 | -4.952 | 3.763 | -0.588 |
| P-value | 0.088 | 0.000 | 0.000 | 0.590 | 0.414 | 0.000 | 0.000 | 0.556 |
| No. of cases | 11019 | 11019 | 2352 | 2352 | 11894 | 11894 | 2593 | 2593 |
| Adj.R-Square | 44.7% | 35.2% | 13.6% | 48.9% | 38.1% | 31.0% | 12.5% | 48.8% |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported below each regression coefficient. Only profit-making dividend firms are included in yearly samples. All reported models are estimated with 15 yearly and 9 industry fixed effects. These yearly and industry dummy coefficients are suppressed for brevity.

* the model is estimated with the BV variable being omitted from the regression

** the model is estimated with the PBT and Dividend variables being omitted from the regression

*** negative BVs are set to zero.

Table 4

| Industry | Intercept | 1/TA | PBT | PBT*f(TA) | DIV | Adj.ER | No. of cases | Adj. R-Square |
|---|---|---|---|---|---|---|---|---|
| SIC 0 | 0.146 | 2143 | 0.512 | -0.171 | 18.963 | -1.688 | 107 | 51.90% |
| t-ratio | 2.401 | 4.569 | 0.509 | -1.605 | 6.132 | -2.696 | | |
| P-value | 0.018 | 0.000 | 0.612 | 0.112 | 0.000 | 0.008 | | |
| SIC 1 | 0.675 | 2266 | 5.027 | -0.271 | 9.740 | -0.165 | 376 | 30.40% |
| t-ratio | 10.779 | 3.367 | 5.911 | -5.093 | 3.428 | -0.861 | | |
| P-value | 0.000 | 0.001 | 0.000 | 0.000 | 0.001 | 0.390 | | |
| SIC 2 | 0.179 | 1392 | 2.746 | 0.013 | 9.256 | 0.835 | 733 | 43.20% |
| t-ratio | 6.600 | 4.907 | 4.319 | 0.299 | 5.588 | 0.892 | | |
| P-value | 0.000 | 0.000 | 0.000 | 0.765 | 0.000 | 0.373 | | |
| SIC 3 | 0.153 | 307 | 5.004 | 0.148 | 7.149 | 0.579 | 2647 | 38.10% |
| t-ratio | 4.244 | 1.368 | 8.015 | 4.046 | 3.469 | 0.950 | | |
| P-value | 0.000 | 0.171 | 0.000 | 0.000 | 0.001 | 0.342 | | |
| SIC 4 | 0.162 | 690 | 6.436 | 0.013 | 4.388 | 0.070 | 3299 | 42.90% |
| t-ratio | 5.191 | 2.365 | 15.583 | 0.426 | 3.319 | 0.154 | | |
| P-value | 0.000 | 0.018 | 0.000 | 0.670 | 0.001 | 0.878 | | |
| SIC 5 | -0.037 | 1820 | 5.546 | 0.083 | 14.167 | 0.606 | 1204 | 49.60% |
| t-ratio | -0.624 | 1.844 | 4.678 | 1.344 | 5.110 | 1.379 | | |
| P-value | 0.533 | 0.065 | 0.000 | 0.179 | 0.000 | 0.168 | | |
| SIC 6 | 0.191 | 579 | 6.256 | 0.088 | 1.616 | 0.065 | 1352 | 41.00% |
| t-ratio | 4.690 | 4.518 | 9.718 | 1.520 | 0.982 | 0.101 | | |
| P-value | 0.000 | 0.000 | 0.000 | 0.129 | 0.326 | 0.920 | | |
| SIC 7 | 0.136 | 978 | 7.204 | 0.059 | 4.969 | 0.772 | 1563 | 57.00% |
| t-ratio | 4.822 | 2.904 | 11.719 | 1.759 | 4.061 | 1.897 | | |
| P-value | 0.000 | 0.004 | 0.000 | 0.079 | 0.000 | 0.058 | | |
| SIC 8 | 0.243 | 3196 | 3.301 | 0.128 | -0.103 | -1.324 | 361 | 65.60% |
| t-ratio | 7.820 | 9.690 | 1.953 | 1.273 | -2.726 | -0.433 | | |
| P-value | 0.000 | 0.000 | 0.052 | 0.204 | 0.007 | 0.665 | | |
| SIC 9 | 0.438 | 696 | 5.673 | 0.435 | -2.535 | 0.121 | 2880 | 26.60% |
| t-ratio | 9.521 | 2.852 | 6.679 | 4.302 | -2.021 | 0.360 | | |
| P-value | 0.000 | 0.004 | 0.000 | 0.000 | 0.043 | 0.719 | | |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported below each regression coefficient. Only profit-making dividend paying and non-dividend firms are included in samples. Regressions are estimated without the BV variable.

## Table 5

| Industry | Intercept | 1/TA | BV | PBT*f(TA) | DIV | Adj.ER | No. of cases | Adj.R-Square |
|---|---|---|---|---|---|---|---|---|
| SIC 0 | 0.150 | 2253 | -0.016 | -0.131 | 19.277 | -1.767 | 107 | 51.80% |
| t-ratio | 2.064 | 4.314 | -0.107 | -1.642 | 6.803 | -2.705 | | |
| P-value | 0.042 | 0.000 | 0.915 | 0.104 | 0.000 | 0.008 | | |
| SIC 1 | 0.263 | 2701 | 0.751 | 0.026 | 16.538 | -0.329 | 376 | 26.80% |
| t-ratio | 1.906 | 3.450 | 3.249 | 0.664 | 6.760 | -1.306 | | |
| P-value | 0.057 | 0.001 | 0.001 | 0.507 | 0.000 | 0.192 | | |
| SIC 2 | 0.053 | 1815 | 0.436 | 0.113 | 9.439 | -1.830 | 733 | 43.60% |
| t-ratio | 1.564 | 5.673 | 3.817 | 3.179 | 5.333 | -1.886 | | |
| P-value | 0.118 | 0.000 | 0.000 | 0.001 | 0.000 | 0.059 | | |
| SIC 3 | 0.008 | 766 | 0.492 | 0.349 | 9.997 | -2.767 | 2647 | 34.80% |
| t-ratio | 0.155 | 2.603 | 5.157 | 10.144 | 4.637 | -3.396 | | |
| P-value | 0.877 | 0.009 | 0.000 | 0.000 | 0.000 | 0.001 | | |
| SIC 4 | -0.043 | 1794 | 0.523 | 0.395 | 8.734 | -2.199 | 3299 | 36.50% |
| t-ratio | -1.164 | 5.759 | 5.225 | 13.996 | 6.623 | -2.986 | | |
| P-value | 0.244 | 0.000 | 0.000 | 0.000 | 0.000 | 0.003 | | |
| SIC 5 | 0.118 | 4082 | -0.393 | 0.328 | 21.406 | 0.117 | 1204 | 46.90% |
| t-ratio | 1.698 | 4.590 | -2.278 | 6.640 | 9.052 | 0.202 | | |
| P-value | 0.089 | 0.000 | 0.023 | 0.000 | 0.000 | 0.840 | | |
| SIC 6 | 0.160 | 1011 | 0.174 | 0.497 | 5.969 | -2.059 | 1352 | 34.30% |
| t-ratio | 2.963 | 6.260 | 1.294 | 10.628 | 3.427 | -2.327 | | |
| P-value | 0.003 | 0.000 | 0.196 | 0.000 | 0.001 | 0.020 | | |
| SIC 7 | 0.104 | 2423 | 0.125 | 0.445 | 11.523 | -1.152 | 1563 | 48.90% |
| t-ratio | 1.915 | 5.664 | 1.271 | 13.878 | 9.622 | -1.200 | | |
| P-value | 0.056 | 0.000 | 0.204 | 0.000 | 0.000 | 0.230 | | |
| SIC 8 | -0.017 | 3377 | 0.467 | 0.393 | -0.116 | -4.699 | 361 | 69.20% |
| t-ratio | -0.432 | 9.402 | 7.314 | 4.678 | -4.400 | -2.621 | | |
| P-value | 0.666 | 0.000 | 0.000 | 0.000 | 0.000 | 0.009 | | |
| SIC 9 | 0.211 | 1391 | 0.470 | 0.962 | 0.226 | -1.334 | 2880 | 25.20% |
| t-ratio | 3.448 | 5.719 | 4.479 | 14.646 | 0.171 | -1.879 | | |
| P-value | 0.001 | 0.000 | 0.000 | 0.000 | 0.864 | 0.060 | | |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported below each regression coefficient. Only profit-making dividend paying and non-dividend firms are included in samples. Regressions are estimated without the PBT variable.

## Table 6

| Industry | Intercept | 1/TA | BV | PBT | PBT x f(TA) | Adj.ER | No. of cases | Adj.R-Square |
|---|---|---|---|---|---|---|---|---|
| SIC 0 | 0.089 | 2322 | 0.415 | 1.159 | 0.098 | -1.981 | 107 | 30.80% |
| t-ratio | 0.965 | 2.712 | 2.289 | 0.714 | 0.574 | -2.716 | | |
| P-value | 0.337 | 0.008 | 0.024 | 0.477 | 0.567 | 0.008 | | |
| SIC 1 | 0.474 | 2054 | 0.404 | 6.198 | -0.212 | -0.075 | 376 | 28.30% |
| t-ratio | 3.253 | 3.312 | 1.734 | 6.857 | -3.826 | -0.492 | | |
| P-value | 0.001 | 0.001 | 0.084 | 0.000 | 0.000 | 0.623 | | |
| SIC 2 | 0.097 | 1379 | 0.505 | 3.547 | -0.042 | -1.041 | 733 | 38.60% |
| t-ratio | 2.595 | 5.679 | 4.324 | 4.310 | -0.854 | -0.874 | | |
| P-value | 0.009 | 0.000 | 0.000 | 0.000 | 0.393 | 0.382 | | |
| SIC 3 | 0.084 | 295 | 0.292 | 5.862 | 0.193 | 0.071 | 2647 | 36.00% |
| t-ratio | 1.660 | 1.334 | 2.836 | 10.191 | 4.837 | 0.102 | | |
| P-value | 0.097 | 0.182 | 0.005 | 0.000 | 0.000 | 0.919 | | |
| SIC 4 | 0.101 | 502 | 0.275 | 6.836 | 0.038 | -0.075 | 3299 | 42.50% |
| t-ratio | 2.876 | 1.644 | 2.892 | 16.109 | 1.254 | -0.153 | | |
| P-value | 0.004 | 0.100 | 0.004 | 0.000 | 0.210 | 0.879 | | |
| SIC 5 | 0.213 | 1256 | -0.337 | 9.237 | 0.036 | 0.031 | 1204 | 45.70% |
| t-ratio | 2.852 | 1.172 | -1.897 | 8.782 | 0.547 | 0.052 | | |
| P-value | 0.004 | 0.241 | 0.058 | 0.000 | 0.584 | 0.959 | | |
| SIC 6 | 0.166 | 549 | 0.102 | 6.421 | 0.097 | -0.004 | 1352 | 41.00% |
| t-ratio | 3.204 | 4.039 | 0.839 | 10.480 | 1.638 | -0.006 | | |
| P-value | 0.001 | 0.000 | 0.402 | 0.000 | 0.101 | 0.995 | | |
| SIC 7 | 0.067 | 734 | 0.196 | 8.402 | 0.056 | 0.672 | 1563 | 56.20% |
| t-ratio | 1.277 | 2.157 | 2.102 | 15.637 | 1.580 | 1.385 | | |
| P-value | 0.202 | 0.031 | 0.036 | 0.000 | 0.114 | 0.166 | | |
| SIC 8 | 0.017 | 3035 | 0.436 | 2.519 | 0.208 | -1.942 | 361 | 69.90% |
| t-ratio | 0.443 | 8.278 | 6.488 | 1.618 | 1.959 | -0.747 | | |
| P-value | 0.658 | 0.000 | 0.000 | 0.107 | 0.051 | 0.456 | | |
| SIC 9 | 0.241 | 709 | 0.398 | 4.957 | 0.470 | -0.052 | 2880 | 26.90% |
| t-ratio | 4.081 | 2.831 | 3.867 | 6.121 | 4.601 | -0.159 | | |
| P-value | 0.000 | 0.005 | 0.000 | 0.000 | 0.000 | 0.874 | | |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported below each regression coefficient. Only profit-making dividend paying and non-dividend firms are included in samples. Regressions are estimated without the Dividend variable.

# CHAPTER 5

# VALUATION OF GEOGRAPHICAL SEGMENTS

## 5.1 INTRODUCTION

In this chapter I analyse empirically the core issue of the thesis – the valuation of specific geographical segments reported by UK multi-segment firms. The key purpose of this analysis is to find out whether the reporting of specific geographical segments communicates useful information to the market and, if so, whether operations reported from specific geographic locations have differential association with the market value of the firm, hence, differential contribution to the firm value. The results reported in this chapter might also provide evidence on the adequacy of the accounting standard SSAP 25, which spells out the segment reporting requirements in the UK.

The chapter is organised as follows. **Section 5.2** provides details on the country-composition of specific geographical regions, disclosure characteristics of specific geographical segments, and some descriptive statistics of each segment's specific financial statement variables. **Section 5.3** investigates empirically (i) how specific geographical operations are associated with the firm value, (ii) whether different geographical locations are associated with differential contributions to the market value of the firm, and (iii) the market's perception of the implications of corporate geographical diversification to firm value. **Section 5.4** addresses the issue of sensitivity of empirical results to the use of alternative deflators, and concludes the chapter.

## 5.2 DATA, VARIABLES, AND DESCRIPTIVE ANALYSIS

### 5.2.1 Definition of geographical regions

Segment-level analysis requires delineation of geographical regions. The UK GAAP (see SSAP 25) on segment identification and disclosure neither specifies the normative format for the firm's segmental report nor does it stipulate what country or geographical regions breakdown shall be used during segment reporting. In terms of segment reporting, the firm's management has, therefore, full discretion with regards to the regional grouping or disaggregation when reporting the geographical operations. The finest level of geographical segment disclosure would imply reporting operations from specific countries. However, examination of firms' segmental reports indicates that in the majority of cases firms tend to agglomerate their foreign operations into multi-country geographical regions such as *Europe*, *America*, *Asia*, etc.

I collect the geographic segment-level data from the Extel Company Analysis database where geographical segment-level data either comes at the specific country level (when firms report information by countries) or is collated into broader geographic regions (when firms report the agglomerated foreign operations).

**Table 5.1** shows the bottom level of country composition of the broader geographic regions utilised by the Extel database to group countries into geographical regions, which are also employed in this study.

There are five primary segments: one domestic (the *UK*) and four foreign segments (*Europe*, *America*, *Asia* and *Mid East & Africa*). As is evident from **Table 5.1**, the Extel database provides the country-level composition of *Europe* and *Asia* segments, yet for *America* and *Middle East & Africa* segments only the sub-regional constituents are available[71].

The examination of the frequencies at which specific countries are being disclosed in firms' segmental reports indicates that very often firms tend not to report foreign operations on a specific country level, but rather agglomerate those operations into broader geographical regions. The result of this is that considerably more data points are

[71] It is, for instance, unclear which countries comprise the Middle East and Africa segment.

available at the region-level rather than at the single country-level, and this relates to all variables (segmental PBTs, Sales, and NAs).

**Table 5.1 Country composition of geographical regions (segments)**

| UK | Europe | America ** | Mid East & Africa | Asia |
|---|---|---|---|---|
| . UK | . Austria<br>. Benelux<br>Belgium<br>Netherlands<br>Luxembourg<br>U&O Benelux*<br>. Eastern Europe<br>Czech Republic<br>Hungary<br>Poland<br>Russia<br>Slovakia<br>U&O East Eur.*<br>. France<br>. Germany<br>. Portugal<br>. Greece<br>. Italy<br>. Ireland<br>. Scandinavia<br>Denmark<br>Finland<br>Norway<br>Sweden<br>U&O Scan-dinavia*<br>. Spain<br>. Switzerland<br>. U&O Europe * | . Central America<br>. North America<br>. South America<br>. U&O America* | . Middle East<br>. Southern Africa<br>. U&O Mid East & Africa* | . Australasia<br>Australasia<br>New Zealand<br>U&O* Australasia<br>. China & Taiwan<br>China<br>Hong Kong<br>Taiwan<br>U&O China & Taiwan*<br>. India<br>. Japan<br>. Korea<br>. South East Asia<br>Indonesia<br>Malaysia<br>Philippines<br>Singapore<br>Thailand<br>Vietnam<br>U&O South East Asia*<br>. U&O Asia* |

* According to the notes in the Extel database, this disclosed item may be classify as U&O either because none of the other country headings adequately describe it or because it represents an indivisible combination of two or more countries.

** Country composition of some of America's sub-regions is provided in Extel's notes. Thus, Central America includes such countries as Mexico, Guatemala, Honduras, Nicaragua, Costa Rica and Panama; South America includes Brazil, Argentina, Venezuela, Colombia, Ecuador, Peru, Bolivia, Chile, Paraguay and Uruguay.

**Table 5.2 Frequency of geographic segments reported from specific regions**

| Segments | Sales * | PBT * | NA * |
|---|---|---|---|
| **United Kingdom** | 8471 | 6091 | 5901 |
| **Europe** | 7472 | 4328 | 4356 |
| Austria | 10 | 0 | 0 |
| Benelux | 393 | 279 | 261 |
| Eastern Europe | 99 | 60 | 67 |
| France | 590 | 316 | 316 |
| Germany | 628 | 293 | 266 |
| Portugal | 8 | 9 | 6 |
| Greece | 7 | 7 | 12 |
| Italy | 232 | 49 | 42 |
| Ireland | 131 | 65 | 64 |
| Scandinavia | 236 | 105 | 93 |
| Spain | 140 | 51 | 49 |
| Switzerland | 23 | 7 | 10 |
| **America** | 5396 | 3813 | 3838 |
| North America | 4126 | 3117 | 3164 |
| Latin America | 336 | 194 | 181 |
| Central America | 16 | 19 | - |
| South America | 153 | 176 | - |
| U&O America | 1363 | 705 | 674 |
| **Mid East & Africa** | 1730 | 666 | 621 |
| **Asia** | 3291 | 1854 | 1862 |
| Australasia | 1464 | 816 | 778 |
| China & Taiwan | 37 | 61 | 53 |
| India | 28 | 12 | 17 |
| Japan | 167 | 52 | 60 |
| Korea | 3 | 0 | 0 |
| SE Asia | 72 | 107 | 103 |
| U&O Asia | 2386 | 1053 | 1077 |

Numbers in this table summarise the general segment disclosures characteristics of the initial sample of firm-years which does not exclude observations with missing financial statement variables and observations which will be identified as outliers in further empirical analysis sections.

* Sales = the turnover from a given geographic region, reported by the firm in the annual report; PBT = Profit Before Tax attributable to a specific geographic segment and reported by the firm in the annual report; NA = Net Assets associated with a specific geographic segment and reported by the firm in the annual report.

From the frequency of data points per country, reported in **Table 5.2**, it is obvious that it would be very difficult to take the analysis of the core issue of this chapter (segments' value contribution) to the country level. Therefore, the analysis in this chapter is based on a relatively small number of broader geographical regions; the *UK*, *Europe*, *Asia*, *America*, and *Middle East & Africa*.

### 5.2.2 Disclosure characteristics of geographical segments

According to SSAP 25, when reporting segments, the firms are expected to disclose at least one specific accounting variable, such as (i) segment's sales, (ii) profit before taxation, and/or (iii) net assets, for each reportable segment. The numbers reported in **Table 5.2** suggest that the segmental sales variable tends to be reported more frequently than segmental PBTs or NAs, both on the country and regional level. In the ideal case the firm would report the comprehensive accounting information (i.e., all three accounting items) for each disclosed segment. In practice, however, the choice of segment-level accounting variables to be reported is at the management's discretion.

In the initial sample of 19,213 firm-years some, 11,271 observations (59%) indicate the existence of segment disclosures, where at least one of the three variables (Sales, PBT or NA) is reported for at least one geographical segment. **Table 5.3** provides some insight into the comprehensiveness of segmental disclosures on the geographical region-level.

**Table 5.3 Number of cases per disclosed segment, under different definitions of disclosure**

| | Sales, or PBT, or NA * | Sales ** | PBT ** | NA ** | PBT & NA *** | PBT & Sales *** | PBT & NA & Sales *** |
|---|---|---|---|---|---|---|---|
| UK | 10555 | 8293 | 6047 | 5811 | 5320 | 3848 | 3557 |
| EU | 8815 | 7340 | 4283 | 4310 | 3924 | 2875 | 2714 |
| America | 6595 | 5315 | 3812 | 3827 | 3484 | 2622 | 2466 |
| Asia | 3988 | 3234 | 1841 | 1842 | 1630 | 1138 | 1053 |
| Mid.East & Africa | 1948 | 1684 | 673 | 627 | 586 | 428 | 386 |

* The segment is considered disclosed if any of the segmental variables (Sales, PBT or NA) is reported. ** The segment is considered disclosed when the noted segmental variable is disclosed. *** The segment is considered disclosed when all noted segmental variables are disclosed simultaneously for that segment.

**Table 5.3** uncovers some interesting segment disclosure characteristics. The table indicates that fewer firms simultaneously disclose all three accounting items, that is, have more comprehensive disclosures on the segment level. Take for example the *UK* segment. There are 3,557 firm-years when the *UK* segment's PBTs, NAs and Sales are reported simultaneously; 6,040 firm-years that report segmental PBTs; and 10,555 firm-years that report at least one of the three accounting variables for the *UK* segment. This pattern persists across all foreign geographical segments. Another noteworthy feature of segment disclosures is the fact that in all geographical segments sales is the most frequently reported figure, followed by PBT and NA.

The above observed disclosure properties are in line with those found by Emmanuel and Garrod (1999), who note that a number of UK companies do not publish net asset figures for a number of their disclosed segments. That is, despite the explicit intention of SSAP 25 to produce more useful data for report users, almost 10% of Emmanuel and Garrod's sample companies fail to report segment net asset figures. They suggest that this could be willful evasion of required disclosure or, perhaps, a symptom of the tension between the internal and external information requirements. That is, whilst sales and PBTs may be fairly easily generated in a standard fashion consistent with the internal performance measures of the company, the question of assets is likely to be much more contentious.

The in-sample segment reporting frequencies are also indicative of relative 'popularity' of a specific foreign region as an investment location for the UK geographically diversified companies. Whichever proxy for this popularity is used (this might be the frequency of reported Sales, or PBTs, or NAs from a given region), the *Continental Europe* segment appear the most popular, as it has the highest number of firm-years which report Sales or PBTs or NAs from that segment. The next most popular investment location is *America*, followed by *Asia*. The *Middle East & Africa region* appears to be the least favorite investment location for the UK companies. Judging by the segmental PBT frequencies, *Continental Europe* has 1.12 times more reported segments than *America.* American segments are, in turn, twice as numerous as those from *Asia*, and *Asia* has 2.9 times more segments *than Middle East & Africa.*

The reason for making more emphasis on segmental PBTs is because segmental PBT is essential for the empirical analysis of this chapter, as segmental sales and net assets do not enter the valuation model employed in this study.

Finally, to complete the picture, I analyse the segment disclosure characteristics by years and industrial affiliation of multi-segment firms. **Table 5.4** summarises these patterns.

**Table 5.4 Disclosure of specific geographic segments' PBTs by years and industries.**

Panel A: Yearly frequencies of geographic segment disclosures (based on PBTs)*

| | Geographical regions | | | | |
|---|---|---|---|---|---|
| Years | UK | Europe | America | Middle East & Africa | Asia |
| 1987 | 3 | 2 | 3 | 1 | 2 |
| 1988 | 7 | 6 | 7 | 3 | 4 |
| 1989 | 66 | 52 | 49 | 17 | 31 |
| 1990 | 261 | 195 | 189 | 48 | 100 |
| 1991 | 389 | 282 | 266 | 59 | 135 |
| 1992 | 429 | 316 | 287 | 62 | 137 |
| 1993 | 486 | 352 | 310 | 64 | 153 |
| 1994 | 527 | 385 | 335 | 69 | 172 |
| 1995 | 531 | 399 | 338 | 65 | 170 |
| 1996 | 523 | 378 | 333 | 56 | 159 |
| 1997 | 526 | 378 | 323 | 45 | 159 |
| 1998 | 510 | 366 | 311 | 41 | 151 |
| 1999 | 500 | 340 | 296 | 46 | 144 |
| 2000 | 558 | 347 | 315 | 48 | 142 |
| 2001 | 509 | 338 | 308 | 40 | 131 |
| 2002*** | 223 | 152 | 143 | 15 | 52 |
| Total | 6047 | 4287 | 3812 | 678 | 1841 |

Table 5.4 (continued from the previous page)

**Panel B: Frequencies of geographical segment disclosures by specific industries ***

| Industries † | Geographical regions: UK | Europe | America | Middle East & Africa | Asia |
|---|---|---|---|---|---|
| SIC 0 | 50 | 30 | 32 | 17 | 45 |
| SIC 1 | 272 | 144 | 195 | 67 | 143 |
| SIC 2 | 226 | 113 | 115 | 24 | 71 |
| SIC 3 | 1070 | 834 | 738 | 141 | 382 |
| SIC 4 | 1577 | 1295 | 1268 | 194 | 503 |
| SIC 5 | 481 | 351 | 245 | 37 | 116 |
| SIC 6 | 566 | 394 | 266 | 85 | 123 |
| SIC 7 | 397 | 212 | 156 | 21 | 69 |
| SIC 8 | 88 | 61 | 53 | 0 | 43 |
| SIC 9 | 1316 | 853 | 744 | 92 | 343 |
| Total ** | 6043 | 4287 | 3812 | 678 | 1838 |

Numbers in this table summarise the general segment disclosures characteristics of the initial sample of firm-years and do not exclude observations with missing firm-level financial statement variables or observations which will be identified as outliers in the empirical analysis sections. * All numbers are based on the disclosure of segmental PBTs. ** Differences between the total numbers in Panel A and Panel B are due to the missing industrial affiliation info for some firm-years. *** Year 2002 is not complete, as it includes only firm-years that reported their results within the first nine months of the year. † The US Standard Industrial Classification System (SIC) is employed to categorise the sample firms into ten principal industries: SIC0 = Agriculture, Forestry and Fishing; SIC1 = Mining; SIC2 = Construction; SIC3 = Food, textile, paper and chemical products (i.e., two-digit SIC codes of 20 through 29); SIC4 = Manufacturing (i.e., two-digit SIC codes of 20 through 29); SIC5 = Transportation, Communications, Electric, Gas, And Sanctuary Services; SIC6 = Wholesale Trade; SIC7 = Retail trade; SIC8 = Finance, Insurance, and Real Estate; SIC9 = Services.

The yearly patterns in **Panel A of Table 5.4** indicate that the relative popularity of specific foreign regions as investment locations has been stable throughout most of the years of the sample period (except the first two years). These yearly patterns reflect the previous conclusions drawn from the analysis of **Table 5.3. Panel A** that segment disclosure was very poor in the late-1980s. This is consistent with the accounting standards (Companies Act, 1985) that guided the segment disclosure in the UK until July 1990 and required only the disclosure of line of business and geographical sales and line of business earnings. With the adoption of SSAP 25, in July 1990, the segment reporting requirements became more onerous[72].

[72] It is also possible that this seemingly nonexistent segment disclosure is partially due to the fact that the Extel database only started compiling segment reporting data in the late-1980s, therefore the data

The segment reporting frequencies for all segments were increasing in early-1990s until the year 1994 and became relatively stable thereafter. Yet somewhat declining frequencies of the *Asia* segment disclosure can be observed after 1994.

The analysis of segment reporting frequencies by firms that belong to different economic sectors is presented in **Panel B**. These frequencies indicate that the relative popularity of specific locations does not change across most industries, and the order of popularity is identical to that reported above (i.e., *Europe* is the most frequent investment location, followed by *America*, then *Asia* and, finally, *Middle East & Africa*). Only in the case of the *Mining* industry (SIC1) does the *Europe*'s popularity notably fall short of *America*'s.

### 5.2.3 Descriptive statistics on disclosed segments

In this section I analyse the descriptive statistics of segment-level PBTs used in the regression analysis sections of this chapter. This implies that all statistics are computed for samples where all variables are deflated by the composite scale proxy and exclude the outliers.

Because all segmental PBTs are scale-deflated, the means and medians provide some indication of a relative average *size* of specific geographical operations across the cross-section of UK multi-segment firms. The comparison of the measures of central tendency (both means and medians) of segment-level PBTs across geographical regions suggests that earnings from domestic (UK) operations account, on average, for a much bigger share of firms' total earnings than the agglomerated foreign earnings or, indeed, the earnings from any single foreign location. Thus, the cross-sectional median of positive earnings from *UK* is 1.9, 2.8, 4.1, 6.2 and 9 times larger than earnings from

available in the Extel database might not cover all multi-segment firms that where operating and reporting geographical segments at that time.

*non-UK* segment, *America*, *Europe*, *Asia*, and *Middle East & Africa*, respectively (see the lower panel of **Table 5.5**).

**Table 5.5 Descriptive statistics on segment-level PBTs.**

**Negative segment-level PBTs**

| | *UK* | *non-UK* * | *Europe* | *America* | *Mid East* | *Asia* |
|---|---|---|---|---|---|---|
| Mean | -0.1349 | -0.0475 | -0.0244 | -0.0367 | -0.0099 | -0.0210 |
| Median | -0.0566 | -0.0116 | -0.0054 | -0.0077 | -0.0025 | -0.0033 |
| Standard Deviation | 0.2258 | 0.0931 | 0.0632 | 0.0765 | 0.0195 | 0.0535 |
| Coefficient of Variation | -1.6736 | -1.9586 | -2.5835 | -2.0870 | -1.9590 | -2.5453 |
| Kurtosis | 19.2130 | 20.5117 | 56.6247 | 19.5734 | 5.2141 | 18.3132 |
| Skewness | -3.8751 | -4.0058 | -6.5806 | -4.0172 | -2.5135 | -4.1168 |
| Minimum | -1.8351 | -0.8195 | -0.7593 | -0.6314 | -0.0763 | -0.3462 |
| Maximum | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| No. of cases | 745 | 909 | 642 | 706 | 52 | 245 |

**Positive segment-level PBTs**

| | *UK* | *non-UK* * | *Europe* | *America* | *Mid East* | *Asia* |
|---|---|---|---|---|---|---|
| Mean | 0.0611 | 0.0375 | 0.0197 | 0.0278 | 0.0146 | 0.0161 |
| Median | 0.0548 | 0.0282 | 0.0134 | 0.0196 | 0.0061 | 0.0089 |
| Standard Deviation | 0.0392 | 0.0341 | 0.0203 | 0.0268 | 0.0236 | 0.0218 |
| Coefficient of Variation | 0.6421 | 0.9105 | 1.0286 | 0.9649 | 1.6166 | 1.3557 |
| Kurtosis | -0.1262 | 2.3588 | 5.1172 | 3.1456 | 16.5791 | 13.3417 |
| Skewness | 0.6517 | 1.3977 | 1.9937 | 1.5943 | 3.5925 | 3.2043 |
| Minimum | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0001 | 0.0000 |
| Maximum | 0.2057 | 0.2402 | 0.1314 | 0.1698 | 0.1748 | 0.1766 |
| No. of cases | 4006 | 3842 | 2817 | 2382 | 487 | 1186 |

Included in descriptive statistics are observations used in the chapter's subsequent regression analysis sections, hence all segmental PBTs are deflated by the composite scale factor and the outliers (i.e., top and bottom 0.5% of segment-level and firm-level regression variables) are eliminated. Descriptive statistics are computed separately for positive segmental PBTs (the upper panel) and for negative segmental PBTs (the lower panel). The number of observations varies across segments, as only segments with non-zero PBTs are included in the computations (i.e., missing segmental PBTs are NOT treated as zeros). * non-*UK* segment is a synthetic segment that agglomerates all foreign operations.

Similar conclusions can be drawn when the negative segmental earnings are compared (the upper panel of **Table 5.5**).

Interestingly, a relationship or association appears to exist between the divergence of the (cross-sectional average) size of segments operating in specific geographical locations and relative popularity of these locations. That is, segments operating in *America* and *Europe* are, on average, much larger than those operating in *Asia*. Similarly, the popularity of *America* and *Europe* investment locations is much higher than that of *Asia* (see **Section 5.2.2**). Segments operating in *Middle East & Africa* are, on average, the smallest, and the region itself represents the least popular investment location. These conclusions remain unchanged when segment-level net assets or sales are used as indicators of the relative cross-sectional average size of specific geographical segments, and are robust to the choice of the measure of central tendency (i.e., mean or median).

Another segment-level descriptive is the frequency of negative earnings reported by firms from a specific geographical location. This is a simple measure of profitability associated with a specific geographical region that might provide some insight into the interpretation of segment valuation regression results later in this chapter. Thus, 23% of firm-years with operations in *America* report losses from that segment. For *Europe* that percentage is 18.6%, for *Asia* – 17.1%, for *UK* – 15.7%, yet *Middle East & Africa* has the lowest percentage, 9.6% (see **Table 5.6**). In other words, more often losses are being reported from *America*, followed by *Europe*, *Asia* and *UK*, and less often from *Middle East & Africa*[73].

In the subsequent sections, where the segment valuation is studied, some of the regressions are estimated for samples that correspond to profit-making firms only. Therefore, I additionally examine what happens to the frequency of negative segmental earnings when the sample excludes cases with firm-level losses (see **Table 5.6**).

In this sample, only 3.9, 11.6, 13.9, 12.1, and 7.7 percent of earnings reported from, respectively, the *UK*, *Europe*, *America*, *Asia*, and *Middle East & Africa* segments are negative. This suggests that, as one would expect, the percentage of segment-level losses are considerably lower in the sample that only includes profit-making firms. Furthermore, it is the losses reported from the domestic (*UK*) region, rather then losses reported from foreign locations, which are considerably more strongly associated with

[73] It is difficult to conclude what causes such notable differences between these geographical segments. On the one hand the higher/lower occurrence of losses in a given location might reflect the objective reality of market conditions in that region. On the other hand, this might be the result of accounting manipulations (e.g., transfer pricing) made by managers when reporting segment-level data.

the frequency of the firm-level losses. Results in **Table 5.6** also suggest that for all geographic locations the occurrence of segmental losses is notably lower when only dividend paying firms are considered.

**Table 5.6 The percentage (frequency) of negative segmental PBTs in differently partitioned samples**

| Segmental variable | Sign of segmental PBT | No. of Cases | Percentage (frequency) of negative segmental PBTs | | | |
|---|---|---|---|---|---|---|
| | | | Sample 1* | Sample 2 * | Sample 3 * | Sample 4 * |
| PBT UK | + | 4887 | | | | |
| | - | 1153 | 19.1% | 3.9% | 6.8% | 2.6% |
| PBT EU | + | 3468 | | | | |
| | - | 819 | 19.1% | 11.6% | 13.1% | 11.0% |
| PBT America | + | 2904 | | | | |
| | - | 908 | 23.8% | 13.9% | 15.8% | 12.9% |
| PBT Asia | + | 1492 | | | | |
| | - | 342 | 18.6% | 12.1% | 13.3% | 11.4% |
| PBT Mid.East | + | 596 | | | | |
| & Africa | - | 77 | 11.4% | 7.7% | 7.5% | 7.0% |

* Sample 1 is the initial total sample; Sample 2 excludes negative firm-level PBT cases; Sample 3 excludes non-dividend paying cases; Sample 4 excludes negative firm-level PBT and non-dividend paying cases.

**Table 5.7 Pair-wise (Pearson) correlations between positive segmental PBTs**

| | UK | Europe | America | Mid East |
|---|---|---|---|---|
| **Non-UK** * | -0.385 | - | - | - |
| *no. of cases* | *3478* | | | |
| **Europe** | -0.233 | - | - | - |
| *no. of cases* | *2584* | | | |
| **America** | -0.234 | 0.050 | - | - |
| *no. of cases* | *2215* | *1791* | | |
| **Mid East** | -0.205 | 0.000 | -0.141 | - |
| *no. of cases* | *427* | *404* | *363* | |
| **Asia** | -0.211 | 0.074 | 0.108 | 0.338 |
| *no. of cases* | *1063* | *1012* | *908* | *356* |

The number of cases varies across the pairs of segments because pair-wise correlation is estimated for firm-years where both segments have positive PBTs.
* non-UK segment is a synthetic segment that agglomerates all foreign operations.

Finally, because the analysis of segment valuation is based on multivariate regressions with at least two segment-level profits being included in the regression and multicollinearity might be a concern, it is important to examine the partial correlations between segments' PBTs. This information is reported in **Table 5.7.**

By and large, the correlation coefficients reported in the table are low, though some are statistically significant (not reported). Therefore, multicollinearity is unlikely to be a problem when the regressions simultaneously include two segments' PBTs.

## 5.3 VALUATION OF DIVERSIFICATION AND SPECIFIC GEOGRAPHICAL SEGMENTS

I test the following valuation relationships, where each, in turn, is tested for various time periods, with and without non-dividend paying firms, with and without industry and yearly dummies, with and without the market-to-book ratio-related dummy variable, and for the entire sample vs. only the profit-making firms:

1. Valuation of differently defined (based on PBT, NA, Sales, when at least one distinct foreign segment is reported, or just the UK one) segment-reporting vs. non-reporting firms, after eliminating the segment and firm-level outliers.
2. Segment valuation of domestic vs. non-UK operations.
3. Segment valuation of only those firm-years that simultaneously operate in:
    a. *UK* and *Europe*, while all other segments are summed up in 'rest'
    b. *UK* and *America*, while all other segments are summed up in 'rest'
    c. *UK* and *Asia*, while all other segments are summed up in 'rest'
    d. *UK* and *Middle East & Africa*, while all other segments are summed up in 'rest'
4. Simultaneous disaggregation of the firm's operations into all segmental components.

### 5.3.1 Valuation differential between geographically diversified and domestic firms

I start the analysis by exploring valuation differences between two mutually exclusive sub-samples. One sample includes firms whose segmental disclosures indicate that the firms are involved in foreign operations. The alternative sample includes firms with no financial statement-related evidence of geographical diversification. In terms of a broader definition of diversification, the firm might be considered geographically diversified if, for at least one distinct foreign segment, it reports one or more segment-level data items. That is, for a firm to qualify as geographically diversified it would be sufficient to have segmental Sales, **or** segmental PBT, **or** segmental NA reported on just one specific foreign region. Specific foreign regions are: *Europe*, *America*, *Asia*, *Middle East and Africa.*

Because the frequency of reporting of the various segment-level accounting items varies, one can further restrict the definition of diversification. For example, the most restricted definition of geographical diversification would be to require **all three** segment-level accounting variables (i.e., PBT, NA and Sales) to be available for a given segment. According to this restricted definition, a firm would be considered as being diversified into a specific foreign location only if all three variables are simultaneously reported for that segment.

Essentially, this definition deals with the *richness* or *completeness* of the information set disclosed by the firm on a specific segment. It might be argued that the richness of the disclosed information is essential to investors/market analysts who assess the market value of the firm. Firm-level financial statements information, specifically earnings, sales and book values are all important constituents of the data set used by analysts when deriving the firm's intrinsic value using various valuation techniques [see Stowe *et al.* (2002)]. Assuming that in valuing segments investors apply a portfolio of techniques similar to those used for valuing the entire firm, then it could be argued that every piece of the scarce segmental financial statements data (recall that according to SSAP 25, for each disclosed segment the firm is required to provide at the most three accounting items: PBT, Sales and NA) would also be incrementally informative and exploited by analysts to arrive at the most accurate firm/segment value estimate. However, earnings have traditionally been the most important value driver in accounting-based firm-level valuation models, therefore segmental earnings are, similarly, likely to have the key role when assessing the contribution of a given segment to the entire value of the firm. One can only speculate if segmental net assets or sales can be a good substitute (in the process of valuation) for missing segmental PBT data. When only one accounting item such as Sales or NA is reported for a given segment, the ability of the investors to assess the value contribution of that segment is likely to be undermined or, even worse, made impossible. One might argue that in the latter case the segment could be treated as not disclosed.

In light of the above reasoning, the valuation differences that might exist between segment-reporting (diversified) and non-diversified (domestic) firms could be tested by using alternative definitions of when the firm is considered as segment-disclosing (diversified). Specifically, alternative definitions include:

**Definition 1:** the firm is considered geographically diversified if at least one accounting item is reported for a specific foreign segment. This will be the least restricted definition of a diversified firm.

**Definition 2:** the firm is geographically diversified only when the PBT data item is available for at least one foreign segment. This is to reflect the possibility that such segmental information as NA or Sales might be discarded by investors/analysts, in the process of valuation, when the major segmental data item, i.e. PBT, is not reported.

The above theorisation regarding the definition of when the firm shall be considered diversified would be important if significant valuation differences could be observed between the two sub-samples of firms with alternative definitions of diversification. However, the empirical results in **Table 5.8** (see Appendix 5.1: Model 5, and Model 1 vs. 2, Models 3 vs. 4) do not reveal any economically significant differential value association of accounting fundamentals between the two sub-samples (**Tables 5.8** through **5.17** are reported in **Appendix 5.1**). This result is further reinforced in Model 5, which includes a dummy variable and an interaction term for each variable. That is, all variables are allowed to vary, depending on whether the observations relates to definition 1 or 2. The fact that none of the interaction terms or dummy variables are statistically significant at the 5% level suggests that the choice of definition does not materially affect valuation associations.

Having discussed the potential importance of the definition of the term *diversified*, in the sections that follow I compare and contrast valuation characteristics of diversified vs. domestic firms in alternatively specified samples.

When the basic model regression is run for the entire sample, following the findings in Chapter 4, all valuation variables are paired with corresponding interaction terms to control for discrepancy in coefficients induced by the sign of firm-level financial results (profit vs. loss). Because the firm-level analysis in Chapter 4 revealed highly statistically significant differences in the overall valuation of firms trading below book value, a corresponding dummy (MB dummy=1 if MV<BV, dummy=0 otherwise) is also included in all regressions that follow.

Because both theoretically and in terms of empirical evidence reported in Chapter 4 the composite scale factor appears to address more appropriately the problem of cross-sectional scale difference, all models that follow are scaled by the composite scale factor. As a cross-check of the robustness of regression results, all regressions are also estimated with other deflators (such as Total Assets) and results are reported in section 5.4.

**Table 5.9** (see **Appendix 5.1**) reports the results from variously specified regressions aimed at bringing to light firm-level valuation differences between geographically diversified firms and geographically focused (domestic) firms.

The first six models (Model 1 through 6) are estimated for samples that include both profitable and loss-making firms, therefore, they all include a negative PBT dummy and corresponding interactions terms for all variables. Models 1 through 4 reflect firm-level valuation for geographically diversified firms, while models 5 and 6 are for non-diversified firms. Furthermore, all 12 models in the table could be grouped into 6 pairs (model 1&2, model 3&4, etc.), where the first model of each pair includes observations from dividend-paying and non-dividend paying firms, while the second model includes only the dividend-paying firms. Note, that econometrically more valid inferences about the valuation of dividends could be drawn from the second models, i.e., where none of the observations have missing or zero values for dividends.

Recall that the primary issue of interest in this section is the valuation differences between geographically diversified and domestic firms. It is important that this comparative analysis is performed between samples that are qualitatively similar in all respects but vary only in terms of the characteristic of interest, i.e. diversified vs. non-diversified. In empirical terms this implies the identification of differences between the following groups of models in **Table 5.8**: Model 1 & 2 vs. Model 5 & 6; Model 7 & 8 vs. Model 9 & 10; and Model 11 vs. Model 12. Below I analyse these relationships.

Before analysing key valuation factors (PBT, BV and Dividends) some general conclusions are in order. The structure of the intercept in the deflated models is presented below.

1. for profit firms that trade above book value:

Intercept = one

2. for profitable firms that trade below book value:

Intercept = one + dummy 2

where dummy 2 = 1 if PBT>0 & MV≤BV and zero otherwise;

3. for loss-making firms that trade above book value:

Intercept = one + dummy1

where dummy 1 = 1 if PBT≤0 & MV>BV and zero otherwise;

4. for loss-making firms trading below book value:

Intercept = one + dummy 3

where dummy3 = 1 if PBT≤0 & MV≤BV; and dummy3 = 0 otherwise.

In all tests, when the firm is profit-making and is trading above book value, the intercept has positive value and is statistically significant at the 1% level. The value of the intercept is substantially lower, yet still positive and statistically significant at the 1% level, for profit-making firms trading at a discount to book value and loss-making firms trading at a premium to book value. The intercept has the lowest, in absolute terms, value and is not statistically significant for loss-making firms trading at a discount. Furthermore, the intercept becomes negative and statistically significant at the 1% level when non-dividend payers are excluded from the loss-making firms trading at a discount (model 11 vs model 12). In other words, in the context of the employed model, the loss-making firms trading at a discount have the lowest cross-sectional relative valuation, while profit-making firms that trade at a premium to book value have the highest relative valuation. The remaining two categories of firms, loss-making premium firms and profit-making discount firms, appear to be in the middle range of valuation. These conclusions conform to the economic intuition.

In the sections that follow I compare the valuation of PBT, BV and Dividends variables, and the relative valuation discount/premium of diversified firms, in a consecutive order, between diversified and domestic firms. Sections 5.3.1.1 through 5.3.1.6 draw on results reported in **Table 5.9** (Appendix 5.1), where models 1 through 6 are estimated on the complete sets of data, while models 7 through 12 are estimated separately for two mutually exclusive sub-samples of firms: profit firms and loss firms.

**5.3.2.1 Valuation of BV**

Regardless of the dividend status of the firm, geographically **diversified** profit-making firms have lower value of the BV coefficient than the **domestic** profit-making firms. Examination of regression results in models 1 through 10 presents clear evidence that the BV coefficients of domestic profit-making firms are always positive, statistically significant at the 1% level and is always substantially higher than that of profit-making diversified firms. Furthermore, the analysis of parameters from models 2 vs. 6, models 4 vs. 6, and models 8 vs. 10 suggests that the BV coefficient is not statistically significant (even at the 10% level) when only dividend-paying profit-making **diversified** firms are considered, while **domestic** dividend-paying profit-makers have positive and statistically significant (at the 1% level) BV multiples.

This conclusion regarding the excess valuation of BVs in domestic firms also holds when these models are estimated without the non-dividend firms being excluded from the sub-samples and are analysed in terms of diversified vs. domestic firms (see model 1 vs. 5 and model 3 vs. 5).

These patterns, however, vanish when regressions are estimated for loss-making firms. In loss-making firms such characteristics of the firm as geographical diversification or dividend paying status no longer influence the valuation of BVs. Here, BV coefficients are always positive, statistically significant at the 1% level, and have **higher** values than in all alternative regression specifications of profit-making firms.

Therefore, one might conclude that regardless of the diversification or dividend paying status-related characteristics of the firm, BV is a more important value driver when firms are reporting losses. This conforms to the existing in the literature theorisation and empirical evidence (see Chapter 2) that the valuation role of BV is subject to the sign of the firm's financial results. Another, more important conclusion for this research is that BV has higher valuation multiples and is a more value-relevant valuation factor for domestic firms. In other words, BV is perceived by the market to be a weaker value driver in geographically diversified firms. However, a word of caution shall accompany this interpretation of results. In my sample, the geographically diversified firms are generally larger than domestic firms. It is possible that this differential valuation of BVs is not purely a result of the phenomenon of diversification, but rather is a reflection of the firm's size-related differential valuation of BV by investors, if investors value small and large companies differently.

#### 5.3.2.2 Valuation of PBT

It shall be noted at the outset that in all alternative tests reported in **Table 5.9**, negative PBTs do not have statistically significant (at any acceptable level) associations with firm value. In other words, firm-level losses have no information content and are value irrelevant. This finding reconfirms the previous results, reported in the Chapter 4, and does also conform to prior empirical finding in the related literature (see Chapter 2).

Positive PBTs, as expected, have positive association with firm value and are highly statistically significant (at least at the 0.1% level) regardless of the dividend payment or diversification-related characteristics of the firm. The primary issue of interest is whether capitalisation of positive PBTs (i.e., profits) is different between diversified and domestic firms. The regression estimated PBT coefficients always have higher values for firms which are geographically diversified, regardless of the dividend-paying status or the definition (discussed earlier in the chapter) of the term 'diversification'[74]. However, these differences are not statistically significant at the 10% level. In other words, there is some weak indication of higher capitalisation of profits reported by multinational firms.

Some additional knowledge about the valuation of earnings could be gained from the analysis of the PBT*f(s) coefficient. Recall that this variable is modelled to account for possible scale-related non-linearity in the PBT coefficient. A positive (negative) sign of the PBT*f(s) coefficient would imply that the PBT coefficient is not a cross-scale constant, but is likely to have larger (smaller) values for bigger firms. In our regressions, the PBT*f(s) coefficient is positive and statistically significant at the 1% level for all profit-making diversified firms. For profit-making domestic firms this coefficient is negative, and is significant at only the 10% level. In economic terms, these results seem to suggest that: (1) investors might apply higher valuation multiples to earnings of **larger** diversified firms; and (2) investors are more likely to apply higher valuation multiples to earnings of **smaller** domestic firms[75].

Finally, both in diversified and domestic loss-making firms' regressions, this coefficient is not statistically different from zero. One would expect this result given the prior evidence that negative earnings are, in general, value-irrelevant.

#### 5.3.2.3 Valuation of Dividends

In Chapter 3 I outlined and discussed major prerequisites for including dividends into the basic model and emphasised that the expected value and sign of the regression estimated dividend coefficient is subject to alternative hypothesised roles which dividends might play in firm valuation. Because there is no clear agreement in the empirical accounting literature both in terms of dividend valuation theorisation and

[74] This fact is apparent when contrasting PBT coefficients in corresponding regressions, that is: Models 1 & 3 vs. model 5, and Models 2 & 4 vs. 6.
[75] The second point conforms to what is often referred to in the literature as the small-firm effect.

empirical findings, I do not put forward and test *a priori* specific hypotheses regarding the expected sign and magnitude of the dividend multiple.

Empirical results reported in **Table 5.9** (see Appendix 5.1) provide a clear indication of the existence of a divergence in dividend valuation between two categories of firms: diversified vs. domestic firms. Regardless of the financial results (i.e., profit vs. loss) reported by firms, dividend coefficients are always positive and statistically significant at least at the 0.3% level for **domestic** firms. In contrast, for **diversified** firms, both in dividend-paying profit-making and loss-making firms, dividends coefficients have substantially lower (yet positive) values and become statistically significant only at the 7 % level (see models 8 & 11). The latter statistically weak yet positive valuation of dividends is further eroded when the alternative **Definition 2** of diversification is applied (see section 5.3.1). Here, dividends are completely value-irrelevant in profit-making firms.

An interesting 'anomaly' can be observed, with regards to the valuation coefficient of dividends, when dividend-paying and non-dividend **diversified** firms are pooled into one sample (see models 1 & 3). Here, the value association of dividends turns **negative** and statistically significant at the 5% level. This is clearly a spurious result, as far as valuation of dividends is concerned, in light of statistically significant and positive valuation of dividends in dividend-paying firms. Because this sample includes firms that do not pay dividends (i.e., the value of dividends for this subset of firms is equal to zero), the valuation of dividends in this larger sample shall, other things being equal, only reflect the valuation associated with dividends in dividend-disclosing firms. This change of the dividend coefficient sign from positive (in dividend-paying sample) to negative (in dividend-paying and non-dividend sample) can only be possible if: (i) zero vs. non-zero dividend firms have differential valuation, and (ii) the very fact that the firm pays (or does not pay) dividends serves as a signal of that differential valuation. In other words, the very dividend status of the firm (i.e., zero vs. non-zero dividends firms) might be in correlation with an **omitted/unknown valuation context** (this might be an additional vector of omitted value drivers or, in a more general case, intrinsically differential model specification, subject to different settings), which might influence the specification of the model. If the omitted/unknown valuation context is indeed correlated with the type of firm (i.e., dividend-paying or non-dividend), then spurious valuation of dividends in the total sample could be purged by including a dummy variable that takes the value of unity for dividend-paying firms, and zero for non-dividend firms.

I re-run all models with this dummy variable being included as an additional variable. In these new regressions, dividends no longer have negative and statistically significant valuation coefficients, which supports the **omitted/unknown valuation context** theorisation. Furthermore, the coefficient on the dividend-related dummy is highly statistically significant and has a negative sign. This suggests that the valuation of firms might be subject (i) to their 'dividend-paying characteristics' (i.e., dividend-paying or non-dividend firms), or (ii) to some intrinsic/true valuation context, which is being proxied by the 'dividend-paying status' of firms. In the latter case, the employed basic model might have an omitted correlated variable (or a set of unaccounted for factors, i.e., contexts) problem, with the dividends being highly correlated with the omitted contexts. The negative sign of this dummy coefficient suggests that firms whose intrinsic valuation context is correlated with the 'dividend-paying characteristics' (or whose valuation context is in itself the 'dividend-paying characteristics') have lower valuation.

Overall, the results suggest that dividends have different valuation roles in domestic vs. geographically diversified firms. Dividends have positive and statistically significant association with the value of domestic firms, but have no apparent valuation role for diversified companies.

#### 5.3.1.4 Valuation of diversification: do investors value multinationality?

To explore the general valuation properties of the two categories of firms, diversified vs. domestic firms, I pool these observations in a single regression and include a binary dummy variable, which takes the value of unity if an observation comes from a **domestic** firm, and the value of zero otherwise. No interaction terms are included.

This simple test restricts the regression coefficients of all value drivers to be equal across diversified and domestic firms, while the sign of the dummy variable will provide a single simple measure of overall valuation differences between the two groups of firms. The dummy coefficient in the regressions (not reported), which are estimated separately for profit-making (i.e., positive PBT) and loss-making (i.e., negative PBT) firms, is negative and statistically significant at the 1% level. This suggests that, on average, the domestic firms are valued at a discount relative to internationally diversified firms. This result is unchanged even when I control for non-dividend paying firms and/or firms trading below book value.

Because yearly regression analyses in Chapter 4 demonstrate that throughout the entire sample period the valuation of firms was changing[76], I also test the economic period-related robustness of the valuation discount found in domestic firms, by repeating previous regressions for two economic sub-periods: the *old economy period*

[76] It is, however, subject to a debate, what exactly was changing: Is it the intrinsic value of firms that was changing, so that the model simply captured these changes? Or, was our model simply reflecting the changes in how investors use accounting information in firm valuation, in other words, was our accounting-based model merely capturing the dynamics of the value association of basic financial statement data?

(pre-1996), and the *new economy period* (post-1996)[77]. Results indicate that the valuation discount of domestic firms was more noticeable during the old economic period, as the dummy has a smaller (larger in absolute terms) negative value and is statistically significant at the 1% level. In the new economy period the dummy has a larger (smaller in absolute terms) negative value, is significant at the 5% level for non-dividend paying firms, and is no longer significant for dividend paying firms. In economic terms, this implies that, during the old economic period, investors valued *diversification* higher than in the new economic period.

One final observation concerns the difference between diversified and domestic firms in terms of the overall value relevance of financial statement data. In all matching pairs of diversified and domestic firms (see Model 1&3 vs. 5; Model 2&4 vs. 6; Model 7 vs. 9; Model 8 vs. 10; Model 11 vs. 12 of **Table 5.9**), the explanatory power of regressions is always higher in the domestic firms' sub-samples. Although most of these differences of the explanatory power do not exceed five percentage points, these patterns remain robust when additional tests were carried out: new economic period vs. old economic period; inclusion of industry and yearly fixed effects and other contextual dummies. This evidence seems to suggest that the basic firm-level financial statement variables (PBT, BV and Dividends) represent a poorer information set for more complex and (on average) larger geographically diversified firms, compared to domestic firms.

### 5.3.2 Incremental information content of segment disclosures

As noted in the literature review chapter, there is an implicit or, often, explicit contention in the literature on segment disclosure and value relevance of segmental information that information reported on the segment-disaggregated level has, or should

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[77] This definition of economic periods was suggested by Core *et al.* (2003) in their study of time-related changes in value association of financial statement data.

have, incremental usefulness for producing more accurate estimates of the entire firm's future performance. In other words, segment-disaggregated accounting data would communicate at least as much information as the corresponding firm-level data.

Assuming that:

(a) to produce more accurate forecasts of the firm's future performance, and ultimately, to come up with a better justified estimate of the firm's intrinsic value, investors/market analysts go beyond the simple firm-level numbers and use a richer set of publicly available information (which includes both firm and segment-level disclosed information and comes at no additional costs); and

(b) the stock market reacts to analysts' valuations/recommendations by adjusting the firm's market value accordingly;

then the firm's market value should be more strongly associated with disaggregated information, than simple firm-level data. It follows that in the context of the operationalised model used in this study, the replacement of a firm-level value driver with its segment-disaggregated components might increase the regressions' explanatory power relative to that where firm-level values were used. This differential explanatory power between the segment-disaggregated and firm-level regressions constitutes the incremental information content. It shall be noted, however, that even when conditions (a) and (b) are in place, disaggregation will not necessarily release incremental information, unless the disaggregated information possesses some specific characteristics.

Some theoretical studies, reviewed in Chapter 2, have come up with specific *analytical* framework of preconditions that make disaggregation incrementally informative. I am, however, unaware of *empirical* studies that investigate the validity of these theories. Due to the specifics of my data set, it is also impossible to test or check for the existence of these preconditions in my study. Therefore, I do not develop or test specific preconditions-related hypothesis, but rather follow a tentative (*ad hoc*) approach to detect the existence or non-existence of incremental information associated with disaggregation of firm-level data.

I also test the information effects of *basic*, *intermediate* and *finest-level* disaggregation. The *basic* disaggregation implies separating the firm-level PBT of the geographically diversified firm into two segmental components: PBT from the domestic operations (i.e., PBT UK), PBT from a *generic foreign segment* (PBT NONUK), and a residual PBT component (PBT Rest), to allow for the incompleteness in the segment-level reporting. For the first *intermediate-level* disaggregation, I split the firm-level PBT into: PBT UK, PBT Europe and PBT Rest. The next *intermediate-level* disaggregation implies: PBT UK, PBT Europe, PBT America and PBT Rest. This series of consecutive desaggreations is continued up to the *finest-level*, which includes the PBTs from each specific geographical region. The above tests represent a narrow definition of disaggregation as they, as a matter of fact, address the incremental information content of disaggregation of firm-level earnings into the segmental earnings.

### 5.3.2.1 Data

Because disaggregation is done on the basis of available segment-level PBT information, the new initial sample shall include only those firm-years that report segmental earnings for at least one foreign segment. Recall that when no segment data-related restriction is imposed the initial composite-scale-deflated sample includes 18,752 observations[78]. However, only 5,658 observations remain in the sample when the segment-level data availability restriction is imposed, and this now constitutes the new initial sample for the geographical segment analysis[79]. This sample is further reduced in the actual tests due to the elimination of both firm-level and, additionally,

[78] The size of this sample will vary depending on the choice of the scale proxy.

[79] That is, there are only 5658 firm-years with segmental PBTs available for any of the following foreign geographical segments: *America, Europe, Asia, Middle East & Africa.*

segmental-PBT outliers. Segmental-PBT outliers are defined as top and bottom 0.5% of a reported segment's PBT values.

The first test addresses the incremental information content of the disaggregation of firm-level PBT into domestic operations' PBT, PBT from a generic foreign segment, and PBT Rest. The *generic foreign segment* PBT is the sum of PBTs of all four specific foreign segments: *America, Europe, Asia, Middle East & Africa.* PBT Rest accounts for the difference between the firm-level PBT and the agglomerated segment-level PBTs, and includes such PBT-related components as: intra-group operations, discontinued operations, central costs, exceptional charges, associated companies, net interest expense and other miscellaneous items.

Of 5,658 observations, the domestic segment's PBTs are not disclosed in 721 cases, which are eliminated. This reduces the size of the testable sample to 4,937 firm-years. The elimination of firm-level outliers and outliers identified separately for PBT UK and PBT NONUK, leaves the sample with 4,764 observations. Of this sample, about 3,800 cases have positive firm-level PBT, meaning that some 20% of the segment information containing sample comes from the loss-making firms. This percentage is similar to the proportion of loss making firms in the entire initial sample of 19,213 cases.

#### 5.3.2.2 Results: Profit making firms

In the analysis that follows I separately test the incremental information content of disaggregation for profit firms (**Table 5.10 Panel A**) and loss-making firms (**Table 5.10 Panel B**).

In the tests that involve **all profit-making** firms, the statistically significant increase of 1.7 percentage points of the explanatory power of Model 2 relative to that of Model 1 from 25.3% to 27% (an F-test that this change is not statistically significant is rejected at the 1% level) suggests that intermediate disaggregation (where consolidated earnings are replaced with the sum of PBTs from the UK, the foreign generic segment and the rest of PBT) does 'release' incremental information. A successive *finest-level* disaggregation of the generic foreign segment PBT into the PBTs relating to specific geographical segments, Model 2 vs. Model 3, is also associated with incremental information. The increase of R-square in Model 3 relative to that of Model 2 is very marginal (0.6 percentage points) yet the F-tests shows that this increase is statistically significant at the 1% level.

One might hypothesise that information contained in dividends suppresses possible information gains from reporting segment-disaggregated profits. Should this be true, successive disaggregation of the firm-level PBT into segmental components shall not result in increasing explanatory power of regressions and dividends shall have statistically significant association with firm value. Therefore, I repeat all the above tests for **only dividend-paying profit-making** firms (Models 4 through 6, **Table 5.10**).

The above hypothesis can confidently be discarded, as all successive disaggregations (Models 4 through 6) increase the regressions' explanatory power, while dividends appear completely irrelevant to valuation. Although the improvements in the explanatory power both in Models 4 vs. 5, and Models 5 vs. 6, are trivial (1.3 and 0.6 percentage point respectively), the F-tests indicate that these increases are statistically significant at the 1% level.

Summarising the above results, one can affirm that more detailed disaggregation of consolidated earnings of profit-making firms does communicate incremental information to the market. Also is noteworthy the fact that the increase in adjusted-$R^2$ is larger in the first phase of disaggregation, where consolidated profits are replaced with three constituent components (i.e., PBT UK, PBT NONUK, PBT Rest), and is smaller when already intermediately disaggregated profits (i.e., those three constituent components) are further replaced with finer-split six components (PBT UK, PBT Europe, PBT America, PBT Asia, PBT Mid.East&Africa, PBT Rest). This evidence seems to suggest that the informativeness of disaggregation is a diminishing function of the fineness of disaggregation. In other words, each successive finer disaggregation would be releasing less information.

#### 5.3.2.3 Results: Loss making firms

Similarly interesting are the results when the information effect of disaggregation is examined for the **loss-making** firms. Disaggregation in the context of **loss-making non-dividend paying** firms appears even **more informative** than for profit-making firms. The comparison of Models 7 vs. 8 in Panel B of **Table 5.10** suggests that the explanatory power of the simple consolidated-level model is 5.5 percentage points lower than when the firm-level earnings are disaggregated into domestic earnings (PBT UK), the generic foreign segment's earnings (PBT NONUK) and the balancing earnings component (PBT Rest).

This increase in information content is highly statistically significant (at the 0.001% level). Yet again the finest disaggregation of Model 9 further releases incremental information relative to the information content of intermediately-disaggregated Model 8. Although the latter increase in the adjusted-$R^2$ is quite marginal (1.2 percentage points), it is still statistically significant at the 1% level. This changing pattern of the adjusted-$R^2$ is similar to that observed in profit-making firms and is yet another indication of the existence of declining marginal informativeness of segment disaggregation.

In-depth investigation of Models 7 through 9 offers some insights into the reasons that make disaggregation more informative in the context of loss-making firms compared to that of profitable firms. Valuation of the firm-level earnings (Model 7) reflects the value irrelevance of firm-level losses and the enhanced value-relevance of book values in loss-reporting firms, which is also found to be the case when the entire sample's valuation properties were analysed in Chapter 4. This empirical result is also consistent with the literature on value-relevance of losses, as discussed in Chapter 2.

When a geographically diversified firm reports consolidated losses, it is still possible that some of its segments are profitable. In fact, this situation is of a frequent occurrence in my sample of diversified firms (see **Table 5.6**) When this information is disclosed, the market has the opportunity to apply differential multiples to positive and negative segment-level earnings, as it does for the consolidated earnings. Compared with a single-number summary of the firm's performance (the consolidated losses) the segment-level disclosure of earnings communicates to investors an unequivocally richer information set about the source(s) of firm-level losses and relative strengths of the firms different geographical constituent elements.

This reasoning is verified by the results of Models 8 and 9, where positive and negative segmental earnings have clearly differential valuation. As was the case with the valuation of firm-level losses, negative segment-level earnings also appear value irrelevant, while the coefficients on the segments' positive earnings are nearly always statistically significant[80].

### 5.3.3 Joint and pair-wise valuation of specific segments

The previous two sections address the issues of divergence in the valuation of geographically diversified vs. domestic firms, and incremental usefulness of segmentally disaggregated information, which pave the way for analysing the core issue of my study – valuation of specific segments.

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[80] These statistically significant coefficients on positive segmental earnings, however, have the unexpected negative sign. This seems to suggest that profit-making segments of loss-making firms are negatively associated with firm value, which is contraintuitive.

Because this analysis is the core subject of the entire study, it is important that all previously identified non-segmental but valuation-affecting contexts are properly controlled for in the models addressing the issue of the valuation of specific geographical segments. More specifically, in a sample that represents a large cross-section of firms-years pooled over time, an explicit account shall be taken of at least the following effects:

- industries and yearly fixed effects;
- the negative firm-level-earnings effect;
- the valuation premium (discount) of firms trading above (below) book value effect; and
- the dividend paying status of the firm.

Econometrically, controlling for the above factors will help reduce the error terms of the estimated regressions, which, in turn, will result in lower standard errors and higher efficiency of the estimated regression coefficients of the key variables of interest.

In the sections that follow I analyse the regression results that test the divergence of valuation of the following segments:

1. *UK* vs. a generic foreign segment (i.e., the sum of non-UK segments)
2. *UK* vs. *Europe*
3. *UK* vs. *America*
4. *UK* vs. *Asia*
5. *UK* vs. *Middle East & Asia*
6. *UK* vs. *Europe* vs. *America* vs. *Asia* vs. *Middle East & Africa*.

Additionally, different partitions of relevant samples and different contexts are used to analyse the sensitivity of the conclusions. All results reported in sections 5.3.3.1 through 5.3.3.4 reflect the **averaged out** valuation differential for the period of 14 years, from 1989 to 2002. Possible time-related changes in the relative valuation of domestic and foreign segments are studied separately in section 5.3.4 of this chapter.

**5.3.3.1 Testing the valuation differences between domestic (UK) vs. foreign operations**

The tests of the valuation differential between the domestic and specific foreign segment operations are performed for samples with available data on UK PBTs and non-UK PBTs. In its complete specification form all regressions include industry and yearly fixed effects, a binary dummy variable that controls for the dividend status of the firm (dividend-paying vs. non-dividend) and another binary dummy variable that accounts for whether the firm trades above or below its book value. To put the analysis in perspective, I start off with the simplest 'stripped-off' version of the model (where no fixed effects, dummies or segmentally disaggregated PBTs are included) and then sequentially append it with fixed effects, dummies and segmentally disaggregated profits.

Panel A of **Table 5.11** (see **Appendix 5.1**) reports the results of 5 sequentially appended models. The sample for which all five models are estimated includes all profit-making segment-reporting firm-years, after the elimination of firm-level and segment-level outliers.

**Model 1** represents the simplest specification, where the variation of the dependent variable is being explained by a simple set of firm-level valuation factors. The notable feature of this model is its relatively low explanatory power, just about 16%. An additional test (where this regression omits the PBT variable) indicates that out of this 16%, 11.5% is attributed to the PBT value driver, while all remaining variables (BV, Dividends, and the adjustment terms) jointly explain less than 4.5%. Overall, these results suggest that the stripped-off model has a relatively low ability to explain the cross-sectional variation in scale-deflated equity market value, and the firm-level profits is the key determinant of value.

**Model 2** is an appended version of model 1 that includes a dummy variable to accounts for whether the firm trades above or below (and, equal to) its book value[81]. This modification sharply increases the explanatory power of the regression, with the adjusted-$R^2$ increasing from 15.9% to 25.3%. Furthermore, the dummy variable itself receives the largest statistical level of significance among all the regression variables and has a negative sign, reconfirming an earlier result that firms trading below book value have lower market valuation relative to firms trading at a premium to book value. In other words, when all regression coefficients are forced to be constant across the two categories of firms (those trading above BV vs. those trading below BV), the regression would **overestimate (underestimate)** the market value of the firms trading below BV (above BV). However, these results shall not be surprising as they conform to those from the analysis of the entire initial sample, presented in Chapter 4. I also split the sample of geographically diversified firms into premium-firms and discount-firms sub-samples and estimate separate basic regressions. The results produce patterns similar to those observed in the total initial sample: the value association of basic value drivers (BV, PBT, Dividends) varies strikingly between the premium and discount firms. This means that, ideally, the model's specification could have been improved by allowing for all coefficients to vary depending on the premium/discount characteristic of the diversified firm. However, due to the reasons outlined in the Chapter 4, I choose not to over-complicate the model and, therefore, only include a binary dummy variable that signifies the premium/discount type of the firm[82].

[81] About 13% of the profit-making segment-reporting firm-years trade at a discount to the BV. For the loss-making sub-sample this percentage is equal to 27%.

[82] This is, of course, a limitation, as all coefficients are effectively being forced to be cross-sectional constants across premium and discount firms. However, this decision comes as a trade-off between this limitation and, on the other hand, the risk of being left to work with an extremely parameterised model with potentially serious econometric problems and difficulties in interpreting the results.

**Model 3** differs from **Model 2** only in that it includes a dummy (that takes the value of one when the firm is dividend-paying, and zero otherwise) to purge the dividend coefficient. As discussed in **Section 5.3.1.3** this dummy captures the average differential valuation effect that is associated with an 'omitted' context or model misspecification that correlates with the dividend status of the firm[83]. Consistent with its intended role and the previous results reported in **Section 5.3.1.3**, this dummy purges the dividend coefficient, which no longer has a statistically significant negative association with firm value. It also indicates that firms that pay dividends have a lower average value than the zero-dividend firms.

Model 3 is upgraded to **Model 4** by including nine binary dummy variables that correspond to nine of the ten industrial affiliations of the firms in the sample. Because each firm in the sample is affiliated with only one of the ten specific industries, the inclusion of all ten binary dummies would generate perfect colinearity. Therefore, only nine industrial dummies are included while, other things being equal, the regression intercept could be interpreted as a proxy for the omitted industry's dummy. Overall, the inclusion of industrial fixed effects notably improves the explanatory power of the regression, by about 4 percentage points (from 25.8% to 30%), yet leaves the value drivers' coefficients similar to those of model 3. In other words, the differential valuation effect of discount vs. premium firms remains highly significant, indicating that it is not an industry-drawn phenomenon.

Finally, **Model 5** controls for all previously identified influential contexts by incorporating industry and yearly fixed effects, the dividend status dummy and the market premium/discount dummy. Regression coefficients in **Model 5** are virtually identical to those of Model 4, yet the final set of controlling dummy variables further improves the explanatory power of the regression by 2.4 percentage points, to 32.4%.

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[83] Recall that dividend status of the firm might itself be the underlying context.

All the following regressions, with geographically disaggregated PBTs, are estimated on the basis of model 5, that is, with the complete set of control variables. Panel B of **Table 5.11** reports the results from regressions where consolidated profits are decomposed into profits from the domestic segment (PUK), generic foreign segment (PNONUK), and a balancing item (PREST), which represents the difference between consolidated profits and the sum of the two segments' profits. Model 1 in Panel B is a segmentally disaggregated version of Model 5 in Panel A. The explanatory power of this model is improved by 1.5 percentage point and although this change has a rather trivial economic significance, it is statistically significant at the 1% level (based on the F-test).

A cursory inspection of the results reveals that all components of the disaggregated firm-level profit are highly statistically significant and, more importantly, the PUK coefficient is statistically higher than that of PNONUK. The Wald test shows that the difference between the PUK and PNONUK coefficients is statistically significant at the 0.1% level. This implies that, overall, investors attach a higher multiple to earnings from domestic operations compared to earnings from agglomerated foreign operations. Also is important the fact that profits that encompass all non-segment operations (PREST) have statistically significant differential value relevance. This, perhaps, shall not be surprising when taking into account that PREST is a sum-total of such potentially valuation-relevant items as profits from discontinued operations, intra-group operations, exceptional charges, net interest expense, and other items.

It shall be recognised, however, that because Model 1 (of Panel B) is estimated for a cross-section of firms-years data pooled over 16 years, it fixates the values of PUK, PNONUK and PREST coefficients through the entire sample period and, consequently, the divergence of value contributions associated with these segments. This issue of the dynamics of the relationships is investigated in more detail in section **5.3.4**.

In its current specification, Model 1 ignores that segments might, in turn, be profit-making or loss-making. Within the sample of 3,798 firm-years, used in model 1, in 139 (384) cases profits reported from the UK (non-UK) segment have a negative sign. Chapter 4 provides strong evidence of differential valuation of positive and negative firm-level earnings. If investors perceive firm-level losses as transitory and, therefore, value irrelevant, then similar logic might underpin the valuation of segment-level losses. **Model 2 in Panel B** addresses this possibility by including two interaction terms, one for negative profits from the UK segment, and the other for negative profits from the non-UK segment. Regression results demonstrate that similar to the value-irrelevance of consolidated earnings, the segment-level losses are also value irrelevant. The results of Wald tests (which are used to test the following restrictions on regression coefficients: PUK coefficient + DPUK coefficient = 0; and PNONUK coefficient + DPNONUK coefficient = 0) suggest that coefficients on losses reported from either the UK or non-UK segments are not statistically significant. Because of the dampening effect of value irrelevance of negative segmental earnings, the coefficients on segmental earnings in Model 1 are lower (higher) than coefficients on positive (negative) segmental earnings in Model 2. The segregation of positive and negative segmental earnings in Model 2 also has an information effect, which is reflected in the increased $R^2$ of Model 2. Although this increase is marginal, and economically insignificant, it is significant statistically at the 1% level (based on the F-test).

**Model 3** is a replication of Model 2 on a sample that excluded non-dividend paying firms. This is done primarily to test the sensitivity of dividends valuation in differently partitioned samples and the robustness of the higher valuation of domestic vs. foreign earnings. Models 3 and 2 produce qualitatively identical results in terms of segments' earnings valuation, as Wald tests suggest that in Model 3 the coefficients on segment-level negative earnings are not statistically different from zero.

**Model 4** is intended to shed some light on the valuation properties of segmental earnings for loss-making firms. The analysis in Chapter 4 suggests that, in loss-making firms, earnings have no value relevance while book value and dividends become the primary value drivers. Models 2 and 3 demonstrate that similar to the value-irrelevance of firm-level negative earnings, negative earnings reported from specific geographical segments also appear value-irrelevant, while positive segmental earnings are positively associated with the value of the entire firm. However, because models 2 and 3 only include firms that are profitable on the consolidated-level, I also test the valuation of positive and negative segmental earnings when those are reported by loss-making firms (see model 4).

Results from Model 4 are somewhat unexpected and difficult to interpret. It appears that disaggregated segment-level positive earnings are **negatively** associated with the firm value (i.e., coefficients on positive segmental earnings are all negative and are statistically significant at the 1% level), while negative segmental earnings are value irrelevant. Although this negative value association of segmental positive earnings is conter-intuitive, disaggregation of consolidated firm-level negative earnings into segmental components improves the explanatory power of the regression by a statistically significant five percentage points. Furthermore, the value of the coefficient on non-UK PBT is statistically lower (Wald test is significant at the 1% level) than UK PBT coefficient, suggesting that UK operations are less value-destructive than non-UK operations.

One of the possible explanations for this negative association might be that the model misspecifies the hypothesised linkage between the equity market value of the firm and financial statements information when the firm is incurring losses on the consolidated level. If segmental profits are highly negatively correlated with variables that are the main **intrinsic** value drivers (and are positively associated with firm value) but are omitted from the regression, then negative valuation of segment-level positive earnings would simply capture this omitted variable effect. With no clear indication of what might cause this result, this argument shall be viewed as only one of many possible explanations of the observed idiosyncratic valuation effect.

In the final model, **Model 5**, I pool profit-making and loss-making firms and estimate the overall valuation divergence of UK vs. non-UK segments. Confirming previous findings from separately studied profit-making and loss-making firms, in the pooled sample UK earnings have, on average, higher valuation relative to non-UK earnings, and negative segmental earnings are not associated with the value of the firm. However, in this total sample the actual coefficients on positive segmental profits are lower than in the profit-making firms' sample, reflecting the negative valuation of positive segmental earnings in loss-making firms.

#### 5.3.3.2 Testing the valuation of UK vs Continental Europe segments

In the tests of the valuation differential between the domestic and *Europe* segment operations, firm-level earnings are split into the following segmental components: *UK* (PUK), *Europe* (PEU), *Rest of the World* (PROW), and Rest of earnings (PREST). Compared to the tests in section 5.3.3.1, here the non-UK sector is segregated into *Europe* (EU) and the *Rest of the World* (ROW). This disaggregation specifically tests relative valuation contributions associated with specific geographical segments: *UK* and *Europe*. In Panel A of **Table 5.12** (see **Appendix 5.1**), where I repeat the five models reported in Panel B of **Table 5.11**, the firm-level PBT is disaggregated into *UK*, *Europe* and *ROW* components. It appears that the patterns of relative valuation of *UK* vs. *Europe* segments are qualitatively identical to the valuation of *UK* vs. *non-UK* segments. Across all samples and model specifications, the *UK* segment appears more valuable than the *Europe* segment. Furthermore, *Europe* and *ROW* operations seem to have identical valuation (Wald test for the difference of PEU and PROW is not statistically significant). The fact that the disaggregation of *non-UK* operations into *Europe* and *ROW* does not identify any differences between the two, explains why the explanatory power of models 1 through 5 in Panel A of **Table 5.12** and corresponding models in Panel B of **Table 5.11** are identical.

A potentially important caveat is in order. The models in **Table 5.12** Panel A are estimated for samples that might contain missing/non-reported *Europe* segmental earnings for some observations. In other words, all observations come from firms that are geographically diversified, yet not necessarily into the *Europe* region. Because the primary issue of interest is the relative valuation of *UK* vs. *Europe*, one might argue that tests shall only include those firm-years that simultaneously operate in both geographical locations: *UK* and *Europe*. Therefore, in Panel B of **Table 5.12** I replicate the 5 models reported in Panel A for the sub-samples of those firms that simultaneously report *UK* and *Europe* profits. There are, obviously, fewer firm-years in all new sub-samples. Thus the elimination of firm-years that do not specifically report *Europe* operations reduces the sub-samples of profit-making firms by a quarter and loss-making firms by a third.

The results of tests in Panel B are, however, identical to those of Panel A, which adds to the robustness of the previous conclusions regarding the higher valuation of domestic (UK) operations relative to *Europe* operations. Also confirmed is the previous finding that *EU* and *ROW* operations have identical valuations (as indicated by Wald tests). This explains why disaggregation of non-UK operations into *EU* and *ROW* does not improve the explanatory power of the regressions.

There is one puzzling result, which I find difficult to interpret: both in Panel A and Panel B the valuation of negative earnings reported from the *Europe* geographical location by profit-making firms is positively and often statistically significantly associated with firm value[84]. This effect, however, disappears in the total sample (that pools profit-making and loss-making firms) where valuation of negative *Europe* earnings becomes value irrelevant.

**5.3.3.3 Testing the valuation of UK vs America segments**

To identify any valuation divergence that might exist between the *UK* and *America* segment, the firm's earnings are disaggregated into the following geographical components: *UK* (PUK), *America* (PAMER), and *Rest of the World* (ROW). In other words, the non-UK earnings are now being disaggregated into earnings from *America* and the *Rest of the World.* In Panel A of **Table 5.13** (see **Appendix 5.1**) regressions are estimated for samples that might contain missing/non-reported American segmental earnings for some observations.

To test the sensitivity of inferences to the exclusion of firm-years that do not operate in *America,* I re-run all 5 regressions for firms that simultaneously operate in both *UK* and *America* segments (see Panel B of **Table 5.13**). The elimination of firm-years that do not specifically report operations from *America* reduces the sub-samples of profit-making firms by some 34% and loss-making firms by 38%. Regardless of the definition of samples (i.e., Panel A or Panel B), regression results unequivocally suggest that there exists a statistically significant (at least at the 5% level, according to the Wald test) valuation differential between the domestic (UK) and American operations. Domestic operations are always more valuable than operations from the region of *America.* Similar to the findings in sections 5.3.3.1 and 5.3.3.2, the value association of

[84] Additional testing (not reported) indicates that this result is likely to be driven by few largest losses reported from the *Europe* segment, which still remain in the sample after the elimination of outliers.

segment-level earnings depends on their sign: positive segmental earnings are positively and statistically significantly associated with firm value while negative segmental earnings tend to be value-irrelevant. In the previous section, where I compare the valuation of *UK* and *EU* segments, there was an anomalous finding of positive value association of segment-level losses when these are reported by loss-making firms. This result is also present in the current tests. What causes this effect remains unclear.

#### 5.3.3.4 Testing the valuation of UK vs. Asia segments

The aim of this section is to assess the relative valuations associated with the domestic (UK) and a generic segment that encompasses the entire geographical region of *Asia*. Similar to the tests that involved other specific foreign segments, this test disaggregates foreign earnings into earnings reported from the *Asia* segment and the *Rest of the World*. In Panel A of **Table 5.14** (see **Appendix 5.1**), regressions are estimated for samples of firms that report segment-disaggregated profits, but do not necessarily operate in *Asia*.

The examination of regression results reported in Panel A suggests that domestic operations are more valuable than those reported from the *Asia* segment. This valuation differential is similar to those already found in previous sections, with regards to such foreign locations as *Europe* and *America*. Also similar to findings reported in sections 5.3.3.1 through 5.3.3.3 is the value-irrelevance associated with negative segmental earnings and the anomalous negative valuation of positive segmental earnings reported by firms incurring losses on the corporate level. Nevertheless, results of Model 5 (Panel A), where loss and profit-making firms are pooled in one sample, still suggest that domestic operations have higher overall valuation than those of *Asia*.

The tests reported in Panel A shall be interpreted with caution, as there might be a caveat to using samples where not all included firm-years have operations in the *Asia* segment. Therefore, in Panel B of **Table 5.14** I repeat the Panel A's tests but restrict the samples only to include firm-years that specifically report the *Asia* segment, that is, these firms simultaneously operate in both the *UK* and *Asia* geographical areas. This reduces the size of sub-samples of profit-making firms by 68% and loss-making firms by 75%.

In models 1 through 3 of Panel B the value of *UK* segmental earnings coefficients are higher then those of *Asia*. These divergences, however, are not statistically significant (Wald test P-value is above the 10% level in all tests). This is, perhaps, due to the generally higher standard errors associated with the estimated segmental PBT coefficients (as compared to those reported in models of **Tables 5.11** through **5.13**), resulting in the Wald test failing to distinguish these segments' valuation. The general patterns of valuation of negative segmental earnings in profit-making firms and positive segmental earnings in loss-making firms is identical to those observed in sections 5.3.3.1 through 5.3.3.3.

#### 5.3.3.5 Testing the valuation of UK vs. Middle East & Asia segments

In this section I test the valuation divergence of domestic and *Middle East & Africa* by means of disaggregating the firm-level PBT into corresponding segmental components. The models in Panel A of **Table 5.15** (see **Appendix 5.1**) are estimated for samples that are not restricted to the firm-years with available earnings for the *Middle East & Africa* segment; while models in Panel B of **Table 5.15** are estimated for firm-years that specifically report earnings from that foreign geographical location.

In all models of Panel A, coefficients on earnings reported from the **Middle East and Africa** segment are not statistically significant, while those reported from the *UK* and *ROW* are segments positive and highly statistically significant. Unlike all previous tests, which dealt with such foreign segments as *Europe*, *America* and *Asia*, in the current tests positive earnings reported from the domestic segment no longer have higher valuation than earnings reported from the *ROW*.

Regression results are somewhat unexpected in the restricted samples – models 1 through 5 of Panel B – where none of the 'fundamental' valuation factors (BV and Dividend) and PBT's segmental components qualifies as value relevant at the 5% level of significance. This is despite the relatively high explanatory power and overall statistical significance of the regressions. Positive earnings reported from the domestic segment by profit-making firms are value relevant at only the 10% level of significance, while earnings from the *Middle East & Africa* segment have negative coefficient, albeit not significant statistically.

I further explore the lack of value-relevance of the basic value drivers by re-running all regressions without fixed effects and dummies. The explanatory power of the models now drops by about 20 to 25 percentage points but renders the BV and PBT coefficients – in the consolidated version of the model – statistically significant at least at the 5% level. Disaggregating the firm-level PBT into segmental components further increases the explanatory power by about 10 percentage points. Additionally, the earnings from the *UK* and *ROW* segments show positive and statistically significant association while value, while earnings from *Middle East & Africa* appear with a negative and statistically not significant coefficient.

A tentative conclusion might be that the inclusion of a large number of fixed effects and dummies 'overcontrols' the model and suppresses the association between the segment-level variables and firm value.

**5.3.3.6 Simultaneous tests of relative valuation of all geographical segments**

Sections 5.3.3.1 through 5.3.3.5 have examined the pair-wise valuation differentials between the domestic vs. a specific foreign segment. In the current section the firm-level PBT is disaggregated, within one model, into the segmental components from all five geographical regions. This approach has benefits and shortcomings. On the benefit side is the fact that it allows the comparison of all pair-wise combinations of segments' earnings coefficients, which are estimated within a single regression. Furthermore, this complete disaggregation is likely to generate more accurate (purged) earnings coefficients for a given segment, as all other segments are controlled for.

However, this approach might also have a problem. Strictly speaking, in order to conclude whether for a generic firm earnings coefficients from segment A are more/less valuable than those from segment B, all firm-years in the sample shall have both numbers available. In a hypothetical extreme cases, if the regression includes a cross-section of firms where none of the firm-years simultaneously operate in both segments, the divergence between these segments' earnings coefficient might prove statistically significant/insignificant but will have little economic meaning. That is, how can we conclude that operations in segment A are more valuable than those in segment B, if none of the firms in the sample operate in both segments simultaneously?

**Table 5.16** (see **Appendix 5.1**) reports results from four models with fully segment-disaggregated PBTs. Model 1 is estimated for profit-making firms without the fixed yearly and industry effects, while Model 2 is estimated with these fixed effects. Although in drawing valuation inferences I predominantly focus on the profit-making firms (Models 1 and 2), I also report Model 3 (without fixed effects) and Model 4 (with fixed effects), which are estimated for the entire sample in order to conclude on the sensitivity of results to the inclusion of loss-making firms.

In each of the four models, the Wald test is used to assess the level of statistical significance of differences between two segments' earnings coefficients. This involves applying Wald tests to ten pairs of segments (i.e., all possible paired combinations of segments):

- *UK* vs. *Europe*;
- *UK* vs. *America*;
- *UK* vs. *Asia*;
- *UK* vs. *Middle East & Africa*;
- *Europe* vs. *America*;
- *Europe* vs. *Asia*;
- *Europe* vs. *Middle East & Africa*;
- *America* vs. *Asia*;
- *America* vs. *Middle East & Africa*;
- *Asia* vs. *Middle East & Africa.*

The inclusion of fixed effects into the models does not, by and large, affect the inferences derived from Wald tests for at least 8 out of 10 pairs. In **Models 1** and **2** the Wald tests indicate that domestic operations are statistically more valuable than operations from *Europe*, *Asia* and *Middle East & Africa*. This agrees with the previous findings reported in sections 5.3.3.2, 5.3.3.4 and 5.3.3.5. However, in contrast to the findings in section 5.3.3.3, here the domestic and American operations have virtually identical valuation. Similar to the *UK* segment, operations in *America* have higher valuation than those from *Europe*, *Asia* and *Middle East & Africa*[85]. The valuation of *Europe* is statistically indistinguishable from that of *Asia*, while *Middle East & Africa* has the lowest valuation with respect to all other geographical regions. Moreover, earnings from the segment of *Middle East & Africa* are not statistically significant.

Conclusions from **Models 3** and **4** are broadly similar to those from Models 1 and 2. Foreign operations, (in model 4 this also relates to *America*) have lower valuation

[85] Although the coefficient on earnings reported from Asia is substantially smaller than that of America, the difference between the two is not statistically significant at the 10% level when the model is estimated with fixed effects.

than the domestic segment. In terms of relative valuation, *America* is next to the *UK*, as it has statistically higher earnings coefficient than *Europe* and *Middle East & Africa*. *America*'s earnings coefficient is also higher than that of *Asia*, yet this difference is not statistically significant. With respect to other segments, *Asia* and *Europe* are in the middle range of valuation, yet further examination of results might indicate that *Asia* is slightly higher valued than *Europe*. Models 3 and 4 provide further evidence of the lowest valuation of the *Middle East & Africa* geographical location. Not only has this segment the lowest valuation, but its earnings coefficients in models 3 and 4 are negative (and statistically significant at the 6% level), suggesting that operations in that segment might even destroy value.

Overall, the results obtained from both test designs (i.e., from models testing *UK* vs. a specific foreign segment, and from a model that simultaneously tests the valuation differences among all segments) lead to similar conclusions, and can be summarised as follows. The segmental operations reported from the *UK* and *America* geographic regions are in the top end of valuation; *Asia* and *UK* are in the middle range; and *Middle East & Africa* is at the bottom end of valuation.

### 5.3.4 Dynamics of relative value contribution associated with specific segments

The analyses in the various parts of section 5.3.3 were based on the assumption that the segments' differential valuation is persistent through time. In other words, segmental earnings coefficients were set to be constant throughout the entire sample period of 16 years. In chapter 3 I discuss factors that might determine segment-level earnings coefficients and instigate the market's differential valuation of earnings from specific geographical segments. Among the most important of these factors are the differences between the various geographical regions in terms of:

1. factors of risk associated with the political, economic and business environment, as perceived by the UK stock market;
2. expected rates of economic growth;
3. segments' risk-return characteristics;
4. expected changes in the regions' (foreign) currency/pound sterling exchange rates;
5. the perceived persistence of profits earned from a specific segment; and
6. differences in profit margins.

The valuation of earnings from a specific segment reflects the collective influence of the above factors. As characteristics of these factors vary across geographical locations, different segments will have different valuations. As in none of the geographical regions these factors are likely to have remained stable over the entire sample period, one would expect (1) the valuation of segment-level earnings per se, and (2) the earnings' valuation differential for different segments, to vary over time. The firm-level yearly analysis of chapter 4 reveals the time-related changing patterns of the key valuation factors. In the tests that follow I investigate the issue of the time-related changing nature of segment-level valuation by splitting the entire sample into variously defined economic sub-periods.

The decision about the periods' boundaries is discretionary. As a starting point I use the definition of economic periods used by Core *et al.* (2003) who split their sample into the pre-1996 period (the old economy) and post-1996 period (the new economy) and demonstrate empirically that the value association of different valuation factors has changed substantially over these two periods. However, because any categorisation of economic periods is bound to be discretionary, I also test an alternative time split[86], with

[86] Ideally, one would estimate a separate regression for each of the 16 years. However, splitting the segment-disclosing sample into 16 years produces inappropriately small yearly samples with insufficient number of data points for some of the segments.

roughly similar number of observations per period: pre-1994, 1994-1997, and 1998-2002.

Panel A and Panel B of **Table 5.17** (see **Appendix 5.1**) report results from the two-period time split and three-period splits respectively, and the Wald test is used to test the level of statistical significance of the divergence between any two segments' earnings coefficients.

In the **old** economic period (Models 1 and 3 of Panel A), earnings from the domestic (*UK*) segment and *America* appear to have statistically and economically indistinguishable valuation coefficients, which are, in turn, statistically higher (see Wald tests' P-values) than those of all remaining foreign geographical segments[87]. The next most valuable segments are *Asia* and *Europe.* The fact that *Asia*'s coefficients tend to exceed those of the *Europe* (yet this difference is not statistically significant) and falls short of that of *America* and *UK* only at a marginally statistically significant (4%) level, indicate that *Asia* might be somewhat higher up than *Europe* in the league of segments' valuation. Finally, the *Middle East & Africa* segment's earnings coefficients are not different from zero statistically and are statistically lower than all other segments' earnings coefficients. The order of relative valuation of geographical segments during the **old** economic period is, therefore, as follows:

Highest valuation: *America* and *UK*;

Medium valuation: *Asia* and *Europe*;

Lowest valuation: *Middle East & Africa.*

In terms of segment valuation, the **new** economic period (Models 2 and 4 of Panel A) differs from the old period in at least two respects:

1. the relative valuation of segments is substantially less distinguishable; and

[87] When the model does not include fixed effects (Model 1) America's earnings coefficient exceeds that of UK, yet this difference has neither statistical nor economical significance.

2. the regression estimated values of segmental earnings' coefficients have radically smaller values.

With regards to the first point, none of the Wald tests are significant at the 1% level; only one (three) out of ten tests in Model 2 (in Model 4) is significant at the 5% level; and only three out of ten tests in Model 2 and Model 4 are significant when the 10% level is used. It is the domestic (UK) location that is valued at a premium relative to all foreign regions. In Model 2, with no fixed effects, it is only the *UK* and *America* segments whose earnings coefficients are positive and statistically different from zero at the 1% level. In the Model 4, with yearly and industrial fixed effects, the UK earnings coefficient is still significant, but none of the foreign segments' earnings coefficients are statistically different from zero, even at the 10% level. In other words, the *UK* operations still remain the most valuable and value relevant.

With regard to the second point, it shall be noted that in the new economy period the segmental earnings coefficients are several times smaller than in the old economy, even when statistically different from zero. This conforms to patterns, reported in Chapter 4, of the time-related characteristics of firm-level earnings coefficients.

A thinner split of the sample period into **three** time periods (Models 1 though 3 of Panel B) indicates that the changes in relative valuation and value relevance of specific segments' earnings, as revealed from the preceding analysis, were taking place gradually. Thus in the **pre-1994** period, earnings reported from *America* clearly has the highest valuation as this segment's earnings coefficient is always larger, both statistically and economically, than those of other geographical segments. The *UK* coefficient has the next highest value, surpassing those of *Asia*, *Europe* and *Middle East & Africa*, yet statistically this difference is only significant for the latter two regions. The third-largest coefficient relates to *Asia*, but its valuation superiority is statistically significant only when compared to the *Middle East & Africa*. Finally, earnings from

*Middle East & Africa* appear to have the lowest valuation of all regions (in fact the coefficient is negative) and has virtually no association with the firm value.

In the **middle period** (1994-1997) it is the domestic segment that has the highest earnings coefficient, which is statistically larger than *America*'s, *Europe*'s, *Asia*'s and *Middle East & Africa*'s coefficients, at least at the 10%, 5%, 10% and 1% level, respectively. *America*'s earnings coefficient has the second-highest value, but its difference from the *Asia*'s and *Europe*'s coefficients is significant neither in economic nor statistical terms. Finally, the *Middle East & Africa* is the only value-irrelevant segment, which is similar to the result from the pre-1994 period.

The **post-1997 period** is the most peculiar in terms of segment-level earnings valuation. It appears that none of the segmental earnings are value-relevant in their own right and no differential valuation exists between the earnings reported from different geographical locations. Furthermore, of all key value drivers (book value, dividends and disaggregated earnings) included in the model, only dividends have statistically significant association with value. The unusually low explanatory power of the model might be a reflection of this fact[88].

Summarising the results obtained from the analysis of different periods, two conclusions might be drawn:

1. the disaggregation of firm-level earnings into geographical components has markedly different information content in different periods; and
2. the relative valuation of operations reported from specific geographical regions changes with time.

A conclusion of a more general nature is that apart from the time-related variability of segments' valuation, changes in other regression parameters are also obvious. Thus, (1) the explanatory power of the regressions steadily declined over the

[88] Further investigation of what causes the observed phenomenon of time-related deterioration in value relevance (or valuation role) of financial statement variables is beyond the scope of my research.

three economic periods; (2) the value association of such financial statement data as firm/segment-level earnings and book values declined over time; and (3) the value association of dividends evolved from being positive and highly statistically significant in the pre-1994 period, to value-irrelevant in the middle period (1994-1997), and, finally, to being negative and statistically significant for the post-1997 period.

## 5.4 ISSUES OF ROBUSTNESS AND SUMMARY OF RESULTS

The bulk of the empirical analysis in this chapter has been carried out by utilising the composite scale-deflated financial statement and market variables. In chapter 4 I argued that in light of the lack of consensus in the literature on what financial variable is the 'best' scale proxy, the use of a composite scale proxy offers a compromise. This is because the composite scale proxy, which encapsulates more than one single-variable scale proxy, diversifies away some of the problems which arise when a single-variable scale deflator is used for samples wherein firms differ across all dimensions. The analysis in chapter 4 has demonstrated empirically that (i) regression parameters are more stable to the definition and treatment of outliers, and (ii) the deflated financial and market variables have more close-to-normal distributions, when the composite scale proxy was used as a deflator. The stability of regression parameters (which is best achieved when the composite scale proxy is used) is of key importance in Chapter 5, because the differential valuation of specific geographic segments is identified by means of comparing the values of segments' PBT coefficients.

Nevertheless, to make the analysis complete and, perhaps, more comparable to other studies in this area, one might need to cross-check the sensitivity of the main results to the use of alternative deflators. This implies re-scaling of variables and repeating the main regressions/tests with the re-scaled variables. Group Total Assets, one year lagged equity Market Value and, finally, group Sales are chosen as alternative deflators. These results are reported in **Appendix 5.2** and are discussed, in brief, in the sections that follow[89].

By and large, the firm-level conclusions, which are based on general regression characteristics (or valuation properties of the models) are similar, regardless of the choice of the deflator (i.e., Composite scale proxy, Total Assets, one year lagged equity market value, and Sales). Across all deflators, the patterns of the time-related changes in the combined value relevance of financial statement information are qualitatively identical. Thus, the explanatory power of regressions that have been estimated over three different time periods (pre-1994, 1994-1997, and 1998-2002), and two different time periods (pre-1996, and 1996-2002), have a clear declining trend for all types of deflators (see **Table 5.16**, in **Appendix 5.1**, and **Tables 5.16S**, **5.16T** and **5.16M**, in **Appendix 5.2**).

The explanatory power of most of the TA and Sales-scaled regressions is notably higher than that of the corresponding lagged MV-scaled regressions. This result is not unexpected, bearing in mind that the lag MV-deflated model is a quasi return-earnings type of specification[90]. The composite deflated models have, on average, somewhat lower explanatory power than the corresponding TA and Sales deflated models, yet have substantially higher explanatory power than that of the lagged MV-deflated models.

In addition, in terms of the adjusted $R^2$, the relative performance of the models across differently partitioned samples are similar for all deflators. Across all deflators, the models explain more of the cross-sectional variation in equity market value when (i) firms trade at a discount to book value, (ii) firms pay dividends, (iii) when the reported

[89] The numbering of the tables in **Appendix 5.2** is identical to that of the corresponding tables in **Appendix 5.1**, but end with letters 'S', when the deflator is Sales, 'MV', when the deflator is lagged-MV, and 'TA', when the deflator is Total Assets.

[90] This has been discussed in more details in Chapter 4

PBTs are positive, and (iv) when observations relate to the first half of the sample period.

The valuation role (or value relevance) of key value drivers, in the context of the employed model, appears to be immune to the choice of deflator. In the profit-making samples, PBT is always positively and statistically significantly related to value, and appear to be the key value driver. Negative PBTs are, by and large, value irrelevant. Regardless of the deflator, when positive, the book value of equity is, usually, statistically significantly and positively associated with value in the loss-making sub-sample. In the profit-making samples this association is, frequently, negative and not statistically significant. Negative BV have no valuation relevance. Dividends are in positive and statistically significant association with the value of the domestic firms, but have no valuation role for geographically diversified firms. Furthermore, when the entire sample period is split into two or three sub-periods, across all alternatively deflated models, dividends have positive (negative) value association for the period(s) covering the early-1990s (late-1990s). Deflation by alternative scale proxies does not impact on such firm-level conclusions as:

- dividend paying firms are valued at a discount relative to none-paying firms
- firms that trade at a discount to equity book value have lower valuation relative to firms trading at a premium.

Finally, the segment-level valuation is found to be more sensitive to the choice of deflator. When the firm-level financial results are disaggregated into two broad segments, domestic and foreign, the domestic segment always comes out as more valuable, across all tested alternative deflators (see Models 2 and 5 in **Tables 5.10, 5.10M, 5.10T, 5.10S, of Appendix 5.2)**[91]. When these tests are repeated with the aggregate foreign operations being further split into specific regions, the *UK* operations

[91] In some tests, however, this difference is not statistically significant at the 5% level.

come out as the most valuable in the composite scale-deflated and the TA-deflated tests. In the majority of lagged MV-deflated tests the most valued regions are *America* and the *UK*. In the Sales-deflated tests the results are less conclusive (see Models 3 and 6 in **Tables 5.10, 5.10M, 5.10T, 5.10S)**[92].

Similar deflation-related low stability of segments' relative valuation can be found, when the segments' valuation differential is tested over different economic periods (see **Tables 5.17, 5.17M, 5.17T, 5.17S**).

By and large, the deflation-related instability of segments' relative valuation can be attributed to several factors. Firstly, because the number of missing values is different for different scale proxies, the resulting deflated samples are not identical in terms of size.

Secondly, outliers are identified and eliminated by applying the 0.5% cut-off rule to all scale-deflated firm and segment-level variables, included in the regression. This, in aggregate, eliminates about 3% of a sample. However, the 3% of observations, which are treated as outliers in, for instance, the Sales-deflated sample, are not the same observations as the 3% of outlier observations in the TA-deflated sample. In other words, differently deflated samples are not entirely identical in terms of the included observations.

Finally, the firm-level and, to a greater extent, segment-level regression parameters in Sales and lagged MV-deflated models are substantially more sensitive to the choice of outliers' cut-off percentage than the results from the composite-scale deflated model. Results from the composite-scale deflated tests become sufficiently robust after the elimination of less than 0.5% of the top and bottom values of each of the regression variables. To achieve a similar robustness for the single-variable deflated regressions, at least the 1% or higher cut off rule should be applied.

[92] In some tests, however, this difference is not statistically significant at the 5% level.

I consider (i) the robustness of the results to the treatment of outliers, and (ii) the importance to limit the loss of observations, as sufficient reasons for relying on the results from the composite-deflated models when drawing conclusions (see below) about segments' relative valuation and value implication of geographic diversification.

## 5.5 CONCLUSIONS

Results indicate that, overall, geographically diversified firms are valued at a premium in relation to domestic firms. Similar to the findings by Garrod and Rees (1998), I find that investors attach significantly higher multiples to earnings reported by diversified firms. This result persists both for the 'old' and 'new' economic periods. At the same time, a significantly higher and positive capitalisation of dividends is observed for domestic firms, while dividends appear neutral for the valuation of diversified firms.

On the segmental level, when all foreign operations are amalgamated in one generic foreign segment and compared with the domestic (UK) segment, the UK-based operations appear the most valuable. When the generic foreign segment is disaggregated into specific foreign segments, the *UK* operations no longer dominate segment valuation.

During the early economic periods (pre-1994 or pre-1996) segmental profits from *America* have the highest capitalisation, followed by the domestic (UK) segment. However, during a more recent economic period (1994-1997) the *UK* segment is associated with the highest contribution to firm value. In the most recent economic period (1998-2002) the earnings information reported from most of the foreign segments appear value-irrelevant. Throughout all periods segmental operations (i.e., profits) from the *Middle East & Africa* are associated with the lowest valuation and, sometimes have negative association with the firm value. This time-related change in the relative valuation of segments' operations possibly reflects the changing economic prospects of different regions of the world.

In addition, one can observe some sort of association between the valuation of a specific geographic segment and the degree of popularity of that geographical region as an investment location for UK firms. Thus, *Middle East and Africa* is found to be the least contributing to the value of the firm segment and it is the most rare investment location for the UK multi-segment firms. *Asia* is the region with the next-lowest relative segmental valuation and popularity as investment location. Among foreign segments *America* and *Europe* are associated with the higher value contribution and are more 'popular' locations of foreign investments by UK multinationals[93].

By and large, empirical tests reported throughout the chapter suggest that segment-level accounting data communicates value relevant information, which is often incremental to the consolidated-level data.

[93] This might be a result of firms being aware of the market's favorable/unfavorable valuation of specific geographical segments and aligning their foreign investment decisions accordingly. It might also be possible that firms simply chose not to disclose (whenever possible) segments which are perceived by the market as value reducing.

APPENDIX 5. 1

**All regressions reported in Appendix 5.1 are deflated by the composite scale factor. Composite scale factor (scale) = (MV+TA+Sale)/3.**

**All regressions reported in Appendix 5.1 and 5.2 are estimated for samples that exclude the outliers. Outliers are defined as the top and/or bottom 0.5% of each variable included in regression.**

**In the tables that follow the following names or acronyms have been used to represent regression variable**

| Name used in regression | Variable description |
|---|---|
| BV | Scale-deflated Book value of ordinary equity |
| PBT | Scale-deflated Profit Before Tax |
| MV | Scale-deflated Market Value of ordinary equity |
| DIV | Scale-deflated Dividends for ordinary shareholders |
| TA | Total Assets of the company |
| Sales | Group turnover |
| Adj.ER | Adjustment term = earnings for ordinary shareholders -- PBT |
| Scale | Composite scale factor = (MV+TA+Sales)/3 |
| 1/Scale; 1/MV; 1/Sale; and 1/TA | Are the reciprocals of Scale, one year lagged-MV, Sales, and TA, respectively. |
| PBT*f(size) | An instrumental variable designed to capture firm size-related non-linearity of the PBT coefficient. PBT*f(size proxy)=PBT*size^(0.2). |
| PUK | Scale-deflated PBT reported form UK segment |
| PNUK | Scale-deflated PBT reported form non-UK segment |
| PAMER | Scale-deflated PBT reported form America segment |
| PEU | Scale-deflated PBT reported form Europe segment |
| PAFR | Scale-deflated PBT reported form Mid.East&Africa segment |
| PASIA | Scale-deflated PBT reported form Asia segment |
| PREST | The difference between the group-level PBT and the sum of segment-level PBTs |
| PROW | PBT of rest of the world (depending on the context of the test) |
| DBV | Interaction term for BV, when PBT is negative |
| DDIV | Interaction term for DIV, when PBT is negative |
| DPBT | Interaction term for negative PBT |
| DAdj.ER | Interaction term for Adj.ER, when PBT is negative |
| DPBT*F(size) | Interaction term for DPBT*f(size), when PBT is negative |
| DPUK | Interaction term for negative PUK |
| DPNUK | Interaction term for negative PNUK |
| DPAMER | Interaction term for negative PAMER |

| | |
|---|---|
| DPEU | Interaction term for negative PEU |
| DPAFR | Interaction term for negative PAFR |
| DPASIA | Interaction term for negative PASIA |
| DPREST | Interaction term for negative PREST |
| DPROW | Interaction term for negative PROW |
| 1/Scale dummy | Interaction term for 1/scale, when PBT is negative |
| NEGMV | Dummy variable: NEGMV=1 if MV<BV, otherwise NEGMV=0. |
| NEGMVPBT | Dummy variable: NEGPBTMV=1 if MV<BV and PBT<0, otherwise NEGPBTMV=0. |
| DUMDIV | Dummy variable: DUMDIV=1 if the firm pays dividends, otherwise DUMDIV=0. |

## Table 5.8

| | | div. and non-div. firms | | only dividend firms | |
|---|---|---|---|---|---|
| | | Definition1* | Definition2* | Definition1* | Definition2* |
| | | Model1 | Model2 | Model3 | Model4 |
| Intercept | | 0.734 | 0.702 | 0.700 | 0.699 |
| | t-ratio | 38.686 | 28.918 | 37.041 | 28.840 |
| | P-value | 0.000 | 0.000 | 0.000 | 0.000 |
| 1/Scale | | 107.9 | 745.7 | -433.6 | -239.0 |
| | t-ratio | 0.843 | 3.550 | -3.802 | -0.872 |
| | P-value | 0.399 | 0.000 | 0.000 | 0.383 |
| BV | | -0.221 | -0.175 | -0.344 | -0.307 |
| | t-ratio | -8.386 | -5.146 | -13.854 | -9.846 |
| | P-value | 0.000 | 0.000 • | 0.000 | 0.000 |
| PBT | | 3.276 | 3.034 | 3.816 | 3.641 |
| | t-ratio | 16.289 | 11.446 | 21.497 | 14.458 |
| | P-value | 0.000 | 0.000 | 0.000 | 0.000 |
| PBT*f(Scale) | | 0.022 | 0.042 | 0.005 | 0.025 |
| | t-ratio | 1.887 | 3.062 | 0.397 | 1.781 |
| | P-value | 0.059 | 0.002 | 0.691 | 0.075 |
| DIV | | -0.277 | -0.070 | 2.123 | 1.357 |
| | t-ratio | -0.644 | -0.127 | 4.635 | 2.335 |
| | P-value | 0.519 | 0.899 | 0.000 | 0.020 |
| Adj.ER | | 0.667 | 0.648 | 1.114 | 1.159 |
| | t-ratio | 1.790 | 1.510 | 5.899 | 5.312 |
| | P-value | 0.074 | 0.131 | 0.000 | 0.000 |
| Adj.R-Square | | 11.6% | 11.6% | 18.4% | 17.0% |
| No.of cases | | 7522 | 4466 | 6882 | 4140 |

| | Only dividend firms | | |
|---|---|---|---|
| | Model 5 | | |
| | Coeff. | t-ratio | P-value |
| Intercept | 0.717 | 23.051 | 0.000 |
| D** | -0.019 | -0.477 | 0.633 |
| 1/Scale | -551.9 | -3.809 | 0.000 |
| D 1/Scale | 312.9 | 1.009 | 0.313 |
| BV | -0.404 | -9.963 | 0.000 |
| DBV** | 0.097 | 1.897 | 0.058 |
| PBT | 4.100 | 13.348 | 0.000 |
| DPBT** | -0.459 | -1.156 | 0.248 |
| PBT*f(Scale) | -0.047 | -1.854 | 0.064 |
| DPBT*f(Scale) | 0.073 | 2.486 | 0.013 |
| DIV | 3.176 | 4.263 | 0.000 |
| DDIV** | -1.819 | -1.925 | 0.054 |
| Adj.ER | 1.052 | 2.562 | 0.010 |
| Dadj.ER** | 0.107 | 0.229 | 0.819 |
| Adj.R-Square | 18.5% | | |
| No. of cases | 6882 | | |

All models are estimated for samples that exclude the loss-reporting firm-years. White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported below or next to each regression coefficient.

* Definition1 = when the firms is considered geographically diversified if at least one of the three accounting items (PBT, Sales, or NA) is reported for a foreign segment. Definition2 = when the firm is considered geographically diversified only when the segmental PBT is reported for a foreign segment.

Model 5 is estimated with dummy variable and interaction terms to test for differential valuation of the Definition 2 firms.

** If firm belongs to Definition 2, then D=1, D 1/TA =1/TA, DBV=BV, DPBT=PBT, DPBT*f(Scale)=PBT*f(Scale), DDIV=DIV, DAdj.ER=Adj.ER; otherwise, if firm does not belong to Definition 2, then D=0, D 1/TA =0, DBV=0, DPBT=0, DPBT*f(S)=0, DDIV=0, DAdj.ER=0.

## Table 5.9

| | Total sample | | | | | |
|---|---|---|---|---|---|---|
| | Diversified firms | | | | Domestic firms | |
| | Definition1* | | Definition2* | | | |
| | dividend and non-dividend firms | only dividend firms | dividend and non-dividend firms* | only dividend firms* | dividend and non-dividend firms | only dividend firms |
| | model 1 | model 2 | model 3 | model 4 | model 5 | model 6 |
| Intercept | 0.715 | 0.684 | 0.692 | 0.680 | 0.562 | 0.505 |
| *t-ratio* | *44.846* | *41.069* | *33.767* | *31.694* | *40.231* | *36.580* |
| *P-value* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* |
| dummy 1 | 0.307 | -0.175 | 0.274 | -0.220 | 0.351 | -0.099 |
| *t-ratio* | *8.603* | *-3.994* | *5.779* | *-4.012* | *10.265* | *-2.661* |
| *P-value* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.008* |
| dummy 2 | -0.504 | -0.432 | -0.485 | -0.427 | -0.514 | -0.453 |
| *t-ratio* | *-48.677* | *-39.663* | *-33.794* | *-27.609* | *-55.453* | *-48.806* |
| *P-value* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* |
| dummy 3 | -0.654 | -0.666 | -0.610 | -0.682 | -0.543 | -0.564 |
| *t-ratio* | *-21.593* | *-18.282* | *-14.700* | *-15.211* | *-18.724* | *-21.572* |
| *P-value* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* |
| 1/scale | 297.3 | -46.5 | 706.7 | 22.4 | 122.0 | 46.9 |
| *t-ratio* | *2.828* | *-0.464* | *4.062* | *0.101* | *1.730* | *0.606* |
| *P-value* | *0.005* | *0.642* | *0.000* | *0.920* | *0.084* | *0.545* |
| 1/scale dummy | 97.7 | 227.7 | -137.7 | 135.6 | 226.1 | 891.4 |
| *t-ratio* | *0.632* | *0.850* | *-0.590* | *0.314* | *2.586* | *4.858* |
| *P-value* | *0.528* | *0.395* | *0.555* | *0.754* | *0.010* | *0.000* |
| BV | 0.135 | -0.001 | 0.132 | 0.007 | 0.452 | 0.284 |
| *t-ratio* | *5.457* | *-0.020* | *4.097* | *0.195* | *24.238* | *14.674* |
| *P-value* | *0.000* | *0.984* | *0.000* | *0.845* | *0.000* | *0.000* |
| DBV | 0.539 | 0.527 | 0.533 | 0.528 | 0.070 | 0.276 |
| *t-ratio* | *12.873* | *8.499* | *9.747* | *6.654* | *1.751* | *5.617* |
| *P-value* | *0.000* | *0.000* | *0.000* | *0.000* | *0.080* | *0.000* |
| PBT | 2.350 | 2.758 | 2.274 | 2.705 | 2.044 | 2.441 |
| *t-ratio* | *14.101* | *16.108* | *10.053* | *11.337* | *12.390* | *14.595* |
| *P-value* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* |
| DPBT | -2.515 | -2.937 | -2.518 | -2.896 | -2.305 | -2.095 |
| *t-ratio* | *-13.417* | *-14.814* | *-10.124* | *-10.450* | *-11.791* | *-3.854* |
| *P-value* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* |
| PBT*f(scale) | 0.067 | 0.053 | 0.085 | 0.068 | -0.030 | -0.022 |
| *t-ratio* | *5.641* | *4.491* | *5.904* | *4.560* | *-2.370* | *-1.789* |
| *P-value* | *0.000* | *0.000* | *0.000* | *0.000* | *0.018* | *0.074* |
| DPBT*(scale) | -0.022 | -0.043 | -0.032 | -0.056 | 0.083 | -0.028 |
| *t-ratio* | *-1.332* | *-2.688* | *-1.586* | *-2.443* | *4.187* | *-0.420* |
| *P-value* | *0.183* | *0.007* | *0.113* | *0.015* | *0.000* | *0.675* |
| DIV | -1.151 | 0.789 | -1.355 | -0.053 | 1.737 | 4.291 |
| *t-ratio* | *-2.934* | *1.825* | *-2.709* | *-0.097* | *4.255* | *9.748* |
| *P-value* | *0.003* | *0.068* | *0.007* | *0.923* | *0.000* | *0.000* |
| DIV dummy | -12.414 | 1.007 | -10.475 | 3.660 | -12.158 | -1.114 |
| *t-ratio* | *-11.592* | *0.902* | *-7.849* | *2.516* | *-10.567* | *-1.078* |
| *P-value* | *0.000* | *0.367* | *0.000* | *0.012* | *0.000* | *0.281* |
| Adj.ER | 0.865 | 0.920 | 0.986 | 0.966 | -0.032 | 0.237 |
| *t-ratio* | *5.598* | *5.598* | *5.349* | *5.045* | *-0.530* | *1.801* |
| *P-value* | *0.000* | *0.000* | *0.000* | *0.000* | *0.596* | *0.072* |
| dAdj.ER | -0.535 | -0.744 | -0.769 | -0.764 | 0.184 | -0.087 |
| *t-ratio* | *-2.332* | *-3.412* | *-3.161* | *-3.118* | *1.175* | *-0.593* |
| *P-value* | *0.020* | *0.001* | *0.002* | *0.002* | *0.240* | *0.553* |
| No. of cases | 9539 | 7474 | 5496 | 4500 | 8638 | 6833 |
| Adj.R-Square | 29.60% | 32.58% | 28.32% | 30.35% | 31.05% | 36.36% |

**Table 5.9 (continued from the previous page...)**

| | Profit firms only | | | | Loss firms only | |
|---|---|---|---|---|---|---|
| | diversified firms | | domestic firms | | Diversified | domestic |
| | dividend and non-dividend firms | only dividend firms | dividend and non-dividend firms | only dividend firms | dividend firms | dividend firms |
| | model 7 | model 8 | model 9 | model 10 | model 11 | model 12 |
| Intercept | 0.715 | 0.684 | 0.562 | 0.505 | 0.509 | 0.406 |
| *t-ratio* | 44.846 | *41.069* | *40.231* | *36.580* | *12.537* | *11.725* |
| *P-value* | 0.000 | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* |
| dummy 2 | -0.504 | -0.432 | -0.514 | -0.453 | | |
| *t-ratio* | -48.677 | *-39.663* | *-55.453* | *-48.806* | | |
| *P-value* | 0.000 | *0.000* | *0.000* | *0.000* | | |
| dummy 3 | | | | | -0.491 | -0.465 |
| *t-ratio* | | | | | *-22.173* | *-16.046* |
| *P-value* | | | | | *0.000* | *0.000* |
| 1/scale | 297.3 | -46.5 | 135.7 | 47.0 | 181.1 | 930.0 |
| *t-ratio* | 2.828 | *-0.464* | *1.827* | *0.607* | *0.730* | *5.592* |
| *P-value* | 0.005 | *0.642* | *0.068* | *0.544* | *0.466* | *0.000* |
| BV | 0.135 | -0.001 | 0.382 | 0.283 | 0.526 | 0.567 |
| *t-ratio* | 5.457 | *-0.020* | *20.034* | *14.477* | *9.418* | *11.814* |
| *P-value* | 0.000 | *0.984* | *0.000* | *0.000* | *0.000* | *0.000* |
| PBT | 2.350 | 2.758 | 2.161 | 2.443 | -0.179 | 0.349 |
| *t-ratio* | 14.101 | *16.108* | *12.997* | *14.589* | *-1.787* | *0.674* |
| *P-value* | 0.000 | *0.000* | *0.000* | *0.000* | *0.074* | *0.501* |
| PBT*f(scale) | 0.067 | 0.053 | -0.024 | -0.022 | 0.009 | -0.049 |
| *t-ratio* | 5.641 | *4.491* | *-1.896* | *-1.782* | *0.848* | *-0.761* |
| *P-value* | 0.000 | *0.000* | *0.058* | *0.075* | *0.397* | *0.447* |
| DIV | -1.151 | 0.789 | 1.998 | 4.296 | 1.796 | 3.101 |
| *t-ratio* | -2.934 | *1.825* | *4.868* | *9.742* | *1.744* | *3.066* |
| *P-value* | 0.003 | *0.068* | *0.000* | *0.000* | *0.081* | *0.002* |
| Adj.ER | 0.865 | 0.920 | -0.016 | 0.238 | 0.176 | 0.155 |
| *t-ratio* | 5.598 | *5.598* | *-0.251* | *1.806* | *1.229* | *2.326* |
| *P-value* | 0.000 | *0.000* | *0.802* | *0.071* | *0.219* | *0.021* |
| No. of cases | 7296 | 6737 | 6917 | 6409 | 737 | 424 |
| Adj.R-Square | 26.42% | 28.93% | 30.70% | 33.53% | 31.08% | 48.72% |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported below each regression coefficient.
dummy 1 = 1 if PBT<0 & MV>BV; and dummy1 = 0 otherwise
dummy 2 = 1 if PBT>0 & MV<BV; and dummy2 = 0 otherwise
dummy 3 = 1 if PBT<0 & MV<BV; and dummy3 = 0 otherwise
* Definition1 = when the firms is considered geographically diversified if at least one of the three accounting items (PBT, Sales, or NA) is reported for a foreign segment. Definition2 = when the firm is considered geographically diversified only when the segmental PBT is reported for a foreign segment.

## Table 5.10

### Panel A: Profit-making firms

| | Dividend paying and nonpaying firms | | | | | | | | | Dividend firms only | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Consolidated level | | | Intermediate disaggregation | | | Fine disaggregation | | | Consolidated level | | | Intermediate disaggregation | | | Fine disaggregation | | |
| | Model 1 | | | Model 2 | | | Model 3 | | | Model 4 | | | Model 5 | | | Model 6 | | |
| | Coeff. | t-ratio | pvalue | Coeff. | t-ratio | pvalue | Coeff. | t-ratio | pvalue | Coeff. | t-ratio | pvalue | Coeff. | t-ratio | pvalue | Coeff. | t-ratio | pvalue |
| Intercept | 0.674 | 30.251 | 0.000 | 0.672 | 27.287 | 0.000 | 0.677 | 26.925 | 0.000 | 0.669 | 28.862 | 0.000 | 0.665 | 26.121 | 0.000 | 0.669 | 25.764 | 0.000 |
| NEGMV | -0.462 | -30.18 | 0.000 | -0.449 | -29.12 | 0.000 | -0.434 | -27.80 | 0.000 | -0.410 | -25.54 | 0.000 | -0.396 | -24.31 | 0.000 | -0.380 | -23.32 | 0.000 |
| 1/Scale | 640.4 | 3.168 | 0.002 | 526.3 | 2.625 | 0.009 | 580.9 | 2.865 | 0.004 | -349.7 | -1.567 | 0.117 | -282.2 | -1.287 | 0.198 | -265.6 | -1.213 | 0.225 |
| BV** | 0.109 | 3.065 | 0.002 | 0.104 | 2.938 | 0.003 | 0.114 | 3.175 | 0.002 | 0.003 | 0.078 | 0.938 | 0.003 | 0.085 | 0.932 | 0.017 | 0.432 | 0.666 |
| PBT | 2.697 | 10.926 | 0.000 | | | | | | | 3.096 | 12.031 | 0.000 | | | | | | |
| PUK | | | | 2.842 | 12.380 | 0.000 | 2.893 | 12.589 | 0.000 | | | | 3.201 | 13.800 | 0.000 | 3.265 | 13.997 | 0.000 |
| DPUK | | | | -5.803 | -4.433 | 0.000 | -6.061 | -4.697 | 0.000 | | | | -1.541 | -1.316 | 0.188 | -1.743 | -1.502 | 0.133 |
| PNUK | | | | 2.102 | 7.905 | 0.000 | | | | | | | 2.388 | 8.830 | 0.000 | | | |
| DPNUK | | | | -4.262 | -2.860 | 0.004 | | | | | | | -1.079 | -1.122 | 0.262 | | | |
| PEU | | | | | | | 1.753 | 4.546 | 0.000 | | | | | | | 2.147 | 5.534 | 0.000 |
| DPEU | | | | | | | 1.753 | 1.250 | 0.211 | | | | | | | 2.339 | 1.414 | 0.157 |
| PAMER | | | | | | | 2.792 | 8.814 | 0.000 | | | | | | | 3.080 | 9.648 | 0.000 |
| DPAMER | | | | | | | -6.666 | -4.329 | 0.000 | | | | | | | -2.613 | -1.564 | 0.118 |
| PASIA | | | | | | | 1.466 | 3.289 | 0.001 | | | | | | | 1.982 | 4.094 | 0.000 |
| DPASIA | | | | | | | -2.091 | -0.991 | 0.322 | | | | | | | -3.361 | -1.458 | 0.145 |
| PAFR | | | | | | | -0.506 | -0.810 | 0.418 | | | | | | | -1.006 | -1.718 | 0.086 |
| DPAFR | | | | | | | 18.015 | 2.505 | 0.012 | | | | | | | 16.579 | 0.999 | 0.318 |
| PREST | | | | 3.799 | 11.514 | 0.000 | 4.078 | 12.746 | 0.000 | | | | 3.795 | 10.760 | 0.000 | 4.116 | 12.163 | 0.000 |
| PBT*f(Scale) | 0.063 | 3.984 | 0.000 | 0.096 | 7.046 | 0.000 | 0.091 | 6.628 | 0.000 | 0.042 | 2.550 | 0.011 | 0.082 | 5.923 | 0.000 | 0.076 | 5.401 | 0.000 |
| DIV | -1.331 | -2.481 | 0.013 | -1.504 | -2.878 | 0.004 | -1.727 | -3.215 | 0.001 | -0.087 | -0.150 | 0.881 | -0.435 | -0.751 | 0.453 | -0.699 | -1.178 | 0.239 |
| Adj.ER | 0.880 | 4.543 | 0.000 | 0.682 | 3.477 | 0.001 | 0.618 | 3.038 | 0.002 | 0.870 | 4.409 | 0.000 | 0.594 | 3.216 | 0.001 | 0.523 | 2.763 | 0.006 |
| No.of cases | 3800 | | | 3800 | | | 3795 | | | 3575 | | | 3575 | | | 3570 | | |
| Adj.R-Square | 25.4% | | | 27.1% | | | 27.7% | | | 26.4% | | | 27.7% | | | 28.3% | | |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported next to regression coefficients.

* PREST does not have dummy because all values are negative

** Negative BVs are set to zero.

**Panel B: Loss-making firms**

| | Dividend non-paying firms | | | | | | | | | Dividend firms only | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Consolidated level | | | Intermediate disaggregation | | | Fine disaggregation | | | Consolidated level | | | Intermediate disaggregation | | | Fine disaggregation | | |
| | Model 7 | | | Model 8 | | | Model 9 | | | Model 10 | | | Model 11 | | | Model 12 | | |
| | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value |
| Intercept | 1.060 | 18.226 | 0.000 | 1.187 | 19.150 | 0.000 | 1.226 | 19.470 | 0.000 | 0.481 | 8.850 | 0.000 | 0.495 | 8.069 | 0.000 | 0.488 | 7.890 | 0.000 |
| NEGMVPBT | -1.057 | -26.86 | 0.000 | -0.995 | -24.58 | 0.000 | -0.987 | -24.06 | 0.000 | -0.449 | -14.9 | 0.000 | -0.446 | -14.73 | 0.000 | -0.440 | -14.3 | 0.000 |
| 1/Scale | 675.5 | 4.881 | 0.000 | 627.8 | 4.410 | 0.000 | 522.5 | 3.931 | 0.000 | -154.5 | -0.40 | 0.687 | -177.4 | -0.438 | 0.661 | -97.7 | -0.24 | 0.807 |
| BV** | 0.688 | 11.484 | 0.000 | 0.597 | 9.163 | 0.000 | 0.568 | 8.738 | 0.000 | 0.502 | 6.594 | 0.000 | 0.476 | 5.988 | 0.000 | 0.476 | 5.930 | 0.000 |
| PBT | -0.067 | -0.474 | 0.636 | | | | | | | 0.250 | 0.845 | 0.399 | | | | | | |
| PUK | | | | -3.001 | -3.440 | 0.001 | -3.102 | -3.541 | 0.000 | | | | 0.418 | 0.625 | 0.532 | 0.322 | 0.472 | 0.637 |
| DPUK | | | | 2.954 | 3.440 | 0.001 | 3.066 | 3.582 | 0.000 | | | | -0.227 | -0.349 | 0.727 | -0.142 | -0.21 | 0.830 |
| PNUK | | | | -5.861 | -4.727 | 0.000 | | | | | | | 0.437 | 0.601 | 0.548 | | | |
| DPNUK | | | | 6.413 | 5.018 | 0.000 | | | | | | | -0.325 | -0.377 | 0.707 | | | |
| PEU | | | | | | | -12.65 | -5.316 | 0.000 | | | | | | | 0.320 | 0.297 | 0.767 |
| DPEU | | | | | | | 13.870 | 5.757 | 0.000 | | | | | | | 0.328 | 0.286 | 0.775 |
| PAMER | | | | | | | -4.843 | -3.186 | 0.001 | | | | | | | 0.061 | 0.071 | 0.944 |
| DPAMER | | | | | | | 4.832 | 3.110 | 0.002 | | | | | | | -0.116 | -0.11 | 0.912 |
| PASIA | | | | | | | -1.852 | -1.401 | 0.161 | | | | | | | 2.444 | 1.319 | 0.188 |
| DPASIA | | | | | | | 2.861 | 1.968 | 0.049 | | | | | | | -5.930 | -1.19 | 0.234 |
| PAFR | | | | | | | -5.924 | -2.342 | 0.019 | | | | | | | -6.534 | -2.98 | 0.003 |
| DPAFR | | | | | | | 1.143 | 0.340 | 0.734 | | | | | | | -9.606 | -0.37 | 0.708 |
| PREST | | | | 0.349 | 1.440 | 0.150 | 0.289 | 1.118 | 0.263 | | | | 0.527 | 1.914 | 0.056 | 0.486 | 1.735 | 0.084 |
| PBT*f(Scale) | 0.045 | 2.540 | 0.011 | 0.016 | 0.973 | 0.330 | 0.020 | 1.146 | 0.252 | -0.018 | -0.66 | 0.509 | -0.025 | -0.949 | 0.343 | -0.023 | -0.84 | 0.408 |
| DIV | | | | | | | | | | 3.536 | 2.494 | 0.013 | 3.710 | 2.617 | 0.009 | 3.945 | 2.760 | 0.006 |
| Adj.ER | 0.168 | 1.088 | 0.277 | 0.243 | 1.608 | 0.108 | 0.234 | 1.555 | 0.120 | 0.110 | 0.467 | 0.641 | 0.118 | 0.512 | 0.609 | 0.146 | 0.609 | 0.543 |
| No.of cases | 573 | | | 573 | | | 573 | | | 383 | | | 383 | | | 383 | | |
| Adj.R-Square | 30.0% | | | 35.5% | | | 36.7% | | | 31.8% | | | 31.7% | | | 31.5% | | |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported next to regression coefficients.
* PREST does not have dummy because all values are negative. ** Negative BVs are set to zero.

Table 5.11

**Panel A: testing for valuation effects when dummies and fixed effects are gradually added in the regression**

**Profit-making firms**

| | Model 1 | | | Model 2 | | | Model 3 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value |
| **Intercept** | 0.663 | 28.397 | 0.000 | 0.671 | 29.988 | 0.000 | 0.792 | 19.666 | 0.000 |
| **NEGMV** | | | | -0.461 | -30.147 | 0.000 | -0.458 | -30.193 | 0.000 |
| **DUMDIV** | | | | | | | -0.147 | -3.828 | 0.000 |
| **1/Scale** | 676.5 | 2.950 | 0.003 | 642.5 | 3.183 | 0.001 | 443.5 | 2.049 | 0.041 |
| **BV**** | -0.217 | -6.495 | 0.000 | 0.112 | 3.170 | 0.002 | 0.095 | 2.694 | 0.007 |
| **PBT** | 3.059 | 11.687 | 0.000 | 2.730 | 10.975 | 0.000 | 2.729 | 10.943 | 0.000 |
| **PBT*f(Scale)** | 0.078 | 4.838 | 0.000 | 0.062 | 3.901 | 0.000 | 0.060 | 3.759 | 0.000 |
| **DIV** | 0.113 | 0.201 | 0.840 | -1.346 | -2.508 | 0.012 | -0.237 | -0.409 | 0.683 |
| **Adj.ER** | 1.005 | 4.492 | 0.000 | 0.880 | 4.542 | 0.000 | 0.870 | 4.496 | 0.000 |
| **No.of cases** | 3795 | | | 3795 | | | 3795 | | |
| **Adj.R-square** | 15.94% | | | 25.32% | | | 25.79% | | |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported next to regression coefficients.

**Table 5.11 Panel A (continued from the previous page...)**

| | Model 4 | | | Model 5 | | |
|---|---|---|---|---|---|---|
| | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value |
| Intercept | 0.629 | 9.946 | 0.000 | 0.298 | 2.279 | 0.023 |
| NEGMV | -0.432 | -29.336 | 0.000 | -0.414 | -26.073 | 0.000 |
| DUMDIV | -0.104 | -2.683 | 0.007 | -0.093 | -2.401 | 0.016 |
| SIC1 | 0.311 | 5.243 | 0.000 | 0.308 | 4.951 | 0.000 |
| SIC2 | -0.142 | -2.890 | 0.004 | -0.147 | -2.811 | 0.005 |
| SIC3 | 0.109 | 2.353 | 0.019 | 0.104 | 2.108 | 0.035 |
| SIC4 | 0.098 | 2.149 | 0.032 | 0.087 | 1.782 | 0.075 |
| SIC5 | 0.080 | 1.623 | 0.104 | 0.060 | 1.148 | 0.251 |
| SIC6 | 0.063 | 1.302 | 0.193 | 0.050 | 0.974 | 0.330 |
| SIC7 | 0.100 | 2.064 | 0.039 | 0.086 | 1.658 | 0.097 |
| SIC8 | -0.006 | -0.088 | 0.930 | -0.017 | -0.246 | 0.806 |
| SIC9 | 0.279 | 5.855 | 0.000 | 0.266 | 5.257 | 0.000 |
| Y2 | | | | 0.102 | 1.205 | 0.228 |
| Y3 | | | | 0.035 | 0.865 | 0.387 |
| Y4 | | | | 0.021 | 0.750 | 0.454 |
| Y5 | | | | 0.050 | 2.199 | 0.028 |
| Y6 | | | | 0.048 | 2.552 | 0.011 |
| Y7 | | | | 0.053 | 3.269 | 0.001 |
| Y8 | | | | 0.043 | 3.022 | 0.003 |
| Y9 | | | | 0.032 | 2.579 | 0.010 |
| Y10 | | | | 0.035 | 3.081 | 0.002 |
| Y11 | | | | 0.031 | 2.947 | 0.003 |
| Y12 | | | | 0.027 | 2.833 | 0.005 |
| Y13 | | | | 0.027 | 3.092 | 0.002 |
| Y14 | | | | 0.026 | 3.120 | 0.002 |
| Y15 | | | | 0.020 | 2.562 | 0.010 |
| Y16 | | | | 0.020 | 2.793 | 0.005 |
| 1/Scale | 311.6 | 1.431 | 0.152 | 357.3 | 1.708 | 0.088 |
| BV** | 0.064 | 1.817 | 0.069 | 0.061 | 1.753 | 0.080 |
| PBT | 2.400 | 9.573 | 0.000 | 2.511 | 9.992 | 0.000 |
| PBT*f(scale) | 0.074 | 4.420 | 0.000 | 0.078 | 4.692 | 0.000 |
| DIV | 0.664 | 1.164 | 0.244 | 0.707 | 1.231 | 0.218 |
| Adj.ER | 0.934 | 4.911 | 0.000 | 0.777 | 3.856 | 0.000 |
| No.of cases | 3795 | | | 3795 | | |
| Adj.R-square | 30.01% | | | 32.37% | | |

All models are estimated for samples that include dividend paying and non-dividend firms. White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported next to regression coefficients. Model 1 is the most basic specification. Model 2 includes the NEGMV dummy variable: NEGMV=1 if MV<BV, and NEGMV=0, otherwise. Model 3 includes an additional dummy variable DUMDIV: DUMDIV=1 if firm pays dividends, and DUMDIV=0, otherwise.

SIC1 through SIC9 are the industry dummy variables. A give industry dummy takes the value of 1, if the firm's principal operations belong to that industry, and zero, otherwise. Y2 through Y16 are the yearly dummy variable, corresponding to one of the 16 sample-period years. A given year dummy takes the value of 1 for observations related to that year, and zero otherwise.

Model 4 is estimated with industry fixed effects. Model 5 includes both industry and yearly fixed effects.

** Negative BVs are set to zero.

## Panel B: Tests of the pricing of UK vs. non-UK segment

| | Profit firms | | | | | | | | | Loss firms | | | Total sample | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dividend & non-dividend firms | | | | | | Dividend firms only | | | Dividend & non-dividend firms | | | Dividend & non-dividend firms | | |
| | Model 1* | | | Model 2 | | | Model 3 | | | Model4 | | | Model 5 | | |
| | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value |
| Intercept | 0.399 | 2.981 | 0.003 | 0.367 | 2.759 | 0.006 | 0.264 | 2.046 | 0.041 | 0.713 | 7.843 | 0.000 | 0.691 | 6.086 | 0.000 |
| NEGMV | -0.399 | -25.17 | 0.000 | -0.399 | -25.091 | 0.000 | -0.355 | -20.873 | 0.000 | | | | -0.431 | -27.93 | 0.000 |
| DUMDIV | -0.132 | -3.410 | 0.001 | -0.108 | -2.900 | 0.004 | | | | -0.265 | -5.662 | 0.000 | -0.205 | -6.945 | 0.000 |
| NEGPBT | | | | | | | | | | | | | 0.044 | 0.825 | 0.409 |
| NEGMVPBT | | | | | | | | | | -0.658 | -21.265 | 0.000 | -0.699 | -13.48 | 0.000 |
| 1/Scale | 333.9 | 1.600 | 0.110 | 226.2 | 1.089 | 0.276 | -429.7 | -1.927 | 0.054 | 736.4 | 5.364 | 0.000 | 33.8 | 0.140 | 0.888 |
| D 1/Scale | | | | | | | | | | | | | 564.8 | 1.998 | 0.046 |
| BV*** | 0.046 | 1.315 | 0.188 | 0.046 | 1.304 | 0.192 | -0.014 | -0.377 | 0.706 | 0.366 | 6.018 | 0.000 | 0.051 | 1.480 | 0.139 |
| DBV | | | | | | | | | | | | | 0.430 | 6.800 | 0.000 |
| PUK | 2.389 | 9.953 | 0.000 | 2.688 | 11.718 | 0.000 | 3.093 | 13.352 | 0.000 | -2.230 | -3.934 | 0.000 | 1.756 | 6.992 | 0.000 |
| DPUK | | | | -4.463 | -3.453 | 0.001 | -1.127 | -1.093 | 0.275 | 2.227 | 4.011 | 0.000 | -2.061 | -8.792 | 0.000 |
| PNUK | 1.610 | 5.206 | 0.000 | 1.816 | 6.293 | 0.000 | 2.226 | 7.620 | 0.000 | -4.458 | -6.113 | 0.000 | 0.928 | 2.965 | 0.003 |
| DPNUK | | | | -2.536 | -1.742 | 0.081 | 0.395 | 0.410 | 0.682 | 5.114 | 6.592 | 0.000 | -0.822 | -2.431 | 0.015 |
| PREST | 3.974 | 11.469 | 0.000 | 4.021 | 11.867 | 0.000 | 3.867 | 10.814 | 0.000 | 0.325 | 1.828 | 0.068 | 4.029 | 11.359 | 0.000 |
| DPREST** | | | | | | | | | | | | | -3.648 | -11.62 | 0.000 |
| PBT*f(Scale) | 0.110 | 7.088 | 0.000 | 0.107 | 7.181 | 0.000 | 0.096 | 6.352 | 0.000 | 0.015 | 1.145 | 0.252 | 0.041 | 2.441 | 0.015 |
| DIV | 0.675 | 1.174 | 0.240 | 0.486 | 0.847 | 0.397 | 0.386 | 0.668 | 0.504 | 2.460 | 1.546 | 0.122 | 3.165 | 5.509 | 0.000 |
| DDIV | | | | | | | | | | | | | -7.109 | -5.132 | 0.000 |
| ADJER | 0.497 | 2.536 | 0.011 | 0.587 | 2.990 | 0.003 | 0.522 | 2.741 | 0.006 | 0.152 | 1.257 | 0.209 | 0.035 | 0.150 | 0.881 |
| DADJER | | | | | | | | | | | | | 0.226 | 0.788 | 0.431 |
| No. of cases | 3795 | | | 3795 | | | 3570 | | | 956 | | | 4751 | | |
| Adj R-Square | 33.82% | | | 34.27% | | | 35.30% | | | 47.10% | | | 34.39% | | |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported next to regression coefficients
* In this model no account is taken of possible differential valuation of segment-level losses.
**dprest = prest if firm-level PBT<0, and =0 otherwise.
*** Negative BVs are set to zero.
All models are estimated with (ten) industrial and (fifteen) yearly fixed effects, which are omitted from the tables for brevity.

## Table 5.12 Tests of the pricing of UK vs. Europe segment

### Panel A: samples include observations with missing PBT Europe

| | Profit firms | | | | | | | | | Loss firms | | | Total sample | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dividend & non-dividend firms | | | | | | Dividend firms only | | | Dividend & non-dividend firms | | | Dividend & non-dividend firms | | |
| | Model 1* | | | Model 2 | | | Model 3 | | | Model4 | | | Model 5 | | |
| | Coeff. | t-ratio | pvalue | Coeff. | t-ratio | pvalue | Coeff. | t-ratio | pvalue | Coeff. | t-ratio | pvalue | Coeff. | t-ratio | pvalue |
| Intercept | 0.468 | 5.760 | 0.000 | 0.446 | 5.526 | 0.000 | 0.372 | 5.018 | 0.000 | 0.694 | 7.769 | 0.000 | 0.690 | 9.183 | 0.000 |
| NEGMV | -0.409 | -25.555 | 0.000 | -0.410 | -25.579 | 0.000 | -0.362 | -21.286 | 0.000 | | | | -0.460 | -29.58 | 0.000 |
| DUMDIV | -0.101 | -2.618 | 0.009 | -0.082 | -2.168 | 0.030 | | | | -0.248 | -5.292 | 0.000 | -0.188 | -6.273 | 0.000 |
| NEGPBT | | | | | | | | | | | | | 0.117 | 2.240 | 0.025 |
| NEGMVPBT | | | | | | | | | | -0.658 | -21.54 | 0.000 | -0.619 | -12.13 | 0.000 |
| 1/Scale | 375.0 | 1.760 | 0.078 | 310.1 | 1.492 | 0.136 | -431.3 | -1.886 | 0.059 | 707.6 | 5.531 | 0.000 | 146.4 | 0.615 | 0.539 |
| D 1/Scale | | | | | | | | | | | | | 395.0 | 1.380 | 0.168 |
| BV** | 0.045 | 1.261 | 0.207 | 0.043 | 1.206 | 0.228 | -0.023 | -0.616 | 0.538 | 0.366 | 6.060 | 0.000 | 0.076 | 2.191 | 0.028 |
| DBV | | | | | | | | | | | | | 0.400 | 6.403 | 0.000 |
| PUK | 2.554 | 9.794 | 0.000 | 2.685 | 10.216 | 0.000 | 3.210 | 11.934 | 0.000 | -2.243 | -3.910 | 0.000 | 1.169 | 4.075 | 0.000 |
| DPUK | | | | -3.390 | -2.474 | 0.013 | -0.053 | -0.051 | 0.959 | 2.283 | 4.074 | 0.000 | -1.467 | -6.150 | 0.000 |
| PEU | 1.647 | 3.937 | 0.000 | 1.414 | 3.263 | 0.001 | 2.115 | 4.824 | 0.000 | -7.033 | -5.862 | 0.000 | -0.201 | -0.465 | 0.642 |
| DPEU | | | | 3.175 | 2.210 | 0.027 | 3.192 | 1.954 | 0.051 | 8.436 | 6.815 | 0.000 | 1.157 | 2.580 | 0.010 |
| PROW | 1.742 | 5.143 | 0.000 | 1.842 | 5.441 | 0.000 | 2.325 | 6.663 | 0.000 | -3.695 | -4.660 | 0.000 | 0.306 | 0.819 | 0.413 |
| DPROW | | | | -3.982 | -3.719 | 0.000 | -1.622 | -1.372 | 0.170 | 3.989 | 4.647 | 0.000 | -0.560 | -1.372 | 0.170 |
| PREST | 2.418 | 7.501 | 0.000 | 2.279 | 7.120 | 0.000 | 2.276 | 6.890 | 0.000 | 0.358 | 1.978 | 0.048 | 0.511 | 1.055 | 0.292 |
| DPREST | | | | | | | | | | | | | -0.069 | -0.152 | 0.879 |
| PBT*f(Scale) | 0.094 | 5.339 | 0.000 | 0.097 | 5.528 | 0.000 | 0.083 | 4.626 | 0.000 | 0.012 | 0.975 | 0.330 | 0.046 | 2.146 | 0.032 |
| DIV | 0.622 | 1.073 | 0.283 | 0.517 | 0.893 | 0.372 | 0.323 | 0.553 | 0.581 | 2.137 | 1.333 | 0.183 | 3.785 | 6.477 | 0.000 |
| DDIV | | | | | | | | | | | | | -7.744 | -5.552 | 0.000 |
| Adj,ER | 0.705 | 3.238 | 0.001 | 0.759 | 3.534 | 0.000 | 0.700 | 3.294 | 0.001 | 0.125 | 1.133 | 0.257 | -0.130 | -0.454 | 0.650 |
| DAdj,ER | | | | | | | | | | | | | 0.362 | 1.120 | 0.263 |
| No. of cases | 3795 | | | 3795 | | | 3570 | | | 956 | | | 4751 | | |
| Adj.R-Square | 32.7% | | | 33.1% | | | 34.3% | | | 47.8% | | | 33.0% | | |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported next to regression coefficients
* In this model no account is taken of possible differential valuation of segment-level losses.
** Negative BVs are set to zero.

## Panel B: Samples exclude observations with missing PBT Europe

| | Profit firms | | | | | | | | | Loss firms | | | Total sample | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dividend & non-dividend firms | | | | | | Dividend firms only | | | Dividend & non-dividend firms | | | Dividend & non-dividend firms | | |
| | Model 1* | | | Model 2 | | | Model 3 | | | Model4 | | | Model 5 | | |
| | Coeff. | t-ratio | pvalue | Coeff. | t-ratio | pvalue | Coeff. | t-ratio | pvalue | Coeff. | t-ratio | pvalue | Coeff. | t-ratio | pvalue |
| Intercept | 0.045 | 0.322 | 0.748 | 0.023 | 0.165 | 0.869 | -0.024 | -0.194 | 0.846 | 4.740 | 0.961 | 0.000 | 0.643 | 4.864 | 0.000 |
| NEGMV | -0.366 | -17.913 | 0.000 | -0.365 | -17.922 | 0.000 | -0.318 | -15.410 | 0.000 | | | | -0.403 | -20.67 | 0.000 |
| DUMDIV | -0.067 | -1.295 | 0.195 | -0.048 | -0.967 | 0.334 | | | | -0.207 | -3.721 | 0.000 | -0.147 | -3.963 | 0.000 |
| NEGPBT | | | | | | | | | | | | | -0.001 | -0.014 | 0.989 |
| NEGMVPBT | | | | | | | | | | -0.557 | -16.02 | 0.000 | -0.654 | -11.05 | 0.000 |
| 1/Scale | -429.0 | -1.833 | 0.067 | -469.8 | -2.073 | 0.038 | -565.1 | -2.198 | 0.028 | 108.9 | 0.742 | 0.458 | -736.5 | -3.238 | 0.001 |
| D 1/Scale | | | | | | | | | | | | | 684.8 | 2.198 | 0.028 |
| BV** | 0.030 | 0.678 | 0.498 | 0.026 | 0.596 | 0.551 | -0.088 | -1.897 | 0.058 | 0.413 | 5.015 | 0.000 | 0.014 | 0.314 | 0.754 |
| DBV | | | | | | | | | | | | | 0.534 | 6.037 | 0.000 |
| PUK | 2.540 | 7.931 | 0.000 | 2.708 | 8.397 | 0.000 | 3.032 | 9.218 | 0.000 | -2.466 | -4.037 | 0.000 | 1.829 | 5.105 | 0.000 |
| DPUK | | | | -3.989 | -2.428 | 0.015 | -0.262 | -0.207 | 0.836 | 2.594 | 4.188 | 0.000 | -2.025 | -6.706 | 0.000 |
| PEU | 1.871 | 4.087 | 0.000 | 1.628 | 3.378 | 0.001 | 2.025 | 4.191 | 0.000 | -6.071 | -4.995 | 0.000 | 0.835 | 1.796 | 0.073 |
| DPEU | | | | 1.881 | 1.471 | 0.141 | 2.397 | 1.673 | 0.094 | 6.825 | 5.491 | 0.000 | -0.424 | -0.885 | 0.376 |
| PROW | 1.785 | 3.867 | 0.000 | 1.820 | 3.898 | 0.000 | 1.994 | 4.218 | 0.000 | -2.319 | -2.336 | 0.020 | 1.319 | 2.593 | 0.010 |
| DPROW | | | | -1.487 | -1.069 | 0.285 | -1.034 | -0.681 | 0.496 | 2.218 | 2.082 | 0.037 | -1.722 | -3.253 | 0.001 |
| PREST | 1.874 | 4.982 | 0.000 | 1.744 | 4.504 | 0.000 | 1.504 | 3.775 | 0.000 | 0.104 | 0.580 | 0.562 | 2.012 | 5.204 | 0.000 |
| DPREST | | | | | | | | | | | | | -1.842 | -6.109 | 0.000 |
| PBT*f(scale) | 0.118 | 5.958 | 0.000 | 0.121 | 6.099 | 0.000 | 0.126 | 6.265 | 0.000 | 0.017 | 1.311 | 0.190 | 0.040 | 1.889 | 0.059 |
| DIV | 0.528 | 0.780 | 0.435 | 0.397 | 0.587 | 0.557 | 0.377 | 0.550 | 0.582 | 3.379 | 1.805 | 0.071 | 3.181 | 4.758 | 0.000 |
| DDIV | | | | | | | | | | | | | -6.042 | -3.585 | 0.000 |
| Adj.ER | 0.440 | 1.853 | 0.064 | 0.471 | 1.960 | 0.050 | 0.550 | 2.286 | 0.022 | 0.011 | 0.061 | 0.951 | -0.129 | -0.483 | 0.629 |
| DAdj.ER | | | | | | | | | | | | | 0.405 | 1.160 | 0.246 |
| No.of cases | 2845 | | | 2845 | | | 2710 | | | 614 | | | 3459 | | |
| Adj.R-Square | 31.7% | | | 32.0% | | | 33.9% | | | 42.1% | | | 30.2% | | |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported next to regression coefficients.

* In this model no account is taken of possible differential valuation of segment-level losses.

** Negative BVs are set to zero

## Table 5.13 Tests of the pricing of UK vs. America segment

### Panel A: Samples include observations with missing PBT America

| | Profit firms | | | | | | | | | Loss firms | | | Total sample | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dividend & non-dividend firms | | | | | | Dividend firms only | | | Dividend & non-dividend firms | | | Dividend & non-dividend firms | | |
| | Model 1* | | | Model 2 | | | Model 3 | | | Model4 | | | Model 5 | | |
| | Coeff. | t-ratio | pvalue | Coeff. | t-ratio | pvalue | Coeff. | t-ratio | pvalue | Coeff. | t-ratio | pvalue | Coeff. | t-ratio | pvalue |
| Intercept | 0.488 | 5.974 | 0.000 | 0.481 | 5.895 | 0.000 | 0.403 | 5.393 | 0.000 | 0.714 | 8.025 | 0.000 | 0.702 | 9.520 | 0.000 |
| NEGMV | -0.409 | -25.69 | 0.000 | -0.410 | -25.69 | 0.000 | -0.361 | -21.34 | 0.000 | | | | -0.440 | -28.64 | 0.000 |
| DUMDIV | -0.103 | -2.649 | 0.008 | -0.083 | -2.209 | 0.027 | | | | -0.252 | -5.378 | 0.000 | -0.188 | -6.388 | 0.000 |
| NEGPBT | | | | | | | | | | | | | 0.076 | 1.450 | 0.147 |
| NEGMVPBT | | | | | | | | | | -0.655 | -21.48 | 0.000 | -0.666 | -13.09 | 0.000 |
| 1/Scale | 378.5 | 1.773 | 0.076 | 330.9 | 1.602 | 0.109 | -397.8 | -1.732 | 0.083 | 688.6 | 5.186 | 0.000 | 127.9 | 0.549 | 0.583 |
| D 1/Scale | | | | | | | | | | | | | 452.7 | 1.631 | 0.103 |
| BV** | 0.047 | 1.331 | 0.183 | 0.048 | 1.361 | 0.173 | -0.020 | -0.528 | 0.598 | 0.368 | 6.072 | 0.000 | 0.050 | 1.432 | 0.152 |
| DBV | | | | | | | | | | | | | 0.445 | 7.021 | 0.000 |
| PUK | 2.569 | 9.848 | 0.000 | 2.693 | 10.240 | 0.000 | 3.214 | 11.969 | 0.000 | -2.312 | -3.999 | 0.000 | 1.698 | 6.089 | 0.000 |
| DPUK | | | | -3.470 | -2.508 | 0.012 | -0.129 | -0.125 | 0.900 | 2.308 | 4.070 | 0.000 | -1.970 | -8.000 | 0.000 |
| PAMER | 2.027 | 5.409 | 0.000 | 2.175 | 5.789 | 0.000 | 2.658 | 7.006 | 0.000 | -3.532 | -4.188 | 0.000 | 1.157 | 2.827 | 0.005 |
| DPAMER | | | | -3.751 | -3.024 | 0.002 | -0.642 | -0.474 | 0.635 | 3.627 | 4.020 | 0.000 | -1.508 | -3.349 | 0.001 |
| PROW | 1.462 | 4.154 | 0.000 | 1.264 | 3.534 | 0.000 | 1.848 | 4.995 | 0.000 | -5.430 | -5.514 | 0.000 | 0.283 | 0.810 | 0.418 |
| DPROW | | | | 2.889 | 2.283 | 0.022 | 2.988 | 2.149 | 0.032 | 6.719 | 6.497 | 0.000 | 0.612 | 1.628 | 0.104 |
| PREST | 2.462 | 7.616 | 0.000 | 2.315 | 7.205 | 0.000 | 2.316 | 7.014 | 0.000 | 0.315 | 1.745 | 0.081 | 2.273 | 7.027 | 0.000 |
| DPREST | | | | | | | | | | | | | -1.879 | -6.729 | 0.000 |
| PBT*f(scale) | 0.091 | 5.204 | 0.000 | 0.094 | 5.391 | 0.000 | 0.081 | 4.496 | 0.000 | 0.017 | 1.287 | 0.198 | 0.037 | 2.091 | 0.036 |
| DIV | 0.566 | 0.985 | 0.324 | 0.446 | 0.779 | 0.436 | 0.270 | 0.468 | 0.640 | 1.879 | 1.185 | 0.236 | 3.161 | 5.534 | 0.000 |
| DDIV | | | | | | | | | | | | | -7.753 | -5.617 | 0.000 |
| ADJER | 0.692 | 3.156 | 0.002 | 0.728 | 3.343 | 0.001 | 0.676 | 3.155 | 0.002 | 0.124 | 1.072 | 0.284 | 0.192 | 0.719 | 0.472 |
| DAdj,ER | | | | | | | | | | | | | 0.058 | 0.186 | 0.853 |
| No.of cases | 3795 | | | 3795 | | | 3570 | | | 956 | | | 4751 | | |
| Adj.R-Square | 32.76% | | | 33.15% | | | 34.36% | | | 47.75% | | | 33.95% | | |
| 1.Wald-test (p-value) | 0.042 | | | 0.051 | | | 0.036 | | | 0.223 | | | 0.050 | | |
| 1. Wald-test (p-value) | 0.087 | | | 0.006 | | | 0.016 | | | 0.121 | | | 0.011 | | |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported next to regression coefficients.

* In this model no account is taken of possible differential valuation of segment-level losses.

** Negative BVs are set to zero

**Panel B samples exclude observations with missing PBT America**

| | Profit firms | | | | | | | | | Loss firms | | | Total sample | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dividend & non-dividend firms | | | | | | Dividend firms only | | | Dividend & non-dividend firms | | | Dividend & non-dividend firms | | |
| | Model 1* | | | Model 2 | | | Model 3 | | | Model4 | | | Model 5 | | |
| | Coeff. | t-ratio | pvalue | Coeff. | t-ratio | pvalue | Coeff. | t-ratio | pvalue | Coeff. | t-ratio | pvalue | Coeff. | t-ratio | pvalue |
| Intercept | 0.471 | 5.108 | 0.000 | 0.474 | 5.162 | 0.000 | 0.303 | 4.455 | 0.000 | 1.625 | 15.824 | 0.000 | 0.747 | 8.415 | 0.000 |
| NEGMV | -0.406 | -19.68 | 0.000 | -0.407 | -19.697 | 0.000 | -0.359 | -16.696 | 0.000 | | | | -0.442 | -21.69 | 0.000 |
| DUMDIV | -0.143 | -2.446 | 0.014 | -0.133 | -2.305 | 0.021 | | | | -0.305 | -4.751 | 0.000 | -0.240 | -5.727 | 0.000 |
| NEGPBT | | | | | | | | | | | | | 0.124 | 1.814 | 0.070 |
| NEGMVPBT | | | | | | | | | | -0.645 | -15.093 | 0.000 | -0.633 | -8.933 | 0.000 |
| 1/Scale | 871.6 | 2.841 | 0.004 | 864.1 | 2.795 | 0.005 | -168.2 | -0.305 | 0.760 | 519.9 | 3.144 | 0.002 | 633.2 | 1.852 | 0.064 |
| D 1/Scale | | | | | | | | | | | | | -225.5 | -0.575 | 0.565 |
| BV** | -0.017 | -0.387 | 0.699 | -0.020 | -0.446 | 0.656 | -0.067 | -1.469 | 0.142 | 0.222 | 2.711 | 0.007 | -0.003 | -0.068 | 0.945 |
| DBV | | | | | | | | | | | | | 0.389 | 4.542 | 0.000 |
| PUK | 3.054 | 9.243 | 0.000 | 3.057 | 9.203 | 0.000 | 3.663 | 10.281 | 0.000 | -2.759 | -3.869 | 0.000 | 1.772 | 4.866 | 0.000 |
| DPUK | | | | -1.544 | -0.634 | 0.526 | 1.298 | 0.927 | 0.354 | 2.606 | 3.711 | 0.000 | -2.181 | -6.743 | 0.000 |
| PAMER | 1.991 | 4.686 | 0.000 | 2.032 | 4.693 | 0.000 | 2.733 | 6.092 | 0.000 | -4.834 | -4.813 | 0.000 | 0.416 | 0.842 | 0.400 |
| DPAMER | | | | -1.542 | -1.085 | 0.278 | 1.061 | 0.742 | 0.458 | 5.469 | 5.025 | 0.000 | -0.241 | -0.452 | 0.651 |
| PROW | 2.318 | 4.966 | 0.000 | 2.122 | 4.405 | 0.000 | 2.629 | 5.243 | 0.000 | -4.154 | -3.243 | 0.001 | 1.104 | 2.274 | 0.023 |
| DPROW | | | | 2.830 | 1.673 | 0.094 | 2.608 | 1.468 | 0.142 | 4.771 | 3.246 | 0.001 | -0.214 | -0.300 | 0.764 |
| PREST | 2.833 | 6.697 | 0.000 | 2.747 | 6.456 | 0.000 | 2.801 | 6.326 | 0.000 | 0.427 | 1.766 | 0.077 | 2.269 | 5.226 | 0.000 |
| DPREST | | | | | | | | | | | | | -1.707 | -4.556 | 0.000 |
| PBT*f(scale) | 0.066 | 3.190 | 0.001 | 0.069 | 3.312 | 0.001 | 0.052 | 2.329 | 0.020 | 0.018 | 1.116 | 0.264 | 0.034 | 1.489 | 0.136 |
| DIV | | | | 0.051 | 0.067 | 0.946 | -0.341 | -0.445 | 0.656 | 1.544 | 0.758 | 0.449 | 2.929 | 3.921 | 0.000 |
| DDIV | 0.062 | 0.082 | 0.935 | | | | | | | | | | -8.147 | -4.622 | 0.000 |
| Adj,ER | 0.812 | 3.331 | 0.001 | 0.824 | 3.352 | 0.001 | 0.657 | 2.571 | 0.010 | 0.453 | 1.184 | 0.236 | 0.357 | 1.204 | 0.229 |
| DAdj,ER | | | | | | | | | | | | | 0.601 | 1.168 | 0.243 |
| No.of cases | 2497 | | | 2497 | | | 2389 | | | 591 | | | 3088 | | |
| Adj.R-Square | 35.00% | | | 35.05% | | | 36.04% | | | 50.21% | | | 36.44% | | |
| 1.Wald-test (p-value) | 0.001 | | | 0.001 | | | 0.004 | | | 0.091 | | | 0.000 | | |
| 1. Wald-test (p-value) | 0.423 | | | 0.833 | | | 0.809 | | | 0.673 | | | 0.117 | | |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported next to regression coefficients.

* In this model no account is taken of possible differential valuation of segment-level losses.

** Negative BVs are set to zero

## Table 5.14 Tests of the pricing of UK vs. Asia segment

### Panel A: Samples include observations with missing PBT Asia

| | Profit firms | | | | | | | | | Loss firms | | | Total sample | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dividend & non-dividend firms | | | | | | Dividend firms only | | | Dividend & non-dividend firms | | | Dividend & non-dividend firms | | |
| | Model 1* | | | Model 2 | | | Model 3 | | | Model4 | | | Model 5 | | |
| | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value |
| Intercept | 0.471 | 5.776 | 0.000 | 0.455 | 5.604 | 0.000 | 0.369 | 5.011 | 0.000 | 0.717 | 8.000 | 0.000 | 0.673 | 9.126 | 0.000 |
| NEGMV | -0.409 | -25.644 | 0.000 | -0.410 | -25.593 | 0.000 | -0.360 | -21.252 | 0.000 | | | | -0.441 | -28.57 | 0.000 |
| DUMDIV | -0.101 | -2.612 | 0.009 | -0.084 | -2.225 | 0.026 | | | | | | | -0.187 | -6.331 | 0.000 |
| NEGPBT | | | | | | | | | | -0.270 | -5.750 | 0.000 | 0.080 | 1.501 | 0.133 |
| NEGMVPBT | | | | | | | | | | -0.657 | -21.25 | 0.000 | -0.667 | -13.05 | 0.000 |
| 1/scale | 374.1 | 1.753 | 0.080 | 317.1 | 1.519 | 0.129 | -432.8 | -1.893 | 0.058 | 739.7 | 5.399 | 0.000 | 109.0 | 0.460 | 0.645 |
| D 1/scale | | | | | | | | | | | | | 507.9 | 1.799 | 0.072 |
| BV** | 0.046 | 1.281 | 0.200 | 0.048 | 1.335 | 0.182 | -0.020 | -0.548 | 0.584 | 0.360 | 5.885 | 0.000 | 0.048 | 1.377 | 0.168 |
| DBV | | | | | | | | | | | | | 0.438 | 6.879 | 0.000 |
| PUK | 2.554 | 9.792 | 0.000 | 2.682 | 10.187 | 0.000 | 3.223 | 12.007 | 0.000 | -2.232 | -3.902 | 0.000 | 1.703 | 6.059 | 0.000 |
| DPUK | | | | -3.315 | -2.383 | 0.017 | -0.039 | -0.038 | 0.970 | 2.224 | 3.987 | 0.000 | -1.998 | -8.125 | 0.000 |
| PASIA | 1.638 | 3.493 | 0.000 | 1.597 | 3.446 | 0.001 | 2.330 | 4.612 | 0.000 | -2.322 | -1.615 | 0.106 | 0.803 | 1.683 | 0.092 |
| DPASIA | | | | -1.799 | -0.950 | 0.342 | -3.334 | -1.500 | 0.134 | 3.253 | 2.076 | 0.038 | -0.262 | -0.385 | 0.700 |
| PROW | 1.722 | 5.175 | 0.000 | 1.736 | 5.149 | 0.000 | 2.258 | 6.593 | 0.000 | -4.876 | -6.441 | 0.000 | 0.725 | 2.045 | 0.041 |
| DPROW | | | | -1.059 | -0.828 | 0.408 | 1.416 | 1.460 | 0.144 | 5.462 | 6.831 | 0.000 | -0.603 | -1.666 | 0.096 |
| PREST | 2.414 | 7.500 | 0.000 | 2.274 | 7.085 | 0.000 | 2.265 | 6.877 | 0.000 | 0.288 | 1.586 | 0.113 | 2.232 | 6.836 | 0.000 |
| DPREST | | | | | | | | | | | | | -1.863 | -6.697 | 0.000 |
| PBT*f(scale) | 0.094 | 5.380 | 0.000 | 0.098 | 5.634 | 0.000 | 0.084 | 4.688 | 0.000 | 0.018 | 1.304 | 0.192 | 0.039 | 2.143 | 0.032 |
| DIV | 0.599 | 1.025 | 0.305 | 0.468 | 0.802 | 0.423 | 0.297 | 0.505 | 0.614 | 2.672 | 1.673 | 0.094 | 3.241 | 5.581 | 0.000 |
| DDIV | | | | | | | | | | | | | -7.648 | -5.518 | 0.000 |
| Adj.ER | 0.701 | 3.205 | 0.001 | 0.744 | 3.442 | 0.001 | 0.696 | 3.262 | 0.001 | 0.161 | 1.291 | 0.197 | 0.224 | 0.869 | 0.385 |
| DAdj.ER | | | | | | | | | | | | | 0.041 | 0.134 | 0.893 |
| No.of cases | 3795 | | | 3795 | | | 3570 | | | 956 | | | 4751 | | |
| Adj.R-Square | 32.71% | | | 32.89% | | | 34.25% | | | 47.16% | | | 33.66% | | |
| 1.Wald-test (p-value) | 0.02 | | | 0.0058 | | | 0.0357 | | | 0.9523 | | | 0.0269 | | |
| 1. Wald-test (p-value) | 0.8435 | | | 0.7411 | | | 0.8743 | | | 0.1033 | | | 0.8596 | | |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported next to regression coefficients. * In this model no account is taken of possible differential valuation of segment-level losses. ** Negative BVs are set to zero.

**Panel B: Samples exclude observations with missing PBT Asia**

| | Profit firms | | | | | | | | | Loss firms | | | Total sample | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dividend & non-dividend firms | | | | | | Dividend firms only | | | Dividend & non-dividend firms | | | Dividend & non-dividend firms | | |
| | Model 1* | | | Model 2 | | | Model 3 | | | Model4 | | | Model 5 | | |
| | Coeff. | t-ratio | pvalue | Coeff. | t-ratio | pvalue | Coeff. | t-ratio | pvalue | Coeff. | t-ratio | pvalue | Coeff. | t-ratio | pvalue |
| Intercept | 0.457 | 4.267 | 0.000 | 0.446 | 4.135 | 0.000 | 0.432 | 4.921 | 0.000 | 0.478 | 6.045 | 0.000 | 0.555 | 6.173 | 0.000 |
| NEGMV | -0.482 | -16.394 | 0.000 | -0.484 | -16.346 | 0.000 | -0.467 | -15.004 | 0.000 | -0.140 | -1.795 | 0.074 | -0.499 | -17.45 | 0.000 |
| DUMDIV | -0.007 | -0.103 | 0.918 | 0.003 | 0.039 | 0.969 | | | | -0.616 | -12.31 | 0.000 | -0.075 | -1.456 | 0.145 |
| NEGPBT | | | | | | | | | | | | | -0.020 | -0.220 | 0.826 |
| NEGMVPBT | | | | | | | | | | | | | -0.673 | -8.445 | 0.000 |
| 1/scale | -860.5 | -1.844 | 0.065 | -939.4 | -2.036 | 0.042 | -721.8 | -1.663 | 0.096 | 1349.9 | 4.715 | 0.000 | -964.9 | -2.159 | 0.031 |
| D 1/scale | | | | | | | | | | | | | 2151.8 | 4.097 | 0.000 |
| BV | 0.084 | 1.247 | 0.212 | 0.085 | 1.267 | 0.205 | 0.068 | 0.966 | 0.334 | 0.310 | 3.277 | 0.001 | 0.113 | 1.731 | 0.083 |
| DBV | | | | | | | | | | | | | 0.320 | 3.162 | 0.002 |
| PUK | 2.054 | 4.820 | 0.000 | 2.136 | 4.944 | 0.000 | 2.195 | 4.917 | 0.000 | -2.006 | -1.936 | 0.054 | 1.056 | 2.489 | 0.013 |
| DPUK | | | | -1.956 | -0.741 | 0.458 | 3.248 | 2.038 | 0.042 | 1.509 | 1.509 | 0.133 | -1.635 | -3.748 | 0.000 |
| PASIA | 1.623 | 2.556 | 0.011 | 1.677 | 2.613 | 0.009 | 1.887 | 2.819 | 0.005 | -2.313 | -1.695 | 0.092 | 0.612 | 1.023 | 0.306 |
| DPASIA | | | | -2.837 | -1.390 | 0.165 | -3.631 | -1.653 | 0.098 | 3.267 | 2.240 | 0.026 | -0.677 | -0.861 | 0.389 |
| PROW | 1.113 | 1.949 | 0.051 | 1.116 | 1.898 | 0.058 | 1.137 | 1.874 | 0.061 | -2.478 | -2.405 | 0.017 | 0.025 | 0.048 | 0.962 |
| DPROW | | | | 0.306 | 0.104 | 0.917 | 7.519 | 3.355 | 0.001 | 2.530 | 2.423 | 0.016 | -0.068 | -0.120 | 0.905 |
| PREST | 1.593 | 2.926 | 0.003 | 1.593 | 2.936 | 0.003 | 1.303 | 2.366 | 0.018 | 0.017 | 0.047 | 0.962 | 0.953 | 1.953 | 0.051 |
| DPREST | | | | | | | | | | | | | -0.613 | -1.254 | 0.210 |
| PBT*f(scale) | 0.067 | 2.543 | 0.011 | 0.067 | 2.556 | 0.011 | 0.074 | 2.825 | 0.005 | 0.076 | 2.517 | 0.013 | 0.074 | 3.719 | 0.000 |
| DIV | -0.651 | -0.613 | 0.540 | -0.748 | -0.708 | 0.479 | -1.090 | -1.014 | 0.311 | 5.438 | 1.446 | 0.150 | 1.013 | 0.997 | 0.319 |
| DDIV | | | | | | | | | | | | | -1.359 | -0.485 | 0.627 |
| Adj,ER | 0.571 | 1.405 | 0.160 | 0.586 | 1.423 | 0.155 | 0.496 | 1.195 | 0.232 | 0.164 | 1.526 | 0.128 | 0.144 | 0.354 | 0.724 |
| DAdj,ER | | | | | | | | | | | | | -0.035 | -0.082 | 0.935 |
| No.of cases | 1194 | | | 1194 | | | 1144 | | | 237 | | | 1431 | | |
| Adj.R-Square | 32.77% | | | 32.68% | | | 33.44% | | | 50.95% | | | 36.29% | | |
| 1.Wald-test (p-value) | 0.438 | | | 0.4084 | | | 0.5958 | | | 0.8493 | | | 0.4163 | | |
| 1. Wald-test (p-value) | 0.4167 | | | 0.3692 | | | 0.2517 | | | 0.9174 | | | 0.3427 | | |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported next to regression coefficients. * In this model no account is taken of possible differential valuation of segment-level losses. ** Negative BVs are set to zero.

## Table 5.15 Tests of the pricing of UK vs. Middle East & Africa segment

### Panel A: Samples include observations with missing PBT Mid.East&Africa

| | Profit firms | | | | | | | | | Loss firms | | | Total sample | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dividend & non-dividend firms | | | | | | Dividend firms only | | | Dividend & non-dividend firms | | | Dividend & non-dividend firms | | |
| | Model 1* | | | Model 2 | | | Model 3 | | | Model4 | | | Model 5 | | |
| | Coeff. | t-ratio | pvalue | Coeff. | t-ratio | pvalue | Coeff. | t-ratio | pvalue | Coeff. | t-ratio | pvalue | Coeff. | t-ratio | pvalue |
| Intercept | 0.502 | 6.231 | 0.000 | 0.484 | 6.065 | 0.000 | 0.419 | 5.822 | 0.000 | 0.715 | 7.918 | 0.000 | 0.695 | 9.423 | 0.000 |
| NEGMV | -0.401 | -24.89 | 0.000 | -0.401 | -24.85 | 0.000 | -0.349 | -20.65 | 0.000 | | | | -0.432 | -27.6 | 0.000 |
| DUMDIV | -0.102 | -2.632 | 0.009 | -0.084 | -2.219 | 0.026 | | | | -0.266 | -5.676 | 0.000 | -0.187 | -6.32 | 0.000 |
| NEGPBT | | | | | | | | | | | | | 0.084 | 1.582 | 0.114 |
| NEGMVPBT | | | | | | | | | | -0.656 | -21.25 | 0.000 | -0.662 | -12.9 | 0.000 |
| 1/scale | 405.1 | 1.777 | 0.076 | 359.1 | 1.630 | 0.103 | -441.1 | -1.893 | 0.058 | 733.5 | 5.334 | 0.000 | 138.7 | 0.552 | 0.581 |
| D 1/scale | | | | | | | | | | | | | 484.2 | 1.644 | 0.100 |
| BV | 0.047 | 1.338 | 0.181 | 0.050 | 1.417 | 0.157 | -0.013 | -0.340 | 0.734 | 0.364 | 5.980 | 0.000 | 0.052 | 1.494 | 0.135 |
| DBV | | | | | | | | | | | | | 0.434 | 6.817 | 0.000 |
| PUK | 2.571 | 9.804 | 0.000 | 2.684 | 10.162 | 0.000 | 3.262 | 12.117 | 0.000 | -2.284 | -4.031 | 0.000 | 1.744 | 6.215 | 0.000 |
| DPUK | | | | -3.295 | -2.382 | 0.017 | -0.058 | -0.059 | 0.953 | 2.283 | 4.119 | 0.000 | -2.018 | -8.19 | 0.000 |
| PAFR | -0.062 | -0.105 | 0.916 | -0.190 | -0.319 | 0.750 | -0.451 | -0.821 | 0.412 | -5.431 | -2.547 | 0.011 | -1.094 | -1.80 | 0.072 |
| DPAFR | | | | 18.606 | 3.383 | 0.001 | 15.325 | 1.332 | 0.183 | 4.630 | 1.506 | 0.132 | -0.127 | -0.05 | 0.960 |
| PROW | 1.846 | 5.582 | 0.000 | 1.875 | 5.611 | 0.000 | 2.498 | 7.300 | 0.000 | -4.186 | -5.696 | 0.000 | 0.940 | 2.701 | 0.007 |
| DPROW | | | | -1.977 | -1.663 | 0.096 | 0.369 | 0.415 | 0.678 | 4.829 | 6.197 | 0.000 | -0.768 | -2.17 | 0.030 |
| PREST | 2.427 | 7.508 | 0.000 | 2.278 | 7.083 | 0.000 | 2.292 | 6.960 | 0.000 | 0.330 | 1.842 | 0.066 | 2.270 | 6.992 | 0.000 |
| DPREST | | | | | | | | | | | | | -1.868 | -6.68 | 0.000 |
| PBT*f(scale) | 0.092 | 5.248 | 0.000 | 0.096 | 5.499 | 0.000 | 0.080 | 4.471 | 0.000 | 0.016 | 1.160 | 0.246 | 0.037 | 2.052 | 0.040 |
| DIV | 0.557 | 0.968 | 0.333 | 0.440 | 0.766 | 0.444 | 0.204 | 0.352 | 0.725 | 2.373 | 1.497 | 0.134 | 3.135 | 5.474 | 0.000 |
| DDIV | | | | | | | | | | | | | -7.651 | -5.51 | 0.000 |
| Adj,ER | 0.688 | 3.159 | 0.002 | 0.730 | 3.397 | 0.001 | 0.661 | 3.115 | 0.002 | 0.151 | 1.251 | 0.211 | 0.216 | 0.835 | 0.404 |
| DAdj,ER | | | | | | | | | | | | | 0.043 | 0.141 | 0.888 |
| No.of cases | 3795 | | | 3795 | | | 3570 | | | 956 | | | 4751 | | |
| Adj.R-Square | 32.85% | | | 33.10% | | | 34.54% | | | 46.98% | | | 33.77% | | |
| 1.Wald-test (p-value) | 0.000 | | | 0.000 | | | 0.000 | | | 0.145 | | | 0.000 | | |
| 1. Wald-test (p-value) | 0.001 | | | 0.001 | | | 0.000 | | | 0.573 | | | 0.001 | | |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported next to regression coefficients. * In this model no account is taken of possible differential valuation of segment-level losses. ** Negative BVs are set to zero.

**Panel B: Samples exclude observations with missing PBT Mid.East&Africa**

| | Profit firms | | | | | | | | | Loss firms | | | Total sample | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dividend & non-dividend firms | | | | | | Dividend firms only | | | Dividend & non-dividend firms | | | Dividend & non-dividend firms | | |
| | Model 1* | | | Model 2 | | | Model 3 | | | Model4 | | | Model 5 | | |
| | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value |
| Intercept | 0.463 | 4.273 | 0.000 | 0.466 | 4.357 | 0.000 | 0.363 | 4.874 | 0.000 | large | 1.022 | 0.315 | 0.503 | 4.902 | 0.000 |
| NEGMV | -0.357 | -8.74 | 0.000 | -0.354 | -8.61 | 0.000 | -0.282 | -6.56 | 0.000 | | | | -0.372 | -9.42 | 0.000 |
| DUMDIV | -0.039 | -0.536 | 0.593 | -0.047 | -0.628 | 0.530 | | | | -0.188 | -1.455 | 0.156 | -0.061 | -0.95 | 0.340 |
| NEGPBT | | | | | | | | | | | | | 0.027 | 0.177 | 0.859 |
| NEGMVPBT | | | | | | | | | | -0.512 | -4.689 | 0.000 | -0.576 | -4.65 | 0.000 |
| 1/scale | 884.7 | 4.301 | 0.000 | 884.4 | 4.225 | 0.000 | -1854.8 | -2.142 | 0.033 | 1544.5 | 4.786 | 0.000 | 770.9 | 3.490 | 0.000 |
| D 1/scale | | | | | | | | | | | | | 657.6 | 1.951 | 0.051 |
| BV | 0.079 | 0.747 | 0.455 | 0.092 | 0.899 | 0.369 | 0.105 | 0.922 | 0.357 | 0.254 | 1.576 | 0.126 | 0.105 | 1.047 | 0.295 |
| DBV | | | | | | | | | | | | | 0.386 | 2.077 | 0.038 |
| PUK | 1.297 | 1.815 | 0.070 | 1.269 | 1.736 | 0.083 | 1.624 | 2.013 | 0.045 | 3.955 | 1.855 | 0.074 | 1.239 | 1.782 | 0.075 |
| DPUK | | | | -0.688 | -0.327 | 0.744 | 1.808 | 0.935 | 0.350 | -1.117 | -0.667 | 0.510 | -2.292 | -3.66 | 0.000 |
| PAFR | -0.678 | -0.897 | 0.370 | -0.961 | -1.253 | 0.211 | -1.048 | -1.460 | 0.145 | -2.917 | -1.591 | 0.123 | -1.496 | -1.82 | 0.069 |
| DPAFR | | | | 15.240 | 2.251 | 0.025 | 2.039 | 0.138 | 0.891 | 4.717 | 1.173 | 0.250 | 0.851 | 0.303 | 0.762 |
| PROW | -0.165 | -0.189 | 0.850 | -0.269 | -0.298 | 0.766 | 0.205 | 0.208 | 0.835 | 1.689 | 0.782 | 0.440 | -0.199 | -0.23 | 0.815 |
| DPROW | | | | -0.210 | -0.094 | 0.925 | 0.518 | 0.220 | 0.826 | -0.431 | -0.109 | 0.914 | -2.316 | -1.52 | 0.129 |
| PREST | -0.802 | -1.164 | 0.245 | -0.825 | -1.202 | 0.230 | -0.879 | -1.232 | 0.219 | 4.278 | 3.142 | 0.004 | -0.717 | -1.03 | 0.304 |
| DPREST | | | | | | | | | | | | | 0.821 | 0.962 | 0.336 |
| PBT*f(scale) | 0.145 | 4.297 | 0.000 | 0.145 | 4.313 | 0.000 | 0.129 | 3.663 | 0.000 | -0.348 | -3.449 | 0.002 | 0.117 | 3.680 | 0.000 |
| DIV | -1.898 | -1.522 | 0.129 | -1.894 | -1.474 | 0.141 | -2.104 | -1.602 | 0.110 | 8.770 | 1.760 | 0.089 | -1.426 | -1.14 | 0.253 |
| DDIV | | | | | | | | | | | | | 2.591 | 0.562 | 0.574 |
| Adj.ER | -0.709 | -1.077 | 0.282 | -0.808 | -1.214 | 0.226 | -0.786 | -1.163 | 0.245 | -7.162 | -2.334 | 0.027 | -1.395 | -1.94 | 0.053 |
| DAdj.ER | | | | | | | | | | | | | 0.264 | 0.069 | 0.945 |
| No.of cases | 476 | | | 476 | | | 449 | | | 63 | | | 539 | | |
| Adj.R-Square | 47.31% | | | 47.23% | | | 48.32% | | | 65.98% | | | 50.00% | | |
| 1.Wald-test (p-value) | 0.005 | | | 0.001 | | | 0.000 | | | 0.000 | | | 0.000 | | |
| 1. Wald-test (p-value) | 0.550 | | | 0.443 | | | 0.099 | | | 0.071 | | | 0.121 | | |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported next to regression coefficients. * In this model no account is taken of possible differential valuation of segment-level losses. ** Negative BVs are set to zero.

**Table 5.16**

| | Profit firms | | | | | | Total sample | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | without fixed effects Model 1 | | | with fixed effects Model 2 | | | without fixed effects Model 3 | | | with fixed effects Model 4 | | |
| | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value |
| Intercept | 0.785 | 18.488 | 0.000 | 0.478 | 4.346 | 0.000 | 0.948 | 25.442 | 0.000 | 0.688 | 6.654 | 0.000 |
| NEGMV | -0.447 | -28.847 | 0.000 | -0.408 | -25.351 | 0.000 | -0.460 | -30.570 | 0.000 | -0.434 | -27.745 | 0.000 |
| DUMDIV | -0.135 | -3.556 | 0.000 | -0.090 | -2.368 | 0.018 | -0.246 | -8.227 | 0.000 | -0.189 | -6.440 | 0.000 |
| NEGPBT | | | | | | | 0.052 | 0.956 | 0.339 | 0.078 | 1.475 | 0.140 |
| NEGMVPBT | | | | | | | -0.749 | -14.538 | 0.000 | -0.664 | -13.041 | 0.000 |
| 1/scale | 185.5 | 0.731 | 0.465 | 54.5 | 0.211 | 0.833 | 218.5 | 0.846 | 0.398 | 155.7 | 0.635 | 0.526 |
| D 1/scale | | | | | | | 379.673 | 1.273 | 0.203 | 420.513 | 1.464 | 0.143 |
| BV | 0.085 | 2.350 | 0.019 | 0.040 | 1.123 | 0.261 | 0.082 | 2.307 | 0.021 | 0.047 | 1.352 | 0.176 |
| DBV** | | | | | | | 0.502 | 7.778 | 0.000 | 0.446 | 7.031 | 0.000 |
| PUK | 3.683 | 17.640 | 0.000 | 3.612 | 17.202 | 0.000 | 1.855 | 6.685 | 0.000 | 1.690 | 6.038 | 0.000 |
| DPUK | -3.709 | -2.739 | 0.006 | -3.004 | -2.127 | 0.033 | -2.143 | -8.767 | 0.000 | -1.946 | -7.901 | 0.000 |
| PEU | 2.564 | 7.074 | 0.000 | 2.510 | 6.632 | 0.000 | 0.482 | 1.191 | 0.234 | 0.268 | 0.638 | 0.523 |
| DPEU | 2.521 | 1.807 | 0.071 | 3.319 | 2.088 | 0.037 | 0.548 | 1.281 | 0.200 | 0.761 | 1.704 | 0.088 |
| PAMER | 3.721 | 13.027 | 0.000 | 3.534 | 11.814 | 0.000 | 1.480 | 3.776 | 0.000 | 1.142 | 2.786 | 0.005 |
| DPAMER | -4.890 | -4.106 | 0.000 | -3.812 | -3.081 | 0.002 | -1.981 | -4.490 | 0.000 | -1.473 | -3.270 | 0.001 |
| PASIA | 2.649 | 6.507 | 0.000 | 2.895 | 6.981 | 0.000 | 0.876 | 1.936 | 0.053 | 0.846 | 1.766 | 0.077 |
| DPASIA | -1.777 | -0.827 | 0.408 | -2.068 | -1.001 | 0.317 | -0.311 | -0.439 | 0.661 | -0.215 | -0.305 | 0.760 |
| PAFR | 0.492 | 0.833 | 0.405 | 0.830 | 1.423 | 0.155 | -1.515 | -2.386 | 0.017 | -1.159 | -1.903 | 0.057 |
| DPAFR | 19.998 | 2.566 | 0.010 | 18.732 | 3.662 | 0.000 | -1.613 | -0.625 | 0.532 | -0.368 | -0.149 | 0.882 |
| PREST | 3.533 | 14.253 | 0.000 | 3.540 | 13.709 | 0.000 | 2.383 | 7.695 | 0.000 | 2.264 | 7.008 | 0.000 |
| DPREST | | | | | | | -1.952 | -7.095 | 0.000 | -1.852 | -6.641 | 0.000 |
| PBT*f(scale) | | | | | | | 0.035 | 2.083 | 0.037 | 0.036 | 2.014 | 0.044 |
| DIV | -0.232 | -0.394 | 0.694 | 0.882 | 1.529 | 0.126 | 2.203 | 3.762 | 0.000 | 3.226 | 5.559 | 0.000 |
| DDIV | | | | | | | -7.049 | -5.041 | 0.000 | -7.796 | -5.643 | 0.000 |
| ADJER | 0.794 | 4.002 | 0.000 | 0.709 | 3.579 | 0.000 | 0.284 | 1.142 | 0.253 | 0.187 | 0.699 | 0.485 |
| DADJER | | | | | | | -0.030 | -0.097 | 0.923 | 0.059 | 0.187 | 0.852 |
| No.of cases | 3795 | | | 3795 | | | 4751 | | | 4751 | | |
| Adj R-Square | 26.48% | | | 32.54% | | | 29.22% | | | 33.99% | | |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported next to regression coefficients.

** Negative BVs are set to zero

**Table 5.16 (continued from the previous page)**

**Wald test of the significance of valuation differential between two segments**

| Compared segments | Model 1<br>P-value | Model 2<br>P-value | Model 3<br>P-value | Model 4<br>P-value |
|---|---|---|---|---|
| UK vs Europe | 0.001 | 0.001 | 0.000 | 0.000 |
| UK vs America | 0.881 | 0.763 | 0.155 | 0.047 |
| UK vs Asia | 0.009 | 0.072 | 0.011 | 0.039 |
| UK vs Mid.East&Africa | 0.000 | 0.000 | 0.000 | 0.000 |
| Europe vs America | 0.003 | 0.010 | 0.014 | 0.033 |
| Europe vs Asia | 0.865 | 0.445 | 0.422 | 0.257 |
| Europe vs Mid.East&Africa | 0.001 | 0.009 | 0.002 | 0.026 |
| America vs Asia | 0.018 | 0.162 | 0.182 | 0.532 |
| America vs Mid.East&Africa | 0.000 | 0.000 | 0.000 | 0.000 |
| Asia vs Mid.East&Africa | 0.003 | 0.004 | 0.001 | 0.006 |

Table 5.17

**Panel A: splitting the sample period into two sub-periods (pre-1996 and post-1995)**

| | Profit firms; Two economic periods | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | without fixed effects | | | | | | with fixed effects | | | | | |
| | old economy (before 1996) Model 1 | | | new economy (1996 onwards) Model 2 | | | old economy (before 1995 ) Model 3 | | | new economy (1996 onwards) Model 4 | | |
| | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value |
| Intercept | 0.646 | 10.180 | 0.000 | 0.837 | 14.264 | 0.000 | 0.269 | 1.717 | 0.086 | 0.715 | 8.457 | 0.000 |
| NEGMV | -0.358 | -17.759 | 0.000 | -0.510 | -22.592 | 0.000 | -0.292 | -14.011 | 0.000 | -0.462 | -19.263 | 0.000 |
| DUMDIV | -0.186 | -3.320 | 0.001 | -0.037 | -0.720 | 0.472 | -0.133 | -2.422 | 0.015 | -0.014 | -0.277 | 0.782 |
| 1/scale | 384.4 | 0.861 | 0.389 | 744.3 | 2.378 | 0.017 | 448.6 | 1.122 | 0.262 | 530.0 | 1.585 | 0.113 |
| BV** | 0.121 | 2.684 | 0.007 | 0.076 | 1.471 | 0.141 | 0.033 | 0.715 | 0.475 | 0.066 | 1.268 | 0.205 |
| PUK | 4.096 | 11.907 | 0.000 | 1.872 | 4.788 | 0.000 | 4.181 | 13.066 | 0.000 | 1.306 | 3.313 | 0.001 |
| DPUK | 0.003 | 0.002 | 0.999 | -5.142 | -3.086 | 0.002 | 1.135 | 0.615 | 0.539 | -4.963 | -2.804 | 0.005 |
| PEU | 2.480 | 4.712 | 0.000 | 1.036 | 1.722 | 0.085 | 2.705 | 5.175 | 0.000 | 0.231 | 0.343 | 0.732 |
| DPEU | 4.091 | 1.923 | 0.054 | 1.842 | 1.273 | 0.203 | 4.809 | 2.228 | 0.026 | 2.633 | 1.602 | 0.109 |
| PAMER | 4.377 | 8.807 | 0.000 | 1.414 | 2.857 | 0.004 | 4.113 | 8.278 | 0.000 | 0.561 | 1.069 | 0.285 |
| DPAMER | -6.469 | -3.401 | 0.001 | -4.655 | -2.874 | 0.004 | -4.862 | -2.888 | 0.004 | -3.555 | -2.085 | 0.037 |
| PASIA | 3.126 | 5.667 | 0.000 | 0.650 | 0.953 | 0.341 | 3.274 | 6.087 | 0.000 | 0.032 | 0.047 | 0.963 |
| DPASIA | -0.434 | -0.291 | 0.771 | -3.839 | -0.652 | 0.514 | -1.343 | -1.298 | 0.194 | -5.069 | -0.853 | 0.393 |
| PAFR | -0.153 | -0.288 | 0.774 | 0.593 | 0.786 | 0.432 | -0.270 | -0.490 | 0.624 | 0.128 | 0.147 | 0.883 |
| DPAFR | 21.309 | 1.205 | 0.228 | 20.994 | 2.261 | 0.024 | 28.839 | 1.714 | 0.086 | 15.089 | 3.047 | 0.002 |
| PREST | 4.370 | 10.275 | 0.000 | 1.022 | 2.481 | 0.013 | 4.367 | 10.646 | 0.000 | 0.427 | 0.975 | 0.330 |
| PBT*f(scale) | 0.024 | 1.124 | 0.261 | 0.110 | 4.326 | 0.000 | 0.046 | 2.260 | 0.024 | 0.145 | 5.043 | 0.000 |
| DIV | 2.790 | 3.835 | 0.000 | -3.634 | -4.113 | 0.000 | 3.100 | 4.392 | 0.000 | -2.213 | -2.505 | 0.012 |
| ADJER | 0.808 | 3.235 | 0.001 | 0.605 | 2.159 | 0.031 | 0.346 | 1.619 | 0.106 | 0 657 | 2.298 | 0.022 |
| No.of cases | 1926 | | | 1869 | | | 1926 | | | 1869 | | |
| Adj.R-Square | 40.55% | | | 21.06% | | | 48.59% | | | 26.95% | | |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported next to regression coefficients.
** Negative BVs are set to zero

**Table 5.17 Panel A (continued from the previous page)**

**Wald test of the significance of valuation differential between two segments**

| | Model 1 | Model 2 | Model 3 | Model 4 |
|---|---|---|---|---|
| Compared segments | P-value | P-value | P-value | P-value |
| UK vs Europe | 0.000 | 0.090 | 0.000 | 0.045 |
| UK vs America | 0.436 | 0.187 | 0.853 | 0.038 |
| UK vs Asia | 0.032 | 0.041 | 0.044 | 0.033 |
| UK vs Mid.East&Africa | 0.000 | 0.078 | 0.000 | 0.157 |
| Europe vs America | 0.000 | 0.537 | 0.003 | 0.599 |
| Europe vs Asia | 0.275 | 0.606 | 0.327 | 0.797 |
| Europe vs Mid.East&Africa | 0.000 | 0.602 | 0.000 | 0.914 |
| America vs Asia | 0.023 | 0.243 | 0.119 | 0.416 |
| America vs Mid.East&Africa | 0.000 | 0.293 | 0.000 | 0.624 |
| Asia vs Mid.East&Africa | 0.000 | 0.952 | 0.000 | 0.924 |

## Panel B: splitting the sample period into three economic sub-periods

| | pre-1994 Model 1 | | | 1994-1997 (inclusive) Model 2 | | | post-1997 Model 3 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value |
| Intercept | 0.767 | 8.003 | 0.000 | 0.593 | 8.986 | 0.000 | 0.942 | 13.478 | 0.000 |
| NEGMV | -0.356 | 14.383 | 0.000 | -0.390 | 12.082 | 0.000 | -0.541 | 22.291 | 0.000 |
| DUMDIV | -0.281 | -3.376 | 0.001 | -0.094 | -1.466 | 0.143 | -0.033 | -0.553 | 0.580 |
| 1/scale | -785.3 | -2.409 | 0.016 | 736.1 | 3.007 | 0.003 | 778.3 | 2.217 | 0.027 |
| BV** | 0.165 | 2.725 | 0.006 | 0.057 | 0.941 | 0.347 | 0.096 | 1.559 | 0.119 |
| PUK | 3.725 | 8.584 | 0.000 | 4.657 | 11.487 | 0.000 | 0.546 | 1.101 | 0.271 |
| DPUK | 0.328 | 0.249 | 0.803 | -8.068 | -2.202 | 0.028 | -2.058 | -1.673 | 0.094 |
| PEU | 2.337 | 3.638 | 0.000 | 3.592 | 5.799 | 0.000 | -0.448 | -0.602 | 0.547 |
| DPEU | 0.708 | 0.244 | 0.807 | 6.747 | 3.305 | 0.001 | 1.708 | 1.172 | 0.241 |
| PAMER | 4.703 | 7.570 | 0.000 | 3.983 | 7.065 | 0.000 | 0.148 | 0.238 | 0.812 |
| DPAMER | -6.074 | -1.865 | 0.062 | -1.444 | -0.647 | 0.518 | -6.254 | -5.344 | 0.000 |
| PASIA | 2.852 | 4.308 | 0.000 | 3.562 | 5.209 | 0.000 | -0.639 | -0.762 | 0.446 |
| DPASIA | -0.252 | -0.121 | 0.904 | -2.441 | -0.677 | 0.498 | -0.340 | -0.059 | 0.953 |
| PAFR | -0.622 | -0.668 | 0.504 | 0.746 | 0.827 | 0.408 | -0.946 | -1.000 | 0.317 |
| DPAFR | 19.333 | 1.513 | 0.130 | 121.368 | 3.000 | 0.003 | 20.438 | 2.393 | 0.017 |
| PREST | 4.240 | 7.391 | 0.000 | 3.362 | 6.241 | 0.000 | 0.439 | 0.859 | 0.390 |
| PBT*f(scale) | -0.012 | -0.494 | 0.622 | 0.073 | 3.126 | 0.002 | 0.110 | 3.447 | 0.001 |
| DIV | 2.859 | 3.148 | 0.002 | 0.221 | 0.221 | 0.825 | -3.585 | -3.450 | 0.001 |
| ADJER | 0.764 | 2.882 | 0.004 | 0.899 | 2.122 | 0.034 | 0.485 | 1.555 | 0.120 |
| No.of cases | 1161 | | | 1489 | | | 1145 | | |
| Adj.R-Square | 38.77% | | | 32.76% | | | 21.65% | | |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported next to regression coefficients.

** Negative BVs are set to zero. Models are estimated for profit-making firm-years and without fixed effects.

### Wald test of the significance of valuation differential between two segments

| Compared segments | Model 1 P-value | Model 2 P-value | Model 3 P-value |
|---|---|---|---|
| UK vs Europe | 0.007 | 0.031 | 0.104 |
| UK vs America | 0.038 | 0.098 | 0.330 |
| UK vs Asia | 0.128 | 0.075 | 0.110 |
| UK vs Mid.East&Africa | 0.000 | 0.000 | 0.082 |
| Europe vs America | 0.000 | 0.532 | 0.424 |
| Europe vs Asia | 0.503 | 0.968 | 0.840 |
| Europe vs Mid.East&Africa | 0.001 | 0.004 | 0.617 |
| America vs Asia | 0.009 | 0.554 | 0.329 |
| America vs Mid.East&Africa | 0.000 | 0.001 | 0.237 |
| Asia vs Mid.East&Africa | 0.001 | 0.008 | 0.786 |

## APPENDIX 5.2

**Appendix 5.2 reports regressions which are scaled by alternative scale-proxies.**

**Tables 5.10TA, 5.12-5.15TA and 5.17TA report regressions scaled by Group Total Assets.**

**Tables 5.10Sale, 5.12-5.15Sale and 5.17Sale report regressions scaled by Group Sales.**

**Tables 5.10MV, 5.12-5.15MV and 5.17MV report regressions scaled by the one year lagged equity market value.**

## Table 5.10M (lagged MV-deflated model)

### Profit-making firms

| | Dividend paying and non-dividend firms | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Consolidated level Model 1 | | | Intermediate disaggregation Model 2 | | | Fine disaggregation Model 3 | | |
| | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value |
| Intercept | 0.815 | 26.041 | 0.000 | 0.793 | 26.059 | 0.000 | 0.809 | 26.407 | 0.000 |
| NEGMV | -0.634 | -14.760 | 0.000 | -0.637 | -15.037 | 0.000 | -0.634 | -13.725 | 0.000 |
| 1/MV | 2267.5 | 3.352 | 0.001 | 2476.9 | 3.816 | 0.000 | 2235.2 | 3.184 | 0.001 |
| BV | 0.229 | 4.496 | 0.000 | 0.246 | 4.967 | 0.000 | 0.234 | 4.498 | 0.000 |
| PBT | 2.637 | 7.575 | 0.000 | | | | | | |
| PUK | | | | 1.841 | 6.707 | 0.000 | 2.758 | 7.492 | 0.000 |
| DPUK | | | | -1.824 | -1.485 | 0.138 | -0.969 | -0.712 | 0.476 |
| PNUK | | | | 1.368 | 4.615 | 0.000 | | | |
| DPNUK | | | | 0.128 | 0.090 | 0.928 | | | |
| PEU | | | | | | | 2.104 | 4.028 | 0.000 |
| DPEU | | | | | | | 0.967 | 0.699 | 0.484 |
| PAMER | | | | | | | 2.861 | 5.494 | 0.000 |
| DPAMER | | | | | | | -1.141 | -0.709 | 0.478 |
| PASIA | | | | | | | 1.941 | 3.859 | 0.000 |
| DPASIA | | | | | | | -0.666 | -0.216 | 0.829 |
| PAFR | | | | | | | 2.408 | 1.637 | 0.102 |
| DPAFR | | | | | | | 2.425 | 0.238 | 0.812 |
| PREST | -1.184 | -4.188 | 0.000 | 0.411 | 1.067 | 0.162 | 1.411 | 3.067 | 0.002 |
| PBT*f(mv) | -0.004 | -0.162 | 0.871 | 0.072 | 4.286 | 0.000 | 0.000 | -0.012 | 0.990 |
| DIV | -0.977 | -1.301 | 0.193 | -0.824 | -1.071 | 0.284 | -1.116 | -1.466 | 0.143 |
| ADJER | 0.589 | 1.562 | 0.118 | 0.518 | 1.724 | 0.085 | 0.548 | 1.536 | 0.124 |
| No.of cases | 3752 | | | 3752 | | | 3752 | | |
| Adj.R-Square | 24.5% | | | 24.0% | | | 24.6% | | |

**Wald test of the significance of valuation differential between two segments**

| Compared Segments | Model 2 p-value | Model 3 p-value |
|---|---|---|
| UK vs Non-UK | 0.1327 | |
| UK vs Europe | | 0.129 |
| UK vs America | | 0.785 |
| UK vs Asia | | 0.039 |
| UK vs Mid.East & Afica | | 0.819 |
| Europe vs America | | 0.121 |
| Europe vs Asia | | 0.765 |
| Europe vs Mid.East & Afica | | 0.845 |
| America vs Asia | | 0.081 |
| America vs Mid.East & Afica | | 0.769 |
| Asia vs Mid.East & Afica | | 0.779 |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported next to regression coefficients.

Table 5.10M (continued from the previous page)

| | Dividend paying firms only | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Consolidated level Model4 | | | Intermediate disaggregation Model5 | | | Fine disaggregation Model6 | | |
| | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value |
| Intercept | 0.827 | 29.008 | 0.000 | 0.791 | 27.426 | 0.000 | 0.782 | 26.955 | 0.000 |
| NEGMV | -0.618 | -14.332 | 0.000 | -0.610 | -14.687 | 0.000 | -0.602 | -15.022 | 0.000 |
| 1/MV | 1508.7 | 2.649 | 0.008 | 1414.7 | 2.452 | 0.014 | 1373.6 | 2.317 | 0.020 |
| BV | 0.253 | 4.361 | 0.000 | 0.240 | 4.235 | 0.000 | 0.263 | 4.608 | 0.000 |
| PBT | 2.880 | 8.280 | 0.000 | | | | | | |
| PUK | | | | 3.235 | 9.120 | 0.000 | 3.288 | 9.200 | 0.000 |
| DPUK | | | | -1.406 | -1.765 | 0.078 | -1.152 | -1.532 | 0.126 |
| PNUK | | | | 2.882 | 8.261 | 0.000 | | | |
| DPNUK | | | | 0.600 | 0.485 | 0.627 | | | |
| PEU | | | | | | | 3.135 | 8.862 | 0.000 |
| DPEU | | | | | | | 0.569 | 0.451 | 0.652 |
| PAMER | | | | | | | 3.443 | 7.383 | 0.000 |
| DPAMER | | | | | | | 0.397 | 0.308 | 0.758 |
| PASIA | | | | | | | 2.505 | 4.937 | 0.000 |
| DPASIA | | | | | | | -2.872 | -0.910 | 0.363 |
| PAFR | | | | | | | 1.430 | 3.313 | 0.001 |
| DPAFR | | | | | | | 8.673 | 1.750 | 0.080 |
| PREST | -1.260 | 1.850 | 0.083 | 1.732 | 4.579 | 0.000 | 1.866 | 4.905 | 0.000 |
| PBT*f(mv) | -0.044 | -2.576 | 0.010 | -0.016 | -0.972 | 0.331 | -0.025 | -1.409 | 0.159 |
| DIV | 0.367 | 0.499 | 0.618 | -0.636 | -0.813 | 0.416 | -0.927 | -1.158 | 0.247 |
| ADJER | 1.056 | 3.990 | 0.000 | 1.162 | 4.554 | 0.000 | 1.035 | 4.077 | 0.000 |
| No.of cases | 3535 | | | 3535 | | | 3535 | | |
| Adj.R-Square | 23.4% | | | 24.9% | | | 25.3% | | |

**Wald test of the significance of valuation differential between two segments**

| Compared segments | Model5 p-value | Model6 p-value |
|---|---|---|
| UK vs Non-UK | 0.1332 | |
| UK vs Europe | | 0.667 |
| UK vs America | | 0.652 |
| UK vs Asia | | 0.061 |
| UK vs Mid.East & Afica | | 0.000 |
| Europe vs America | | 0.502 |
| Europe vs Asia | | 0.216 |
| Europe vs Mid.East & Afica | | 0.000 |
| America vs Asia | | 0.074 |
| America vs Mid.East & Afica | | 0.000 |
| Asia vs Mid.East & Afica | | 0.026 |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported next to regression coefficients.

## Table 5.10T (TA-deflated model)

### Profit-making firms

| | Dividend paying and non-dividend firms | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Consolidated level Model1 | | | Intermediate disaggregation Model2 | | | Fine disaggregation Model3 | | |
| | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value |
| Intercept | 0.227 | 5.163 | 0.000 | 0.059 | 1.200 | 0.230 | 0.043 | 0.854 | 0.393 |
| NEGMV | -0.436 | -12.17 | 0.000 | -0.391 | -11.14 | 0.000 | -0.369 | -10.495 | 0.000 |
| 1/TA | 2066.8 | 4.108 | 0.000 | 1645.5 | 3.036 | 0.002 | 1713.4 | 3.356 | 0.001 |
| BV | 0.177 | 1.686 | 0.092 | 0.226 | 1.995 | 0.046 | 0.255 | 2.202 | 0.028 |
| PBT | 8.466 | 11.612 | 0.000 | | | | | | |
| PUK | | | | 9.512 | 12.804 | 0.000 | 9.445 | 12.720 | 0.000 |
| DPUK | | | | -17.291 | -4.799 | 0.000 | -17.108 | -4.665 | 0.000 |
| PNUK | | | | 7.673 | 9.304 | 0.000 | | | |
| DPNUK | | | | -8.364 | -3.455 | 0.001 | | | |
| PEU | | | | | | | 8.772 | 7.651 | 0.000 |
| DPEU | | | | | | | -7.190 | -2.028 | 0.043 |
| PAMER | | | | | | | 7.687 | 7.848 | 0.000 |
| DPAMER | | | | | | | -8.844 | -3.352 | 0.001 |
| PASIA | | | | | | | 5.995 | 4.741 | 0.000 |
| DPASIA | | | | | | | -16.064 | -1.939 | 0.052 |
| PAFR | | | | | | | 3.319 | 2.144 | 0.032 |
| DPAFR | | | | | | | -11.921 | -0.894 | 0.371 |
| PREST | 5.320 | 6.131 | 0.000 | 4.915 | 5.971 | 0.000 | 4.845 | 5.777 | 0.000 |
| PBT*f(TA) | 0.059 | 1.201 | 0.230 | 0.144 | 2.906 | 0.004 | 0.149 | 2.948 | 0.003 |
| DIV | -0.764 | -0.486 | 0.627 | -2.174 | -1.384 | 0.166 | -2.621 | -1.599 | 0.110 |
| ADJER | 0.663 | 1.698 | 0.090 | 1.019 | 3.089 | 0.002 | 0.955 | 2.898 | 0.004 |
| No.of cases | 3840 | | | 3840 | | | 3840 | | |
| Adj.R-Square | 35 6% | | | 38.5% | | | 38.8% | | |

**Wald test of the significance of valuation differential between two segments**

| Compared Segments | Model 2 p-value | Model3 p-value |
|---|---|---|
| UK vs Non-UK | 0.0005 | |
| UK vs Europe | | 0.501 |
| UK vs America | | 0.014 |
| UK vs Asia | | 0.002 |
| UK vs Mid.East & Afica | | 0.000 |
| Europe vs America | | 0.384 |
| Europe vs Asia | | 0.067 |
| Europe vs Mid.East & Afica | | 0.001 |
| America vs Asia | | 0.175 |
| America vs Mid.East & Afica | | 0.006 |
| Asia vs Mid.East & Afica | | 0.144 |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported next to regression coefficients.

## Model 5.10T (continued from the previous page)

| | Dividend firms only | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Consolidated level Model4 | | | Intermediate disaggregation Model5 | | | Fine disaggregation Model6 | | |
| | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value |
| Intercept | 0.176 | 3.761 | 0.000 | 0.022 | 0.435 | 0.664 | 0.002 | 0.029 | 0.977 |
| NEGMV | -0.352 | -10.51 | 0.000 | -0.310 | -9.196 | 0.000 | -0.281 | -8.365 | 0.000 |
| 1/TA | 301.1 | 0.515 | 0.607 | 281.7 | 0.479 | 0.632 | 23.3 | 0.039 | 0.969 |
| BV | 0.046 | 0.450 | 0.653 | 0.114 | 1.028 | 0.304 | 0.148 | 1.290 | 0.197 |
| PBT | 8.892 | 11.127 | 0.000 | | | | | | |
| PUK | | | | 9.995 | 12.357 | 0.000 | 10.031 | 12.352 | 0.000 |
| DPUK | | | | -8.426 | -4.307 | 0.000 | -7.912 | -3.990 | 0.000 |
| PNUK | | | | 8.168 | 9.026 | 0.000 | | | |
| DPNUK | | | | -3.712 | -1.357 | 0.175 | | | |
| PEU | | | | | | | 9.710 | 7.750 | 0.000 |
| DPEU | | | | | | | -6.806 | -1.997 | 0.046 |
| PAMER | | | | | | | 7.879 | 7.867 | 0.000 |
| DPAMER | | | | | | | -3.176 | -0.841 | 0.400 |
| PASIA | | | | | | | 8.075 | 5.228 | 0.000 |
| DPASIA | | | | | | | -20.522 | -2.392 | 0.017 |
| PAFR | | | | | | | 2.199 | 2.551 | 0.011 |
| DPAFR | | | | | | | -30.166 | -1.675 | 0.094 |
| PREST | | | | 4.842 | 5.512 | 0.000 | 4.825 | 5.394 | 0.000 |
| PBT*f(TA) | 0.034 | 0.656 | 0.512 | 0.124 | 2.373 | 0.018 | 0.123 | 2.305 | 0.021 |
| DIV | 1.842 | 1.087 | 0.277 | -0.931 | -0.531 | 0.595 | -1.327 | -0.735 | 0.462 |
| ADJER | 0.682 | 1.554 | 0.120 | 0.709 | 1.794 | 0.073 | 0.681 | 1.732 | 0.083 |
| No.of cases | 3592 | | | 3592 | | | 3592 | | |
| Adj.R-Square | 39.7% | | | 41.8% | | | 42.2% | | |

### Wald test of the significance of valuation differential between two segments

| Compared Segments | Model 5 p-value | Model 6 p-value |
|---|---|---|
| UK vs Non-UK | 0.0008 | |
| UK vs Europe | | 0.756 |
| UK vs America | | 0.002 |
| UK vs Asia | | 0.140 |
| UK vs Mid.East & Afica | | 0.000 |
| Europe vs America | | 0.146 |
| Europe vs Asia | | 0.356 |
| Europe vs Mid.East & Afica | | 0.000 |
| America vs Asia | | 0.890 |
| America vs Mid.East & Afica | | 0.000 |
| Asia vs Mid.East & Afica | | 0.000 |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported next to regression coefficients.

**Table 5.10S (Sales-deflated model)**

**Profit-making firms**

| | Dividend paying and non-dividend firms | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Consolidated level Model1 | | | Intermediate disaggregation Model 2 | | | Fine disaggregation Model3 | | |
| | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value |
| Intercept | 0.280 | 4.259 | 0.000 | 0.251 | 3.900 | 0.000 | 0.186 | 3.175 | 0.001 |
| NEGMV | -1.369 | -8.165 | 0.000 | -1.366 | -8.100 | 0.000 | -1.323 | -7.836 | 0.000 |
| 1/sale | 2316.3 | 1.462 | 0.144 | 1503.2 | 1.098 | 0.272 | 101.1 | 0.153 | 0.878 |
| BV | 1.609 | 6.063 | 0.000 | 1.571 | 5.889 | 0.000 | 1.606 | 6.056 | 0.000 |
| PBT | 8.591 | 2.946 | 0.003 | | | | | | |
| PUK | | | | 8.949 | 2.922 | 0.003 | 9.887 | 3.249 | 0.001 |
| DPUK | | | | -13.193 | -2.651 | 0.008 | -11.541 | -2.310 | 0.021 |
| PNUK | | | | 7.117 | 3.052 | 0.002 | | | |
| DPNUK | | | | -7.671 | -1.134 | 0.257 | | | |
| PEU | | | | | | | 10.123 | 4.296 | 0.000 |
| DPEU | | | | | | | -50.948 | -1.814 | 0.070 |
| PAMER | | | | | | | 11.341 | 4.363 | 0.000 |
| DPAMER | | | | | | | -5.180 | -1.173 | 0.241 |
| PASIA | | | | | | | 2.030 | 0.795 | 0.427 |
| DPASIA | | | | | | | 10.182 | 0.773 | 0.440 |
| PAFR | | | | | | | 6.730 | 1.917 | 0.055 |
| DPAFR | | | | | | | -76.041 | -7.123 | 0.000 |
| PREST | | | | 6.041 | 2.550 | 0.011 | 6.899 | 2.931 | 0.003 |
| PBT*f(sale) | -0.025 | -0.263 | 0.792 | 0.016 | 0.179 | 0.858 | -0.066 | -0.789 | 0.430 |
| DIV | -11.70 | -2.249 | 0.024 | -11.92 | -2.091 | 0.037 | -13.42 | -2.261 | 0.024 |
| ADJER | 4.520 | 2.009 | 0.045 | 4.465 | 2.103 | 0.036 | 3.275 | 1.765 | 0.078 |
| No.of cases | 3865 | | | 3865 | | | 3865 | | |
| Adj.R-Square | 35.3% | | | 35.8% | | | 37.6% | | |

**Wald test of the significance of valuation differential between two segments**

| Compared Segments | Model 2 p-value | Model 3 p-value |
|---|---|---|
| UK vs Non-UK | 0.270 | |
| UK vs Europe | | 0.919 |
| UK vs America | | 0.326 |
| UK vs Asia | | 0.006 |
| UK vs Mid.East & Afica | | 0.122 |
| Europe vs America | | 0.584 |
| Europe vs Asia | | 0.000 |
| Europe vs Mid.East & Afica | | 0.255 |
| America vs Asia | | 0.000 |
| America vs Mid.East & Afica | | 0.052 |
| Asia vs Mid.East & Afica | | 0.190 |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported next to regression coefficients.

**Table 5.10S (continued from the previous page)**

| | Dividend firms only | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Consolidated level Model4 | | | Intermediate disaggregation Model4 | | | Fine disaggregation Model5 | | |
| | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value |
| Intercept | 0.130 | 3.063 | 0.002 | 0.120 | 2.736 | 0.006 | -0.001 | -0.017 | 0.987 |
| NEGMV | -0.938 | -7.987 | 0.000 | -0.934 | -8.090 | 0.000 | -0.414 | -9.303 | 0.000 |
| 1/sale | 336.6 | 0.203 | 0.839 | 174.2 | 0.104 | 0.917 | 4507.2 | 1.577 | 0.115 |
| BV | 1.198 | 5.170 | 0.000 | 1.196 | 5.145 | 0.000 | -0.413 | -0.568 | 0.570 |
| PBT | 6.572 | 4.465 | 0.000 | | | | | | |
| PUK | | | | 6.263 | 4.129 | 0.000 | 10.402 | 7.263 | 0.000 |
| DPUK | | | | 2.523 | 0.562 | 0.574 | -7.695 | -2.035 | 0.042 |
| PNUK | | | | 7.973 | 5.182 | 0.000 | | | |
| DPNUK | | | | -5.975 | -1.085 | 0.278 | | | |
| PEU | | | | | | | 15.158 | 8.098 | 0.000 |
| DPEU | | | | | | | -20.930 | -2.959 | 0.003 |
| PAMER | | | | | | | 10.781 | 5.393 | 0.000 |
| DPAMER | | | | | | | 0.389 | 0.042 | 0.966 |
| PASIA | | | | | | | 14.358 | 5.618 | 0.000 |
| DPASIA | | | | | | | -20.560 | -3.242 | 0.001 |
| PAFR | | | | | | | 3.201 | 1.437 | 0.151 |
| DPAFR | | | | | | | -25.460 | -0.275 | 0.783 |
| PREST | | | | 3.033 | 2.371 | 0.018 | 2.976 | 1.563 | 0.118 |
| PBT*f(sale) | 0.017 | 0.229 | 0.819 | -0.007 | -0.094 | 0.925 | -0.027 | -0.299 | 0.765 |
| DIV | -4.977 | -1.611 | 0.107 | -4.333 | -1.417 | 0.157 | 1.235 | 0.418 | 0.676 |
| ADJER | -1.004 | -1.412 | 0.158 | -0.769 | -1.121 | 0.262 | 1.004 | 1.237 | 0.216 |
| No.of cases | 3613 | | | 3613 | | | 3613 | | |
| Adj.R-Square | 47.1% | | | 47.3% | | | 31.1% | | |

**Wald test of the significance of valuation differential between two segments**

| Compared Segments | Model4 p-value | Model5 p-value |
|---|---|---|
| UK vs Non-UK | 0.022 | |
| UK vs Europe | | 0.022 |
| UK vs America | | 0.737 |
| UK vs Asia | | 0.110 |
| UK vs Mid.East & Afica | | 0.003 |
| Europe vs America | | 0.085 |
| Europe vs Asia | | 0.775 |
| Europe vs Mid.East & Afica | | 0.000 |
| America vs Asia | | 0.210 |
| America vs Mid.East & Afica | | 0.002 |
| Asia vs Mid.East & Afica | | 0.003 |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported next to regression coefficients.

## Table 5.12-5.15M (Lagged MV-deflated model)

| UK vs EU Model 1 | | UK vs America Model 2 | | UK vs Asia Model 3 | | UK vs Mid.East & Afr. Model 4 | |
|---|---|---|---|---|---|---|---|
| Intercept | 1.058 | Intercept | 1.157 | Intercept | 0.959 | Intercept | 0.901 |
| t-test | 8.263 | t-test | 8.523 | t-test | 14.321 | t-test | 5.556 |
| p-value | 0.000 | p-value | 0.000 | p-value | 0.000 | p-value | 0.000 |
| NEGMV | -0.426 | NEGMV | -0.42 | NEGMV | -0.388 | NEGMV | -0.624 |
| t-test | -12.354 | t-test | -11.85 | t-test | -11.629 | t-test | -3.501 |
| p-value | 0.000 | p-value | 0.000 | p-value | 0.000 | p-value | 0.001 |
| DUMDIV | -0.211 | DUMDIV | -0.31 | DUMDIV | -0.016 | DUMDIV | -0.185 |
| t-test | -1.717 | t-test | -2.340 | t-test | -0.222 | t-test | -1.104 |
| p-value | 0.086 | p-value | 0.019 | p-value | 0.824 | p-value | 0.270 |
| 1/lagMV | 1850 | 1/lagMV | 2523 | 1/lagMV | 210 | 1/lagMV | 3014 |
| t-test | 3.467 | t-test | 1.895 | t-test | 0.583 | t-test | 1.918 |
| p-value | 0.001 | p-value | 0.058 | p-value | 0.560 | p-value | 0.056 |
| BV * | 0.063 | BV* | 0.068 | BV* | -0.405 | BV* | 1.048 |
| t-test | 2.200 | t-test | 1.252 | t-test | -2.679 | t-test | 0.213 |
| p-value | 0.028 | p-value | 0.211 | p-value | 0.007 | p-value | 0.832 |
| PUK | 3.716 | PUK | 3.329 | PUK | 2.598 | PUK | 3.238 |
| t-test | 8.566 | t-test | 7.102 | t-test | 6.178 | t-test | 3.841 |
| p-value | 0.000 | p-value | 0.000 | p-value | 0.000 | p-value | 0.000 |
| DPUK | -2.803 | DPUK | 0.480 | DPUK | -3.090 | DPUK | -2.113 |
| t-test | -2.636 | t-test | 0.197 | t-test | -3.222 | t-test | -0.991 |
| p-value | 0.008 | p-value | 0.844 | p-value | 0.001 | p-value | 0.322 |
| PEU | 2.838 | PAMER | 3.206 | PASIA | 2.539 | PAFR | 3.575 |
| t-test | 6.221 | t-test | 4.560 | t-test | 5.968 | t-test | 1.587 |
| p-value | 0.000 | p-value | 0.000 | p-value | 0.000 | p-value | 0.113 |
| DPEU | 0.082 | DPAMER | -0.48 | DPASIA | -3.313 | DPAFR | 1.643 |
| t-test | 0.058 | t-test | -0.254 | t-test | -1.056 | t-test | 0.172 |
| p-value | 0.954 | p-value | 0.800 | p-value | 0.291 | p-value | 0.863 |
| PREST** | 2.300 | PREST** | 1.442 | PREST** | 1.221 | PREST** | 2.985 |
| t-test | 5.032 | t-test | 2.942 | t-test | 3.057 | t-test | 2.608 |
| p-value | 0.000 | p-value | 0.003 | p-value | 0.002 | p-value | 0.009 |
| DPREST | 1.172 | DPRESTAM | 1.329 | DPRESTAS | 0.363 | DPRESTAF | -1.373 |
| t-test | 1.712 | t-test | 2.015 | t-test | 0.525 | t-test | -0.881 |
| p-value | 0.087 | p-value | 0.044 | p-value | 0.600 | p-value | 0.379 |
| PBT*f(mv) | -0.034 | PBT*f(mv) | -0.016 | PBT*f(mv) | -0.029 | PBT*f(mv) | -0.016 |
| t-test | -1.635 | t-test | -0.463 | t-test | -1.412 | t-test | -0.426 |
| p-value | 0.102 | p-value | 0.643 | p-value | 0.158 | p-value | 0.670 |
| DIV | 1.038 | DIV | 0.254 | DIV | 1.032 | DIV | 3.015 |
| t-test | 1.177 | t-test | 0.324 | t-test | 0.901 | t-test | 2.047 |
| p-value | 0.239 | p-value | 0.746 | p-value | 0.368 | p-value | 0.041 |
| ADJER | 0.757 | ADJER | 0.251 | ADJER | -0.061 | ADJER | 0.830 |
| t-test | 2.514 | t-test | 0.629 | t-test | -0.391 | t-test | 0.482 |
| p-value | 0.012 | p-value | 0.530 | p-value | 0.695 | p-value | 0.630 |
| No.of cases | 2794 | | 2482 | | 1195 | | 468 |
| Adj.R-Square | 19.6% | Adj.R-Square | 19.8% | Adj.R-Square | 13.3% | Adj.R-Square | 22.8% |
| Wald p-value | 0.035 | Wald p-value | 0.771 | Wald p-value | 0.896 | Wald p-value | 0.861 |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported below regression coefficients.
Samples include dividend paying and non-dividend profit-making firms, and exclude cases where a given foreign segment PBT is missing.
* negative BVs are set to zero.
** PREST is the difference between the group-level PBT and the sum of the UK and the given foreign segment's PBT.

## Table 5.12-5.15T (TA-deflated model)

| UK vs EU<br>Model 1 | | UK vs America<br>Model 2 | | UK vs Asia<br>Model 3 | | UK vs Mid.East & Afr.<br>Model 4 | |
|---|---|---|---|---|---|---|---|
| Intercept | 0.500 | Intercept | 0.599 | Intercept | 0.453 | Intercept | 0.444 |
| t-ratio | *3.598* | t-ratio | *5.612* | t-ratio | *4.127* | t-ratio | *4.261* |
| p-value | *0.000* | p-value | *0.000* | p-value | *0.000* | p-value | *0.000* |
| NEGMV | -0.323 | NEGMV | -0.392 | NEGMV | -0.404 | NEGMV | -0.370 |
| t-ratio | *-8.692* | t-ratio | *-11.640* | t-ratio | *-8.524* | t-ratio | *-6.302* |
| p-value | *0.000* | p-value | *0.000* | p-value | *0.000* | p-value | *0.000* |
| DUMDIV | -0.409 | DUMDIV | -0.426 | DUMDIV | -0.236 | DUMDIV | -0.076 |
| t-ratio | *-3.167* | t-ratio | *-3.903* | t-ratio | *-2.373* | t-ratio | *-0.633* |
| p-value | *0.002* | p-value | *0.000* | p-value | *0.018* | p-value | *0.527* |
| 1/TA | -372.76 | 1/TA | 3034.47 | 1/TA | 496.38 | 1/TA | 1136.52 |
| t-ratio | *-0.704* | t-ratio | *3.116* | t-ratio | *0.626* | t-ratio | *3.018* |
| p-value | *0.481* | p-value | *0.002* | p-value | *0.531* | p-value | *0.003* |
| BV * | 0.022 | BV * | -0.292 | BV * | -0.771 | BV * | -4.674 |
| t-ratio | *0.076* | t-ratio | *-0.992* | t-ratio | *-0.949* | t-ratio | *-0.644* |
| p-value | *0.939* | p-value | *0.321* | p-value | *0.343* | p-value | *0.520* |
| PUK | 9.497 | PUK | 8.513 | PUK | 9.977 | PUK | 7.430 |
| t-ratio | *10.629* | t-ratio | *9.700* | t-ratio | *9.532* | t-ratio | *4.104* |
| p-value | *0.000* | p-value | *0.000* | p-value | *0.000* | p-value | *0.000* |
| DPUK | -17.99 | DPUK | -20.53 | DPUK | -10.10 | DPUK | -14.68 |
| t-ratio | *-3.756* | t-ratio | *-3.677* | t-ratio | *-3.487* | t-ratio | *-2.406* |
| p-value | *0.000* | p-value | *0.000* | p-value | *0.000* | p-value | *0.017* |
| PEU | 8.454 | PAMER | 7.319 | PASIA | 5.970 | PAFR | 3.171 |
| t-ratio | *6.511* | t-ratio | *6.778* | t-ratio | *3.594* | t-ratio | *1.388* |
| p-value | *0.000* | p-value | *0.000* | p-value | *0.000* | p-value | *0.166* |
| DPEU | -8.087 | DPAMER | -7.073 | DPASIA | -14.209 | DPAFR | -7.535 |
| t-ratio | *-2.115* | t-ratio | *-2.851* | t-ratio | *-1.705* | t-ratio | *-0.586* |
| p-value | *0.034* | p-value | *0.004* | p-value | *0.088* | p-value | *0.558* |
| PREST ** | 3.340 | PREST ** | 4.595 | PREST ** | 4.405 | PREST ** | 2.289 |
| t-ratio | *2.821* | t-ratio | *4.098* | t-ratio | *2.954* | t-ratio | *1.562* |
| p-value | *0.005* | p-value | *0.000* | p-value | *0.003* | p-value | *0.119* |
| DPREST | 4.151 | DPREST | 4.247 | DPREST | 5.690 | DPREST | 0.221 |
| t-ratio | *3.031* | t-ratio | *3.362* | t-ratio | *3.106* | t-ratio | *0.098* |
| p-value | *0.002* | p-value | *0.001* | p-value | *0.002* | p-value | *0.922* |
| PBT*f(TA) | 0.217 | PBT*f(TA) | 0.102 | PBT*f(TA) | 0.064 | PBT*f(TA) | 0.144 |
| t-ratio | *3.555* | t-ratio | *1.855* | t-ratio | *0.791* | t-ratio | *2.245* |
| p-value | *0.000* | p-value | *0.064* | p-value | *0.429* | p-value | *0.025* |
| DIV | -0.525 | DIV | 3.391 | DIV | 2.846 | DIV | -3.890 |
| t-ratio | *-0.264* | t-ratio | *1.622* | t-ratio | *1.357* | t-ratio | *-1.142* |
| p-value | *0.792* | p-value | *0.105* | p-value | *0.175* | p-value | *0.254* |
| Adj.ER | 0.537 | Adj.ER | 1.003 | Adj.ER | -0.199 | Adj.ER | 0.930 |
| t-ratio | *1.238* | t-ratio | *2.320* | t-ratio | *-0.406* | t-ratio | *0.328* |
| p-value | *0.216* | p-value | *0.020* | p-value | *0.685* | p-value | *0.743* |
| No.of cases | 2863 | | 2512 | | 1220 | | 477 |
| Adj.R-Square | 39.3% | Adj.R-Square | 41.2% | Adj.R-Square | 35.3% | Adj.R-Square | 45.4% |
| Wald p-value | 0.3658 | Wald p-value | 0.0976 | Wald p-value | 0.0069 | Wald p-value | 0.0143 |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported below regression coefficients. Samples include dividend paying and non-dividend profit-making firms, and exclude cases where a given foreign segment PBT is missing.

* negative BVs are set to zero.

** PREST is the difference between the group-level PBT and the sum of the UK and the given foreign segment's PBT.

## Table 5.12-5.15S (Sales-deflated model)

| UK vs EU Model 1 | | UK vs America Model 2 | | UK vs Asia Model 3 | | UK vs Mid.East & Afr. Model 4 | |
|---|---|---|---|---|---|---|---|
| Intercept | 1.630 | Intercept | 1.247 | Intercept | 1.332 | Intercept | 0.372 |
| t-ratio | *2.516* | t-ratio | *2.986* | t-ratio | *1.365* | t-ratio | *2.017* |
| p-value | *0.012* | p-value | *0.003* | p-value | *0.172* | p-value | *0.044* |
| NEGMV | -0.795 | NEGMV | -0.579 | NEGMV | -0.677 | NEGMV | -0.352 |
| t-ratio | *-5.471* | t-ratio | *-9.950* | t-ratio | *-5.179* | t-ratio | *-4.506* |
| p-value | *0.000* | p-value | *0.000* | p-value | *0.000* | p-value | *0.000* |
| DUMDIV | -1.640 | DUMDIV | -1.091 | DUMDIV | -1.126 | DUMDIV | -0.305 |
| t-ratio | *-2.489* | t-ratio | *-2.692* | t-ratio | *-1.124* | t-ratio | *-1.377* |
| p-value | *0.013* | p-value | *0.007* | p-value | *0.261* | p-value | *0.169* |
| 1/Sales | 3527.7 | 1/Sales | 4412.2 | 1/Sales | 9597.7 | 1/Sales | 935.3 |
| t-ratio | *1.188* | t-ratio | *2.095* | t-ratio | *1.190* | t-ratio | *1.972* |
| p-value | *0.235* | p-value | *0.036* | p-value | *0.234* | p-value | *0.049* |
| BV * | 0.560 | BV * | 0.084 | BV * | -4.570 | BV * | -20.21 |
| t-ratio | *0.721* | t-ratio | *0.129* | t-ratio | *-1.908* | t-ratio | *-1.612* |
| p-value | *0.471* | p-value | *0.898* | p-value | *0.056* | p-value | *0.108* |
| PUK | 22.317 | PUK | 10.982 | PUK | 11.917 | PUK | 1.575 |
| t-ratio | *3.649* | t-ratio | *4.587* | t-ratio | *1.985* | t-ratio | *0.216* |
| p-value | *0.000* | p-value | *0.000* | p-value | *0.047* | p-value | *0.829* |
| DPUK | -14.84 | DPUK | -23.74 | DPUK | -1.61 | DPUK | -12.58 |
| t-ratio | *-1.989* | t-ratio | *-2.517* | t-ratio | *-0.182* | t-ratio | *-1.720* |
| p-value | *0.047* | p-value | *0.012* | p-value | *0.856* | p-value | *0.086* |
| PEU | 20.563 | PAMER | 12.553 | PASIA | 10.399 | PAFR | -0.425 |
| t-ratio | *5.661* | t-ratio | *4.720* | t-ratio | *2.755* | t-ratio | *-0.093* |
| p-value | *0.000* | p-value | *0.000* | p-value | *0.006* | p-value | *0.926* |
| DPEU | -65.58 | DPAMER | -12.20 | DPASIA | -0.76 | DPAFR | -24.92 |
| t-ratio | *-1.580* | t-ratio | *-4.365* | t-ratio | *-0.058* | t-ratio | *-0.629* |
| p-value | *0.114* | p-value | *0.000* | p-value | *0.953* | p-value | *0.530* |
| PREST ** | 10.966 | PREST ** | 4.652 | PREST ** | 5.291 | PREST ** | -6.943 |
| t-ratio | *2.760* | t-ratio | *1.819* | t-ratio | *1.091* | t-ratio | *-0.610* |
| p-value | *0.006* | p-value | *0.069* | p-value | *0.275* | p-value | *0.542* |
| DPRESTEU | 11.173 | DPRESTAM | 5.398 | DPRESTAS | 4.895 | DPRESTAF | 8.389 |
| t-ratio | *1.881* | t-ratio | *2.129* | t-ratio | *0.778* | t-ratio | *0.868* |
| p-value | *0.060* | p-value | *0.033* | p-value | *0.436* | p-value | *0.386* |
| PBT*f(sale) | -0.119 | PBT*f(sale) | -0.029 | PBT*f(sale) | 0.020 | PBT*f(sale) | 0.346 |
| t-ratio | *-0.791* | t-ratio | *-0.290* | t-ratio | *0.093* | t-ratio | *1.099* |
| p-value | *0.429* | p-value | *0.772* | p-value | *0.926* | p-value | *0.272* |
| DIV | -10.606 | DIV | 2.754 | DIV | 4.122 | DIV | 11.166 |
| t-ratio | *-1.621* | t-ratio | *0.793* | t-ratio | *0.719* | t-ratio | *1.174* |
| p-value | *0.105* | p-value | *0.428* | p-value | *0.472* | p-value | *0.241* |
| ADJER | 7.191 | ADJER | 1.925 | ADJER | 3.892 | ADJER | -8.010 |
| t-ratio | *2.094* | t-ratio | *0.958* | t-ratio | *1.060* | t-ratio | *-1.126* |
| p-value | *0.036* | p-value | *0.338* | p-value | *0.289* | p-value | *0.261* |
| No.of cases | 2897 | | 2541 | | 1207 | | 478 |
| Adj.R-Square | 21.0% | | 28.5% | | 16.6% | | 40.0% |
| Wald p-value | 0.690 | | 0.216 | | 0.756 | | 0.572 |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported below regression coefficients. Samples include dividend paying and non-dividend profit-making firms, and exclude cases where a given foreign segment PBT is missing.

* negative BVs are set to zero.

** PREST is the difference between the group-level PBT and the sum of the UK and the given foreign segment's PBT.

**Table 5.17M (lagged MV-deflated model)**

**Panel A: The sample period is split into two sub-periods (pre-1996 and post-1995)**

| | Old economy period (i.e., before 1996) | | | New economy period (i.e., 1996 onwards) | | |
|---|---|---|---|---|---|---|
| | Model 1 | | | Model 2 | | |
| | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value |
| Intercept | 0.827 | 6.502 | 0.000 | 0.972 | 10.880 | 0.000 |
| NEGMV | -0.573 | -14.083 | 0.000 | -0.775 | -11.650 | 0.000 |
| DUMDIV | -0.213 | -1.710 | 0.087 | -0.040 | -0.441 | 0.659 |
| 1/MV | 2066.7 | 2.467 | 0.014 | 1268.2 | 2.818 | 0.005 |
| BV** | 0.201 | 4.487 | 0.000 | 0.415 | 5.274 | 0.000 |
| PUK | 3.930 | 8.649 | 0.000 | 1.851 | 4.992 | 0.000 |
| DPUK | 1.750 | 1.028 | 0.304 | -2.393 | -1.833 | 0.067 |
| PEU | 3.138 | 5.172 | 0.000 | 2.113 | 4.787 | 0.000 |
| DPEU | 0.637 | 0.336 | 0.737 | 0.855 | 0.560 | 0.576 |
| PAMER | 4.657 | 6.060 | 0.000 | 1.933 | 4.111 | 0.000 |
| DPAMER | -0.882 | -0.649 | 0.517 | -1.172 | -0.557 | 0.577 |
| PASIA | 2.996 | 4.229 | 0.000 | 0.981 | 1.453 | 0.146 |
| DPASIA | -1.900 | -1.040 | 0.298 | -0.719 | -0.185 | 0.853 |
| PAFR | 1.112 | 1.834 | 0.067 | 3.871 | 1.757 | 0.079 |
| DPAFR | 1.002 | 0.094 | 0.925 | -9.550 | -0.761 | 0.447 |
| PREST | 2.315 | 3.832 | 0.000 | 1.453 | 3.638 | 0.000 |
| PBT*f(mv) | -0.019 | -0.507 | 0.612 | -0.007 | -0.309 | 0.757 |
| DIV | 0.732 | 0.783 | 0.433 | -2.761 | -2.631 | 0.009 |
| ADJER | 0.094 | 0.227 | 0.821 | 1.129 | 4.794 | 0.000 |
| No.of cases | 2099 | | | 2175 | | |
| Adj.R-Square | 36.9% | | | 19.9% | | |

**Wald test of the significance of valuation differential between two segments**

| | Model 1 | Model 2 |
|---|---|---|
| Compared segments | P-value | P-value |
| UK vs Europe | 0.083 | 0.468 |
| UK vs America | 0.223 | 0.812 |
| UK vs Asia | 0.099 | 0.128 |
| UK vs Mid.East & Africa | 0.000 | 0.357 |
| Europe vs America | 0.011 | 0.700 |
| Europe vs Asia | 0.832 | 0.073 |
| Europe vs Mid. East & Africa | 0.001 | 0.436 |
| America vs Asia | 0.010 | 0.118 |
| America vs Mid. East & Africa | 0.000 | 0.372 |
| Asia vs Mid.East & Africa | 0.005 | 0.235 |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported next to regression coefficients

** negative BVs are set to zero.

## Panel B: splitting the sample period into three economic sub-periods

| | Pre-1994 Model 1 | | | 1994-1997 (Inclusive) Model 2 | | | Post-1997 Model 3 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Coeff. | t-ratio | p-value | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value |
| Intercept | 0.854 | 4.092 | 0.000 | 0.946 | 8.635 | 0.000 | 0.900 | 8.008 | 0.000 |
| NEGMV | -0.584 | -11.367 | 0.000 | -0.651 | -6.779 | 0.000 | -0.722 | -10.635 | 0.000 |
| DUMDIV | -0.273 | -1.352 | 0.176 | -0.168 | -1.513 | 0.130 | 0.036 | 0.320 | 0.749 |
| 1/MV | 2511.7 | 2.479 | 0.013 | 2045.7 | 2.072 | 0.038 | 578.6 | 1.350 | 0.177 |
| BV** | 0.179 | 3.441 | 0.001 | 0.267 | 3.373 | 0.001 | 0.443 | 4.659 | 0.000 |
| PUK | 3.713 | 6.138 | 0.000 | 3.049 | 5.239 | 0.000 | 1.610 | 2.776 | 0.006 |
| DPUK | -2.035 | -1.649 | 0.099 | 3.879 | 2.205 | 0.027 | -3.343 | -2.740 | 0.006 |
| PEU | 2.096 | 2.516 | 0.012 | 2.921 | 3.831 | 0.000 | 1.474 | 1.936 | 0.053 |
| DPEU | 2.268 | 0.973 | 0.330 | 1.200 | 0.522 | 0.602 | -0.269 | -0.129 | 0.897 |
| PAMER | 4.520 | 4.687 | 0.000 | 3.420 | 5.166 | 0.000 | 1.345 | 2.147 | 0.032 |
| DPAMER | -1.022 | -0.474 | 0.635 | -2.957 | -1.059 | 0.289 | -1.887 | -0.848 | 0.396 |
| PASIA | 2.798 | 3.958 | 0.000 | 1.624 | 1.718 | 0.086 | 1.323 | 1.888 | 0.059 |
| DPASIA | 1.783 | 0.575 | 0.565 | 1.526 | 0.623 | 0.533 | -5.290 | -1.282 | 0.200 |
| PAFR | 0.640 | 0.863 | 0.388 | 6.065 | 1.925 | 0.054 | 0.428 | 0.706 | 0.480 |
| DPAFR | -11.003 | -0.468 | 0.640 | 9.481 | 1.940 | 0.052 | -12.623 | -0.669 | 0.503 |
| PREST | 1.739 | 2.363 | 0.018 | 2.441 | 4.067 | 0.000 | 1.005 | 1.920 | 0.055 |
| PBT*f(mv) | 0.000 | 0.005 | 0.996 | 0.001 | 0.023 | 0.982 | -0.003 | -0.087 | 0.930 |
| DIV | 1.657 | 1.659 | 0.097 | -0.473 | -0.289 | 0.772 | -2.581 | -1.959 | 0.050 |
| ADJER | 0.293 | 0.974 | 0.330 | 1.744 | 2.761 | 0.006 | 0.967 | 3.172 | 0.002 |
| No.of cases | 1154 | | | 1454 | | | 1144 | | |
| Adj.R-Square | 38.0% | | | 28.2% | | | 17.6% | | |

Models are estimated for profit-making firm-years and without fixed effects.

**Wald test of the significance of valuation differential between two segments**

| Compared segments | Model 1 P-Value | Model 2 P-Value | Model 3 P-Value |
|---|---|---|---|
| UK vs Europe | 0.026 | 0.825 | 0.846 |
| UK vs America | 0.313 | 0.470 | 0.536 |
| UK vs Asia | 0.120 | 0.047 | 0.620 |
| UK vs Mid.East&Africa | 0.000 | 0.366 | 0.015 |
| Europe vs America | 0.005 | 0.482 | 0.858 |
| Europe vs Asia | 0.413 | 0.130 | 0.849 |
| Europe vs Mid.East&Africa | 0.079 | 0.367 | 0.137 |
| America vs Asia | 0.066 | 0.021 | 0.975 |
| America vs Mid.East&Africa | 0.000 | 0.422 | 0.094 |
| Asia vs Mid.East&Africa | 0.002 | 0.216 | 0.184 |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported next to regression coefficients.

** negative BVs are set to zero.

**Table 5.17T (TA-deflated model)**

**Panel A: The sample period is split into two sub-periods (pre-1996 and post-1995)**

| | Old economy period (i.e., before 1996) Model 1 * | | | New economy period (i.e., 1996 onwards) Model 2 * | | |
|---|---|---|---|---|---|---|
| | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value |
| Intercept | 0.531 | 6.425 | 0.000 | 0.551 | 4.132 | 0.000 |
| NEGMV | -0.275 | -9.284 | 0.000 | -0.476 | -10.695 | 0.000 |
| DUMDIV | -0.432 | -5.346 | 0.000 | -0.373 | -2.935 | 0.003 |
| 1/TA | 1788.3 | 3.159 | 0.002 | 2649.1 | 2.804 | 0.005 |
| BV** | 0.197 | 0.803 | 0.422 | -0.731 | -1.543 | 0.123 |
| PUK | 7.841 | 14.288 | 0.000 | 9.545 | 8.580 | 0.000 |
| DPUK | 1.416 | 0.434 | 0.665 | -17.350 | -4.181 | 0.000 |
| PEU | 6.893 | 10.157 | 0.000 | 8.960 | 6.904 | 0.000 |
| DPEU | -2.159 | -0.526 | 0.599 | -1.717 | -0.457 | 0.647 |
| PAMER | 7.841 | 10.090 | 0.000 | 7.342 | 5.284 | 0.000 |
| DPAMER | -11.547 | -2.509 | 0.012 | -6.307 | -1.994 | 0.046 |
| PASIA | 9.789 | 5.939 | 0.000 | 4.000 | 2.488 | 0.013 |
| DPASIA | -8.944 | -2.116 | 0.034 | -11.115 | -1.022 | 0.307 |
| PAFR | 2.994 | 2.393 | 0.017 | 2.491 | 1.350 | 0.177 |
| DPAFR | -15.467 | -2.946 | 0.003 | 18.775 | 1.003 | 0.316 |
| PREST | 7.927 | 8.783 | 0.000 | 3.355 | 3.125 | 0.002 |
| PBT*f(ta) | 0.015 | 0.410 | 0.682 | 0.228 | 3.114 | 0.002 |
| DIV | 5.679 | 4.323 | 0.000 | -4.953 | -1.850 | 0.064 |
| ADJER | 0.385 | 1.128 | 0.259 | 0.743 | 1.297 | 0.195 |
| No.of cases | 2146 | | | 2228 | | |
| Adj.R-Square | 56.6% | | | 31.7% | | |

**Wald test of the significance of valuation differential between two segments**

| Compared segments | Model 1 P-value | Model 2 P-value |
|---|---|---|
| UK vs Europe | 0.040 | 0.529 |
| UK vs America | 0.999 | 0.036 |
| UK vs Asia | 0.195 | 0.000 |
| UK vs Mid.East & Africa | 0.000 | 0.000 |
| Europe vs America | 0.173 | 0.228 |
| Europe vs Asia | 0.073 | 0.004 |
| Europe vs Mid. East & Africa | 0.001 | 0.000 |
| America vs Asia | 0.224 | 0.042 |
| America vs Mid. East & Africa | 0.000 | 0.010 |
| Asia vs Mid.East & Africa | 0.001 | 0.456 |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported next to regression coefficients.
** negative BVs are set to zero.

**Panel B: splitting the sample period into three economic sub-periods**

| | Pre-1994 Model 1 | | | 1994-1997 (inclusive) Model 2 | | | Post-1997 Model 3 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Coeff. | t-ratio | p-value | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value |
| Intercept | 0.573 | 4.815 | 0.000 | 0.411 | 3.017 | 0.003 | 0.401 | 1.966 | 0.049 |
| NEGMV | -0.284 | -7.438 | 0.000 | -0.287 | -6.460 | 0.000 | -0.460 | -7.010 | 0.000 |
| DUMDIV | -0.451 | -4.000 | 0.000 | -0.358 | -2.691 | 0.007 | -0.221 | -1.217 | 0.224 |
| 1/TA | 1939.2 | 1.299 | 0.194 | 719.2 | 1.582 | 0.114 | 1597.6 | 2.236 | 0.025 |
| BV** | 0.199 | 0.515 | 0.607 | 0.267 | 1.487 | 0.137 | -1.729 | -2.354 | 0.019 |
| PUK | 7.200 | 8.121 | 0.000 | 10.723 | 12.836 | 0.000 | 9.354 | 5.154 | 0.000 |
| DPUK | -2.233 | -0.872 | 0.383 | -25.53 | -4.570 | 0.000 | -9.673 | -2.555 | 0.011 |
| PEU | 6.052 | 4.326 | 0.000 | 8.088 | 9.538 | 0.000 | 11.265 | 3.728 | 0.000 |
| DPEU | -6.866 | -1.795 | 0.073 | 3.789 | 0.860 | 0.390 | -11.83 | -1.673 | 0.094 |
| PAMER | 8.042 | 6.888 | 0.000 | 9.143 | 8.112 | 0.000 | 5.476 | 2.546 | 0.011 |
| DPAMER | -19.68 | -2.245 | 0.025 | -5.087 | -1.736 | 0.083 | -6.303 | -1.670 | 0.095 |
| PASIA | 5.507 | 4.353 | 0.000 | 7.447 | 3.606 | 0.000 | 5.067 | 1.841 | 0.066 |
| DPASIA | 0.528 | 0.120 | 0.905 | -8.009 | -1.229 | 0.219 | -32.83 | -1.273 | 0.203 |
| PAFR | 2.482 | 1.448 | 0.148 | 5.304 | 2.153 | 0.031 | 3.459 | 2.147 | 0.032 |
| DPAFR | -33.11 | -1.107 | 0.268 | -10.10 | -1.510 | 0.131 | -9.349 | -0.297 | 0.766 |
| PREST | 6.068 | 5.105 | 0.000 | 7.110 | 7.237 | 0.000 | 3.162 | 1.733 | 0.083 |
| PBT*f(ta) | 0.017 | 0.304 | 0.761 | 0.030 | 0.647 | 0.518 | 0.283 | 2.509 | 0.012 |
| DIV | 4.378 | 2.850 | 0.004 | 0.724 | 0.386 | 0.699 | -5.700 | -1.392 | 0.164 |
| ADJER | 0.336 | 0.993 | 0.321 | 0.108 | 0.123 | 0.902 | 1.240 | 1.664 | 0.096 |
| No.of cases | 1178 | | | 1488 | | | 1174 | | |
| Adj.R-Square | 52.8% | | | 55.5% | | | 29.0% | | |

**Wald test of the significance of valuation differential between two segments**

| Compare segments | Model 1 P-value | Model 2 P-value | Model 3 P-value |
|---|---|---|---|
| UK vs Europe | 0.232 | 0.001 | 0.450 |
| UK vs America | 0.269 | 0.085 | 0.013 |
| UK vs Asia | 0.070 | 0.084 | 0.077 |
| UK vs Mid.East & Africa | 0.003 | 0.024 | 0.000 |
| Europe vs America | 0.082 | 0.347 | 0.056 |
| Europe vs Asia | 0.697 | 0.740 | 0.085 |
| Europe vs Mid. East & Africa | 0.041 | 0.249 | 0.001 |
| America vs Asia | 0.020 | 0.424 | 0.874 |
| America vs Mid. East & Africa | 0.001 | 0.133 | 0.196 |
| Asia vs Mid.East & Africa | 0.126 | 0.481 | 0.499 |
| UK vs Europe | 0.007 | 0.014 | 0.672 |
| UK vs America | 0.003 | 0.095 | 0.067 |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported next to regression coefficients.
** negative BVs are set to zero.

## Table 5.17S (Sales-deflated model)

### Panel A: The sample period is split into two sub-periods (pre-1996 and post-1995)

| | Old economy period (i.e., before 1996) Model 1 * | | | New economy period (i.e., 1996 onwards) Model 2 * | | |
|---|---|---|---|---|---|---|
| | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value |
| Intercept | 0.572 | 3.893 | 0.000 | 1.471 | 2.789 | 0.005 |
| NEGMV | -0.363 | -8.391 | 0.000 | -0.938 | -6.688 | 0.000 |
| DUMDIV | -0.533 | -3.752 | 0.000 | -1.627 | -2.947 | 0.003 |
| 1/sale | 2524.3 | 5.056 | 0.000 | 4198.2 | 1.510 | 0.131 |
| BV** | 0.870 | 3.014 | 0.003 | -0.553 | -0.428 | 0.669 |
| PUK | 9.738 | 4.554 | 0.000 | 25.759 | 4.747 | 0.000 |
| DPUK | 1.253 | 0.330 | 0.742 | -16.633 | -2.348 | 0.019 |
| PEU | 10.500 | 4.426 | 0.000 | 30.852 | 5.494 | 0.000 |
| DPEU | -34.424 | -2.181 | 0.029 | -56.311 | -1.714 | 0.086 |
| PAMER | 9.964 | 4.259 | 0.000 | 25.607 | 5.351 | 0.000 |
| DPAMER | -33.833 | -2.971 | 0.003 | -2.236 | -0.371 | 0.710 |
| PASIA | 12.656 | 4.792 | 0.000 | 18.023 | 3.535 | 0.000 |
| DPASIA | -13.408 | -3.180 | 0.001 | 2.368 | 0.215 | 0.830 |
| PAFR | -2.206 | -0.803 | 0.422 | 10.321 | 1.114 | 0.265 |
| DPAFR | -5.618 | -1.472 | 0.141 | 12.444 | 0.313 | 0.754 |
| PREST | 7.111 | 2.934 | 0.003 | 16.481 | 3.710 | 0.000 |
| PBT*f(sale) | -0.080 | -1.558 | 0.119 | -0.395 | -2.296 | 0.022 |
| DIV | 6.550 | 1.975 | 0.048 | -13.834 | -1.832 | 0.067 |
| ADJER | 3.315 | 1.089 | 0.276 | 7.536 | 2.212 | 0.027 |
| No.of cases | 2165 | | | 2232 | | |
| Adj.R-Square | 55.4% | | | 25.7% | | |

### Wald test of the significance of valuation differential between two segments

| Compared segments | Model 1 P-Value | Model 2 P-value |
|---|---|---|
| UK vs Europe | 0.470 | 0.286 |
| UK vs America | 0.753 | 0.954 |
| UK vs Asia | 0.023 | 0.107 |
| UK vs Mid.East & Africa | 0.001 | 0.081 |
| Europe vs America | 0.669 | 0.293 |
| Europe vs Asia | 0.190 | 0.016 |
| Europe vs Mid. East & Africa | 0.001 | 0.037 |
| America vs Asia | 0.046 | 0.101 |
| America vs Mid. East & Africa | 0.002 | 0.083 |
| Asia vs Mid.East & Africa | 0.000 | 0.444 |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported next to regression coefficients

** negative BVs are set to zero.

## Panel B: splitting the sample period into three economic sub-periods

| | Pre-1994 Model 1 | | | 1994-1997(inclusive) Model 2 | | | Post-1997 Model 3 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Coeff. | t-ratio | p-value | Coeff. | t-ratio | p-value | Coeff. | t-ratio | p-value |
| Intercept | 0.610 | 2.042 | 0.041 | 0.654 | 2.200 | 0.028 | 1.867 | 2.040 | 0.041 |
| NEGMV | -0.372 | -5.799 | 0.000 | -0.583 | -4.264 | 0.000 | -1.058 | -4.896 | 0.000 |
| DUMDIV | -0.656 | -2.283 | 0.022 | -0.751 | -2.220 | 0.026 | -1.714 | -1.871 | 0.061 |
| 1/sale | 1521.51 | 0.540 | 0.589 | 1989.00 | 1.985 | 0.047 | 1329.84 | 0.477 | 0.634 |
| BV** | 1.182 | 2.577 | 0.010 | 1.726 | 2.688 | 0.007 | -1.869 | -1.110 | 0.267 |
| PUK | 11.414 | 3.426 | 0.001 | 22.663 | 3.571 | 0.000 | 22.834 | 2.535 | 0.011 |
| DPUK | -4.677 | -1.364 | 0.173 | -2.820 | -0.322 | 0.747 | -18.41 | -2.676 | 0.007 |
| PEU | 16.607 | 3.549 | 0.000 | 28.289 | 4.529 | 0.000 | 16.979 | 3.711 | 0.000 |
| DPEU | -76.84 | -1.503 | 0.133 | -5.506 | -0.552 | 0.581 | -67.74 | -1.366 | 0.172 |
| PAMER | 12.958 | 3.526 | 0.000 | 24.643 | 3.942 | 0.000 | 20.590 | 3.266 | 0.001 |
| DPAMER | -44.40 | -2.951 | 0.003 | -14.38 | -0.881 | 0.378 | -1.185 | -0.137 | 0.891 |
| PASIA | 15.505 | 4.543 | 0.000 | 27.534 | 3.297 | 0.001 | 6.924 | 1.937 | 0.053 |
| DPASIA | -12.31 | -0.908 | 0.364 | -24.251 | -2.910 | 0.004 | 3.474 | 0.262 | 0.794 |
| PAFR | 5.512 | 1.037 | 0.300 | 11.476 | 1.448 | 0.148 | 18.253 | 2.740 | 0.006 |
| DPAFR | -22.92 | -0.226 | 0.821 | 15.736 | 0.172 | 0.863 | -35.66 | -1.020 | 0.308 |
| PREST | 7.382 | 1.942 | 0.052 | 15.910 | 3.087 | 0.002 | 14.068 | 1.896 | 0.058 |
| PBT*f(sale) | -0.208 | -1.747 | 0.081 | -0.483 | -3.132 | 0.002 | -0.238 | -0.860 | 0.390 |
| DIV | 7.319 | 1.670 | 0.095 | -11.57 | -1.057 | 0.290 | -13.58 | -1.361 | 0.173 |
| ADJER | 5.710 | 1.690 | 0.091 | 5.190 | 1.016 | 0.310 | 5.961 | 1.561 | 0.118 |
| No.of cases | 1186 | | | 1493 | | | 1186 | | |
| Adj.R-Square | 56.8% | | | 32.8% | | | 18.3% | | |

### Wald test of the significance of valuation differential between two segments

| Compared segments | Model 1 p-value | Model 2 p-value | Model 3 p-value |
|---|---|---|---|
| UK vs Europe | 0.035 | 0.199 | 0.367 |
| UK vs America | 0.109 | 0.490 | 0.573 |
| UK vs Asia | 0.005 | 0.446 | 0.033 |
| UK vs Mid.East&Africa | 0.033 | 0.020 | 0.521 |
| Europe vs America | 0.153 | 0.459 | 0.428 |
| Europe vs Asia | 0.681 | 0.891 | 0.016 |
| Europe vs Mid.East&Africa | 0.000 | 0.021 | 0.781 |
| America vs Asia | 0.144 | 0.665 | 0.007 |
| America vs Mid.East&Africa | 0.007 | 0.014 | 0.672 |
| Asia vs Mid.East&Africa | 0.003 | 0.095 | 0.067 |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported next to regression coefficients.
All models are estimated for profit-making firm-years and without fixed effects.
** negative BVs are set to zero.

# CHAPTER 6

## VALUATION OF LINE-OF-BUSINESS SEGMENT

### 6.1. INTRODUCTION

In this chapter I extend the analysis of Chapter 5 by investigating the value relevance of line-of-business segment information disclosed by already geographically diversified multi-segment firms. More specifically, the empirical investigation of this chapter addresses the following questions:

- whether the basic accounting information is differentially associated to the firm value across two categories of multi-segment firms: firms that disclose geographic segments only vs. those that simultaneously disclose geographic and line-of-business information;

- whether specific industrial segments of firms operating in more than one line-of-business are differentially association with the value of the firm, that is, have differential value contributions.

It is important to emphasise that this chapter specifically deals with firms which are diversified across both geographic and industrial dimensions. This approach, to some extent, facilitates the cross-examination of the valuation effects associated with both types of corporate diversification.

The chapter is organised as follows. **Section 6.2** discusses the process of data collection and methods used for classifying the reported business segments into specific industries/economic sectors. It also analyses the business segment-level descriptive statistics. **Section 6.3** reports, describes and analyses various business segment-level tests and results. **Section 6.4** provides further evidence on the robustness of the empirical results, and summarises the main findings of this chapter.

## 6.2. DATA AND DESCRIPTIVE ANALYSIS

### 6.2.1 Data Collection and Segment Identification Issues

To identify industrially multi-segment firms, I follow the approach adopted in Chapter 5. That is, the firm's disclosure or non-disclosures of segment-level accounting numbers, contained in the financial statements, is used to identify whether the firm is diversified industrially and, if yes, whether it is diversified into specific lines of business.

Until June 1990 segment disclosure requirements in the UK were governed by the Companies Act 1985, where companies were only required to disclose turnovers by (a) Class of business and (b) Geographical market. Thereafter, the Act was superseded by SSAP 25, which adds the requirement to disclose both Profit/Loss before tax and Net Assets by Class of business and Geographical market.

Similar to the analysis in Chapter 5, in this chapter I identify the line-of-business segment reporting firms on the basis of the availability or disclosure of the segment-level accounting data, specifically the PBTs. Before proceeding to the analysis of descriptive statistics, it is necessary to summarise the process of data collection, as it required considerable manual work and investigative efforts.

Several technical problems have been encountered during the collection and sorting of data on firms' business segments.

First of all, unlike geographic segment data, line-of-business segment information for the UK firms is not readily available, in the required electronic format, from Extel Company Analysis database. Therefore, the required information is collated manually from the sample companies' financial reports contained in the Extel Company Analysis database.

Secondly, similar to the situation with geographic segment disclosures, when disclosing the line-of-business segments, the reported accounting information is often incomplete. Only rarely do firms simultaneously report all three accounting data items required by SSAP 25 (i.e., PBT, NA and Sales) for each disclosed line-of-business segment and year when financial statements are available in Extel. This incomplete segment information might present a problem when determining which firms should be categorised as industrially diversified. This problem arises when line-of-business PBTs are not reported for a given firm-year but other segment-level accounting data, such as NAs and Sales, are reported[94]. Because of missing segmental PBTs such firm-years are excluded from the analysis. In other words, only firm-years with available segmental PBTs are included in the sample. Hence, firm-years with missing segmental PBTs, yet available NAs and/or Sales, are implicitly considered as not diversified[95].

In the process of data collection it became clear that firms are often inconsistent in grouping and reporting their line-of-business segmental operations. For example, on a number of occasions the line-of-business segment reports include geographic regions as specific line-of-business[96]. These firm-years are excluded from the sample because geographical segment valuation was the subject of Chapter 5 and the present chapter specifically focuses on the industrial segments.

Another problem that complicates line-of-business data collection, categorisation and subsequent empirical analysis, is the idiosyncrasy across the sample firms in terms of line-of-business segment identification. Different firms categorise and report their line-of-business operations in different ways. In a way, this flexibility or discretion to define and report business segments is implied in SSAP 25. Thus, in reporting line-of-business accounting data, some 450 geographically diversified firms use more than 800 different line-of-business segment names/labels. Typically, these segment names/labels

[94] The source of this problem – whether it is due to firms submitting incomplete segmental reports or whether it is due to inaccuracies/errors in the Extel database – is unknown.
[95] This assumption is restrictive but necessary because in the employed regression model value contributions associated with specific business segments are inferred from the values of the segments' PBT coefficient.
[96] This might happen when the firm groups all its operations (albeit from different lines-of-business) performed in a foreign location into one business unit and report it as a geographical unit.

themselves do not convey information sufficient for categorising these segments into specific economic sectors or industries.

The categorisation of line-of-business operations into specific economic sectors is necessary for the subsequent empirical analysis of segment valuation. Industrial affiliation of a reported line-of-business can be identified only by examining individual companies' annual reports. Therefore, to identify the nature of each reported line-of-business segment, I analyse the content of the textual information contained in various sections of the firms' annual reports (e.g., chairman's statements, operations' review, etc.). Annual reports are accessed online, using the firms' official web sites. If this information is not available online, I access the brief summaries of firms' operations reported by such online business information sources as http://briefings.ft.com/company/, www.business.com, www.corporateinformation.com, etc.

The content analysis of business disclosures of the sample firms suggests that firms can be categorised into several categories, depending on the segment disclosure styles. Within the *first* category are the firms whose business segments reflect operations that relate to different industries or economic sectors. In this case it could be said that the firm is **industrially** diversified.

In the *second* category are the firms whose business segments are organised and reported to reflect specific product lines within a single industry or economic sector. In this case, the firm can not be considered industrially diversified. In the *third* category are the firms whose all lines-of-business relate to the same industry, yet cater to different segments of the product/services market or types of customers. That is, the line-of-business segments might be organised by type of customers being served. There are also firms whose line-of-business segment reporting style is a combination of the previously listed categories.

It is obvious that when dealing with the *second* and *third* categories, there are virtually unlimited number of possible types/names of line-of-business segments. In practice, this considerably complicates the categorisation of the plethora of line-of-business segments (reported by the cross-section of firms) into a few distinct and mutually exclusive specific lines-of-business. This problem becomes particularly difficult given that the emphasis of this chapter is on the relative valuation of operations associated with specific economic sectors. Recall that the primary objective of this chapter is to examine the market's perception of the relative value contributions associated with specific line-of-business operations of (geographically diversified) firms, and more specifically, with operations from specific industries/economic sectors.

Another technical problem is that the financial statement numbers reported in the Extel files occasionally have different scaling within the cross-section of sample firms or even within a single firm. For example, for one firm the financial numbers might be reported in GBP millions, while for another firm these numbers might be stated in thousands. Similar scaling problems often exist within a single firm across different years. When such cases were identified rescaling was performed.

The analysis of segment reports and the textual information in the annual reports of the sample firms revealed that many companies frequently changed their reported lines-of-business over the sample period. These changes usually took place in three ways:

1. changes in the number of reported line-of-business segments over a period of several years;

2. changes in the names of the previously reported line-of-business segments; and/or,

3. changes in the composition of the firm's line-of-business segment reports.

The **first case** usually relates to situations where the firm enters into new line-of-business (through organic growth, acquisitions, mergers, etc.) or stops operating in some of its previously reported lines-of-business. This type of segment reporting change does not complicate the data collection and segment identification process.

Some segment identification problems arise in the **second case**, where firms change the names/labels of specific line-of-business operations. The difficulty is that without analysing the content of the firm's annual reports, it is not possible to conclude whether the reporting of a new line-of-business reflects the emergence of new area of operations within the firm, or is simply a result of the alteration of the previously existing segment's name. Non-availability, for a number of sample firms, of annual reports from earlier years of the sample period adds to the problem of tracing the name changes and, in general, of segment identification.

The **third case** is, perhaps, the most complicated of the three. It reflects the reorganisation and revision (by the firm's management) of how the information about the firm's segment-level operations is disclosed by the firm. Here the firm might split a previously reported single segment into two new reported segments. For example, a single reported segment *'Precision Engineering & Electronic Systems'* can be reported as such for some years, and then be split and reported as two different segments. Similarly, two previously separately reported segments might then be agglomerated and reported under one heading. The latter might complicate the classification of the new segment within a particular industry/line of business if, for example, the initial two segments belonged to two completely different economic sectors/industries. Note, that the physical structure of the firm's operations remains unchanged. Yet again, in all these cases the process of segment identification and classification requires analysing the content of the firm's annual reports for each year when there was a structural change in the segmental report.

Having examined some of the major difficulties associated with the use of the line-of-business segments' reports, it is also necessary to touch upon the procedures of segment categorisation by economic sectors.

After collecting the raw line-of-business segmental data, I examine the nature of business involvement of a specific segment within each firm and match the names of segments with the 'best-fitting' economic sectors. For this purpose I use two alternative economic sector classification systems: (1) the Financial Time Stock Exchange Global Classification System (UK FTSE GCS), and (2) the United States Standard Industrial Classification codes (US SIC)[97]. The systems have somewhat different organisation, yet have been equally widely used in the international capital markets. Therefore, for the reasons of completeness of this study, in the empirical analysis sections of this chapter I will be reporting segment valuation results based on two alternative systems of segments' industrial classification. Regardless of the choice of the system, the process of segment classification by economic sectors bears a considerable degree of discretion, as in many cases it is not possible to relate the firm's specific segment to a particular industry. To attach the firm's segment to an industry and minimise the subjectivity of judgment I refer, as a starting point, to the firm's primary and secondary industry information contained in the Extel database.

For many firm-years the names of some business segment, used by the firm, appear to match the name of the entire firm's industry group. In this straightforward case the content analysis of the firm's annual reports becomes unnecessary and the segment is simply considered to belong to the economic sector of the entire firm. For example, if the entire firm belongs to the *'Beverages'* economic sector, and one of its reported business segments is labelled as *'Brewers'*, then that segment will be classified into the *'Beverages'* economic sector. However, if another segment of the same firm is

[97] The detailed structures of FTSE and SIC systems are presented in the relevant empirical analysis sections of the chapter.

labels as *'Restaurants and Pubs'*, it is necessary to cross-check its business substance with the annual report, because this business segment might better relate to the *'Leisure and Hotels'* economic sector, which is different from the *'Beverages'* economic sector. In many cases the cross-checks with annual reports are also necessary when the name of one segment matches the name of some specific economic sector, yet the firm belongs to another economic sector. For example, the segment name *'Transport'*, reported by an *'Automobiles and Parts'* economic sector firm perfectly matches the name of the economic sector *'Transport'*. Yet in reality, the segment name *'Transport'* could mean the manufacturing of vehicles and, therefore, should be categorised into the *'Automobiles and Parts'* economic sector. In such cases, only the content analysis of relevant sections of the firm's annual reports would shed light on the true industrial affiliation/belonging of a segment.

### 6.2.2 Segment Industrial Classification and disclosure characteristics

As was previously mentioned, for the completeness of analyses, in the empirical sections of this chapter two alternative systems of industry/economic sector classification (UK FTSE GCS and US SIC codes) are used to identify the industrial affiliation of a given business segment. Both systems have unique structural peculiarities that would impact upon the (pattern of) industrial distribution of the sample's line-of-business segments and the interpretation of segments' valuation results. The following two sub-sections examine both systems in more detail.

#### 6.2.2.1 The US Standard Industrial Classification System and segment disclosure statistics

The US Standard Industrial Classification system consists of nine primary divisions, where each division has its unique one-digit SIC code[98]. Furthermore, each division includes several major groups with a two-digit SIC code attached to each group. There are more than 70 two-digit SIC major groups/industries. This hierarchy extends up to the four-digit codes level. The analysis would have certainly benefited if it was possible to use the finest level (i.e., four-digit) SIC codes. However, in the context of the model and test design employed in this study, and in light of the insufficient number of segments associated with the two-digit SIC groups, it is not feasible to take the empirical analysis beyond the one-digit SIC codes. The primary one-digit SIC divisions are:

A. Agriculture, Forestry and Fishing

B. Mining

C. Construction

D. Manufacturing

E. Transportation, Communications, Electric, Gas, and Sanitary Services

F. Wholesale Trade

G. Retail Trade

H. Finance, Insurance and Real Estate

I. Services

The composition of these primary divisions, in terms of the number of two-digit industries, varies considerably. Divisions A, B, C and F have the smallest numbers (i.e., five or less) of two-digit industries, while the division D is the largest and includes 20

[98] Details of the structure of the SIC system can be found on the official web site of the U.S. Department of Labour (see: http://www.osha.gov/pls/imis/sic_manual.html).

two-digit manufacturing industries. It is, therefore, not surprising that the majority of the sample firm' business segments belong to the Manufacturing division.

To be included in the sample, the geographically diversified firm must report at least one specific business segment for a given year. Some 2,169 geographically diversified firm-years meet this requirement and report 6,342 specific business segments in total, suggesting that on average 2.9 (6342/2169=2.92) segments are reported for each firm-year[99]. In other words, an average sample firm operates in three lines-of-business.

However, further analysis of the industrial affiliations of these segments, based on the one-digit SIC codes, reveals that firms are much more focused. This is because, although being reported under different headings, the **majority** of business segments reported by a firm-year often belong to the same one-digit SIC code. In many instances **all** business segments reported by a firm-year belong to one SIC one-digit industry code. In other words, the firm might report different line-of-business segments and be considered industrially diversified under the two or three-digit SIC codes, yet remain industrially focused in terms of the one-digit SIC codes.

As was mentioned earlier in this chapter, data problems and the test design limit the level of SIC codes that could be used to categorise the segments. Therefore, I amalgamate different business segments when they belong to the same one-digit SIC code. This results in 3096 one-digit SIC segments being identified within the sample of 2013 firm-years, making firms look substantially less diversified. That is, firms on average, report 1.54 (3295/2169=1.54) segments in any year.

**Table 6.1** reveals further particulars of in-sample segment disclosures.

[99] Of these 6342 segments, I was not able to identify either two- or one-digit SIC industry codes for some 150 business segments.

**Table 6.1**

**Panel A. Frequency of segment types reported in each year *.**

| Year | One-digit SIC Industry of the reported business segments | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | A. Agriculture, Forestry and Fishing | B. Mining | C. Construction | D. Manufacturing | E. Transportation, Communications, Electric, Gas & Sanitary Services | F. Wholesale Trade | G. Retail Trade | H. Finance, Insurance and Real Estate | I. Services | Total |
| 1991 | 0 | 0 | 0 | 2 | 0 | 2 | 3 | 1 | 1 | 9 |
| 1992 | 0 | 1 | 2 | 10 | 2 | 5 | 2 | 1 | 5 | 28 |
| 1993 | 1 | 1 | 5 | 26 | 4 | 12 | 6 | 3 | 12 | 70 |
| 1994 | 5 | 5 | 21 | 153 | 29 | 48 | 24 | 32 | 63 | 380 |
| 1995 | 6 | 5 | 21 | 201 | 44 | 63 | 37 | 35 | 84 | 496 |
| 1996 | 6 | 5 | 20 | 201 | 41 | 56 | 35 | 38 | 85 | 487 |
| 1997 | 6 | 9 | 20 | 200 | 44 | 52 | 34 | 35 | 97 | 497 |
| 1998 | 5 | 8 | 19 | 185 | 42 | 51 | 41 | 29 | 91 | 471 |
| 1999 | 6 | 7 | 21 | 162 | 40 | 43 | 40 | 31 | 95 | 445 |
| 2000 | 1 | 3 | 11 | 70 | 25 | 18 | 25 | 13 | 47 | 213 |
| Total | 36 | 44 | 140 | 1210 | 271 | 350 | 247 | 218 | 580 | 3096 |

* Numbers are based on the primary sample which does not exclude the outliers.

**Panel B. Frequency of segment types reported by firms of a given principal industry *.**

| Principal Industry of the Entire Firm ** | One-digit SIC Industry of the reported business segments | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | A. Agriculture, Forestry and Fishing | B. Mining | C. Construction | D. Manufacturing | E. Transportation, Communications, Electric, Gas & Sanitary Services | F. Wholesale Trade | G. Retail Trade | H. Finance, Insurance and Real Estate | I. Services | Total |
| FTSE 0 | 0 | 0 | 0 | 73 | 5 | 109 | 38 | 20 | 63 | 308 |
| FTSE 1 | 0 | 44 | 90 | 237 | 19 | 41 | 4 | 60 | 50 | 545 |
| FTSE 2 | 0 | 0 | 33 | 478 | 26 | 48 | 1 | 28 | 41 | 655 |
| FTSE 3 | 0 | 0 | 0 | 112 | 0 | 15 | 11 | 0 | 6 | 144 |
| FTSE 4 | 36 | 0 | 7 | 123 | 12 | 68 | 26 | 12 | 7 | 291 |
| FTSE 5 | 0 | 0 | 10 | 165 | 161 | 62 | 156 | 75 | 325 | 954 |
| FTSE 6 | 0 | 0 | 0 | 1 | 5 | 2 | 11 | 6 | 3 | 28 |
| FTSE 7 | 0 | 0 | 0 | 0 | 41 | 5 | 0 | 13 | 6 | 65 |
| FTSE 8^ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| FTSE 9 | 0 | 0 | 0 | 21 | 2 | 0 | 0 | 4 | 79 | 106 |
| Total | 36 | 44 | 140 | 1210 | 271 | 350 | 247 | 218 | 580 | 3096 |

* Numbers are based on the primary sample which does not exclude the outliers.
** FTSE GCS is used as the basis for firms' classified into industries. FTSE 0 = Resources; FTSE 1 = Basic Industries; FTSE 2 = General Industrials; FTSE 3 = Cyclical Consumer Goods; FTSE 4 = Non-Cyclical Consumer Goods; FTSE 5 = Cyclical Services; FTSE 6 = Non-Cyclical Services; FTSE 7 = Utilities; FTSE 8 Financials; FTSE 9 = Information Technology.
^ There are no observations in this sector, because the FTSE-based financial firms are not included in the sample.

The table shows that nearly 39% of all reported business segments operate in the Manufacturing industries. The next most frequently reported industry of segments' operations is Services (18.7%). This is in sharp contrast with Mining, and Agriculture, Forestry and Fishing industries with less than 1.5% of segments operating in these sectors. This uneven distribution of segment's industrial affiliation is, however, not inconsistent with the industrial distribution of the sample firms (see Chapter 4 for details).

The yearly break-down of segment reporting frequencies in **Panel A of Table 6.1** reveals the non-static pattern of segment disclosures. From 1991 through 1995, in each consecutive year there were more reported segments across all lines-of-business. Using the available data it is difficult to identify the cause of this growth. It is possible that firms had been gradually or, for some reason, reluctantly reacting to the adoption in year 1991 of a new segment reporting standard (SSAP 25). The cause, however, might also be of a technical origin, reflecting the compilation of data by Extel Company Analysis. The pattern would also be consistent with a conjecture that firms were increasing the level of industrial diversification in the first half of the 1990s, hence, more reported segments. It is, however, difficult to defend this hypothesis as the numbers reported in **Panels A** and **C** of **Table 6.2** (see **Section 6.2.2.2** below) indicate that the level of industrial diversification had been decreasing.

**Panel B** of **Table 6.1** provides further insight into the relationships between the reported segments and the principal industry of the segment reported firm. Because firms' industries are identified using the FTSE GCS system and the segments' industries are based on the SIC system, **Panel B** also provides some indication of the level of association between these two industry classification systems.

The reported patterns indicate that there is little relation between the firms' principal industry and the types of business segments these firms report. For example, it is not unusual for firms with principal operations in the 'Basic Industries' sector to report segments in such sectors as *'Mining'*, *'Construction'*, *'Manufacturing'*, *'Finance'*, *'Services'*, *'Wholesale Trade'*, etc. Similar spread of segment-level industries is observed when the firm's principal operations are in the *'Non-Cyclical Consumer Goods'* industry. Perhaps, the most focused are the firms with principal operations in the *'IT'* and *'Utilities'* sectors. Such firms report segments from only four different industries. It is also noteworthy that the *'Utilities'* sector firms do not operate in the most frequently reported segment industry, Manufacturing.

Despite this wide segment-level industry spread of firms operating in a given principal industry, one could still identify one dominant segment for each firm-industry.

| **Principal industry of the firm** | **Dominant segment-level industry** |
|---|---|
| Resources | Wholesale Trade |
| Basic Industries | Manufacturing |
| General Industrials | Manufacturing |
| Cyclical Consumer Goods | Manufacturing |
| Non-Cyclical Consumer Goods | Manufacturing |
| Cyclical Services | Services |
| Non-Cyclical Services | Retail Trade |
| Utilities | Transportation, Communications, Electric, Gas & Sanitary Services |
| Financials | - |
| Information Technology | Services |

The above revealed associations between the two systems of industrial classification might provide a benchmark for comparing the segmental relative valuation results reported in **Section 3.2** with those reported in **Section 3.3**.

#### 6.2.2.2 The FTSE Global Classification System and segment disclosure statistics

Similar to the US SIC system, the UK FTSE Global Classification System also has a hierarchical structure and includes ten basic economic groups, 37 sectors and about 100 sub-sectors[100].

To investigate the value contributions associated with business segments operating in specific economic sectors each reported business segment needs to be categorised according to the FTSE economic groups. The empirical analysis would have certainly benefited if it was possible to go beyond the ten economic groups and use finer categorisation, such as economic sectors and sub-sectors. This, however, is unfeasible, taking into account the problem of limited data and the test design. The ten basic economic groups comprising the FTSE GCS system are:

0 Resources

1 Basic Industries

2 General Industries

3 Cyclical Consumer Goods

4 Non-Cyclical Consumer Goods

5 Cyclical Services

6 Non-Cyclical Services

7 Utilities

8 Financials

9 IT

To be included in the sample the firm-year must report at least one business segment per reported year. There are 2,176 such firm-years. Because of missing firm-level data, some 189 firm-years are eliminated, reducing the sample to 1987 observations. Analogous to the approach used in SIC-based analysis, for a given firm-

[100] Details of the structure of the FTSE Global Classification System can be found on the official web site of FTSE Group (see: http://www.ftse.com).

year I amalgamate separately reported business segments that belong to the same FTSE GCS economic groups. This results in **3,036** FTSE-based segments, making the average number of segments per firm-year equal to 1.53 (i.e., 3036/1987=1.53). This number is virtually identical to that obtained when the SIC codes were used and indicates that sample firms have, on average, low level of industrial diversification.

**Table 6.2**

**Panel A. Frequency of segment types reported in each year ***

| | FTSE GCS Industry of the reported business segments | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | 0. Resources | 1. Basic Industries | 2. General Industries | 3. Cyclical Consumer | 4. Non-Cyclical Consumer | 5. Cyclical Services | 6. Non-Cyclical Services | 7. Utilities | 8. Financials | 9. IT | Total no. of segments |
| 1991 | 0 | 1 | 2 | 1 | 0 | 5 | 0 | 0 | 1 | 0 | 10 |
| 1992 | 1 | 5 | 8 | 3 | 4 | 7 | 0 | 1 | 1 | 0 | 30 |
| 1993 | 0 | 10 | 17 | 8 | 6 | 15 | 0 | 1 | 3 | 0 | 60 |
| 1994 | 5 | 68 | 84 | 32 | 38 | 95 | 3 | 6 | 32 | 7 | 370 |
| 1995 | 5 | 77 | 107 | 41 | 57 | 142 | 7 | 11 | 36 | 11 | 494 |
| 1996 | 5 | 83 | 105 | 39 | 53 | 136 | 8 | 9 | 38 | 12 | 488 |
| 1997 | 5 | 77 | 107 | 41 | 57 | 142 | 7 | 11 | 36 | 11 | 494 |
| 1998 | 9 | 80 | 99 | 32 | 48 | 138 | 7 | 9 | 34 | 20 | 476 |
| 1999 | 8 | 70 | 85 | 28 | 42 | 133 | 7 | 10 | 34 | 25 | 442 |
| 2000 | 3 | 18 | 32 | 13 | 13 | 55 | 7 | 5 | 14 | 12 | 172 |
| Total | 41 | 489 | 646 | 238 | 318 | 868 | 46 | 63 | 229 | 98 | 3036 |

**Panel B. Frequency of segment types reported by firms of a given Industry ***

| | FTSE GCS Industry of the reported business segments | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Principal Industry of the Entire Firm ** | 0. Resources | 1. Basic Industries | 2. General Industries | 3. Cyclical Consumer Goods | 4. Non-Cyclical Consumer Goods | 5. Cyclical Services | 6. Non-Cyclical Services | 7. Utilities | 8. Financials | 9. IT | Total no. of segments |
| FTSE 0 | 32 | 7 | 4 | 0 | 4 | 6 | 0 | 1 | 3 | 0 | 57 |
| FTSE 1 | 14 | 320 | 45 | 13 | 20 | 56 | 0 | 8 | 49 | 0 | 525 |
| FTSE 2 | 0 | 120 | 463 | 72 | 37 | 79 | 3 | 3 | 25 | 4 | 806 |
| FTSE 3 | 0 | 0 | 35 | 115 | 4 | 18 | 0 | 0 | 3 | 4 | 179 |
| FTSE 4 | 0 | 16 | 21 | 12 | 181 | 52 | 16 | 0 | 9 | 3 | 310 |
| FTSE 5 | 0 | 33 | 46 | 21 | 63 | 630 | 12 | 9 | 109 | 28 | 951 |
| FTSE 6 | 0 | 0 | 0 | 0 | 1 | 0 | 11 | 0 | 5 | 0 | 17 |
| FTSE 7 | 0 | 0 | 12 | 0 | 0 | 5 | 3 | 41 | 14 | 1 | 76 |
| FTSE 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| FTSE 9 | 0 | 0 | 18 | 0 | 0 | 2 | 3 | 0 | 14 | 67 | 104 |
| Total | 46 | 496 | 644 | 233 | 310 | 848 | 48 | 62 | 231 | 107 | 3025 |

**Table 6.2** (continued from the previous page)

**Panel C. Yearly and Industrial structure of the sample firms***

| Year | The principal FTSE GCS Industries of the sample firms | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0. Resources | 1. Basic Industries | 2. General Industries | 3. Cyclical Consumer Goods | 4. Non-Cyclical Consumer Goods | 5. Cyclical Services | 6. Non-Cyclical Services | 7. Utilities | 8. Financials | 9. IT | Total no. of firms |
| 1991 | 0 | 0 | 2 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 6 |
| 1992 | 1 | 4 | 4 | 1 | 2 | 4 | 0 | 1 | 0 | 1 | 18 |
| 1993 | 0 | 8 | 12 | 2 | 4 | 10 | 0 | 1 | 0 | 3 | 40 |
| 1994 | 3 | 44 | 62 | 14 | 23 | 72 | 0 | 2 | 0 | 10 | 230 |
| 1995 | 3 | 52 | 80 | 21 | 36 | 104 | 1 | 7 | 0 | 11 | 315 |
| 1996 | 3 | 56 | 81 | 21 | 31 | 105 | 2 | 6 | 0 | 11 | 316 |
| 1997 | 7 | 54 | 80 | 21 | 31 | 115 | 2 | 7 | 0 | 14 | 331 |
| 1998 | 7 | 52 | 74 | 19 | 35 | 113 | 2 | 6 | 0 | 14 | 322 |
| 1999 | 6 | 44 | 64 | 16 | 30 | 110 | 2 | 6 | 0 | 16 | 294 |
| 2000 | 2 | 11 | 25 | 7 | 7 | 48 | 2 | 5 | 0 | 8 | 115 |
| Total | 32 | 325 | 484 | 122 | 199 | 685 | 11 | 41 | 0 | 88 | 1987 |

* Numbers are based on the primary sample which does not exclude the outliers. ** FTSE GCS is used as the basis for firms' classified into industries. FTSE 0 = Resources; FTSE 1 = Basic Industries; FTSE 2 = General Industrials; FTSE 3 = Cyclical Consumer Goods; FTSE 4 = Non-Cyclical Consumer Goods; FTSE 5 = Cyclical Services; FTSE 6 = Non-Cyclical Services; FTSE 7 = Utilities; FTSE 8 Financials; FTSE 9 = Information Technology.

Panels A and B of **Table 6.2** reveal that patterns of uneven distribution of segments' industrial affiliation are similar yet less pronounced than those reported in Pales A and B of **Table 6.1**. The two most frequently reported business segments relate to *'Cyclical Services'* and *'General Industrials'* industries and account for 29% and 21% of all reported segments, respectively. In contrast, less than 2% of segments operate in such industries as *'Resources'*, *'Utilities'* and *'Non-Cyclical Services'*. This uneven distribution of segment's industrial affiliation is, however, consistent with the industrial distribution of the sample firms (see **Panel C** of **Table 6.2**).

Yearly distributions of segments reported in **Panel A** of **Table 6.1** show identical patterns to those found in **Panel A** of **Table 6.2**. That is, across all FTSE GCG industries the numbers of disclosed segments were growing up until 1995, and largely remained unchanged in the following years. Possible explanations for this pattern have already been discussed in **Section 6.2.2.1** of this chapter.

**Panel B of Table 6.2** provides further details on the relationships between the industrial affiliation of reported segments and the principal industry of the segment reporting firm. Because both the firms and reported segments are classified using the FTSE GCS system, one might expect close association between the firm's principal industry and the most frequently reported industry for its segments. Indeed, between 55% to 66% of segments, reported by a firm with principal activities in a given industry, belong to that industry[101]. It should also be noted that for the majority of firms' principal industries the remaining 45% to 34 % of reported segments are relatively well spread between the remaining industries. That is, there are no obvious relationships between the principal industry of firms and non-principal industry segments reported by firm.

### 6.2.3 Variables' Descriptive Statistics

This section deals with the descriptive statistics of business segments' PBTs, based on the final samples used in the subsequent regression analysis sections of this chapter. All statistics, therefore, are computed for segment-level PBT variables which have been scale-deflated (by the composite scale proxy) and trimmed to exclude the outliers (i.e., top and bottom 0.5% of each regression variable). In the table that follows the descriptive statistics are computed separately for positive and negative segment-level PBTs. This is to allow comparability between different industrial segments that report profits (or losses). To expose the relationships between the firm-level and segment-level negative earnings, all descriptives are computed for two samples: the total sample and the sub-sample that excluded observations with firm-level losses (see **Table 6.3** in **Appendix 6.1**).

[101] For example, there are in total 57 business segments reported by the *Resources* sector firms. Of this number, 32 segments (i.e., 56%) operate in the *Resources* sector and the remaining 25 segments (i.e., 44%) operate in other industries (see Panel B of **Table 6.2**).

Because all segmental PBTs are scale-deflated (and the scale proxy is computed as the average of equity market value, total assets and sales) the means and medians provide some measure of the average size of a specific industry segment relative to other industry segments. In the Panel A of **Table 6.3 (Appendix 6.1)** segments' industries are based on the FTSE industry classification system. The comparison of the median and mean values across segments suggests that earnings reported from segments in the *'Non-Cyclical Services'* account for a bigger share of firms' total earnings than those of any other segment, while *'Utilities'* and *'Financials'* industries are associated with the smallest segments.

In the Panel B of **Table 6.3 (Appendix 6.1)** segments' industries are based on the US SIC one-digit codes. Segments operating in 'Mining' and 'Manufacturing' industries are the largest while those associated with *'Agriculture, Forestry and Fishing'*, *'Finance, Insurance and Real Estate'* and *'Transportation, Communications, etc.'* are the smallest segments.

Among the important segment-level PBT characteristics is the frequency of reported negative segmental PBTs. When compared across lines-of-business it provides a simple measure of relative successfulness of specific segmental operations. It might also provide some insight into the interpretation of segments' relative valuation results, reported in the empirical sections of this chapter.

Information presented in **Table 6.4** reveals that segments differ substantially in terms of frequency of reporting negative results. In as much as 32%, 20% and 13% of cases, segments operating in *'Resources'*, *'Information Technology'* and *'Financial'* sectors, respectively, report losses. This contrasts with percentages which are below 9% for the remaining seven out ten FTSE-based industries (see upper panel of **Table 6.4**).

Similar divergences are found across the US SIC-based business segments. Thus, 42% of segment-firm-years operating in the 'Mining' industry report losses, while for the remaining eight segments this percentage does not exceed 12.5%.

**Table 6.4**

**Segments classified on the basis of FTSE GCS**

| | Total sample * | | | Profit-making firm-years * | | |
|---|---|---|---|---|---|---|
| Industry of the segment | Number of positive segmental PBTs | Number of negative segmental PBTs | % of negative PBTs in total | Number of positive segmental PBTs | Number of negative segmental PBTs | % of negative PBTs in total |
| FTSE 0 | 23 | 11 | 32.35% | 23 | 3 | 11.54% |
| FTSE1 | 461 | 23 | 4.75% | 424 | 10 | 2.30% |
| FTSE 2 | 584 | 41 | 6.56% | 529 | 14 | 2.58% |
| FTSE 3 | 217 | 15 | 6.47% | 193 | 5 | 2.53% |
| FTSE 4 | 288 | 18 | 5.88% | 262 | 5 | 1.87% |
| FTSE 5 | 787 | 55 | 6.53% | 728 | 18 | 2.41% |
| FTSE 6 | 44 | 4 | 8.33% | 44 | 3 | 6.38% |
| FTSE 7 | 59 | 2 | 3.28% | 56 | 2 | 3.45% |
| FTSE 8 | 196 | 29 | 12.89% | 179 | 23 | 11.39% |
| FTSE 9 | 78 | 19 | 19.59% | 67 | 7 | 9.46% |
| **Segments classified on the basis of US SIC codes** | | | | | | |
| SIC A | 30 | 2 | 6.25% | 28 | 0 | 0.00% |
| SIC B | 19 | 14 | 42.42% | 18 | 4 | 18.18% |
| SIC C | 119 | 17 | 12.50% | 111 | 7 | 5.93% |
| SIC D | 1104 | 64 | 5.48% | 1002 | 18 | 1.76% |
| SIC E | 243 | 16 | 6.18% | 232 | 7 | 2.93% |
| SIC F | 311 | 29 | 8.53% | 277 | 15 | 5.14% |
| SIC G | 210 | 27 | 11.39% | 198 | 9 | 4.35% |
| SIC H | 182 | 20 | 9.90% | 166 | 12 | 6.74% |
| SIC I | 479 | 65 | 11.95% | 423 | 23 | 5.16% |

* Based on final samples used in regression analysis and exclude outliers (i.e., top and bottom 0.5% of each firm or segment-level variable).

The majority of regression results reported in **Section 6.3** of this chapter relate to samples that exclude firm-level loss-making firms. Therefore **Table 6.4** additionally reports frequencies of segmental losses for samples that exclude observations with firm-level losses. As one might expect, the frequency of segmental losses is substantially lower across all segments. These results suggest that, as one would expect, the percentages of segment-level losses are considerably lower in the sample that only includes profit-making firms. In relative terms, nevertheless, segments that have higher frequency of losses in the full sample have higher frequency of losses in the new sample as well.

## 6.3. ANALYSIS OF SEGMENTS' VALUATION AND LINE-OF-BUSINESS DIVERSIFICATION

### 6.3.1 Firm-level empirical results

To assess the relative value contributions associated with specific business segments, I follow the methodology used in the Chapter 5, and measure the relative valuation of business segments by comparing the values of regression-estimated segmental earnings coefficients.

It should be reminded that the working sample in this chapter is smaller than that of Chapter 5 because it only includes firm-years that are diversified across geographic and business dimensions (i.e., simultaneously report geographic and business segment data). Restricting the sample to firms which are diversified across both geographic and industrial dimensions would reflect the combined valuation effects, associated with both types of corporate diversification. There also exists another (technical) reason for restricting the sample to firm-years which are diversified across both dimensions. The line-of-business data are primarily collected and compiled manually. Given the time constraints of my research, it would not be possible to collect and compile the required data for the entire (initial) sample. The sample size might vary, depending on the choice of economic sector classification system (FTSE GCS vs. UK SIC).

To alleviate the scale-related problems discussed in Chapter 3, all OLS regressions are estimated in a scale-deflated form and after the outliers are eliminated[102]. The elimination of outliers reduces the sample to 1919 firm-years.

[102] The primary deflator used in this study is a composite size proxy, computed as follows: deflator=(MV+TA+Sales)/3. Outliers are defined as top and bottom 0.5% of observations for each scale-deflated variable included in the regression. Results of the robustness checks, with alternative scale deflators, are reported in Section 6.4.

The analyses in Chapters 4 and 5 reveal that a number of contexts and factors can affect regression results and, hence, segment valuation inferences. Of such factors and contexts, that need to be taken into account when running regressions in this chapter, are:

- the sign of firm-level and segment-level earnings;
- the dividend paying status of the firm;
- the premium/discount of the market value of the firm relative to the book value; and
- industry and yearly effects.

In regressions that test value relevance and valuation of business segments, I do not control for specific characteristics of geographical diversification of firms, because:

1. all firms included in this analysis are, by definition, geographically diversified; and, more importantly,
2. firms do not report business vs. geographic segment information in a matrix format.

Before addressing the core issue of this chapter, the valuation of specific business segments, I start off with the basic firm-level model and investigate two issues: the influence of the above listed contexts on the firm-level regression parameters, and the incremental information content of the business segment disclosures.

**Table 6.5** (see **Appendix 6.1**) reports the basic regression results for alternatively defined samples. Model 1 is estimated for the entire sample and does not control for any of the above listed effects. Although the estimated coefficient of three basic value drivers (PBT, BV and Div) are all statistically significant at least at the 5% level, the PBT coefficient has an unexpected (negative) sign and the regression explanatory power is relatively low, at 15.6%. To isolate the effect of losses, Model 2 is estimated for profit-making firms only. In this model the PBT has the expected sign and is highly statistically significant. The explanatory power of this model is 21.6%, substantially higher than in Model 1. Model 3 is estimated for profit-making firms but excludes the non-dividend paying firms. Model 3 and Model 2 have similar regression coefficients for all key value drivers yet the latter has somewhat higher explanatory power (23.3%).

Model 4 and 5 are estimated to assess the performance of the basic valuation model when the firms report negative consolidated results. None of these regressions appear statistically significant at the 1% level and none of the key valuation factors' coefficients are statistically significant at the 5% level. Furthermore, Model 5 is not statistically significant even at the 10% level. The conclusion, therefore, is that in the given sample, the employed basic valuation model fails to explain even a fraction of the cross-sectional variation of the market value of equity when firms report firm-level losses. Therefore, the analysis that follows will primarily relate to profit-making firms, unless otherwise specified.

**Table 6.6** (see **Appendix 6.1**) reports the results of regressions (estimated for profit-making firms) which are being gradually appended with dummies to control for the market value premium/discount, fixed yearly and industry effects.

Models 1 and 2 in **Table 6.6** are the extensions of Models 2 and 3 of **Table 6.5**, in the sense that they include the market value premium/discount dummy. Consistent with previous results reported in Chapter 5, the premium/discount dummy coefficient is highly statistically significant, has a negative value, yet does not affect the PBT coefficients. Furthermore, similar to previous findings, the inclusion of this dummy improves the explanatory power of the regressions by about 5% points. The interpretation of this result is the same as in Chapter 5: firms that trade at a discount to book value have, on average, lower valuation than firms trading at a premium.

Models 3 and 4 of **Table 6.6** are estimated with industry dummies. Although six out of eight yearly dummies are not statistically significant, they, nevertheless, notably improve the explanatory power of the regressions (by about 7% points). In these models the values of PBT, Div and BV value association coefficients are slightly different from those in models 1 and 2, yet the qualitative inferences remain unchanged.

Finally, the inclusion of yearly dummies alone or in conjunction with the market premium and industry dummies (as in models 5 and 6 of **Table 6.6**) has no impact either on the explanatory power of the regressions, or the estimated coefficients. This is despite the statistical significance (at the 5% level) of 5 out of 9 yearly dummies. Therefore, I do not employ yearly dummies in the segment-level tests reported later in this chapter.

The examination of results in **Table 6.6** and **Table 6.5** (models 2 and 3) reveals commonalities with results reported in similar tests of Chapter 5. These include:

- in the context of the employed model, firms trading at a discount to book value have lower cross-sectional relative valuation than firms trading at a premium;
- in profit-making firms the BV is negatively (yet not always statistically significantly) associated with the firm value;
- regardless of the number of dummies included, the PBT always has positive and statistically significant association with value, and its coefficient is always higher for the dividend-paying firms;
- dividends are also positively associated with value, and have higher valuation coefficient in regressions that exclude non-dividend firm-years;
- robust statistical significance and positive sign of the PBTS coefficient, throughout all relevant models reported in Chapters 5 and 6, indicates that the PBT value association coefficient is not a cross-scale constant, but rather is positively correlated with the scale of the firm;

- finally, in all tests the explanatory power of models that exclude non-dividend firm-years is marginally yet persistently higher than in models that do not exclude such firm-years.

### 6.3.2 Segmental Valuation using FTSE GCS

In the previous section I examined general characteristics of the model's performance when the consolidated data were used. In this section I examine the performance of the model and the issue of relative valuation of specific line-of-business operations associated with specific FTSE GCS economic groups. To do this I use two alternative, yet complementary, test designs. In the first instance the firm-level PBT of the basic valuation model is replaced with its segment-level PBT components. In the second type of test design, the firm-level model is amended with segment-level PBT components. These methods are complementary in the sense that they help address different technical problems associated with regression estimation process.

Simple disaggregation of the firm-level earnings into segmental counterparts maintains the equivalence of the disaggregated and the firm-level models. However, because of the low quality of the business segment data (either due to inconsistencies in the segment reporting practices of the UK firms, which might reflect inadequacy of the segment reporting requirements contained SSAP 25, or flaws and errors in the Extel database, or the impossibility to correctly identify the industrial characteristic of a specific business segment), in a substantial proportion of the sample the sum of segmental PBTs, in a given firm year, deviates considerably from the firm-level PBT. Furthermore, more often than not these deviations are very large and could not be merely attributed to such specific non-segmental components of the firm-level PBTs as PBT from discontinued operations, or other items. This results in a situation where the residual (non-segment) component of the firm-level PBT often accounts for a larger share of the firm-level PBT than do all business segments taken together, which affects the robustness of segment-level PBT coefficients.

In the alternative test the basic model is appended with segment level PBTs. Here, the model specification is:

$$mv = a_{0,1} + a_{0,0} * (1/s) + a_1 * bv + a_2 * pbt + \sum_{i=1}^{n} b_i * pbt_i + a_3 * pbt * f(size) + a_4 * div + u$$

where $pbt_i$ is the profit before tax, reported from segment $i$.

The shortcoming of this approach is the departure of the appended model from the basic theoretical model. The good news, however, is that it is no longer necessary to include in the regression the non-segment component of the firm-level PBT. Inferences regarding the relative valuation of specific segments can be drawn either by comparing the coefficients of segmental PBTs added to the regression or by comparing a given segment's PBT coefficient with the firm-level PBT coefficient. Furthermore, the latter could also reveal how the capitalisation of a specific segment's earnings compares to the cross-sectionally average capitalisation of earnings of the sample firms.

### 6.3.2.1 Test results based on disaggregation

I start off with models 1 and 2, reported in **Table 6.6 (Appendix 6.1)**, and replace the firm-level PBT with its business segment-level components. **Table 6.7 (Appendix 6.1)** reports the results from segment-disaggregated models. In Model 1 of **Table 6.7**, a disaggregated version of Model 1 of **Table 6.6**, the firm-level PBT is replaced by ten segment-level components. This simple disaggregation improves the explanatory power of the regression by a notable 6 percentage points, suggesting that business segment reporting has incremental value relevance. Although all ten segmental PBT coefficients have the expected (positive) sign, only four of them are statistically significant. Of all segments, the PBT9 has the highest valuation coefficient, which is statistically larger than all other statistically significant segmental coefficients. In other words, segments operating in the *'IT'* economic sector are perceived to be creating more value. The *'Cyclical Services'* economic sector is the next most valuable line-of-business, followed by the *'General Industries'* line-of-business.

Model 1 does not control for the possibility that some of the segmental PBTs might be negative. It is often the case that firms report positive consolidated financial results, yet on the segmental level they might report losses for a specific segment. From the firm-level analysis in Chapter 4 and geographic segment-level analysis in Chapter 5, it is known that the market attaches different values to positive and negative earnings. Therefore, to allow for non-linearities in the line-of-business segment PBT coefficients, the model is appended with ten interaction terms, corresponding to the ten segments. Results are reported in Model 2 of **Table 6.7** and suggest that neither the segmental PBT coefficients nor the remaining value drivers' coefficients are affected. This is because the number of negative segmental PBTs per reported segment is very small and does not influence the segmental PBT coefficients. **Table 6.8** (see below) shows the frequency of firm-years with positive and negative segmental PBTs, by segments' economic sector, in the profit-making sample.

These small numbers of negative segmental PBTs also explain the incongruity of the regression estimated interaction terms' coefficients[103].

Models 3 and 4 of **Table 6.7** repeat Models 1 and 2, respectively, and are estimated for the dividend-paying sub-sample. The values of the estimated segmental PBT coefficients are higher than in Models 1 and 2, yet all previous qualitative inferences remain unaffected[104].

[103] Statistically, for most of the lines-of-business, there are not enough negative segmental PBT data points to allow robust estimation of the interaction terms' coefficients.
[104] Models 1 and 3 have also been re-estimated with negative segmental PBTs set to zero. This, however, did not change the results.

Table 6.8

| | Single-industry and Multi-industry firm-years * | | | Multi-industry firm-years only * | | |
|---|---|---|---|---|---|---|
| Economic sectors | Total ** | Positive segmental PBTs | Negative segmental PBTs | Total ** | Positive segmental PBTs | Negative segmental PBTs |
| 0. Resources | 26 | 23 | 3 | 21 | 19 | 2 |
| 1. Basic Industries | 434 | 424 | 10 | 276 | 269 | 7 |
| 2. General Industries | 543 | 529 | 14 | 355 | 341 | 14 |
| 3. Cyclical Consumer Goods | 198 | 193 | 5 | 133 | 128 | 5 |
| 4. Non-Cyclical Consumer Goods | 267 | 262 | 5 | 181 | 176 | 5 |
| 5. Cyclical Services | 746 | 728 | 18 | 367 | 350 | 17 |
| 6. Non-Cyclical Services | 47 | 44 | 3 | 36 | 33 | 3 |
| 7. Utilities | 58 | 56 | 2 | 41 | 39 | 2 |
| 8. Financials | 202 | 179 | 23 | 196 | 173 | 23 |
| 9. IT | 74 | 67 | 7 | 44 | 38 | 6 |

* Single-industry firms are those that report multiple business segments, yet all business segments are in one industry. Multi-industry firms are those multi-segment firms whose reported segments operate in different industries.
** Total numbers are lower than those reported in **Table 6.3** because they exclude outliers and reflect only the firm-years that report firm-level positive earnings.

The observed low statistical significance of segmental PBTs might be due to several reasons. On a technical level, the relatively small number of non-zero data points per line-of-business combined with the large number of regression coefficients being estimated precludes robust estimation of the PBT coefficients. On an economic level, the lack of statistically significant value association of segmental profits might indicate that the market does not value earnings information from specific lines-of-business, suggesting that this information is, in general, of low quality and unreliable. Because this information is produced (disclosed) in accordance with SSAP25's segment reporting requirements, one might conclude that SSAP25 is not adequate, as far as the value relevance of business segment information is concerned. An alternative explanation of the observed low value relevance of the segmental information is that the FTSE GCS economic classification system, used for classifying business operations by economic sectors, fails to categorise operations in economically distinguishable categories. However, even this point can be related back to the issue of inadequacy of SSAP25. This is because SSAP25 does not require companies to disclose specific (FTSE, SIC-based or any other classification system-based) economic sectors/industries in which the reported business segments belong.

The examination of the economic substance of the ten FTSE GCS economic groups (i.e., industries making up a given economic group) does not reveal much of the logic of the composition of the economic groups. Some economic groups, for example, include under the same umbrella functionally dissimilar industries, while some functionally similar operations are classified into different economic groups. For example, the *'Non-Cyclical Consumer Goods'* economic group encapsulates such completely different, in economic substance, sub-sectors/industries as *'Brewers'* and *'Health Maintenance Organisations'*, and *'Non-Cyclical Services'* group is comprised of two dissimilar sectors: *'Food and Drug Retailers'*, and *'Telecommunication Services'*. On the other hand, such (operationally and economically) closely related industries as *'Telecommunication Services'* and *'Internet and Computer Services'* are categorised into *'Non-Cyclical Services'* and *'IT'* economic groups respectively. Therefore, it might be difficult to substantiate the regression-estimated segmental PBT coefficients.

Because the primary objective of my study is the identification of value contributions associated with segments operating in specific lines-of-business, it might be useful to agglomerate some of the FTSE GCS economic groups into larger sectors, based on the similarity of the economic substance of industries included in a given economic group. The term 'similarity of economic substance' entails subjective judgement and requires some clarification. In the context of this study, the similarity of different lines-of-business is inferred from the closeness of definitions and descriptions of the economic sectors and sub-sectors comprising each of the 10 major FTSE GCS economic groups. Results reported in the sections that follow reflect several alternative agglomerations (where several initial economic groups are agglomerated into larger sectors).

Based on the similarity of definitions of economic activities, I agglomerate the least technologically advanced 'traditional' industries, that is, *'Basic Industries'*, *'Resources'* and *'Utilities'*, into one sector. Respectively, the PBTs of these three lines-of-business (i.e., PBT0, PBT1 and PBT7) are agglomerated into one PBT item, PBT017. Similarly, *'Cyclical Consumer Goods'* and *'Non-Cyclical Consumer Goods'* are combined into one segment which appears in regressions as PBT34. The most technologically advanced 'new' industries, *'Non-Cyclical Services'* and *'IT'*, are also agglomerated into one segment, PBT69. This reduces the number of economic sectors to six.

The **Table 6.9 (Appendix 6.1)** reports regression results with agglomerated segments. All four regressions reported in **Table 6.9** are in agreement with those reported earlier, confirming the previous findings that specific lines-of-business have different relative valuation. Segments operating in the 'traditional' industries (i.e., represented by PBT017) have the lowest association with the equity market value, and hence could be thought of as being perceived by the market as having the lowest relative contribution to the value of the firm. In fact, the PBT017 coefficient is only significant at the 1% level in samples that exclude non-dividend firms (Models 3 and 4). In Model 2, estimated for the sample that includes non-dividend firms, the PBT017 coefficient is significant only at the 10% level.

Somewhat surprising is the relative valuation of segments operating in the financial sector. In relative terms the financial segments have statistically indistinguishable valuation from that of segments operating in the 'traditional' industries. In other words, the financial operations are at the bottom of the line-of-business segment valuation ranking. It should be noted, that because the FTSE GCS-based financial firms are excluded from the sample, this result is representative of financial segments of the non-financial firms only.

The PBT coefficient related to segments operating in *'Cyclical'* and *'Non-Cyclical Consumer Goods'* sectors is statistically significant (at the 1% level) yet its value is the second-lowest.

Segments operating in the *'General Industries'* economic group are in the middle of the valuation ranking, and this result is robust to different samplings. The second most valued segmental operations belong to the *'Cyclical Services'* economic group. This group encompasses such sector firms as General Retailers, Leisure and Hotel companies, Media and Entertainment firms and support services. Finally, the most valuable segment operations are those related to the Hi-Tech economic group, which is an agglomeration of such economic sub-sectors as Telecommunication Services, IT Hardware and Software, and Food and Drug retailers.

The results of the Wald tests, which are used to test the pair-wise restriction of the equality of two specific segments' PBT coefficients, indicate that all segments are perceived to have value contributions which are statistically different from each other.

Based on the empirical results, specific lines-of-business can be arranged in the order from the least to most valuable as follows:

1. Traditional Industries (include: *'Basic Industries'*, *'Resources'* and *'Utilities'*);
2. Finance-related lines-of-business;
3. *'Cyclical'* and *'Non-Cyclical Consumer Goods'*;

4. *'General Industrials'*;
5. *'Cyclical Services'* (include: General Retailers, Leisure and Hotels, Media and Entertainment and Support services);
6. Hi-Tech group (includes: Telecommunication Services, IT Hardware and Software, Food and Drug Retailers).

Summarising the above results of segments' relative valuation, one could reach a general conclusion that the services and technologically highly advanced new sector segments are perceived by the market as contributing more value than segments operating in traditional or low-tech industries. One rather contra-intuitive finding is the low relative valuation of segments operating in the financial sectors.

Similar to the findings of the geographic segment analysis, reported in Chapter 5, the evidence of differential valuation role played by dividends in the firm-level and disaggregated models is also found in the present chapter, where the line-of-business disaggregation is analysed. It appears that dividends have incremental information content (and are positively related to value) when the model is presented on the firm-level. However, when earnings are disaggregated into their constituent geographic or line-of-business components, the dividends coefficient looses its statistical significance. This implies that segment-disaggregated earnings present a better summary of value-relevant information, substituting the information conveyed by dividends.

Finally, the comparison of the Adjusted $R^2$ across Models 1 and 2 (of **Table 6.6**), Models 1 through 4 (of **Table 6.7**) and Models 1 through 4 (of **Table 6.9**) suggests that disaggregation of the firm-level data into business segment components has information content and improves the explanatory power of the regressions by 5 to 7 percentage points[105].

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[105] Similar results on the information content of disaggregation are obtained in the alternatively scaled regressions (see **Tables 6.6TA** and **6.7TA** in **Appendix 6.2**).

By and large, it can be concluded that segment-level information, reported from specific lines-of-business, is value relevant and has differential pricing.

#### 6.3.2.2 Test results based on appending the model

The relative value contributions of segments operating in specific industries are inferred by comparing segments' PBT coefficients with the cross-sectional average value of the firm-level PBT coefficient. This is because the PBT coefficient in the firm-level regression reflects the cross-sectionally average capitalisation of firm-level PBTs. If the market attaches differential valuation (and, hence, capitalisation) to a specific segment's PBT, compared to the cross-sectional value of the firm-level PBT, then the PBT coefficients of the line-of-business segments, added into the regression, should be statistically different from zero. A positive (negative) industrial PBT coefficient would indicate that PBT from that industry has higher (lower) capitalisation than the cross-sectional average PBT coefficient. Furthermore, relative valuation of given two lines-of-business could be inferred by testing the statistical significance of the divergence of their PBT coefficients.

**Table 6.10** through **6.12** (see **Appendix 6.1**) summarise the results. Tests in **Tables 6.10** and **6.11**, which are based on the appending of the firm-level model with just one segment's PBT, are identical in all respects except that regressions in **Table 6.11** are estimated for samples that exclude firm-years where all reported segments operate in a single industry. Results in **Tables 6.10** and **6.11** provide strong evidence that profits reported from segments operating in the *'Basic Industries'* (*'IT'*) sector have substantially lower (higher) capitalisation than the in-sample (cross-sectional average) capitalisation of the firm-level profits.

Differential valuation of different industrial segments could also be tested more directly, by simultaneously including all ten segments' PBTs into the basic model and employing the Wald test for testing the equality of all possible pairs of segmental PBT coefficients. Panel A of **Table 6.12** reports the test results for two samples of firm-years: firm-years whose all reported business segments belong to a single industry; and firm-years that report segments from at least two different industries. These results do not change any of the previous conclusions: different business segment operations have differential valuation, and the *'IT'* (*'Basic Industries'*) sector is perceived to be substantially more (less) valuable then all remaining business operations.

Although some of the remaining eight segments' PBT multipliers are statistically different from one another and relative to the firm-level earnings' multiplier, the inferences are less robust. If one begins the analysis with an *a priori* belief that the FTSE GCS classification system adequately classifies business operations into industries/sectors which are materially distinguishable from one another in terms of perceived risks, returns, growth opportunities, cyclicality and, hence, valuation-wise then the failure to identify valuation differentials across many lines-of-business might suggest the opposite. However, this might also be due to relatively small number of data points per industrial segment. In either case, one is likely to obtain better robustness by agglomerating some of the qualitatively similar industrial operations. Therefore I agglomerate some of the segments, as described in the **Section 6.3.2.1**, and repeat the tests.

**Panel B of Table 6.12** report regression and Wald test results. As was expected, these results are more robust, with regards to the relative valuation of segmental operations, and are nearly identical to those obtained from the disaggregated mode test design (see **Section 6.3.2.1**). The relative valuation of business operations by FTSE GCS economic sectors can be summarised as follows (in the order from the least to the most valuable sector):

1. *'Resources'*; *'Basic Industries'*; *'Utilities'*.

2. *'Cyclical Consumer Goods'*; *'Non-Cyclical Consumer Goods'*.

3. *'General Industrials'*; *'Non-Cyclical Services'*; *'Financials'*.

4. *'IT'* and *'Cyclical Services'*.

With regard to relative pricing of specific lines-of-business, results in **Tables 6.10** through **6.12** reconfirm previous conclusions, where model-disaggregation test design was used. Furthermore, the comparison of the Adjusted $R^2$ across Models 1 and 2 (of **Table 6.6**) and Models 1 through 11 (of **Table 6.10**) suggests that earnings information related to different lines-of-business segments have differential information content. That is, the inclusion of a specific business segment's earnings, into the firm-level regression, has differential impact on the Adjusted $R^2$. For the majority of business segments, this impact is minuscule and often statistically insignificant, while for segments operating in the *IT* or *Cyclical Services* sectors, this impact is large and statistically significant.

### 6.3.3 Segmental Valuation using the US SIC codes

In this section I examine the relative valuation of firms' line-of-business operations associated with specific industries, based on the US Standard Industrial Classification codes. Methodologically this task is addressed in a similar way as in the **Section 6.3.2**, where two complementary empirical test designs where used. That is, in the first type of test design the firm-level financial result is disaggregated into the constituent business segment-level components. The second type of test design entails appending the firm-level model with segmental PBTs.

#### 6.3.3.1 Test results based on disaggregation

**Table 6.7 (Appendix 6.1)** reports the results from segment-disaggregated models using the first type of test design. In Models 1 and 3 of **Table 6.13 (Appendix 6.1)**, which are the disaggregated versions of Models 1 and 3 of **Table 6.7**, the firm-level PBT is replaced by ten segment-level components. This simple disaggregation improves the explanatory power of the regressions by a statistically significant 4 percentage point, suggesting that information conveyed by specific segments' reported earnings is of incremental value relevance. Unlike the results where segments were classified using the FTSE GCS (see **Table 6.7** in **Appendix 6.1**), here all ten segmental PBT coefficients are statistically significant at the 1% level and have the expected (positive) sign.

To purge the estimated segments' coefficients from the dampening effect of differential (i.e., lower) valuation of segment-level losses, Models 1 and 3 of **Table 6.13** need to be appended with ten interaction terms corresponding to the negative segmental PBTs[106]. In the appended Models 2 and 4, the coefficients of segment-level positive earnings are, as expected, slightly higher than in Models 1 and 3 and have yet higher level of statistical significance. Five out of ten interaction terms come with theoretically expected negative coefficients and the rest are positive. However, due to insufficient numbers of cases with segment-level losses reported per line-of-business, most of the interaction terms are not statistically significant, their signs lack robustness[107] and, therefore could, by and large, be disregarded in the process of analysis.

I use the Wald test to assess the statistical significance of the differential between the PBT coefficients of any two segments. Because there are ten lines-of-business in total, there would be 45 pair-wise combinations of segments. Wald test results are reported below the corresponding tables in **Appendix 6.1.**

Despite the sample and specification differences associated with Models 1 through 4 of **Table 6.13**, the results of specific segments' relative valuations are statistically

[106] The interaction term assumes the value of 0 if the segment's PBT is positive, and the value of the segment's PBT otherwise.
[107] Nine out of ten interaction terms have less than 16 non-zero observations, which is less than the number of regression parameters (28 in total) that have to be estimated!

robust. However, with regards to two particular segments (operating in the *'Agriculture, Forestry and Fishing'* and *'Mining'* industries) the results shall not be taken at face value. This is because the number of non-zero data points for these segments barely exceeds the number of regression estimated coefficients.

The examination of other segments' results reveals the following relations. Segments operating in the *'Services'* industry are statistically more valuable than all remaining segments. The next two most valuable and valuation-wise indistinguishable segment industries are *'Finance, Insurance and Real Estate'* and *'Transportation, Communications, Electric, Gas and Sanitary Services'*. It is noteworthy that the latter industry is essentially a services sector. In light of the top valuation of the other services industry *'Services'*, one might conclude that, in general, segments operating in services sectors are perceived as contributing more to the value of the firm.

*'Manufacturing'* is the third most valued line-of-business. Segments operating in *'Wholesale Trade'* and *'Retail Trade'* have statistically identical valuation and are valued below those operating in the *'Manufacturing'* industry. This difference, however, is not statistically significant at the 1% level. Finally, segments in *'Construction'* have the lowest valuation of all sectors and, according to the Wald test's p-values, in all cases these differentials are statistically significant at least at the 1% level.

On the whole, the above results suggest the following order for the line-of-business relative valuation:

| | **Economic sectors based on the US SIC system.** |
|---|---|
| Most valued: | • Services;<br>• Transportation, Communications, Electric, Gas and Sanitary Services;<br>• Finance, Insurance and Real Estate. |
| Medium valued: | • Manufacturing<br>• Retail Trade<br>• Wholesale Trade |
| Least valued: | • Construction |
| Inconclusive: | • Agriculture, Forestry, and Fishing; Mining |

#### 6.3.3.2 Test results based on appending the basic model with segment data

Methodologically this section replicates the analysis presented in **Section 6.3.2.2** by using an alternative to FTSE GCS system of industry categorisation – the US SIC codes.

Test results are reported in **Tables 6.14** through **6.16** (see **Appendix 6.1**). Tests in **Table 6.14** are based on the sample of multi-segment firms irrespective of whether these segments belong to a single one-digit SIC code or come from different one-digit SIC codes. **Table 6.15** repeats these tests for a sub-sample of firms that operate segments in at least two different one-digit SIC code industries. Models 2 through 10, in **Tables 6.14** and **6.15**, are the basic firm-level models which are being appended with one segmental PBT at a time, while the firm-level model in **Table 6.16** is appended with all segmental PBTs. This is done to evaluate the robustness of results.

Segment valuation results are consistent across the tests reported in **Tables 6.14** through **6.16** and, in general, are qualitatively identical to those where model-disaggregation approach was used (**Section 6.3.3.1**). Drawing on the results from the Wald tests, it is possible to conclude that segments operating in *'Agriculture, Forestry and Fishing'* and *'Construction'* are perceived by the market as the least value-creating, while the most valuable segment operations are associated with *'Services'*; and *'Transportation, Communication, Electric, Gas, and Sanitary Services'* industries. 'Manufacturing', *'Retail'* and *'Wholesale Trade'* industry segments are in the middle range of valuation.

It shall be noted that the number of non-zero observations from segments operating in three basic industries (*'Agriculture, Forestry and Fishing'*; Construction; and, particularly, *'Mining'*) is insufficient (see **Tables 6.17**) for generating reliable segmental PBT coefficients. Therefore, based on the prior tests that did not reveal significant differences across the parameters of these economic sectors (particularly between the *'Construction'* and *'Agriculture, Forestry and Fishing'*), I agglomerate these segments and re-run the test. The statistically highly significant and negative value of the PBT coefficient corresponding to the new agglomerated segment (see **Table 6.18**) indicates that it has lower capitalisation relative to that of the cross-sectional average firm-level PBT. This result along with the fact that relative valuation of the remaining segments is unaffected reassures previous conclusions on segments' relative valuation.

Finally, to assess the impact on the segments' relative valuation of such firm-specific contexts as the profitability of the firm (profit-making vs. loss-making) or the dividend-paying status of the firm, I re-run all above tests for differently partitioned sub-samples and, where necessary, with the model being appended with dummies and interaction terms. Results (not reported) indicated that virtually none of the segment valuation relationships are affected by contexts. Segments that have previously been identified as the most (least) 'valuable' remain as such regardless of whether the firm is incurring losses or reporting positive profits on the consolidated level, or whether it pays dividends or not.

Analyses in **Section 6.3.3** demonstrate that, by and large, the results and conclusions remain robust to various test specifications. Furthermore, the conclusions with regard to differential valuation of specific business segments show notable compatibility between the two alternative systems of industrial classification (SIC vs. FTSE GCS). In addition, similar to conclusions drawn from the FTSE-based tests, the SIC-based results indicated that the earnings information related to different lines-of-business segments have differential information content. That is, the inclusion of a specific business segment's earnings, into the firm-level regression, has differential impact on the Adjusted $R^2$. This impact is large and statistically significant for segments operating in the *Services* related industries, while for the majority of other lines-of-business, this impact is small and often statistically insignificant.

## 6.4 ISSUES OF ROBUSTNESS, AND THE SUMMARY OF RESULTS

In this section I summarise the obtained empirical results and examine the issue of their robustness to the use of alternative deflators.

The sample of business-segment reporting firms, used in this chapter, is substantially smaller than the entire sample, which has been used in Chapter 4 for the consolidated-level analysis. Nevertheless, the key firm-level test results, such as the pricing of the firm-level earnings, book values and dividends, as well as the valuation implications of specific contexts, remain unchanged across both samples. Therefore, I do not re-cite them in this section, but proceed with providing the summary of the business segment-level valuation results.

There is considerable variation of the value relevance of segmental earnings among business segments operating in different industries. It is somewhat difficult to summarise the conclusions on the relative valuation of specific line-of-business segments, because two different industry classification systems (SIC and FTSE GCS) have been used to categorise business segments' operations. Correspondingly, two sets of tests have been performed.

Nevertheless, when the content of a specific industry in the SIC system is qualitatively similar to the content of an industry in the FTSE GCS system, the segment valuation results seem to lead to similar conclusions. For example, segments operating in the SIC's services-related industries, and segments operating in the FTSE GCS's services-related industries, have similar value relevance and relative valuation.

In all tests, profits reported by segments operating in the IT sector have the highest pricing. In addition, the IT segmental profit coefficient is always positive and has the highest level of statistical significance. This indicates that investors perceive the IT segmental information as being highly value relevant. Segmental profits, associated with the services-related operations, have the second-highest pricing and value relevance, after the IT sector.

Segments operating in the 'old' or less knowledge-intensive sectors, such as *Mining*, *Basic Industries* (e.g., construction and building materials; chemicals; steel and other metals; forestry and paper), and *Utilities*, are associated with the lowest relative contribution to the equity market value of the firm.

Somewhat surprising is the result related to the pricing of profits, reported from the financial sector segments. The valuation of financial segments is statistically indistinguishable from segments operating in the 'old' industries. In other words, the financial segments' operations appear to be at the bottom of the line-of-business segment valuation ranking.

Segments operating in the remaining economic sectors (such as *General Industrials* and *Cyclical and Non-Cyclical Goods*) are in the middle range of relative valuation.

Another interesting finding relates to contextual pricing of dividends. Dividends are positively priced and have incremental information content in the firm-level model. However, when earnings are disaggregated into segmental elements, the dividends coefficient loses its statistical significance. This implies the segment-disaggregated earnings represent a better summary of value-relevant information, substituting the information contained in dividends.

The above summarised results are found to be robust to alternative model specifications, with regard to definition of scale. **Appendix 6.2** reports tests results where models are deflated by alternative scale proxies: Group Total Assets; Group Sales; and, One year lagged market capitalisation.

The segment valuation results from all alternative deflations, reported in **Appendix 6.2**, are qualitatively similar to those that are based on the composite deflated-models. Although such general regression parameters, as the adjusted R-Square, the magnitude of earnings, dividends and book value coefficients are influenced by the choice of the deflator (which, nevertheless, conforms with the previous findings of Chapter 4), the relative pricing of the specific line-of-business segments remains remarkably robust across all deflators. More specifically, regardless of the choice of a deflator, the segments which are classified (according to either the SIC or FTSE GSC system) into the services-related or knowledge-intensive sectors, have the statistically highest valuation. In addition, earnings reported from these segments have the highest value relevance (information content), as is indicated by the impact their inclusion has on the explanatory power of the regression. In the similar way, segments operating in the low-tech 'old' industries have the lowest valuation and value association.

The fact that segmental earnings information has very marginal value relevance for the majority of lines-of-business (either in terms of FTSE GCS or SIC system), seems to suggest that either the business segment reporting requirements in the UK (i.e., SSAP25) are not entirely adequate or, indeed, investors do not price differentially the business segments which have different industrial characteristics.

## APPENDIX 6.1

**All regressions reported in Appendix 6.1 are deflated by the composite scale factor. Composite scale factor (scale) = (MV+TA+Sale)/3.**

**All regressions reported in Appendix 6.1 and 6.2 are estimated for samples that exclude the outliers. Outliers are defined as the top and/or bottom 0.5% of each variable included in regression.**

**In the tables that follow the following names or acronyms have been used to represent regression variable**

| Name used in regression | Variable description |
|---|---|
| | **1. Consolidated firm-level variables** |
| BV | Scaled Book value of ordinary equity |
| PBT | Scaled Profit Before Tax |
| MV | Scaled Market Value of ordinary equity |
| DIV | Scaled Dividends for ordinary shareholders |
| TA | Total Assets of the company |
| Sales | Group turnover |
| Adj.ER | Adjustment term = earnings for ordinary shareholders -- PBT |
| Scale | Composite scale factor = (MV+TA+Sales)/3 |
| PBT*f(size) | An instrumental variable designed to capture firm size-related non-linearity of the PBT coefficient. PBT*f(size proxy)=PBT*size^(0.2). |
| DBV | Interaction term for BV, when PBT is negative |
| DDIV | Interaction term for DIV, when PBT is negative |
| DPBT | Interaction term for negative PBT |
| DAdj.ER | Interaction term for Adj.ER, when PBT is negative |
| DPBT*F(size) | Interaction term for DPBT*f(size), when PBT is negative |
| 1/Scale; 1/MV; 1/Sale; and 1/TA | Are the reciprocals of Scale, one year lagged-MV, Sales, and TA, respectively. |
| D 1/Scale | Interaction term for 1/scale, when PBT is negative |
| | |
| | **2. Segment-level variables: segments' industrial affiliation is classified according to the FTSE economic sector classification system** |
| PBT0 | Scaled PBT reported form segments in *Resources* economic sector |
| PBT1 | Scaled PBT reported form segments in *Basic Industries* economic sector |
| PBT2 | Scaled PBT reported form segments in *General Industries* economic sector |
| PBT3 | Scaled PBT reported form segments in *Cyclical Consumer Goods* |

| | |
|---|---|
| | economic sector |
| PBT4 | Scaled PBT reported form segments in *Non-Cyclical Consumer Goods* economic sector |
| PBT5 | Scaled PBT reported form segments in *Cyclical Services* economic sector |
| PBT6 | Scaled PBT reported form segments in *Non-Cyclical Services* economic sector |
| PBT7 | Scaled PBT reported form segments in *Utilities* economic sector |
| PBT8 | Scaled PBT reported form segments in *Financials* economic sector |
| PBT9 | Scaled PBT reported form segments in *Information Technology* economic sector |
| PBT017 | =PBT0+PBT1+PBT7 |
| PBT34 | =PBT3+PBT4 |
| PBT69 | =PBT6+PBT9 |
| DPBT0 | Interaction term for negative PBT0 |
| DPBT1 | Interaction term for negative PBT1 |
| DPBT2 | Interaction term for negative PBT2 |
| DPBT3 | Interaction term for negative PBT3 |
| DPBT4 | Interaction term for negative PBT4 |
| DPBT5 | Interaction term for negative PBT5 |
| DPBT6 | Interaction term for negative PBT6 |
| DPBT7 | Interaction term for negative PBT7 |
| DPBT8 | Interaction term for negative PBT8 |
| DPBT9 | Interaction term for negative PBT9 |
| DPBT017 | Interaction term for negative PBT017 |
| DPBT34 | Interaction term for negative PBT34 |
| DPBT69 | Interaction term for negative PBT69 |
| PREST | The difference between the group-level PBT and the sum of segment-level PBTs |
| DPREST | Interaction term for negative PREST |
| | |
| | **3. Segment-level variables: segments' industrial affiliation is classified according to the SIC industry classification system** |
| PBTA | Scaled PBT reported form segments in *Agriculture, Forestry and Fishing* |
| PBTB | Scaled PBT reported form segments in *Mining* |
| PBTC | Scaled PBT reported form segments in *Construction* |
| PBTD | Scaled PBT reported form segments in *Manufacturing of basic goods* |
| PBTDA | Scaled PBT reported form segments in *Manufacturing of complex goods* |
| PBTE | Scaled PBT reported form segments in *Transportation, Communications, Electric, Gas and Sanitary Services* |
| PBTF | Scaled PBT reported form segments in *Wholesale Trade* |
| PBTG | Scaled PBT reported form segments in *Retail Trade* |
| PBTH | Scaled PBT reported form segments in *Finance, Insurance and Real Estate* |
| PBTI | Scaled PBT reported form segments in *Services* |
| PBTABC | = PBTA + PBTB + PBTC |
| PBTD1 | =PBTD + PBTDa |

| | |
|---|---|
| DPBTA | Interaction term for negative PBTA |
| DPBTB | Interaction term for negative PBTB |
| DPBTC | Interaction term for negative PBTC |
| DPBTD | Interaction term for negative PBTD |
| DPBTDA | Interaction term for negative PBTDA |
| DPBTE | Interaction term for negative PBTE |
| DPBTF | Interaction term for negative PBTF |
| DPBTG | Interaction term for negative PBTG |
| DPBTH | Interaction term for negative PBTH |
| DPBTI | Interaction term for negative PBTI |
| DPBTABC | Interaction term for negative PBTABC |
| DPBTD1 | Interaction term for negative PBTD1 |

**Table 6.3**

**Panel A. Segments' industries are based on the FTSE GCS**

| Total sample: Positive segment-level PBTs | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Industry | FTSE 0 | FTSE1 | FTSE 2 | FTSE 3 | FTSE 4 | FTSE 5 | FTSE 6 | FTSE 7 | FTSE 8 | FTSE 9 |
| Mean | 0.476 | 0.445 | 0.460 | 0.480 | 0.439 | 0.441 | 0.554 | 0.268 | 0.375 | 0.437 |
| Median | 0.434 | 0.384 | 0.419 | 0.464 | 0.422 | 0.387 | 0.519 | 0.168 | 0.289 | 0.374 |
| Standard Deviation | 0.267 | 0.276 | 0.283 | 0.253 | 0.267 | 0.283 | 0.249 | 0.187 | 0.248 | 0.283 |
| Minimum | 0.120 | 0.111 | 0.111 | 0.111 | 0.111 | 0.111 | 0.135 | 0.112 | 0.112 | 0.113 |
| Maximum | 0.954 | 0.997 | 0.999 | 0.979 | 0.999 | 1.000 | 0.925 | 0.811 | 0.995 | 0.977 |
| No. of cases * | 23 | 461 | 584 | 217 | 288 | 787 | 44 | 59 | 196 | 78 |

| Total sample: Negative segment-level PBTs | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Industry | FTSE0 | FTSE1 | FTSE 2 | FTSE 3 | FTSE 4 | FTSE 5 | FTSE 6 | FTSE 7 | FTSE 8 | FTSE 9 |
| Mean | -0.408 | -0.401 | -0.417 | -0.390 | -0.266 | -0.380 | -0.301 | -0.353 | -0.406 | -0.429 |
| Median | -0.399 | -0.272 | -0.325 | -0.252 | -0.219 | -0.324 | -0.256 | -0.353 | -0.334 | -0.241 |
| Standard Deviation | 0.235 | 0.286 | 0.275 | 0.281 | 0.156 | 0.209 | 0.202 | 0.277 | 0.257 | 0.340 |
| Minimum | -0.915 | -0.967 | -0.984 | -0.992 | -0.688 | -0.849 | -0.553 | -0.549 | -0.995 | -0.988 |
| Maximum | -0.120 | -0.112 | -0.111 | -0.115 | -0.119 | -0.118 | -0.137 | -0.157 | -0.114 | -0.117 |
| No. of cases * | 11 | 23 | 41 | 15 | 18 | 55 | 4 | 2 | 29 | 19 |

| Profit-making firm-years sub-sample: Positive segment-level PBTs | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Industry | FTSE 0 | FTSE1 | FTSE 2 | FTSE 3 | FTSE 4 | FTSE 5 | FTSE 6 | FTSE 7 | FTSE 8 | FTSE 9 |
| Mean | 0.476 | 0.446 | 0.459 | 0.479 | 0.432 | 0.441 | 0.554 | 0.259 | 0.379 | 0.442 |
| Median | 0.434 | 0.385 | 0.420 | 0.462 | 0.403 | 0.384 | 0.519 | 0.165 | 0.294 | 0.389 |
| Standard Deviation | 0.267 | 0.277 | 0.286 | 0.257 | 0.267 | 0.284 | 0.249 | 0.188 | 0.251 | 0.277 |
| Minimum | 0.120 | 0.111 | 0.111 | 0.111 | 0.111 | 0.111 | 0.135 | 0.112 | 0.112 | 0.113 |
| Maximum | 0.954 | 0.997 | 0.999 | 0.979 | 0.999 | 1.000 | 0.925 | 0.811 | 0.995 | 0.977 |
| No. of cases * | 23 | 424 | 529 | 193 | 262 | 728 | 44 | 56 | 179 | 67 |

| Profit-making firm-years sub-sample: Negative segment-level PBTs | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Industry | FTSE 0 | FTSE1 | FTSE 2 | FTSE 3 | FTSE 4 | FTSE 5 | FTSE 6 | FTSE 7 | FTSE 8 | FTSE 9 |
| Mean | -0.270 | -0.500 | -0.352 | -0.375 | -0.290 | -0.320 | -0.216 | -0.353 | -0.417 | -0.336 |
| Median | -0.248 | -0.531 | -0.327 | -0.252 | -0.240 | -0.284 | -0.139 | -0.353 | -0.336 | -0.141 |
| Standard Deviation | 0.144 | 0.321 | 0.221 | 0.349 | 0.181 | 0.168 | 0.136 | 0.277 | 0.258 | 0.331 |
| Minimum | -0.424 | -0.967 | -0.919 | -0.992 | -0.572 | -0.648 | -0.373 | -0.549 | -0.995 | -0.968 |
| Maximum | -0.138 | -0.122 | -0.111 | -0.142 | -0.119 | -0.118 | -0.137 | -0.157 | -0.114 | -0.126 |
| No. of cases * | 3 | 10 | 14 | 5 | 5 | 18 | 3 | 2 | 23 | 7 |

## Panel B. Segments' industries are based on the US SIC codes

| Total sample: Positive segment-level PBTs | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Industry | SIC A | SIC B | SIC C | SIC D | SIC E | SIC F | SIC G | SIC H | SIC I |
| Mean | 0.355 | 0.607 | 0.372 | 0.500 | 0.352 | 0.401 | 0.402 | 0.337 | 0.386 |
| Median | 0.331 | 0.686 | 0.352 | 0.423 | 0.252 | 0.339 | 0.355 | 0.268 | 0.330 |
| Standard Deviation | 0.259 | 0.280 | 0.240 | 0.365 | 0.258 | 0.269 | 0.273 | 0.259 | 0.266 |
| Minimum | 0.000 | 0.132 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Maximum | 0.947 | 0.991 | 0.954 | 1.935 | 0.960 | 0.987 | 0.977 | 0.995 | 0.988 |
| No. of cases * | 30 | 19 | 119 | 1104 | 243 | 311 | 210 | 182 | 479 |

| Total sample: Negative segment-level PBTs | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Industry | SIC A | SIC B | SIC C | SIC D | SIC E | SIC F | SIC G | SIC H | SIC I |
| Mean | -0.199 | -0.309 | -0.359 | -0.370 | -0.382 | -0.290 | -0.372 | -0.278 | -0.333 |
| Median | -0.199 | -0.256 | -0.247 | -0.304 | -0.280 | -0.236 | -0.269 | -0.230 | -0.233 |
| Standard Deviation | 0.281 | 0.245 | 0.291 | 0.252 | 0.302 | 0.210 | 0.279 | 0.236 | 0.267 |
| Minimum | -0.398 | -0.799 | -0.933 | -0.967 | -0.962 | -0.688 | -0.993 | -0.876 | -0.992 |
| Maximum | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| No. of cases * | 2 | 14 | 17 | 64 | 16 | 29 | 27 | 20 | 65 |

| Profit-making firm-years sub-sample: Positive segment-level PBTs | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Industry | SIC A | SIC B | SIC C | SIC D | SIC E | SIC F | SIC G | SIC H | SIC I |
| Mean | 0.338 | 0.627 | 0.374 | 0.503 | 0.359 | 0.393 | 0.407 | 0.343 | 0.384 |
| Median | 0.255 | 0.702 | 0.352 | 0.421 | 0.254 | 0.328 | 0.355 | 0.274 | 0.313 |
| Standard Deviation | 0.255 | 0.275 | 0.238 | 0.372 | 0.259 | 0.269 | 0.274 | 0.260 | 0.268 |
| Minimum | 0.000 | 0.132 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Maximum | 0.947 | 0.991 | 0.954 | 1.935 | 0.960 | 0.982 | 0.977 | 0.995 | 0.988 |
| No. of cases * | 28 | 18 | 111 | 1002 | 232 | 277 | 198 | 166 | 423 |

| Profit-making firm-years sub-sample: Negative segment-level PBTs | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Industry | SIC A | SIC B | SIC C | SIC D | SIC E | SIC F | SIC G | SIC H | SIC I |
| Mean | - | -0.241 | -0.255 | -0.385 | -0.371 | -0.226 | -0.276 | -0.203 | -0.357 |
| Median | - | -0.200 | -0.179 | -0.338 | -0.248 | -0.172 | -0.224 | -0.159 | -0.225 |
| Standard Deviation | - | 0.132 | 0.309 | 0.251 | 0.317 | 0.202 | 0.273 | 0.185 | 0.308 |
| Minimum | - | -0.424 | -0.933 | -0.967 | -0.962 | -0.688 | -0.669 | -0.594 | -0.992 |
| Maximum | - | -0.138 | 0.000 | 0.000 | -0.116 | 0.000 | 0.000 | 0.000 | 0.000 |
| No. of cases * | - | 4 | 7 | 18 | 7 | 15 | 9 | 12 | 23 |

The number of observations varies across specific business segments because only segments with non-zero PBTs are included in computations (i.e. missing segmental PBTs are NOT treated as zeros).

**Tables 6.5 through 6.12 report regressions where the FTSE GCS industry classification system has been used for categorising business segment operations**

**Table 6.5**

| | All firms | Profit-making firms | | Loss-making firms | |
|---|---|---|---|---|---|
| | | Div & non-div. firms | Dividend firms only | Div & non-div. firms | Dividend firms only |
| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 |
| Intercept | 0.781 | 0.661 | 0.674 | 0.668 | 0.699 |
| t-ratio | 25.287 | 19.023 | 18.769 | 7.874 | 6.237 |
| P-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1/Scale | 0.897 | 0.894 | 0.143 | 0.932 | 1.567 |
| t-ratio | 3.140 | 1.815 | 0.349 | 2.011 | 1.733 |
| P-value | 0.002 | 0.070 | 0.727 | 0.045 | 0.085 |
| BV | -0.292 | -0.382 | -0.448 | 0.192 | -0.296 |
| t-ratio | -6.113 | -8.037 | -9.515 | 1.402 | -1.640 |
| P-value | 0.000 | 0.000 | 0.000 | 0.162 | 0.103 |
| PBT | -0.521 | 1.853 | 2.153 | 0.331 | 1.519 |
| t-ratio | -2.336 | 4.733 | 5.855 | 0.618 | 2.546 |
| P-value | 0.019 | 0.000 | 0.000 | 0.537 | 0.012 |
| PBT*f(scale) | 0.660 | 0.646 | 0.578 | 0.000 | -0.375 |
| t-ratio | 8.696 | 7.120 | 6.777 | 0.001 | -2.127 |
| P-value | 0.000 | 0.000 | 0.000 | 0.999 | 0.035 |
| DIV | 3.122 | 2.017 | 2.454 | -3.826 | 1.429 |
| t-ratio | 3.780 | 2.394 | 2.748 | -1.937 | 0.609 |
| P-value | 0.000 | 0.017 | 0.006 | 0.054 | 0.544 |
| Adj.ER | 0.137 | 1.037 | 1.117 | -0.021 | -0.533 |
| t-ratio | 0.278 | 2.915 | 3.332 | -0.030 | -0.455 |
| P-value | 0.781 | 0.004 | 0.001 | 0.976 | 0.650 |
| No.of cases | 1919 | 1676 | 1619 | 244 | 144 |
| Adj.R-Square | 15.6% | 21.6% | 23.3% | 2.8% * | 0.2% ** |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported below each regression coefficient.

* R-square is significant only at 5% level

** R-square is not significant at 10% level

**Table 6.6**

**Profit-making firms**

| | Div. & non-div. firms Model 1 | | Dividend firms only Model 2 | | Div. & non-div. firms Model 3 | | Dividend firms only Model 4 | | Div. & non-div. firms Model 5 | | Dividend firms only Model 6 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Coeff. | t-ratio | Coeff. | t-ratio | Coeff. | t-ratio | Coeff. | t-ratio | Coeff. | t-ratio | Coeff. | t-ratio |
| ONE | 0.647 | 19.183 | 0.658 | 18.907 | 0.619 | 4.518 | 0.704 | 4.503 | 0.518 | 3.669 | 0.613 | 3.806 |
| NEGMV | -0.358 | -15.37 | -0.349 | -15.04 | -0.348 | -15.76 | -0.337 | -15.42 | -0.350 | -15.21 | -0.339 | -14.81 |
| SEG1 | | | | | -0.165 | -1.267 | -0.227 | -1.535 | -0.163 | -1.251 | -0.226 | -1.529 |
| SEG2 | | | | | -0.038 | -0.289 | -0.102 | -0.685 | -0.035 | -0.267 | -0.100 | -0.677 |
| SEG3 | | | | | -0.129 | -0.981 | -0.192 | -1.288 | -0.126 | -0.955 | -0.190 | -1.275 |
| SEG4 | | | | | -0.053 | -0.407 | -0.125 | -0.842 | -0.051 | -0.385 | -0.124 | -0.836 |
| SEG5 | | | | | 0.046 | 0.353 | -0.025 | -0.172 | 0.048 | 0.365 | -0.025 | -0.171 |
| SEG6 | | | | | -0.276 | -2.085 | -0.324 | -2.177 | -0.283 | -2.118 | -0.332 | -2.212 |
| SEG7 | | | | | -0.129 | -1.002 | -0.169 | -1.162 | -0.133 | -1.025 | -0.173 | -1.190 |
| SEG9 | | | | | 0.406 | 2.800 | 0.336 | 2.072 | 0.410 | 2.839 | 0.339 | 2.096 |
| Y2 | | | | | | | | | -0.048 | -0.782 | -0.049 | -0.755 |
| Y3 | | | | | | | | | 0.069 | 1.206 | 0.067 | 1.121 |
| Y4 | | | | | | | | | 0.085 | 2.098 | 0.077 | 1.742 |
| Y5 | | | | | | | | | 0.075 | 1.912 | 0.071 | 1.638 |
| Y6 | | | | | | | | | 0.123 | 3.100 | 0.116 | 2.666 |
| Y7 | | | | | | | | | 0.108 | 2.669 | 0.093 | 2.122 |
| Y8 | | | | | | | | | 0.077 | 1.871 | 0.068 | 1.499 |
| Y9 | | | | | | | | | 0.119 | 2.757 | 0.107 | 2.272 |
| Y10 | | | | | | | | | 0.120 | 2.177 | 0.112 | 1.894 |
| 1/Scale | 0.930 | 1.912 | 0.407 | 1.321 | 0.792 | 1.750 | -0.108 | -0.269 | 0.778 | 1.726 | -0.089 | -0.221 |
| BV | -0.113 | -2.074 | -0.191 | -3.541 | 0.008 | 0.158 | -0.072 | -1.384 | 0.015 | 0.289 | -0.065 | -1.254 |
| PBT | 1.834 | 4.963 | 2.131 | 6.238 | 1.244 | 3.316 | 1.598 | 4.485 | 1.222 | 3.242 | 1.575 | 4.391 |
| PBT*f(scale) | 0.575 | 6.507 | 0.522 | 6.350 | 0.675 | 7.027 | 0.586 | 6.289 | 0.671 | 7.011 | 0.586 | 6.289 |
| DIV | 1.073 | 1.314 | 1.507 | 1.748 | 2.202 | 2.850 | 2.658 | 3.257 | 2.262 | 2.913 | 2.693 | 3.250 |
| ADJER | 0.985 | 3.116 | 1.090 | 3.749 | 1.068 | 4.267 | 1.121 | 4.669 | 1.044 | 4.047 | 1.097 | 4.456 |
| No.of cases | 1676 | | 1619 | | 1676 | | 1619 | | 1676 | | 1619 | |
| Adj.R-Square | 26.9% | | 28.4% | | 34.0% | | 35.3% | | 34.0% | | 35.3% | |

All models are estimated for profit-making samples.
White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported next to each regression coefficient.

SEG1 through SEG9 are the firm-level industry dummies, and Y2 through Y10 are the firm-level yearly dummies.

| | |
|---|---|
| | Highlights coefficients, which are statistically significant at the 1%level |
| | Highlights coefficients, which are statistically significant at the 5%level |
| | Highlights coefficients, which are statistically significant at the 10%level |

Table 6.7

Profit-making firms

| | Dividend & non-Div firms | | | | | | Dividend firms only | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Model 1 | | | Controlling for segment-level losses Model 2 | | | Model 3 | | | Controlling for segment-level losses Model 4 | | |
| | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value |
| Intercept | 0.568 | 15.238 | 0.000 | 0.567 | 14.922 | 0.000 | 0.579 | 15.158 | 0.000 | 0.579 | 14.775 | 0.000 |
| NEGMV | -0.358 | -16.102 | 0.000 | -0.356 | -16.133 | 0.000 | -0.348 | -15.628 | 0.000 | -0.346 | -15.598 | 0.000 |
| 1/Scale | 0.763 | 1.591 | 0.112 | 0.777 | 1.615 | 0.106 | -0.154 | -0.332 | 0.740 | -0.169 | -0.355 | 0.723 |
| BV | -0.001 | -0.024 | 0.981 | -0.004 | -0.079 | 0.937 | -0.074 | -1.384 | 0.166 | -0.077 | -1.445 | 0.149 |
| PBT0 | 0.572 | 0.625 | 0.532 | 0.495 | 0.537 | 0.592 | 1.271 | 1.216 | 0.224 | 1.204 | 1.141 | 0.254 |
| PBT1 | 0.178 | 0.402 | 0.687 | 0.136 | 0.304 | 0.761 | 0.737 | 1.749 | 0.080 | 0.712 | 1.674 | 0.094 |
| PBT2 | 1.748 | 4.106 | 0.000 | 1.714 | 3.984 | 0.000 | 2.301 | 5.763 | 0.000 | 2.279 | 5.638 | 0.000 |
| PBT3 | 0.361 | 0.726 | 0.468 | 0.332 | 0.661 | 0.508 | 0.875 | 1.844 | 0.065 | 0.856 | 1.787 | 0.074 |
| PBT4 | 1.397 | 2.735 | 0.006 | 1.363 | 2.647 | 0.008 | 1.945 | 4.021 | 0.000 | 1.929 | 3.959 | 0.000 |
| PBT5 | 2.585 | 5.890 | 0.000 | 2.565 | 5.802 | 0.000 | 3.063 | 7.556 | 0.000 | 3.068 | 7.526 | 0.000 |
| PBT6 | 0.572 | 0.582 | 0.560 | 0.462 | 0.468 | 0.640 | 1.221 | 1.286 | 0.198 | 1.129 | 1.185 | 0.236 |
| PBT7 | 0.661 | 1.305 | 0.192 | 0.758 | 1.494 | 0.135 | 1.339 | 2.678 | 0.007 | 1.472 | 2.946 | 0.003 |
| PBT8 | 0.573 | 0.946 | 0.344 | 0.428 | 0.654 | 0.513 | 1.444 | 2.275 | 0.023 | 1.287 | 1.835 | 0.066 |
| PBT9 | 4.665 | 5.313 | 0.000 | 4.762 | 5.237 | 0.000 | 5.182 | 5.185 | 0.000 | 5.304 | 5.098 | 0.000 |
| PREST | 0.492 | 1.258 | 0.209 | 0.359 | 0.912 | 0.362 | 0.816 | 2.142 | 0.032 | 0.695 | 1.815 | 0.070 |
| DPBT0* | 0.000 | ... | ... | 0.000 | ... | ... | 0.000 | ... | ... | 0.000 | ... | ... |
| DPBT1 | | | | 2.963 | 0.650 | 0.516 | | | | 0.748 | 0.169 | 0.866 |
| DPBT2 | | | | 1.615 | 1.022 | 0.307 | | | | 1.115 | 0.718 | 0.473 |
| DPBT3 | | | | -11.607 | -1.133 | 0.257 | | | | -12.056 | -1.210 | 0.226 |
| DPBT4 | | | | -41.438 | -0.607 | 0.544 | | | | -39.791 | -0.586 | 0.558 |
| DPBT5 | | | | -2.821 | -1.017 | 0.309 | | | | -3.605 | -1.231 | 0.218 |
| DPBT6 | | | | 91.941 | 5.680 | 0.000 | | | | 96.386 | 5.664 | 0.000 |
| DPBT7 | | | | -0.419 | -0.065 | 0.948 | | | | 1.097 | 0.150 | 0.881 |
| DPBT8 | | | | 17.980 | 1.292 | 0.196 | | | | 29.806 | 5.722 | 0.000 |
| DPBT9 | | | | -8.454 | -3.298 | 0.001 | | | | -6.771 | -4.245 | 0.000 |
| PBT*f(scale) | 0.751 | 8.189 | 0.000 | 0.766 | 8.377 | 0.000 | 0.669 | 7.597 | 0.000 | 0.681 | 7.731 | 0.000 |
| DIV | 0.903 | 1.148 | 0.251 | 0.927 | 1.176 | 0.240 | 0.839 | 0.995 | 0.320 | 0.809 | 0.957 | 0.339 |
| Adj.ER | 1.025 | 4.178 | 0.000 | 1.085 | 4.692 | 0.000 | 1.063 | 4.534 | 0.000 | 1.112 | 4.995 | 0.000 |
| No.of cases | 1676 | | | 1676 | | | 1619 | | | 1619 | | |
| Adj.R-Square | 33.77% | | | 33.87% | | | 35.35% | | | 35.53% | | |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported next to regression coefficients.

Table 6.9

**Profit-making firms**

| | Dividend and non-Dividend firms | | | | | | Dividend firms only | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Model 1 | | | Controlling for segment-level losses Model 2 | | | Model 3 | | | Controlling for segment-level losses Model 4 | | |
| | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value |
| Intercept | 0.555 | 15.404 | 0.000 | 0.560 | 15.270 | 0.000 | 0.561 | 15.350 | 0.000 | 0.566 | 15.180 | 0.000 |
| NEGMV | -0.356 | -15.703 | 0.000 | -0.349 | -15.195 | 0.000 | -0.345 | -15.212 | 0.000 | -0.339 | -14.741 | 0.000 |
| 1/Scale | 0.804 | 1.651 | 0.099 | 0.813 | 1.687 | 0.092 | 0.025 | 0.060 | 0.952 | -0.147 | -0.312 | 0.755 |
| BV | -0.007 | -0.125 | 0.901 | -0.008 | -0.148 | 0.882 | -0.080 | -1.545 | 0.122 | -0.081 | -1.604 | 0.109 |
| PBT017 | 0.655 | 1.466 | 0.143 | 0.752 | 1.713 | 0.087 | 1.217 | 2.852 | 0.004 | 1.347 | 3.230 | 0.001 |
| PBT2 | 1.993 | 4.731 | 0.000 | 2.053 | 4.951 | 0.000 | 2.506 | 6.367 | 0.000 | 2.581 | 6.642 | 0.000 |
| PBT34 | 1.317 | 2.777 | 0.005 | 1.423 | 3.038 | 0.002 | 1.810 | 4.070 | 0.000 | 1.944 | 4.437 | 0.000 |
| PBT5 | 2.834 | 6.472 | 0.000 | 2.984 | 6.825 | 0.000 | 3.279 | 8.141 | 0.000 | 3.462 | 8.616 | 0.000 |
| PBT69 | 4.086 | 5.538 | 0.000 | 4.304 | 6.094 | 0.000 | 4.476 | 5.653 | 0.000 | 4.796 | 6.201 | 0.000 |
| PBT8 | 0.887 | 1.503 | 0.133 | 0.710 | 1.142 | 0.253 | 1.717 | 2.806 | 0.005 | 1.368 | 2.140 | 0.032 |
| PREST | 0.647 | 1.737 | 0.082 | -0.801 | -1.647 | 0.100 | 0.911 | 2.538 | 0.011 | -0.304 | -0.662 | 0.508 |
| DPBT017 | | | | -18.833 | -1.309 | 0.190 | | | | -22.753 | -1.542 | 0.123 |
| DPBT2 | | | | 0.995 | 0.642 | 0.521 | | | | 0.492 | 0.326 | 0.744 |
| DPBT34 | | | | -14.252 | -1.114 | 0.265 | | | | -13.527 | -1.076 | 0.282 |
| DPBT5 | | | | -6.392 | -2.248 | 0.025 | | | | -6.592 | -2.188 | 0.029 |
| DPBT69 | | | | -10.626 | -4.276 | 0.000 | | | | -8.565 | -5.345 | 0.000 |
| DPBT8 | | | | 17.670 | 1.266 | 0.206 | | | | 29.623 | 5.539 | 0.000 |
| DPREST | | | | 2.320 | 3.501 | 0.000 | | | | 1.975 | 2.944 | 0.003 |
| PBT*f(scale) | 0.711 | 8.094 | 0.000 | 0.730 | 8.516 | 0.000 | 0.645 | 7.743 | 0.000 | 0.651 | 7.929 | 0.000 |
| DIV | 0.792 | 1.017 | 0.309 | 0.768 | 0.999 | 0.318 | 0.797 | 0.949 | 0.343 | 0.754 | 0.907 | 0.364 |
| Adj.ER | 1.027 | 4.220 | 0.000 | 0.929 | 4.433 | 0.000 | 1.077 | 4.643 | 0.000 | 0.977 | 4.719 | 0.000 |
| No.of cases | 1673 | | | 1673 | | | 1616 | | | 1616 | | |
| Adj.R-Square | 32.82% | | | 33.74% | | | 34.38% | | | 35.35% | | |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported next to regression coefficients.

**Table 6.10**

**Profit-making firms**

| | Basic model Model1 | PBT seg x = PBT0 Model2 | PBT seg x = PBT1 Model3 | PBT seg x = PBT2 Model4 | PBT seg x = PBT3 Model5 |
|---|---|---|---|---|---|
| Intercept | 0.647 | 0.645 | 0.653 | 0.648 | 0.656 |
| t-ratio | 19.183 | 19.232 | 19.505 | 18.834 | 19.175 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| NEGMV | -0.358 | -0.354 | -0.365 | -0.358 | -0.356 |
| t-ratio | -15.368 | -15.595 | -15.836 | -15.361 | -15.396 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1/Scale | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 |
| t-ratio | 1.912 | 1.810 | 1.793 | 1.913 | 1.865 |
| p-value | 0.056 | 0.070 | 0.073 | 0.056 | 0.062 |
| BV | -0.113 | -0.127 | -0.081 | -0.113 | -0.118 |
| t-ratio | -2.074 | -2.365 | -1.535 | -2.037 | -2.174 |
| p-value | 0.038 | 0.018 | 0.125 | 0.042 | 0.030 |
| PBT | 1.834 | 1.877 | 1.897 | 1.823 | 1.846 |
| t-ratio | 4.963 | 5.046 | 5.196 | 4.839 | 4.998 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| PBT seg x | - | -0.420 | -1.658 | 0.002 | -1.330 |
| t-ratio | - | -0.579 | -9.108 | 0.010 | -4.891 |
| p-value | - | 0.563 | 0.000 | 0.992 | 0.000 |
| DPBT seg x | - | -53.305 | 7.655 | 1.774 | 1.805 |
| t-ratio | - | -3.553 | 1.075 | 1.005 | 0.163 |
| p-value | - | 0.000 | 0.282 | 0.315 | 0.871 |
| PBT*f(scale) | 0.575 | 0.578 | 0.574 | 0.574 | 0.556 |
| t-ratio | 6.507 | 6.426 | 6.558 | 6.414 | 6.284 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| DIV | 1.073 | 1.142 | 1.268 | 1.074 | 1.299 |
| t-ratio | 1.314 | 1.415 | 1.583 | 1.306 | 1.602 |
| p-value | 0.189 | 0.157 | 0.113 | 0.192 | 0.109 |
| Adj.ER | 0.985 | 0.989 | 0.957 | 0.981 | 0.982 |
| t-ratio | 3.116 | 3.098 | 3.160 | 3.096 | 3.128 |
| p-value | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 |
| No. of cases | 1676 | 1676 | 1676 | 1676 | 1676 |
| Adj. R-Square | 26.92% | 27.66% | 28.73% | 26.85% | 27.30% |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported below each regression coefficient.

Table 6.10 (continued from the previous page...)

| | PBT seg x = PBT4 Model6 | PBT seg x = PBT5 Model7 | PBT seg x = PBT6 Model8 | PBT seg x = PBT7 Model9 | PBT seg x = PBT8 Model10 | PBT seg x = PBT9 Model11 |
|---|---|---|---|---|---|---|
| Intercept | 0.647 | 0.618 | 0.647 | 0.644 | 0.648 | 0.625 |
| t-ratio | 19.170 | 18.192 | 19.119 | 18.482 | 19.097 | 19.346 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| NEGMV | -0.358 | -0.358 | -0.359 | -0.357 | -0.359 | -0.351 |
| t-ratio | -15.318 | -15.656 | -15.453 | -15.332 | -15.337 | -15.580 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1/Scale | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 |
| t-ratio | 1.916 | 1.712 | 1.930 | 1.918 | 1.916 | 1.878 |
| p-value | 0.055 | 0.087 | 0.054 | 0.055 | 0.055 | 0.060 |
| BV | -0.113 | -0.083 | -0.111 | -0.106 | -0.110 | -0.090 |
| t-ratio | -2.080 | -1.600 | -2.036 | -1.862 | -1.987 | -1.716 |
| p-value | 0.038 | 0.110 | 0.042 | 0.063 | 0.047 | 0.086 |
| PBT | 1.825 | 1.378 | 1.776 | 1.815 | 1.827 | 1.533 |
| t-ratio | 4.937 | 3.736 | 4.741 | 4.892 | 4.940 | 4.110 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| PBT seg x | -0.114 | 1.459 | -0.690 | -0.301 | -0.321 | 3.360 |
| t-ratio | -0.391 | 7.383 | -0.822 | -1.118 | -0.732 | 4.185 |
| p-value | 0.696 | 0.000 | 0.411 | 0.264 | 0.464 | 0.000 |
| DPBT seg x | -2.230 | -3.675 | 98.180 | 3.534 | 12.363 | -6.544 |
| t-ratio | -0.046 | -1.004 | 7.095 | 1.288 | 0.907 | -2.316 |
| p-value | 0.963 | 0.315 | 0.000 | 0.198 | 0.364 | 0.021 |
| PBT*f(scale) | 0.578 | 0.635 | 0.593 | 0.583 | 0.577 | 0.618 |
| t-ratio | 6.539 | 7.340 | 6.486 | 6.483 | 6.485 | 6.984 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| DIV | 1.096 | 0.879 | 1.101 | 1.113 | 1.043 | 1.741 |
| t-ratio | 1.336 | 1.122 | 1.338 | 1.357 | 1.278 | 2.136 |
| p-value | 0.181 | 0.262 | 0.181 | 0.175 | 0.201 | 0.033 |
| Adj.ER | 0.984 | 1.039 | 1.001 | 0.998 | 0.992 | 1.043 |
| t-ratio | 3.101 | 3.773 | 3.182 | 3.175 | 3.151 | 3.545 |
| p-value | 0.002 | 0.000 | 0.001 | 0.001 | 0.002 | 0.000 |
| No. of cases | 1676 | 1676 | 1676 | 1676 | 1676 | 1676 |
| Adj. R-Square | 26.84% | 29.75% | 26.92% | 26.85% | 26.89% | 29.11% |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported below each regression coefficient.

## Table 6.11

### Profit-making firms

| | basic model Model1 | PBT seg x = PBT0 Model2 | PBT seg x = PBT1 Model3 | PBT seg x = PBT2 Model4 | PBT seg x = PBT3 Model5 |
|---|---|---|---|---|---|
| Intercept | 0.558 | 0.558 | 0.597 | 0.560 | 0.558 |
| t-ratio | 12.874 | 12.785 | 13.472 | 12.416 | 12.628 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| NEGMV | -0.381 | -0.381 | -0.359 | -0.381 | -0.380 |
| t-ratio | -12.532 | -12.522 | -11.841 | -12.593 | -12.500 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1/Scale | 0.4 | 0.4 | 0.3 | 0.4 | 0.4 |
| t-ratio | 1.766 | 1.765 | 1.272 | 1.736 | 1.760 |
| p-value | 0.077 | 0.078 | 0.203 | 0.083 | 0.078 |
| BV | 0.060 | 0.062 | 0.036 | 0.059 | 0.059 |
| t-ratio | 0.852 | 0.860 | 0.519 | 0.827 | 0.832 |
| p-value | 0.394 | 0.390 | 0.604 | 0.408 | 0.405 |
| PBT | 2.044 | 2.039 | 2.384 | 2.061 | 2.053 |
| t-ratio | 4.231 | 4.216 | 5.134 | 4.205 | 4.229 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| PBT seg x | 0.000 | -0.021 | -0.241 | -0.013 | -0.004 |
| t-ratio | 0.000 | -0.239 | -6.181 | -0.356 | -0.088 |
| p-value | 0.000 | 0.811 | 0.000 | 0.722 | 0.930 |
| DPBT seg x | 0.000 | -0.011 | 0.602 | -0.008 | -0.083 |
| t-ratio | 0.000 | -0.072 | 7.048 | -0.076 | -0.784 |
| p-value | 0.000 | 0.942 | 0.000 | 0.939 | 0.433 |
| PBT*f(scale) | 0.377 | 0.378 | 0.302 | 0.373 | 0.375 |
| t-ratio | 3.971 | 3.989 | 3.244 | 3.875 | 3.929 |
| p-value | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 |
| DIV | 1.993 | 1.991 | 2.278 | 2.046 | 2.012 |
| t-ratio | 1.671 | 1.661 | 1.979 | 1.695 | 1.675 |
| p-value | 0.095 | 0.097 | 0.048 | 0.090 | 0.094 |
| Adj.ER | 0.808 | 0.803 | 1.002 | 0.812 | 0.814 |
| t-ratio | 1.215 | 1.201 | 1.521 | 1.218 | 1.228 |
| p-value | 0.224 | 0.230 | 0.128 | 0.223 | 0.220 |
| No. of cases | 708 | | | | |
| Adj. R-Square | 33.64% | | | | |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported below each regression coefficient.

**Table 6.11 (continued from the previous page...)**

| | PBT seg x = PBT4 Model6 | PBT seg x = PBT5 Model7 | PBT seg x = PBT6 Model8 | PBT seg x = PBT7 Model9 | PBT seg x = PBT8 Model10 | PBT seg x = PBT9 Model11 |
|---|---|---|---|---|---|---|
| Intercept | 0.562 | 0.556 | 0.552 | 0.557 | 0.547 | 0.525 |
| t-ratio | 12.892 | 11.998 | 12.862 | 12.818 | 12.355 | 13.010 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| NEGMV | -0.378 | -0.380 | -0.380 | -0.383 | -0.381 | -0.361 |
| t-ratio | -12.318 | -12.379 | -12.516 | -12.352 | -12.472 | -12.549 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1/Scale | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | -0.2 |
| t-ratio | 1.765 | 1.767 | 1.726 | 1.761 | 1.982 | -0.452 |
| p-value | 0.078 | 0.077 | 0.084 | 0.078 | 0.048 | 0.651 |
| BV | 0.062 | 0.060 | 0.059 | 0.066 | 0.057 | 0.090 |
| t-ratio | 0.881 | 0.854 | 0.839 | 0.907 | 0.808 | 1.404 |
| p-value | 0.378 | 0.393 | 0.401 | 0.365 | 0.419 | 0.160 |
| PBT | 2.017 | 2.045 | 2.151 | 2.046 | 2.081 | 1.844 |
| t-ratio | 4.189 | 4.235 | 4.461 | 4.225 | 4.346 | 3.880 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| PBT seg x | -0.052 | 0.004 | 0.171 | -0.106 | 0.049 | 0.733 |
| t-ratio | -1.178 | 0.107 | 1.521 | -0.754 | 0.872 | 4.250 |
| p-value | 0.239 | 0.915 | 0.128 | 0.451 | 0.383 | 0.000 |
| DPBT seg x | 0.173 | -0.024 | 0.701 | 0.103 | -0.261 | -0.696 |
| t-ratio | 0.772 | -0.141 | 3.892 | 0.526 | -1.550 | -2.294 |
| p-value | 0.440 | 0.888 | 0.000 | 0.599 | 0.121 | 0.022 |
| PBT*f(scale) | 0.385 | 0.377 | 0.342 | 0.380 | 0.368 | 0.387 |
| t-ratio | 4.069 | 3.963 | 3.514 | 3.965 | 3.900 | 4.127 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| DIV | 1.984 | 2.010 | 2.266 | 1.983 | 2.140 | 2.735 |
| t-ratio | 1.665 | 1.659 | 1.889 | 1.665 | 1.783 | 2.443 |
| p-value | 0.096 | 0.097 | 0.059 | 0.096 | 0.075 | 0.015 |
| Adj.ER | 0.774 | 0.810 | 0.913 | 0.824 | 0.794 | 0.759 |
| t-ratio | 1.147 | 1.217 | 1.447 | 1.240 | 1.191 | 1.168 |
| p-value | 0.251 | 0.223 | 0.148 | 0.215 | 0.234 | 0.243 |
| No. of cases Adj. R-Square | | | | | | |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported below each regression coefficient.

* Samples include only multi-industry firms (i.e., when firms report segments from different industries).

Table 6.12

Panel A

Profit-making firms

| | Single and multi-industry firms Model 1 | | | Only multi-industry firms* Model 2 | | |
|---|---|---|---|---|---|---|
| | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value |
| Intercept | 0.681 | 18.342 | 0.000 | 0.584 | 10.370 | 0.000 |
| NEGMV | -0.339 | -15.160 | 0.000 | -0.343 | -11.511 | 0.000 |
| 1/Scale | 0.438 | 0.862 | 0.389 | -0.264 | -0.851 | 0.395 |
| BV | -0.054 | -1.070 | 0.284 | 0.067 | 1.010 | 0.312 |
| PBT | 1.391 | 3.877 | 0.000 | 2.244 | 4.864 | 0.000 |
| PBT0 | -0.004 | -0.044 | 0.965 | 0.033 | 0.430 | 0.667 |
| PBT1 | -0.296 | -10.289 | 0.000 | -0.247 | -5.317 | 0.000 |
| PBT2 | -0.092 | -3.525 | 0.000 | -0.009 | -0.230 | 0.818 |
| PBT3 | -0.166 | -4.666 | 0.000 | -0.057 | -1.079 | 0.281 |
| PBT4 | -0.112 | -2.558 | 0.011 | -0.095 | -1.897 | 0.058 |
| PBT5 | -0.028 | -0.841 | 0.401 | -0.039 | -0.811 | 0.418 |
| PBT6 | -0.136 | -1.391 | 0.164 | 0.113 | 0.883 | 0.377 |
| PBT7 | -0.273 | -1.961 | 0.050 | -0.177 | -1.243 | 0.214 |
| PBT8 | -0.079 | -1.494 | 0.135 | -0.008 | -0.132 | 0.895 |
| PBT9 | 0.767 | 5.503 | 0.000 | 0.628 | 3.629 | 0.000 |
| DPBT0 | -1.389 | -0.837 | 0.402 | -0.060 | -0.315 | 0.752 |
| DPBT1 | 0.555 | 4.024 | 0.000 | 0.600 | 6.000 | 0.000 |
| DPBT2 | 0.202 | 2.070 | 0.038 | 0.021 | 0.194 | 0.846 |
| DPBT3 | -0.046 | -0.424 | 0.671 | -0.110 | -0.799 | 0.424 |
| DPBT4 | 0.223 | 1.080 | 0.280 | 0.353 | 1.256 | 0.209 |
| DPBT5 | 0.156 | 1.274 | 0.203 | 0.035 | 0.212 | 0.832 |
| DPBT6 | 1.381 | 6.187 | 0.000 | 0.958 | 4.205 | 0.000 |
| DPBT7 | 0.479 | 2.537 | 0.011 | 0.377 | 1.799 | 0.072 |
| DPBT8 | 0.020 | 0.110 | 0.912 | -0.101 | -0.502 | 0.616 |
| DPBT9 | -0.659 | -2.372 | 0.018 | -0.514 | -1.829 | 0.067 |
| PBT*f(scale) | 0.619 | 6.905 | 0.000 | 0.302 | 3.151 | 0.002 |
| DIV | 2.455 | 3.218 | 0.001 | 3.307 | 2.992 | 0.003 |
| Adj.ER | 0.987 | 3.709 | 0.000 | 1.019 | 1.607 | 0.108 |
| No. of cases | 1676 | | | 731 | | |
| Adj. R-Square | 33.88% | | | 39.24% | | |

* Samples include only multi-industry firms (i.e., when firms report segments from different industries). White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported next to the regression coefficients.

**Wald test of the significance of valuation differential between each pair of specific segments included in Model 1 and Model 1**

| Compared segments | | | Model1 p-value | Model2 p-value |
|---|---|---|---|---|
| PBT0 | vs | PBT1 | 0.001 | 0.002 |
| PBT0 | vs | PBT2 | 0.285 | 0.591 |
| PBT0 | vs | PBT3 | 0.060 | 0.306 |
| PBT0 | vs | PBT4 | 0.230 | 0.137 |
| PBT0 | vs | PBT5 | 0.771 | 0.384 |
| PBT0 | vs | PBT6 | 0.285 | 0.587 |
| PBT0 | vs | PBT7 | 0.087 | 0.177 |
| PBT0 | vs | PBT8 | 0.421 | 0.646 |
| PBT0 | vs | PBT9 | 0.000 | 0.001 |
| PBT1 | vs | PBT2 | 0.000 | 0.000 |
| PBT1 | vs | PBT3 | 0.001 | 0.001 |
| PBT1 | vs | PBT4 | 0.000 | 0.007 |
| PBT1 | vs | PBT5 | 0.000 | 0.000 |
| PBT1 | vs | PBT6 | 0.105 | 0.007 |
| PBT1 | vs | PBT7 | 0.871 | 0.631 |
| PBT1 | vs | PBT8 | 0.000 | 0.000 |
| PBT1 | vs | PBT9 | 0.000 | 0.000 |
| PBT2 | vs | PBT3 | 0.069 | 0.428 |
| PBT2 | vs | PBT4 | 0.676 | 0.096 |
| PBT2 | vs | PBT5 | 0.082 | 0.541 |
| PBT2 | vs | PBT6 | 0.655 | 0.361 |
| PBT2 | vs | PBT7 | 0.196 | 0.244 |
| PBT2 | vs | PBT8 | 0.822 | 0.984 |
| PBT2 | vs | PBT9 | 0.000 | 0.000 |
| PBT3 | vs | PBT4 | 0.287 | 0.516 |
| PBT3 | vs | PBT5 | 0.001 | 0.759 |
| PBT3 | vs | PBT6 | 0.768 | 0.216 |
| PBT3 | vs | PBT7 | 0.447 | 0.418 |
| PBT3 | vs | PBT8 | 0.148 | 0.468 |
| PBT3 | vs | PBT9 | 0.000 | 0.000 |
| PBT4 | vs | PBT5 | 0.130 | 0.373 |
| PBT4 | vs | PBT6 | 0.824 | 0.150 |
| PBT4 | vs | PBT7 | 0.257 | 0.570 |
| PBT4 | vs | PBT8 | 0.626 | 0.192 |
| PBT4 | vs | PBT9 | 0.000 | 0.000 |
| PBT5 | vs | PBT6 | 0.275 | 0.253 |
| PBT5 | vs | PBT7 | 0.085 | 0.356 |
| PBT5 | vs | PBT8 | 0.414 | 0.648 |
| PBT5 | vs | PBT9 | 0.000 | 0.000 |
| PBT6 | vs | PBT7 | 0.407 | 0.124 |
| PBT6 | vs | PBT8 | 0.605 | 0.405 |
| PBT6 | vs | PBT9 | 0.000 | 0.018 |
| PBT7 | vs | PBT8 | 0.201 | 0.274 |
| PBT7 | vs | PBT9 | 0.000 | 0.000 |
| PBT8 | vs | PBT9 | 0.000 | 0.001 |

**Table 6.12 (continued from the previous page...)**

**Panel B (some of the business segments are agglomerated)**

| | Single and multi-industry firms Model 1 | | | Only multi-industry firms* Model 2 | | |
|---|---|---|---|---|---|---|
| | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value |
| Intercept | 0.699 | 18.447 | 0.000 | 0.619 | 10.615 | 0.000 |
| NEGMV | -0.342 | -14.781 | 0.000 | -0.352 | -11.394 | 0.000 |
| 1/Scale | 0.646 | 1.357 | 0.175 | 0.011 | 0.038 | 0.969 |
| BV | -0.070 | -1.380 | 0.168 | 0.058 | 0.868 | 0.385 |
| PBT | 1.610 | 4.448 | 0.000 | 2.364 | 4.852 | 0.000 |
| PBT017 | -0.283 | -9.975 | 0.000 | -0.271 | -5.956 | 0.000 |
| PBT2 | -0.097 | -3.668 | 0.000 | -0.027 | -0.674 | 0.500 |
| PBT34 | -0.170 | -5.226 | 0.000 | -0.137 | -3.045 | 0.002 |
| PBT5 | -0.040 | -1.218 | 0.223 | -0.071 | -1.485 | 0.138 |
| PBT69 | 0.353 | 3.587 | 0.000 | 0.331 | 3.027 | 0.002 |
| PBT8 | -0.097 | -1.904 | 0.057 | -0.045 | -0.744 | 0.457 |
| DPBT017 | 0.446 | 2.820 | 0.005 | 0.622 | 6.220 | 0.000 |
| DPBT2 | 0.114 | 1.143 | 0.253 | -0.018 | -0.162 | 0.871 |
| DPBT34 | 0.260 | 0.880 | 0.379 | 0.192 | 0.697 | 0.486 |
| DPBT5 | 0.199 | 1.526 | 0.127 | 0.142 | 0.831 | 0.406 |
| DPBT69 | -0.121 | -0.513 | 0.608 | -0.079 | -0.360 | 0.719 |
| DPBT8 | 0.106 | 0.540 | 0.589 | 0.001 | 0.006 | 0.995 |
| PBT*f(scale) | 0.547 | 6.209 | 0.000 | 0.248 | 2.296 | 0.022 |
| DIV | 2.237 | 2.892 | 0.004 | 3.141 | 2.657 | 0.008 |
| Adj.ER | 0.970 | 3.680 | 0.000 | 0.548 | 0.742 | 0.458 |
| No. of cases | 1673 | | | 708 | | |
| Adj. R-Square | 31.83% | | | 39.07% | | |

* Samples include only multi-industry firms (i.e., when firms report segments from different industries). White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported next to the regression coefficients.

**Wald test of the significance of valuation differential between each pair of specific segments included in Model 1 and Model 2**

| Compared segments | | | Model1 p-value | Model2 p-value |
|---|---|---|---|---|
| PBT017 | vs | PBT2 | 0.000 | 0.000 |
| PBT017 | vs | PBT34 | 0.002 | 0.007 |
| PBT017 | vs | PBT5 | 0.000 | 0.000 |
| PBT017 | vs | PBT69 | 0.000 | 0.000 |
| PBT017 | vs | PBT8 | 0.001 | 0.001 |
| PBT2 | vs | PBT34 | 0.059 | 0.026 |
| PBT2 | vs | PBT5 | 0.113 | 0.341 |
| PBT2 | vs | PBT69 | 0.000 | 0.002 |
| PBT2 | vs | PBT8 | 0.997 | 0.757 |
| PBT34 | vs | PBT5 | 0.003 | 0.239 |
| PBT34 | vs | PBT69 | 0.000 | 0.000 |
| PBT34 | vs | PBT8 | 0.207 | 0.134 |
| PBT5 | vs | PBT69 | 0.000 | 0.001 |
| PBT5 | vs | PBT8 | 0.342 | 0.686 |
| PBT69 | vs | PBT8 | 0.000 | 0.004 |

**Tables 6.13 through 6.18 report regressions where the SIC system has been used for categorising business segment operations.**

**Table 6.13**

**Profit-making firms**

| | Dividend & non-Div firms | | | | | |
|---|---|---|---|---|---|---|
| | Model 1 | | | Controlling for segment-level losses Model 2 | | |
| | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value |
| Intercept | 0.635 | 18.303 | 0.000 | 0.650 | 18.181 | 0.000 |
| NEGMV | -0.367 | -15.563 | 0.000 | -0.362 | -15.461 | 0.000 |
| 1/Scale | 1148.540 | 2.122 | 0.034 | 977.222 | 1.743 | 0.081 |
| BV | -0.095 | -1.764 | 0.078 | -0.116 | -2.151 | 0.032 |
| PBTA | 1.863 | 4.891 | 0.000 | 1.910 | 4.931 | 0.000 |
| PBTB | 2.087 | 5.399 | 0.000 | 2.200 | 5.704 | 0.000 |
| PBTC | 1.477 | 3.939 | 0.000 | 1.501 | 3.939 | 0.000 |
| PBTD | 1.903 | 5.041 | 0.000 | 1.943 | 5.072 | 0.000 |
| PBTDA | 1.887 | 5.034 | 0.000 | 1.928 | 5.075 | 0.000 |
| PBTE | 1.991 | 5.188 | 0.000 | 2.032 | 5.222 | 0.000 |
| PBTF | 1.784 | 4.712 | 0.000 | 1.818 | 4.736 | 0.000 |
| PBTG | 1.842 | 4.731 | 0.000 | 1.897 | 4.807 | 0.000 |
| PBTH | 1.991 | 5.088 | 0.000 | 1.991 | 5.040 | 0.000 |
| PBTI | 2.162 | 5.787 | 0.000 | 2.202 | 5.811 | 0.000 |
| PREST | 1.974 | 5.279 | 0.000 | 2.015 | 5.316 | 0.000 |
| DPBTA * | 0.000 | ... | ... | 0.000 | ... | ... |
| DPBTB | | | | -4.575 | -3.068 | 0.002 |
| DPBTC | | | | 1.027 | 1.852 | 0.064 |
| DPBTD | | | | 0.339 | 1.992 | 0.046 |
| DPBTDA | | | | 0.363 | 1.575 | 0.115 |
| DPBTE | | | | -0.140 | -0.394 | 0.694 |
| DPBTF | | | | 0.689 | 1.941 | 0.052 |
| DPBTG | | | | -0.846 | -9.262 | 0.000 |
| DPBTH | | | | -0.221 | -0.324 | 0.746 |
| DPBTI | | | | -0.533 | -1.271 | 0.204 |
| PBT*f(scale) | 0.144 | 6.009 | 0.000 | 0.140 | 5.830 | 0.000 |
| DIV | 0.188 | 2.942 | 0.003 | 0.175 | 2.773 | 0.006 |
| Adj.ER | 1.060 | 3.669 | 0.000 | 1.067 | 3.717 | 0.000 |
| No.of cases | 1661 | | | 1661 | | |
| Adj.R-Square | 30.20% | | | 30.91% | | |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported next to the regression coefficients.

**Table 6.13 (continued from the previous page...)**

| | Dividend firms only | | | | | |
|---|---|---|---|---|---|---|
| | Model 3 | | | Controlling for segment-level losses Model 4 | | |
| | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value |
| Intercept | 0.655 | 17.946 | 0.000 | 0.672 | 17.997 | 0.000 |
| NEGMV | -0.353 | -15.316 | 0.000 | -0.347 | -15.145 | 0.000 |
| 1/Scale | 490.282 | 1.573 | 0.116 | 16.899 | 0.046 | 0.963 |
| BV | -0.198 | -3.818 | 0.000 | -0.221 | -4.342 | 0.000 |
| PBTA | 2.244 | 6.499 | 0.000 | 2.375 | 6.846 | 0.000 |
| PBTB | 2.598 | 7.359 | 0.000 | 2.809 | 8.206 | 0.000 |
| PBTC | 1.920 | 5.528 | 0.000 | 2.017 | 5.767 | 0.000 |
| PBTD | 2.384 | 6.866 | 0.000 | 2.503 | 7.183 | 0.000 |
| PBTDA | 2.361 | 6.847 | 0.000 | 2.482 | 7.174 | 0.000 |
| PBTE | 2.474 | 6.987 | 0.000 | 2.596 | 7.314 | 0.000 |
| PBTF | 2.266 | 6.503 | 0.000 | 2.385 | 6.823 | 0.000 |
| PBTG | 2.302 | 6.391 | 0.000 | 2.426 | 6.711 | 0.000 |
| PBTH | 2.567 | 7.267 | 0.000 | 2.634 | 7.402 | 0.000 |
| PBTI | 2.612 | 7.625 | 0.000 | 2.732 | 7.950 | 0.000 |
| PREST | 2.440 | 7.120 | 0.000 | 2.562 | 7.445 | 0.000 |
| DPBTA * | 0.000 | ... | ... | 0.000 | ... | ... |
| DPBTB | | | | -5.472 | -5.322 | 0.000 |
| DPBTC | | | | 1.484 | 4.755 | 0.000 |
| DPBTD | | | | 0.257 | 1.475 | 0.140 |
| DPBTDA | | | | 0.339 | 1.190 | 0.234 |
| DPBTE | | | | -0.161 | -0.428 | 0.668 |
| DPBTF | | | | 0.430 | 1.294 | 0.196 |
| DPBTG | | | | -0.741 | -2.887 | 0.004 |
| DPBTH | | | | 0.406 | 1.136 | 0.256 |
| DPBTI | | | | -0.390 | -0.754 | 0.451 |
| PBT*f(scale) | 0.125 | 5.714 | 0.000 | 0.117 | 5.304 | 0.000 |
| DIV | 0.201 | 2.922 | 0.003 | 0.189 | 2.768 | 0.006 |
| Adj ER | 1.234 | 4.915 | 0.000 | 1.246 | 5.021 | 0.000 |
| No.of cases | 1593 | | | 1593 | | |
| Adj.R-Square | 31.61% | | | 32.50% | | |

* Only only positive PBT0 are reported from this segment.
White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported next to the regression coefficients.

## Table 6.14

**Profit-making firms**

| | Basic model<br>Model 1 | PBT seg x = PBTA<br>Model 2 | PBT seg x = PBTB<br>Model 3 | PBT seg x = PBTC<br>Model 4 | PBT seg x = PBTD1<br>Model 5 |
|---|---|---|---|---|---|
| Intercept | 0.611 | 0.611 | 0.611 | 0.618 | 0.638 |
| t-ratio | 19.363 | 19.378 | 19.075 | 19.560 | 18.680 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| NEGMV | -0.374 | -0.371 | -0.373 | -0.357 | -0.379 |
| t-ratio | -15.957 | -15.576 | -16.039 | -14.841 | -16.180 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1/Scale | 1343.5 | 1336.2 | 1281.8 | 1293.3 | 1294.1 |
| t-ratio | 2.393 | 2.377 | 2.251 | 2.298 | 2.333 |
| p-value | 0.017 | 0.017 | 0.024 | 0.022 | 0.020 |
| BV | -0.104 | -0.103 | -0.111 | -0.108 | -0.103 |
| t-ratio | -1.933 | -1.915 | -2.062 | -2.012 | -1.928 |
| p-value | 0.053 | 0.056 | 0.039 | 0.044 | 0.054 |
| PBT | 1.985 | 1.993 | 2.014 | 2.082 | 2.033 |
| t-ratio | 5.437 | 5.444 | 5.489 | 5.679 | 5.601 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| PBT seg x | - | -0.108 | 0.076 | -0.435 | -0.079 |
| t-ratio | - | -0.911 | 1.023 | -7.228 | -3.797 |
| p-value | - | 0.363 | 0.306 | 0.000 | 0.000 |
| DPBT seg x | - | - | -1.584 | 0.480 | 0.406 |
| t-ratio | - | - | -1.047 | 3.067 | 2.604 |
| p-value | - | - | 0.295 | 0.002 | 0.009 |
| PBT*f(scale) | 0.141 | 0.140 | 0.141 | 0.136 | 0.138 |
| t-ratio | 5.962 | 5.913 | 5.927 | 5.764 | 5.849 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| DIV | 0.186 | 0.184 | 0.185 | 0.191 | 0.180 |
| t-ratio | 2.804 | 2.770 | 2.790 | 2.893 | 2.710 |
| p-value | 0.005 | 0.006 | 0.005 | 0.004 | 0.007 |
| Adj.ER | 1.073 | 1.068 | 1.076 | 1.102 | 1.083 |
| t-ratio | 3.678 | 3.643 | 3.678 | 3.827 | 3.837 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| No. of cases | 1661 | 1661 | 1661 | 1661 | 1661 |
| Adj. R-Square | 27.27% | 27.24% | 27.41% | 28.48% | 27.78% |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported below the regression coefficients.

**Table 6.14 (continued from previous page...)**

| | PBT seg x = PBTE Model 6 | PBT seg x = PBTF Model 7 | PBT seg x = PBTG Model 8 | PBT seg x = PBTH Model 9 | PBT seg x = PBTI Model 10 |
|---|---|---|---|---|---|
| Intercept | 0.607 | 0.629 | 0.616 | 0.615 | 0.572 |
| t-ratio | 19.232 | 19.627 | 19.256 | 19.466 | 19.669 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| NEGMV | -0.374 | -0.371 | -0.376 | -0.372 | -0.372 |
| t-ratio | -15.918 | -15.726 | -16.060 | -15.864 | -16.090 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1/Scale | 1368.9 | 1315.4 | 1344.8 | 1351.1 | 1252.5 |
| t-ratio | 2.432 | 2.350 | 2.399 | 2.405 | 2.310 |
| p-value | 0.015 | 0.019 | 0.016 | 0.016 | 0.021 |
| BV | -0.108 | -0.107 | -0.103 | -0.097 | -0.078 |
| t-ratio | -2.008 | -1.994 | -1.916 | -1.807 | -1.483 |
| p-value | 0.045 | 0.046 | 0.055 | 0.071 | 0.138 |
| PBT | 2.062 | 1.964 | 1.904 | 1.924 | 1.962 |
| t-ratio | 5.637 | 5.382 | 5.124 | 5.226 | 5.419 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| PBT seg x | 0.115 | -0.202 | -0.094 | -0.134 | 0.228 |
| t-ratio | 1.981 | -4.940 | -1.803 | -2.552 | 4.530 |
| p-value | 0.048 | 0.000 | 0.071 | 0.011 | 0.000 |
| DPBT seg x | -0.092 | 0.314 | -0.243 | 0.287 | -0.558 |
| t-ratio | -0.582 | 1.681 | -0.725 | 0.887 | -1.672 |
| p-value | 0.561 | 0.093 | 0.468 | 0.375 | 0.095 |
| PBT*f(scale) | 0.136 | 0.140 | 0.146 | 0.144 | 0.146 |
| t-ratio | 5.761 | 5.942 | 6.090 | 6.053 | 6.300 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| DIV | 0.182 | 0.180 | 0.188 | 0.187 | 0.190 |
| t-ratio | 2.743 | 2.759 | 2.843 | 2.794 | 2.942 |
| p-value | 0.006 | 0.006 | 0.004 | 0.005 | 0.003 |
| Adj.ER | 1.071 | 1.048 | 1.092 | 1.091 | 1.081 |
| t-ratio | 3.696 | 3.577 | 3.749 | 3.776 | 3.745 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| No. of cases | 1661 | 1661 | 1661 | 1661 | 1661 |
| Adj. R-Square | 27.36% | 27.94% | 27.36% | 27.36% | 28.63% |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported below the regression coefficients.

**Table 6.15**

**Profit-making firms**

| | Basic model Model 1 | PBT seg x = PBTA Model 2 | PBT seg x = PBTB Model 3 | PBT seg x = PBTC Model 4 | PBT seg x = PBTD1 Model 5 |
|---|---|---|---|---|---|
| Intercept | 0.526 | 0.527 | 0.530 | 0.534 | 0.526 |
| t-ratio | 14.383 | 14.445 | 14.101 | 14.563 | 13.478 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| NEGMV | -0.311 | -0.305 | -0.310 | -0.285 | -0.310 |
| t-ratio | -10.471 | -10.016 | -10.399 | -9.377 | -10.459 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1/Scale | 1599.1 | 1558.3 | 1447.0 | 1436.0 | 1714.4 |
| t-ratio | 2.833 | 2.746 | 2.500 | 2.526 | 3.115 |
| p-value | 0.005 | 0.006 | 0.012 | 0.012 | 0.002 |
| BV | -0.165 | -0.163 | -0.170 | -0.170 | -0.164 |
| t-ratio | -2.434 | -2.396 | -2.472 | -2.564 | -2.400 |
| p-value | 0.015 | 0.017 | 0.013 | 0.010 | 0.016 |
| PBT | 2.766 | 2.786 | 2.764 | 3.055 | 2.770 |
| t-ratio | 6.246 | 6.256 | 6.174 | 6.827 | 6.260 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| PBT seg x | - | -0.114 | 0.075 | -0.442 | 0.006 |
| t-ratio | - | -0.891 | 1.474 | -8.006 | 0.262 |
| p-value | - | 0.373 | 0.141 | 0.000 | 0.794 |
| DPBT seg x | - | 0.000 | -0.412 | 0.483 | 0.215 |
| t-ratio | - | 0.000 | -1.314 | 3.615 | 1.318 |
| p-value | - | 0.000 | 0.189 | 0.000 | 0.187 |
| PBT*f(scale) | 0.153 | 0.151 | 0.153 | 0.141 | 0.153 |
| t-ratio | 5.817 | 5.730 | 5.778 | 5.402 | 5.816 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| DIV | 0.192 | 0.188 | 0.190 | 0.196 | 0.186 |
| t-ratio | 2.662 | 2.597 | 2.623 | 2.722 | 2.570 |
| p-value | 0.008 | 0.009 | 0.009 | 0.006 | 0.010 |
| Adj.ER | 1.516 | 1.506 | 1.527 | 1.583 | 1.561 |
| t-ratio | 2.856 | 2.817 | 2.868 | 2.919 | 2.952 |
| p-value | 0.004 | 0.005 | 0.004 | 0.004 | 0.003 |
| No. of cases | 846 | 846 | 846 | 846 | 846 |
| Adj. R-Square | 38.96% | 38.93% | 38.86% | 41.00% | 38.94% |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported below the regression coefficients.

**Table 6.15 (continued from the previous page...)**

| | PBT seg x = PBTE Model 6 | PBT seg x = PBTF Model 7 | PBT seg x = PBTG Model 8 | PBT seg x = PBTH Model 9 | PBT seg x = PBTI Model 10 |
|---|---|---|---|---|---|
| Intercept | 0.516 | 0.542 | 0.533 | 0.532 | 0.511 |
| t-ratio | 14.375 | 14.448 | 14.167 | 14.368 | 14.166 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| NEGMV | -0.306 | -0.310 | -0.314 | -0.312 | -0.310 |
| t-ratio | -10.297 | -10.357 | -10.602 | -10.485 | -10.535 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1/Scale | 1866.0 | 1630.2 | 1541.0 | 1677.4 | 1569.5 |
| t-ratio | 3.420 | 2.973 | 2.677 | 2.856 | 2.731 |
| p-value | 0.001 | 0.003 | 0.007 | 0.004 | 0.006 |
| BV | -0.186 | -0.166 | -0.166 | -0.158 | -0.157 |
| t-ratio | -2.740 | -2.472 | -2.456 | -2.336 | -2.388 |
| p-value | 0.006 | 0.013 | 0.014 | 0.019 | 0.017 |
| PBT | 2.956 | 2.760 | 2.671 | 2.694 | 2.729 |
| t-ratio | 6.741 | 6.257 | 5.975 | 6.025 | 6.202 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| PBT seg x | 0.269 | -0.134 | -0.089 | -0.094 | 0.157 |
| t-ratio | 3.904 | -2.906 | -1.413 | -1.689 | 2.896 |
| p-value | 0.000 | 0.004 | 0.158 | 0.091 | 0.004 |
| DPBT seg x | -0.352 | 0.106 | -0.303 | 0.169 | -0.198 |
| t-ratio | -1.255 | 0.569 | -0.883 | 0.495 | -1.501 |
| p-value | 0.210 | 0.570 | 0.377 | 0.621 | 0.133 |
| PBT*f(scale) | 0.142 | 0.152 | 0.159 | 0.157 | 0.155 |
| t-ratio | 5.504 | 5.810 | 5.973 | 5.898 | 5.984 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| DIV | 0.171 | 0.187 | 0.198 | 0.193 | 0.183 |
| t-ratio | 2.398 | 2.633 | 2.797 | 2.612 | 2.557 |
| p-value | 0.016 | 0.008 | 0.005 | 0.009 | 0.011 |
| Adj.ER | 1.602 | 1.481 | 1.552 | 1.549 | 1.597 |
| t-ratio | 2.953 | 2.934 | 2.923 | 2.918 | 3.157 |
| p-value | 0.003 | 0.003 | 0.003 | 0.004 | 0.002 |
| No. of cases | 846 | 846 | 846 | 846 | 846 |
| Adj. R-Square | 40.25% | 39.36% | 39.13% | 38.97% | 39.55% |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported below the regression coefficients.

## Table 6.16

## Profit-making firms

| | Single and multiple industry firms | | | Multiple industry firms | | |
|---|---|---|---|---|---|---|
| | Model 1 | | | Model 2 | | |
| | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value |
| Intercept | 0.647 | 19.124 | 0.000 | 0.552 | 13.079 | 0.000 |
| NEGMV | -0.350 | -14.599 | 0.000 | -0.268 | -8.707 | 0.000 |
| 1/Scale | 1092.790 | 1.993 | 0.046 | 1536.540 | 2.609 | 0.009 |
| BV | -0.095 | -1.806 | 0.071 | -0.185 | -2.811 | 0.005 |
| PBT | 2.008 | 5.360 | 0.000 | 3.015 | 6.705 | 0.000 |
| PBTA | -0.122 | -0.967 | 0.333 | -0.185 | -1.330 | 0.184 |
| PBTB | 0.151 | 1.690 | 0.091 | 0.157 | 2.152 | 0.031 |
| PBTC | -0.457 | -7.351 | 0.000 | -0.444 | -7.428 | 0.000 |
| PBTD1 | -0.081 | -3.627 | 0.000 | 0.006 | 0.204 | 0.838 |
| PBTE | 0.040 | 0.646 | 0.518 | 0.207 | 2.902 | 0.004 |
| PBTF | -0.190 | -4.511 | 0.000 | -0.112 | -2.328 | 0.020 |
| PBTG | -0.115 | -2.160 | 0.031 | -0.096 | -1.460 | 0.144 |
| PBTH | -0.118 | -2.234 | 0.026 | -0.068 | -1.178 | 0.239 |
| PBTI | 0.164 | 3.278 | 0.001 | 0.110 | 1.999 | 0.046 |
| DPBTB | -1.641 | -1.095 | 0.274 | -0.414 | -1.325 | 0.185 |
| DPBTC | 0.366 | 2.274 | 0.023 | 0.392 | 2.854 | 0.004 |
| DPBTD1 | 0.444 | 2.749 | 0.006 | 0.278 | 1.599 | 0.110 |
| DPBTE | 0.107 | 0.699 | 0.484 | -0.174 | -0.679 | 0.497 |
| DPBTF | 0.255 | 1.439 | 0.150 | 0.052 | 0.273 | 0.785 |
| DPBTG | -0.093 | -0.276 | 0.782 | -0.214 | -0.635 | 0.525 |
| DPBTH | 0.371 | 1.321 | 0.187 | 0.177 | 0.578 | 0.563 |
| DPBTI | -0.462 | -1.436 | 0.151 | -0.095 | -0.720 | 0.472 |
| PBT*f(scale) | 0.143 | 5.985 | 0.000 | 0.142 | 5.433 | 0.000 |
| DIV | 0.179 | 2.816 | 0.005 | 0.157 | 2.210 | 0.027 |
| Adj.ER | 1.139 | 4.148 | 0.000 | 1.797 | 3.429 | 0.001 |
| No.of cases | 1661 | | | 846 | | |
| Adj.R-Square | 31.0% | | | 42.7% | | |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported next to the regression coefficients.

## Table 6.17

| Segments | Multi-industry firms-year observations (no.of cases=838)* | | Single and multi-industry firm-years (no. of cases=1661)* | |
|---|---|---|---|---|
| Pbtab | 43 | 39 | 48 | 43 |
| Pbtabc | 134 | 125 | 159 | 148 |
| pbtd1 | 570 | 554 | 1017 | 999 |
| Pbtfg | 354 | 335 | 450 | 431 |
| Pbteh | 311 | 293 | 387 | 368 |
| Pbta | 27 | 27 | 29 | 29 |
| Pbtb | 16 | 12 | 19 | 14 |
| Pbtc | 95 | 90 | 115 | 109 |
| Pbtd | 433 | 421 | 670 | 656 |
| Pbtda | 329 | 315 | 539 | 525 |
| Pbte | 175 | 169 | 241 | 234 |
| Pbtf | 234 | 219 | 286 | 271 |
| Pbtg | 161 | 152 | 205 | 196 |
| Pbth | 170 | 157 | 180 | 167 |
| Pbti | 276 | 256 | 452 | 430 |

* Samples exclude loss-making firms and outliers

## Table 6.18

### Profit-making firms

| | Single and multiple industry firms | | | Multiple industry firms | | |
|---|---|---|---|---|---|---|
| | Model 1 | | | Model 2 | | |
| | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value |
| Intercept | 0.633 | 18.830 | 0.000 | 0.526 | 12.447 | 0.000 |
| NEGMV | -0.356 | -14.711 | 0.000 | -0.281 | -9.180 | 0.000 |
| 1/Scale | 1206.720 | 2.230 | 0.026 | 2004.450 | 3.838 | 0.000 |
| BV | -0.075 | -1.427 | 0.154 | -0.155 | -2.367 | 0.018 |
| PBT | 2.015 | 5.391 | 0.000 | 3.018 | 6.648 | 0.000 |
| PBTABC * | -0.251 | -4.753 | 0.000 | -0.231 | -3.933 | 0.000 |
| PBTD1 | -0.080 | -3.575 | 0.000 | 0.009 | 0.321 | 0.749 |
| PBTE | 0.051 | 0.837 | 0.402 | 0.226 | 3.183 | 0.001 |
| PBTF | -0.195 | -4.643 | 0.000 | -0.115 | -2.417 | 0.016 |
| PBTG | -0.109 | -2.050 | 0.040 | -0.080 | -1.209 | 0.226 |
| PBTH | -0.133 | -2.513 | 0.012 | -0.087 | -1.532 | 0.126 |
| PBTI | 0.161 | 3.199 | 0.001 | 0.104 | 1.873 | 0.061 |
| DPBTABC * | -0.152 | -0.452 | 0.651 | 0.133 | 1.091 | 0.275 |
| DPBTD1 | 0.448 | 2.781 | 0.005 | 0.281 | 1.641 | 0.101 |
| DPBTE | 0.031 | 0.173 | 0.863 | -0.280 | -0.907 | 0.365 |
| DPBTF | 0.257 | 1.461 | 0.144 | 0.049 | 0.258 | 0.797 |
| DPBTG | -0.101 | -0.302 | 0.762 | -0.235 | -0.702 | 0.483 |
| DPBTH | 0.395 | 1.403 | 0.160 | 0.196 | 0.642 | 0.521 |
| DPBTI | -0.463 | -1.436 | 0.151 | -0.099 | -0.744 | 0.457 |
| PBT*f(scale) | 0.142 | 5.975 | 0.000 | 0.142 | 5.368 | 0.000 |
| DIV | 0.188 | 2.922 | 0.003 | 0.170 | 2.367 | 0.018 |
| Adj ER | 1.099 | 3.921 | 0.000 | 1.700 | 3.296 | 0.001 |
| No.of cases | 1661 | | | 846 | | |
| Adj.R-Square | 30.3% | | | 41.9% | | |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported next to the regression coefficients.

# APPENDIX 6.2

**Appendix 6.2 reports regressions which are scaled by alternative scale-proxies.**

**Tables 6.7TA, 6.10TA, 6.13TA and 6.14TA report regressions scaled by Group Total Assets.**

**Tables 6.7Sale, 6.10Sale, 6.13Sale and 6.14Sale report regressions scaled by Group Sales.**

**Tables 6.7MV, 6.10MV, 6.13MV and 6.14MV report regressions scaled by the one year lagged equity market value.**

## Table 6.7TA (TA-deflated model)

### Profit-making firms

| | Dividend & non-Dividend firms | | | | | |
|---|---|---|---|---|---|---|
| | | | | Controlling for segment-level losses | | |
| | Model 1 | | | Model 2 | | |
| | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value |
| Intercept | 0.051 | 0.950 | 0.342 | 0.030 | 0.553 | 0.580 |
| NEGMV | -0.375 | -8.770 | 0.000 | -0.367 | -9.037 | 0.000 |
| 1/TA | 2.498 | 2.066 | 0.039 | 2.510 | 2.078 | 0.038 |
| BV | 0.289 | 2.134 | 0.033 | 0.287 | 2.167 | 0.030 |
| PBT0 | 2.578 | 1.105 | 0.269 | 2.389 | 1.008 | 0.313 |
| PBT1 | 2.403 | 3.166 | 0.002 | 2.404 | 3.161 | 0.002 |
| PBT2 | 4.389 | 6.222 | 0.000 | 4.371 | 6.167 | 0.000 |
| PBT3 | 3.484 | 4.405 | 0.000 | 3.493 | 4.424 | 0.000 |
| PBT4 | 4.638 | 5.012 | 0.000 | 4.604 | 4.965 | 0.000 |
| PBT5 | 6.282 | 7.890 | 0.000 | 6.265 | 7.865 | 0.000 |
| PBT6 | 4.795 | 3.094 | 0.002 | 4.699 | 3.011 | 0.003 |
| PBT7 | 1.892 | 1.886 | 0.059 | 2.031 | 2.005 | 0.045 |
| PBT8 | 2.316 | 1.771 | 0.076 | 2.298 | 1.661 | 0.097 |
| PBT9 | 10.512 | 6.522 | 0.000 | 10.807 | 6.576 | 0.000 |
| PREST | 1.049 | 1.299 | 0.194 | 0.627 | 0.779 | 0.436 |
| DPBT0 | | | | -13.219 | -0.693 | 0.489 |
| DPBT1 | | | | -8.102 | -1.488 | 0.137 |
| DPBT2 | | | | -4.539 | -1.740 | 0.082 |
| DPBT3 | | | | 7.047 | 0.182 | 0.855 |
| DPBT4 | | | | -73.349 | -1.384 | 0.166 |
| DPBT5 | | | | -6.973 | -1.779 | 0.075 |
| DPBT6 | | | | 157.536 | 4.359 | 0.000 |
| DPBT7 | | | | 22.080 | 1.549 | 0.121 |
| DPBT8 | | | | 14.311 | 1.112 | 0.266 |
| DPBT9 | | | | -20.587 | -2.422 | 0.015 |
| PBT*f(ta) | 0.938 | 4.719 | 0.000 | 0.998 | 5.026 | 0.000 |
| DIV | 4.040 | 3.093 | 0.002 | 4.081 | 3.144 | 0.002 |
| Adj.ER | 0.527 | 1.195 | 0.232 | 0.730 | 1.815 | 0.070 |
| No.of cases | 1670 | | | 1670 | | |
| Adj.R-Square | 49.2% | | | 49.6% | | |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported next to the regression coefficients.

**Table 6.7TA (continued from the previous page...)**

| | Dividend firms only | | | | | |
|---|---|---|---|---|---|---|
| | | | | Controlling for segment-level losses | | |
| | Model 3 | | | Model 4 | | |
| | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value |
| Intercept | 0.068 | 1.234 | 0.217 | 0.051 | 0.913 | 0.361 |
| NEGMV | -0.357 | -8.617 | 0.000 | -0.353 | -8.601 | 0.000 |
| 1/TA | 0.184 | 0.160 | 0.873 | 0.051 | 0.043 | 0.966 |
| BV | 0.205 | 1.674 | 0.094 | 0.211 | 1.718 | 0.086 |
| PBT0 | 4.455 | 1.838 | 0.066 | 4.336 | 1.760 | 0.078 |
| PBT1 | 3.797 | 5.508 | 0.000 | 3.835 | 5.513 | 0.000 |
| PBT2 | 5.616 | 9.114 | 0.000 | 5.641 | 9.075 | 0.000 |
| PBT3 | 4.848 | 6.841 | 0.000 | 4.890 | 6.881 | 0.000 |
| PBT4 | 6.086 | 7.378 | 0.000 | 6.107 | 7.380 | 0.000 |
| PBT5 | 7.607 | 10.962 | 0.000 | 7.657 | 10.994 | 0.000 |
| PBT6 | 6.440 | 4.441 | 0.000 | 6.401 | 4.378 | 0.000 |
| PBT7 | 3.402 | 3.726 | 0.000 | 3.573 | 3.869 | 0.000 |
| PBT8 | 4.351 | 3.291 | 0.001 | 4.117 | 2.884 | 0.004 |
| PBT9 | 12.613 | 7.030 | 0.000 | 12.944 | 7.074 | 0.000 |
| PREST | 2.142 | 2.881 | 0.004 | 1.804 | 2.477 | 0.013 |
| DPBT0 | | | | -40.677 | -2.545 | 0.011 |
| DPBT1 | | | | -8.665 | -1.481 | 0.139 |
| DPBT2 | | | | -5.725 | -2.421 | 0.015 |
| DPBT3 | | | | 4.380 | 0.118 | 0.906 |
| DPBT4 | | | | -71.439 | -1.370 | 0.171 |
| DPBT5 | | | | -11.368 | -4.954 | 0.000 |
| DPBT6 | | | | 143.462 | 4.247 | 0.000 |
| DPBT7 | | | | 23.143 | 1.498 | 0.134 |
| DPBT8 | | | | 25.543 | 4.689 | 0.000 |
| DPBT9 | | | | -14.518 | -4.745 | 0.000 |
| PBT*f(ta) | 0.715 | 4.111 | 0.000 | 0.758 | 4.379 | 0.000 |
| DIV | 3.072 | 2.313 | 0.021 | 2.966 | 2.236 | 0.025 |
| Adj.ER | 0.672 | 1.596 | 0.110 | 0.818 | 2.114 | 0.035 |
| No.of cases | 1612 | | | 1612 | | |
| Adj.R-Square | 51.5% | | | 51.7% | | |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported next to the regression coefficients.

## Table 6.7S (Group Sales-deflated model)

### Profit-making firms

| | Dividend & non-Div firms | | | | | |
|---|---|---|---|---|---|---|
| | | | | Controlling for segment-level losses | | |
| | Model 1 | | | Model 2 | | |
| | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value |
| Intercept | 0.073 | 2.444 | 0.015 | 0.066 | 2.153 | 0.031 |
| NEGMV | -0.449 | -9.607 | 0.000 | -0.448 | -9.551 | 0.000 |
| 1/Sale | 0.887 | 1.217 | 0.224 | 0.877 | 1.172 | 0.241 |
| BV | 0.441 | 4.530 | 0.000 | 0.439 | 4.353 | 0.000 |
| PBT0 | 7.529 | 2.771 | 0.006 | 7.541 | 2.778 | 0.005 |
| PBT1 | 3.611 | 4.060 | 0.000 | 3.658 | 4.054 | 0.000 |
| PBT2 | 5.973 | 7.489 | 0.000 | 6.012 | 7.440 | 0.000 |
| PBT3 | 4.449 | 4.636 | 0.000 | 4.544 | 4.687 | 0.000 |
| PBT4 | 6.360 | 5.771 | 0.000 | 6.405 | 5.777 | 0.000 |
| PBT5 | 7.018 | 7.571 | 0.000 | 7.032 | 7.511 | 0.000 |
| PBT6 | 7.386 | 3.311 | 0.001 | 7.372 | 3.237 | 0.001 |
| PBT7 | 1.801 | 1.773 | 0.076 | 1.803 | 1.750 | 0.080 |
| PBT8 | 2.168 | 1.883 | 0.060 | 2.442 | 1.871 | 0.061 |
| PBT9 | 14.730 | 5.554 | 0.000 | 14.863 | 5.358 | 0.000 |
| PREST | 2.791 | 3.166 | 0.002 | 2.730 | 3.083 | 0.002 |
| DPBT0 | | | | 5.871 | 0.500 | 0.617 |
| DPBT1 | | | | -10.060 | -1.564 | 0.118 |
| DPBT2 | | | | -2.192 | -0.627 | 0.531 |
| DPBT3 | | | | -8.644 | -0.328 | 0.743 |
| DPBT4 | | | | -81.507 | -1.516 | 0.129 |
| DPBT5 | | | | -0.285 | -0.024 | 0.981 |
| DPBT6 | | | | 7.030 | 0.266 | 0.791 |
| DPBT7 | | | | 7.965 | 0.795 | 0.426 |
| DPBT8 | | | | -29.423 | -0.746 | 0.456 |
| DPBT9 | | | | -12.079 | -2.506 | 0.012 |
| PBT*f(sale) | 0.353 | 2.205 | 0.027 | 0.361 | 2.260 | 0.024 |
| DIV | 4.877 | 3.194 | 0.001 | 4.891 | 3.160 | 0.002 |
| Adj.ER | 0.732 | 1.083 | 0.279 | 0.798 | 1.159 | 0.246 |
| No.of cases | 1671 | | | 1671 | | |
| Adj.R-Square | 52.3% | | | 52.2% | | |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported next to the regression coefficients.

**Table 6.7S (continued from the previous page...)**

| | Dividend firms only | | | | | |
|---|---|---|---|---|---|---|
| | Model 3 | | | Controlling for segment-level losses Model 4 | | |
| | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value |
| Intercept | 0.061 | 1.922 | 0.055 | 0.056 | 1.698 | 0.089 |
| NEGMV | -0.453 | -8.322 | 0.000 | -0.447 | -8.270 | 0.000 |
| 1/Sale | 1.820 | 0.986 | 0.324 | 1.910 | 0.873 | 0.383 |
| BV | 0.383 | 3.119 | 0.002 | 0.375 | 2.971 | 0.003 |
| PBT0 | 8.103 | 3.080 | 0.002 | 8.055 | 3.113 | 0.002 |
| PBT1 | 4.110 | 4.365 | 0.000 | 4.126 | 4.218 | 0.000 |
| PBT2 | 6.361 | 7.574 | 0.000 | 6.384 | 7.363 | 0.000 |
| PBT3 | 4.997 | 5.012 | 0.000 | 5.047 | 4.950 | 0.000 |
| PBT4 | 6.735 | 5.946 | 0.000 | 6.744 | 5.814 | 0.000 |
| PBT5 | 7.426 | 7.656 | 0.000 | 7.426 | 7.438 | 0.000 |
| PBT6 | 7.933 | 3.508 | 0.000 | 7.883 | 3.411 | 0.001 |
| PBT7 | 2.306 | 2.155 | 0.031 | 2.287 | 2.063 | 0.039 |
| PBT8 | 2.629 | 2.126 | 0.033 | 2.701 | 1.907 | 0.056 |
| PBT9 | 16.661 | 4.897 | 0.000 | 16.812 | 4.845 | 0.000 |
| PREST | 3.228 | 3.488 | 0.000 | 3.066 | 3.274 | 0.001 |
| DPBT0 | | | | 13.954 | 0.448 | 0.654 |
| DPBT1 | | | | -4.437 | -0.717 | 0.473 |
| DPBT2 | | | | -2.838 | -0.837 | 0.403 |
| DPBT3 | | | | -10.077 | -0.361 | 0.718 |
| DPBT4 | | | | -81.626 | -1.461 | 0.144 |
| DPBT5 | | | | -14.085 | -1.794 | 0.073 |
| DPBT6 | | | | 7.346 | 0.247 | 0.805 |
| DPBT7 | | | | 3.989 | 0.393 | 0.694 |
| DPBT8 | | | | 30.497 | 3.441 | 0.001 |
| DPBT9 | | | | -13.669 | -2.609 | 0.009 |
| PBT*f(sale) | 0.402 | 2.530 | 0.011 | 0.426 | 2.645 | 0.008 |
| DIV | 4.064 | 2.405 | 0.016 | 3.959 | 2.333 | 0.020 |
| Adj.ER | 0.959 | 1.419 | 0.156 | 1.011 | 1.499 | 0.134 |
| No.of cases | 1614 | | | 1614 | | |
| Adj.R-Square | 52.3% | | | 52.2% | | |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported next to the regression coefficients

## Table 6.7MV (One year lagged MV-deflated model)

### Profit-making firms

| | Dividend & non-Div firms | | | | | |
|---|---|---|---|---|---|---|
| | Model 1 | | | Controlling for segment-level losses Model 2 | | |
| | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value |
| Intercept | 0.828 | 20.533 | 0.000 | 0.817 | 20.199 | 0.000 |
| NEGMV | -0.503 | -14.018 | 0.000 | -0.502 | -14.063 | 0.000 |
| 1/MV | 0.159 | 0.868 | 0.385 | 0.194 | 1.003 | 0.316 |
| BV | 0.260 | 5.339 | 0.000 | 0.264 | 5.394 | 0.000 |
| PBT0 | 1.695 | 3.125 | 0.002 | 1.673 | 3.104 | 0.002 |
| PBT1 | 1.286 | 3.524 | 0.000 | 1.279 | 3.510 | 0.000 |
| PBT2 | 1.523 | 4.494 | 0.000 | 1.506 | 4.507 | 0.000 |
| PBT3 | 1.417 | 3.145 | 0.002 | 1.426 | 3.162 | 0.002 |
| PBT4 | 1.706 | 4.218 | 0.000 | 1.729 | 4.281 | 0.000 |
| PBT5 | 2.376 | 6.409 | 0.000 | 2.416 | 6.528 | 0.000 |
| PBT6 | 2.390 | 2.704 | 0.007 | 2.344 | 2.639 | 0.008 |
| PBT7 | 1.629 | 3.400 | 0.001 | 1.688 | 3.535 | 0.000 |
| PBT8 | 2.029 | 2.280 | 0.023 | 2.029 | 2.014 | 0.044 |
| PBT9 | 7.871 | 5.332 | 0.000 | 8.425 | 5.491 | 0.000 |
| PREST | 1.523 | 4.493 | 0.000 | 1.505 | 4.505 | 0.000 |
| DPBT0 | | | | 7.911 | 1.681 | 0.093 |
| DPBT1 | | | | -0.235 | -0.098 | 0.922 |
| DPBT2 | | | | -2.662 | -2.583 | 0.010 |
| DPBT3 | | | | -27.522 | -9.228 | 0.000 |
| DPBT4 | | | | 0.575 | 0.026 | 0.979 |
| DPBT5 | | | | 5.408 | 1.791 | 0.073 |
| DPBT6 | | | | 98.680 | 4.404 | 0.000 |
| DPBT7 | | | | 11.318 | 1.198 | 0.231 |
| DPBT8 | | | | 8.944 | 4.276 | 0.000 |
| DPBT9 | | | | -8.618 | -4.905 | 0.000 |
| PBT*f(mv) | 0.053 | 0.611 | 0.541 | 0.073 | 0.843 | 0.399 |
| DIV | -0.165 | -0.180 | 0.857 | -0.035 | -0.038 | 0.969 |
| Adj.ER | 0.589 | 1.761 | 0.078 | 0.761 | 2.532 | 0.011 |
| No.of cases | 1331 | | | 1331 | | |
| Adj.R-Square | 23.1% | | | 23.7% | | |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported next to the regression coefficients.

**Model 6.7MV (continued from the previous page...)**

| | Dividend firms only | | | | | |
|---|---|---|---|---|---|---|
| | | | | Controlling for segment-level losses | | |
| | Model 3 | | | Model 4 | | |
| | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value |
| Intercept | 0.832 | 19.647 | 0.000 | 0.817 | 19.261 | 0.000 |
| NEGMV | -0.494 | -13.775 | 0.000 | -0.494 | -13.812 | 0.000 |
| 1/MV | 0.288 | 0.753 | 0.452 | 0.314 | 0.749 | 0.454 |
| BV | 0.231 | 4.595 | 0.000 | 0.233 | 4.631 | 0.000 |
| PBT0 | 1.733 | 2.483 | 0.013 | 1.687 | 2.400 | 0.016 |
| PBT1 | 1.118 | 2.903 | 0.004 | 1.116 | 2.877 | 0.004 |
| PBT2 | 1.426 | 4.016 | 0.000 | 1.393 | 3.968 | 0.000 |
| PBT3 | 1.286 | 2.624 | 0.009 | 1.300 | 2.608 | 0.009 |
| PBT4 | 1.501 | 3.574 | 0.000 | 1.524 | 3.607 | 0.000 |
| PBT5 | 2.227 | 5.687 | 0.000 | 2.274 | 5.756 | 0.000 |
| PBT6 | 2.272 | 2.540 | 0.011 | 2.226 | 2.472 | 0.013 |
| PBT7 | 1.544 | 3.069 | 0.002 | 1.613 | 3.219 | 0.001 |
| PBT8 | 1.801 | 1.997 | 0.046 | 1.755 | 1.722 | 0.085 |
| PBT9 | 8.478 | 4.432 | 0.000 | 9.158 | 4.645 | 0.000 |
| PREST | 1.426 | 4.014 | 0.000 | 1.392 | 3.967 | 0.000 |
| DPBT0 | | | | 6.822 | 1.017 | 0.309 |
| DPBT1 | | | | 0.061 | 0.024 | 0.981 |
| DPBT2 | | | | -2.689 | -2.568 | 0.010 |
| DPBT3 | | | | -28.128 | -9.081 | 0.000 |
| DPBT4 | | | | -2.528 | -0.115 | 0.908 |
| DPBT5 | | | | 1.653 | 0.842 | 0.400 |
| DPBT6 | | | | 106.397 | 4.459 | 0.000 |
| DPBT7 | | | | 9.409 | 1.001 | 0.317 |
| DPBT8 | | | | 8.650 | 4.042 | 0.000 |
| DPBT9 | | | | -9.612 | -4.440 | 0.000 |
| PBT*f(mv) | 0.085 | 0.946 | 0.344 | 0.111 | 1.240 | 0.215 |
| DIV | 0.203 | 0.205 | 0.838 | 0.411 | 0.418 | 0.676 |
| Adj.ER | 0.599 | 1.737 | 0.082 | 0.787 | 2.616 | 0.009 |
| No.of cases | 1287 | | | 1287 | | |
| Adj.R-Square | 21.8% | | | 22.6% | | |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported next to the regression coefficients

## Model 6.7MV (continued from the previous page...)

**Wald test of the significance of valuation differential between each pair of specific segments included in Model 2 and Model 4**

| Compared segments | | | Model2 p-value | Model4 p-value |
|---|---|---|---|---|
| PBT0 | vs | PBT1 | 0.381 | 0.330 |
| PBT0 | vs | PBT2 | 0.691 | 0.602 |
| PBT0 | vs | PBT3 | 0.614 | 0.523 |
| PBT0 | vs | PBT4 | 0.905 | 0.782 |
| PBT0 | vs | PBT5 | 0.099 | 0.314 |
| PBT0 | vs | PBT6 | 0.436 | 0.561 |
| PBT0 | vs | PBT7 | 0.976 | 0.902 |
| PBT0 | vs | PBT8 | 0.717 | 0.948 |
| PBT0 | vs | PBT9 | 0.000 | 0.000 |
| PBT1 | vs | PBT2 | 0.337 | 0.252 |
| PBT1 | vs | PBT3 | 0.624 | 0.561 |
| PBT1 | vs | PBT4 | 0.081 | 0.110 |
| PBT1 | vs | PBT5 | 0.000 | 0.000 |
| PBT1 | vs | PBT6 | 0.169 | 0.152 |
| PBT1 | vs | PBT7 | 0.178 | 0.116 |
| PBT1 | vs | PBT8 | 0.404 | 0.475 |
| PBT1 | vs | PBT9 | 0.000 | 0.000 |
| PBT2 | vs | PBT3 | 0.799 | 0.777 |
| PBT2 | vs | PBT4 | 0.405 | 0.622 |
| PBT2 | vs | PBT5 | 0.000 | 0.000 |
| PBT2 | vs | PBT6 | 0.287 | 0.291 |
| PBT2 | vs | PBT7 | 0.581 | 0.522 |
| PBT2 | vs | PBT8 | 0.570 | 0.695 |
| PBT2 | vs | PBT9 | 0.000 | 0.000 |
| PBT3 | vs | PBT4 | 0.353 | 0.501 |
| PBT3 | vs | PBT5 | 0.001 | 0.002 |
| PBT3 | vs | PBT6 | 0.257 | 0.254 |
| PBT3 | vs | PBT7 | 0.478 | 0.427 |
| PBT3 | vs | PBT8 | 0.516 | 0.625 |
| PBT3 | vs | PBT9 | 0.000 | 0.000 |
| PBT4 | vs | PBT5 | 0.010 | 0.005 |
| PBT4 | vs | PBT6 | 0.452 | 0.390 |
| PBT4 | vs | PBT7 | 0.904 | 0.800 |
| PBT4 | vs | PBT8 | 0.744 | 0.801 |
| PBT4 | vs | PBT9 | 0.000 | 0.000 |
| PBT5 | vs | PBT6 | 0.927 | 0.952 |
| PBT5 | vs | PBT7 | 0.028 | 0.056 |
| PBT5 | vs | PBT8 | 0.677 | 0.576 |
| PBT5 | vs | PBT9 | 0.000 | 0.000 |
| PBT6 | vs | PBT7 | 0.406 | 0.441 |
| PBT6 | vs | PBT8 | 0.786 | 0.684 |
| PBT6 | vs | PBT9 | 0.000 | 0.001 |
| PBT7 | vs | PBT8 | 0.713 | 0.878 |
| PBT7 | vs | PBT9 | 0.000 | 0.000 |
| PBT8 | vs | PBT9 | 0.000 | 0.001 |

## Table 6.10TA (TA-deflated model)

### Profit-making firms

| | Basic model Model1 | PBT seg x = PBT0 Model2 | PBT seg x = PBT1 Model3 | PBT seg x = PBT2 Model4 | PBT seg x = PBT3 Model5 |
|---|---|---|---|---|---|
| Intercept | 0.203 | 0.238 | 0.267 | 0.242 | 0.248 |
| t-ratio | 3.467 | 4.268 | 4.784 | 4.267 | 4.368 |
| p-value | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 |
| NEGMV | -0.393 | -0.404 | -0.417 | -0.403 | -0.404 |
| t-ratio | -8.036 | -9.000 | -9.186 | -8.804 | -8.857 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1/TA | 2.996 | 2.881 | 2.782 | 2.843 | 2.852 |
| t-ratio | 2.527 | 2.422 | 2.328 | 2.371 | 2.393 |
| p-value | 0.012 | 0.015 | 0.020 | 0.018 | 0.017 |
| BV | -0.023 | -0.032 | 0.023 | -0.048 | -0.038 |
| t-ratio | -0.143 | -0.224 | 0.157 | -0.322 | -0.257 |
| p-value | 0.886 | 0.822 | 0.875 | 0.747 | 0.797 |
| PBT | 5.527 | 5.199 | 5.161 | 5.476 | 5.252 |
| t-ratio | 7.415 | 7.261 | 7.298 | 7.174 | 7.375 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| PBT seg x | - | -1.022 | -2.757 | -0.557 | -1.328 |
| t-ratio | - | -0.521 | -8.605 | -1.654 | -2.823 |
| p-value | - | 0.602 | 0.000 | 0.098 | 0.005 |
| DPBT seg x | - | -3.094 | 13.141 | -2.715 | 19.947 |
| t-ratio | - | -0.169 | 1.067 | -2.174 | 0.511 |
| p-value | - | 0.866 | 0.286 | 0.030 | 0.609 |
| PBT*f(ta) | 0.385 | 0.512 | 0.521 | 0.461 | 0.489 |
| t-ratio | 1.908 | 2.575 | 2.674 | 2.319 | 2.496 |
| p-value | 0.056 | 0.010 | 0.008 | 0.020 | 0.013 |
| DIV | 7.735 | 6.381 | 6.432 | 6.543 | 6.505 |
| t-ratio | 4.470 | 4.055 | 4.136 | 4.179 | 4.134 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Adj.ER | 0.345 | 0.343 | 0.367 | 0.390 | 0.342 |
| t-ratio | 0.567 | 0.552 | 0.614 | 0.631 | 0.551 |
| p-value | 0.571 | 0.581 | 0.539 | 0.528 | 0.582 |
| No. of cases | 1670 | 1670 | 1670 | 1670 | 1670 |
| Adj. R-Square | 40.0% | 40.0% | 41.2% | 40.0% | 40.1% |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported below the regression coefficients.

**Table 6.10TA (continued from the previous page...)**

| | PBT seg x = PBT4 Model6 | PBT seg x = PBT5 Model7 | PBT seg x = PBT6 Model8 | PBT seg x = PBT7 Model9 | PBT seg x = PBT8 Model10 | PBT seg x = PBT9 Model11 |
|---|---|---|---|---|---|---|
| Intercept | 0.241 | 0.187 | 0.244 | 0.241 | 0.242 | 0.214 |
| t-ratio | 4.234 | 3.466 | 4.275 | 4.234 | 4.258 | 3.863 |
| p-value | 0.000 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 |
| NEGMV | -0.403 | -0.420 | -0.401 | -0.394 | -0.404 | -0.366 |
| t-ratio | -8.800 | -9.379 | -8.781 | -8.683 | -8.831 | -8.649 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1/TA | 2.869 | 2.743 | 2.862 | 2.865 | 2.869 | 2.721 |
| t-ratio | 2.409 | 2.236 | 2.400 | 2.411 | 2.412 | 2.346 |
| p-value | 0.016 | 0.025 | 0.016 | 0.016 | 0.016 | 0.019 |
| BV | -0.041 | 0.130 | -0.051 | -0.029 | -0.035 | -0.050 |
| t-ratio | -0.277 | 0.915 | -0.343 | -0.196 | -0.233 | -0.347 |
| p-value | 0.782 | 0.360 | 0.731 | 0.845 | 0.816 | 0.729 |
| PBT | 5.242 | 4.127 | 5.311 | 5.161 | 5.210 | 4.314 |
| t-ratio | 7.435 | 5.739 | 7.374 | 7.221 | 7.332 | 6.169 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| PBT seg x | 0.051 | 2.474 | 1.519 | -2.044 | -1.484 | 6.862 |
| t-ratio | 0.085 | 5.844 | 1.084 | -4.083 | -1.369 | 4.490 |
| p-value | 0.932 | 0.000 | 0.278 | 0.000 | 0.171 | 0.000 |
| DPBT seg x | -22.827 | -5.321 | 238.687 | 30.949 | 1.841 | -13.822 |
| t-ratio | -0.674 | -1.240 | 5.558 | 5.959 | 0.150 | -1.487 |
| p-value | 0.500 | 0.215 | 0.000 | 0.000 | 0.881 | 0.137 |
| PBT*f(ta) | 0.499 | 0.617 | 0.471 | 0.524 | 0.511 | 0.655 |
| t-ratio | 2.558 | 3.214 | 2.329 | 2.666 | 2.607 | 3.424 |
| p-value | 0.011 | 0.001 | 0.020 | 0.008 | 0.009 | 0.001 |
| DIV | 6.328 | 5.417 | 6.389 | 6.353 | 6.321 | 8.140 |
| t-ratio | 4.021 | 3.800 | 4.072 | 4.044 | 4.017 | 5.410 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Adj.ER | 0.344 | 0.406 | 0.366 | 0.380 | 0.359 | 0.656 |
| t-ratio | 0.554 | 0.717 | 0.597 | 0.615 | 0.578 | 1.188 |
| p-value | 0.580 | 0.473 | 0.551 | 0.539 | 0.563 | 0.235 |
| No. of cases | 1670 | 1670 | 1670 | 1670 | 1670 | 1670 |
| Adj. R-Square | 39.9% | 42.7% | 40.0% | 40.0% | 39.9% | 43.7% |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported below the regression coefficients

## Table 6.10Sales (Group Sales-deflated model)

### Profit-making firms

| | PBT seg x = PBT0 Model1 | PBT seg x = PBT1 Model2 | PBT seg x = PBT2 Model3 | PBT seg x = PBT3 Model4 | PBT seg x = PBT4 Model5 |
|---|---|---|---|---|---|
| Intercept | 0.178 | 0.207 | 0.174 | 0.186 | 0.166 |
| t-ratio | 5.882 | 6.792 | 5.762 | 6.042 | 5.435 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| NEGMV | -0.549 | -0.557 | -0.553 | -0.552 | -0.557 |
| t-ratio | -9.479 | -9.469 | -9.317 | -9.343 | -9.438 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1/Sale | 1.232 | 1.134 | 1.229 | 1.220 | 1.189 |
| t-ratio | 1.276 | 1.198 | 1.261 | 1.259 | 1.237 |
| p-value | 0.202 | 0.231 | 0.207 | 0.208 | 0.216 |
| BV | 0.398 | 0.408 | 0.399 | 0.398 | 0.415 |
| t-ratio | 3.806 | 3.926 | 3.792 | 3.801 | 4.000 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| PBT | 6.872 | 6.915 | 7.023 | 6.912 | 7.057 |
| t-ratio | 7.244 | 7.370 | 6.825 | 7.280 | 7.542 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| PBT seg x | 2.296 | -2.680 | -0.239 | -1.902 | 1.205 |
| t-ratio | 0.947 | -8.175 | -0.561 | -3.749 | 1.525 |
| p-value | 0.344 | 0.000 | 0.575 | 0.000 | 0.127 |
| DPBT seg x | 21.274 | 0.510 | -2.224 | -3.062 | 7.222 |
| t-ratio | 1.558 | 0.051 | -1.206 | -0.149 | 0.232 |
| p-value | 0.119 | 0.959 | 0.228 | 0.881 | 0.816 |
| PBT*f(sale) | -0.081 | -0.097 | -0.096 | -0.088 | -0.132 |
| t-ratio | -0.439 | -0.550 | -0.507 | -0.487 | -0.755 |
| p-value | 0.661 | 0.583 | 0.612 | 0.626 | 0.450 |
| DIV | 4.238 | 4.620 | 4.343 | 4.405 | 4.155 |
| t-ratio | 2.511 | 2.852 | 2.629 | 2.670 | 2.556 |
| p-value | 0.012 | 0.004 | 0.009 | 0.008 | 0.011 |
| Adj.ER | 0.220 | 0.119 | 0.195 | 0.202 | 0.201 |
| t-ratio | 0.243 | 0.131 | 0.212 | 0.220 | 0.223 |
| p-value | 0.808 | 0.896 | 0.832 | 0.826 | 0.824 |
| No. of cases | 1671 | 1671 | 1671 | 1671 | 1671 |
| Adj. R-Square | 41.7% | 42.4% | 41.5% | 41.6% | 41.6% |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported below the regression coefficients.

**Table 6.10Sale (continued from the previous page...)**

| | PBT seg x = PBT5 Model6 | PBT seg x = PBT6 Model7 | PBT seg x = PBT7 Model8 | PBT seg x = PBT8 Model9 | PBT seg x = PBT9 Model10 |
|---|---|---|---|---|---|
| Intercept | 0.176 | 0.166 | 0.106 | 0.166 | 0.152 |
| t-ratio | 6.312 | 5.495 | 3.431 | 5.443 | 5.385 |
| p-value | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 |
| NEGMV | -0.524 | -0.552 | -0.525 | -0.553 | -0.512 |
| t-ratio | -8.867 | -9.355 | -9.354 | -9.367 | -9.845 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1/Sale | 1.173 | 1.270 | 1.190 | 1.261 | 1.147 |
| t-ratio | 1.183 | 1.291 | 1.298 | 1.298 | 1.285 |
| p-value | 0.237 | 0.197 | 0.194 | 0.194 | 0.199 |
| BV | 0.359 | 0.403 | 0.514 | 0.413 | 0.401 |
| t-ratio | 3.504 | 3.835 | 4.921 | 3.910 | 4.048 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| PBT | 5.905 | 6.947 | 6.494 | 6.850 | 5.712 |
| t-ratio | 6.194 | 7.270 | 6.961 | 7.234 | 6.583 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| PBT seg x | 2.307 | 2.279 | -3.724 | -1.903 | 9.420 |
| t-ratio | 5.812 | 1.075 | -7.959 | -3.085 | 3.605 |
| p-value | 0.000 | 0.282 | 0.000 | 0.002 | 0.000 |
| DPBT seg x | -17.434 | 128.231 | 41.992 | -35.615 | -6.559 |
| t-ratio | -1.559 | 4.943 | 3.921 | -0.971 | -2.054 |
| p-value | 0.119 | 0.000 | 0.000 | 0.331 | 0.040 |
| PBT*f(sale) | 0.044 | -0.091 | 0.107 | -0.061 | 0.048 |
| t-ratio | 0.247 | -0.496 | 0.612 | -0.341 | 0.285 |
| p-value | 0.805 | 0.620 | 0.541 | 0.733 | 0.776 |
| DIV | 3.823 | 4.587 | 5.719 | 4.557 | 6.400 |
| t-ratio | 2.480 | 2.760 | 3.482 | 2.744 | 3.974 |
| p-value | 0.013 | 0.006 | 0.000 | 0.006 | 0.000 |
| Adj.ER | 0.279 | 0.269 | 0.721 | 0.198 | 0.269 |
| t-ratio | 0.326 | 0.298 | 0.846 | 0.216 | 0.320 |
| p-value | 0.744 | 0.766 | 0.398 | 0.829 | 0.749 |
| No. of cases | 1671 | 1671 | 1671 | 1671 | 1671 |
| Adj. R-Square | 43.7% | 41.6% | 43.2% | 41.7% | 46.5% |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported below the regression coefficients

## Table 6.10MV (One year lagged MV-deflated model)

## Profit-making firms

| | basic model Model1 | PBT seg x = PBT0 Model2 | PBT seg x = PBT1 Model3 | PBT seg x = PBT2 Model4 | PBT seg x = PBT3 Model5 | PBT seg x = PBT4 Model6 |
|---|---|---|---|---|---|---|
| Intercept | 0.907 | 0.906 | 0.903 | 0.903 | 0.906 | 0.907 |
| t-ratio | 22.135 | 22.004 | 22.076 | 21.968 | 22.157 | 22.115 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| NEGMV | -0.500 | -0.500 | -0.507 | -0.498 | -0.497 | -0.500 |
| t-ratio | -13.554 | -13.562 | -13.690 | -13.456 | -13.510 | -13.562 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1/MV | 0.160 | 0.171 | 0.120 | 0.151 | 0.190 | 0.159 |
| t-ratio | 0.884 | 0.923 | 0.670 | 0.843 | 1.011 | 0.878 |
| p-value | 0.377 | 0.356 | 0.503 | 0.399 | 0.312 | 0.380 |
| BV | 0.223 | 0.224 | 0.238 | 0.221 | 0.221 | 0.223 |
| t-ratio | 4.480 | 4.476 | 4.845 | 4.441 | 4.458 | 4.491 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| PBT | 2.045 | 2.036 | 2.117 | 2.073 | 2.053 | 2.041 |
| t-ratio | 6.027 | 5.970 | 6.128 | 6.095 | 6.048 | 6.033 |
| p-value | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| PBT seg x | - | -0.097 | -0.687 | 0.000 | -0.395 | -0.059 |
| t-ratio | - | -0.233 | -3.593 | -0.309 | -1.455 | -0.263 |
| p-value | - | 0.816 | 0.000 | 0.758 | 0.146 | 0.792 |
| DPBT seg x | - | 6.021 | 3.207 | -3.017 | -24.171 | 46.357 |
| t-ratio | - | 1.829 | 1.144 | -2.575 | -9.675 | 1.649 |
| p-value | - | 0.067 | 0.253 | 0.010 | 0.000 | 0.099 |
| PBT*f(mv) | -0.044 | -0.041 | -0.037 | -0.039 | -0.049 | -0.043 |
| t-ratio | -0.544 | -0.507 | -0.464 | -0.485 | -0.609 | -0.534 |
| p-value | 0.586 | 0.612 | 0.643 | 0.627 | 0.542 | 0.593 |
| DIV | -1.143 | -1.141 | -1.019 | -1.147 | -1.004 | -1.130 |
| t-ratio | -1.282 | -1.281 | -1.143 | -1.286 | -1.107 | -1.258 |
| p-value | 0.200 | 0.200 | 0.253 | 0.199 | 0.268 | 0.208 |
| Adj.ER | 0.590 | 0.589 | 0.611 | 0.624 | 0.591 | 0.588 |
| t-ratio | 1.719 | 1.711 | 1.799 | 1.834 | 1.725 | 1.705 |
| p-value | 0.086 | 0.087 | 0.072 | 0.067 | 0.084 | 0.088 |
| No. of cases | 1331 | 1331 | 1331 | 1331 | 1331 | 1331 |
| Adj. R-Square | 15.5% | 15.4% | 16.0% | 15.5% | 15.6% | 15.4% |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported below the regression coefficients.

**Table 6.10MV (continued from the previous page...)**

| | PBT seg x = PBT5<br>Model7 | PBT seg x = PBT6<br>Model8 | PBT seg x = PBT7<br>Model9 | PBT seg x = PBT8<br>Model10 | PBT seg x = PBT9<br>Model11 |
|---|---|---|---|---|---|
| Intercept | 0.881 | 0.906 | 0.907 | 0.907 | 0.854 |
| t-ratio | 20.678 | 22.096 | 21.685 | 22.109 | 22.171 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| NEGMV | -0.503 | -0.500 | -0.501 | -0.500 | -0.499 |
| t-ratio | -13.408 | -13.548 | -13.552 | -13.345 | -14.533 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1/MV | 0.126 | 0.161 | 0.160 | 0.154 | 0.220 |
| t-ratio | 0.689 | 0.891 | 0.885 | 0.852 | 1.230 |
| p-value | 0.491 | 0.373 | 0.376 | 0.394 | 0.219 |
| BV | 0.235 | 0.220 | 0.222 | 0.221 | 0.247 |
| t-ratio | 4.757 | 4.427 | 4.363 | 4.347 | 5.447 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| PBT | 1.773 | 2.063 | 2.048 | 2.078 | 1.711 |
| t-ratio | 5.295 | 6.015 | 5.983 | 6.067 | 5.173 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| PBT seg x | 0.704 | 0.709 | 0.061 | 0.360 | 6.451 |
| t-ratio | 3.588 | 0.934 | 0.213 | 0.491 | 4.283 |
| p-value | 0.000 | 0.351 | 0.832 | 0.623 | 0.000 |
| DPBT seg x | -2.149 | 84.929 | 4.717 | 5.008 | -7.701 |
| t-ratio | -0.345 | 4.818 | 2.209 | 2.493 | -4.596 |
| p-value | 0.730 | 0.000 | 0.027 | 0.013 | 0.000 |
| PBT*f(mv) | 0.017 | -0.051 | -0.045 | -0.052 | 0.021 |
| t-ratio | 0.212 | -0.622 | -0.548 | -0.647 | 0.267 |
| p-value | 0.832 | 0.534 | 0.584 | 0.518 | 0.789 |
| DIV | -1.083 | -1.086 | -1.143 | -1.163 | -0.114 |
| t-ratio | -1.235 | -1.215 | -1.279 | -1.307 | -0.128 |
| p-value | 0.217 | 0.224 | 0.201 | 0.191 | 0.898 |
| Adj.ER | 0.656 | 0.606 | 0.590 | 0.583 | 0.582 |
| t-ratio | 2.013 | 1.782 | 1.720 | 1.697 | 1.739 |
| p-value | 0.044 | 0.075 | 0.085 | 0.090 | 0.082 |
| No. of cases | 1331 | 1331 | 1331 | 1331 | 1331 |
| Adj. R-Square | 16.5% | 15.5% | 15.4% | 15.4% | 22.1% |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported below the regression coefficients

## Table 6.13TA (TA -deflated model)

### Profit-making firms

| | Dividend & non-Div firms | | | | | |
|---|---|---|---|---|---|---|
| | Model 1 | | | Controlling for segment-level losses Model 2 | | |
| | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value |
| Intercept | 0.228 | 4.016 | 0.000 | 0.203 | 3.543 | 0.000 |
| NEGMV | -0.359 | -8.676 | 0.000 | -0.356 | -8.786 | 0.000 |
| 1/TA | 2.483 | 2.485 | 0.013 | 2.329 | 2.283 | 0.022 |
| BV | -0.104 | -0.926 | 0.354 | -0.099 | -0.886 | 0.376 |
| PBTA | 1.982 | 1.716 | 0.086 | 2.171 | 1.914 | 0.056 |
| PBTB | 8.188 | 2.130 | 0.033 | 8.342 | 2.059 | 0.039 |
| PBTC | 0.462 | 0.501 | 0.616 | 0.545 | 0.592 | 0.554 |
| PBTD | 4.325 | 5.732 | 0.000 | 4.294 | 5.694 | 0.000 |
| PBTDA | 4.540 | 6.239 | 0.000 | 4.521 | 6.221 | 0.000 |
| PBTE | 5.766 | 6.025 | 0.000 | 5.702 | 5.972 | 0.000 |
| PBTF | 5.138 | 6.080 | 0.000 | 5.090 | 6.041 | 0.000 |
| PBTG | 4.959 | 5.329 | 0.000 | 4.929 | 5.301 | 0.000 |
| PBTH | 4.834 | 3.072 | 0.002 | 4.507 | 2.879 | 0.004 |
| PBTI | 7.736 | 8.327 | 0.000 | 7.856 | 8.389 | 0.000 |
| PREST | 3.164 | 3.660 | 0.000 | 2.837 | 3.269 | 0.001 |
| DPBTB | | | | -7.160 | -1.599 | 0.110 |
| DPBTC | | | | -7.718 | -1.476 | 0.140 |
| DPBTD | | | | 0.876 | 0.387 | 0.699 |
| DPBTDA | | | | -3.359 | -1.976 | 0.048 |
| DPBTE | | | | -2.347 | -0.893 | 0.372 |
| DPBTF | | | | -4.354 | -0.836 | 0.403 |
| DPBTG | | | | -5.930 | -2.048 | 0.041 |
| DPBTH | | | | 0.782 | 0.043 | 0.966 |
| DPBTI | | | | -9.911 | -3.473 | 0.001 |
| PBT*f(ta) | 0.762 | 3.629 | 0.000 | 0.815 | 3.847 | 0.000 |
| DIV | 5.754 | 3.588 | 0.000 | 5.911 | 3.653 | 0.000 |
| Adj.ER | 0.562 | 1.045 | 0.296 | 0.644 | 1.241 | 0.215 |
| No.of cases | 1670 | | | 1670 | | |
| Adj.R-Square | 44.88% | | | 45.14% | | |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported next to the regression coefficients.

**Table 6.13TA (continued from the previous page...)**

| | Div firms only | | | | | |
|---|---|---|---|---|---|---|
| | | | | Controlling for segment-level losses | | |
| | | Model 3 | | | Model 4 | |
| | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value |
| Intercept | 0.217 | 3.400 | 0.001 | 0.203 | 3.162 | 0.002 |
| NEGMV | -0.359 | -8.036 | 0.000 | -0.363 | -8.235 | 0.000 |
| 1/TA | 0.735 | 0.708 | 0.479 | 0.419 | 0.402 | 0.688 |
| BV | -0.092 | -0.586 | 0.558 | -0.088 | -0.567 | 0.570 |
| PBTA | 2.343 | 2.052 | 0.040 | 2.589 | 2.283 | 0.022 |
| PBTB | 9.684 | 2.596 | 0.009 | 10.083 | 2.557 | 0.011 |
| PBTC | 1.359 | 1.410 | 0.159 | 1.485 | 1.537 | 0.124 |
| PBTD | 5.570 | 7.805 | 0.000 | 5.607 | 7.839 | 0.000 |
| PBTDA | 5.719 | 8.304 | 0.000 | 5.771 | 8.374 | 0.000 |
| PBTE | 7.075 | 7.763 | 0.000 | 7.080 | 7.780 | 0.000 |
| PBTF | 6.401 | 7.900 | 0.000 | 6.417 | 7.932 | 0.000 |
| PBTG | 6.304 | 6.904 | 0.000 | 6.359 | 6.963 | 0.000 |
| PBTH | 6.953 | 4.310 | 0.000 | 6.446 | 4.050 | 0.000 |
| PBTI | 9.008 | 9.525 | 0.000 | 9.113 | 9.597 | 0.000 |
| PREST | 4.454 | 5.663 | 0.000 | 4.322 | 5.403 | 0.000 |
| DPBTB | | | | -10.356 | -2.478 | 0.013 |
| DPBTC | | | | -3.742 | -1.362 | 0.173 |
| DPBTD | | | | -0.188 | -0.077 | 0.939 |
| DPBTDA | | | | -4.786 | -2.625 | 0.009 |
| DPBTE | | | | -1.880 | -0.765 | 0.444 |
| DPBTF | | | | -10.350 | -1.689 | 0.091 |
| DPBTG | | | | -19.511 | -3.352 | 0.001 |
| DPBTH | | | | 14.446 | 0.674 | 0.500 |
| DPBTI | | | | -10.730 | -1.870 | 0.061 |
| PBT*f(ta) | 0.558 | 2.824 | 0.005 | 0.579 | 2.915 | 0.004 |
| DIV | 4.668 | 2.694 | 0.007 | 4.750 | 2.726 | 0.006 |
| Adj.ER | 0.720 | 1.354 | 0.176 | 0.809 | 1.547 | 0.122 |
| No.of cases | 1600 | | | 1600 | | |
| Adj.R-Square | 45.82% | | | 45.81% | | |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported next to the regression coefficients

## Table 6.13Sale (Group Sale-deflated model)

### Profit-making firms

| | Dividend & non-Div firms | | | | | |
|---|---|---|---|---|---|---|
| | Model 1 | | | Controlling for segment-level losses Model 2 | | |
| | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value |
| Intercept | 0.129 | 2.971 | 0.003 | 0.117 | 2.742 | 0.006 |
| NEGMV | -0.536 | -7.097 | 0.000 | -0.526 | -7.336 | 0.000 |
| 1/Sale | 1.415 | 1.239 | 0.216 | 0.348 | 0.336 | 0.737 |
| BV | 0.473 | 3.165 | 0.002 | 0.437 | 2.921 | 0.003 |
| PBTA | 4.600 | 2.506 | 0.012 | 5.114 | 2.749 | 0.006 |
| PBTB | 9.966 | 3.018 | 0.003 | 11.285 | 3.179 | 0.001 |
| PBTC | -0.229 | -0.156 | 0.876 | 0.008 | 0.005 | 0.996 |
| PBTD | 5.827 | 3.632 | 0.000 | 6.107 | 3.792 | 0.000 |
| PBTDA | 5.032 | 4.453 | 0.000 | 5.266 | 4.695 | 0.000 |
| PBTE | 2.993 | 2.228 | 0.026 | 3.148 | 2.309 | 0.021 |
| PBTF | 5.180 | 4.283 | 0.000 | 5.417 | 4.493 | 0.000 |
| PBTG | 5.176 | 3.398 | 0.001 | 5.629 | 3.715 | 0.000 |
| PBTH | 4.562 | 1.621 | 0.105 | 6.384 | 2.521 | 0.012 |
| PBTI | 8.583 | 6.004 | 0.000 | 9.118 | 6.507 | 0.000 |
| PREST | 3.505 | 3.205 | 0.001 | 3.434 | 3.090 | 0.002 |
| DPBTB | | | | -6.230 | -1.975 | 0.048 |
| DPBTC | | | | -13.384 | -1.063 | 0.288 |
| DPBTD | | | | -4.182 | -1.237 | 0.216 |
| DPBTDA | | | | -4.147 | -1.962 | 0.050 |
| DPBTE | | | | -0.437 | -0.064 | 0.949 |
| DPBTF | | | | -0.899 | -0.181 | 0.856 |
| DPBTG | | | | -9.822 | -0.625 | 0.532 |
| DPBTH | | | | -12.144 | -2.218 | 0.027 |
| DPBTI | | | | -10.513 | -1.580 | 0.114 |
| PBT*f(sale) | 0.116 | 2.019 | 0.044 | 0.117 | 2.023 | 0.043 |
| DIV | 4.125 | 2.031 | 0.042 | 4.059 | 2.020 | 0.043 |
| Adj.ER | 0.169 | 0.211 | 0.833 | 0.164 | 0.205 | 0.838 |
| No.of cases | 1670 | | | 1670 | | |
| Adj.R-Square | 40.5% | | | 40.8% | | |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported next to the regression coefficients.

**Table 6.13Sale (continued from the previous page...)**

| | Dividend firms only | | | | | |
|---|---|---|---|---|---|---|
| | | | | Controlling for segment-level losses | | |
| | | Model 3 | | | Model 4 | |
| | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value |
| Intercept | 0.096 | 2.607 | 0.009 | 0.097 | 2.554 | 0.011 |
| NEGMV | -0.491 | -7.634 | 0.000 | -0.496 | -7.388 | 0.000 |
| 1/Sale | 1.147 | 0.704 | 0.481 | 0.441 | 0.271 | 0.786 |
| BV | 0.323 | 2.081 | 0.037 | 0.319 | 1.918 | 0.055 |
| PBTA | 4.897 | 2.847 | 0.004 | 5.224 | 2.932 | 0.003 |
| PBTB | 11.241 | 3.539 | 0.000 | 12.328 | 3.770 | 0.000 |
| PBTC | 0.512 | 0.328 | 0.743 | 0.598 | 0.372 | 0.710 |
| PBTD | 6.991 | 4.294 | 0.000 | 7.141 | 4.333 | 0.000 |
| PBTDA | 6.112 | 5.349 | 0.000 | 6.255 | 5.433 | 0.000 |
| PBTE | 4.426 | 3.251 | 0.001 | 4.563 | 3.302 | 0.001 |
| PBTF | 6.352 | 5.105 | 0.000 | 6.489 | 5.174 | 0.000 |
| PBTG | 6.021 | 4.193 | 0.000 | 6.229 | 4.260 | 0.000 |
| PBTH | 9.204 | 3.487 | 0.000 | 8.762 | 3.210 | 0.001 |
| PBTI | 10.210 | 7.012 | 0.000 | 10.380 | 6.953 | 0.000 |
| PREST | 4.371 | 3.817 | 0.000 | 4.439 | 3.858 | 0.000 |
| DPBTB | | | | -6.379 | -2.433 | 0.015 |
| DPBTC | | | | -3.312 | -0.529 | 0.597 |
| DPBTD | | | | -5.203 | -1.502 | 0.133 |
| DPBTDA | | | | -6.144 | -3.117 | 0.002 |
| DPBTE | | | | -1.157 | -0.163 | 0.870 |
| DPBTF | | | | -3.807 | -0.549 | 0.583 |
| DPBTG | | | | -10.199 | -0.621 | 0.534 |
| DPBTH | | | | 19.588 | 0.657 | 0.511 |
| DPBTI | | | | -1.187 | -0.189 | 0.850 |
| PBT*f(sale) | 0.101 | 1.693 | 0.090 | 0.097 | 1.629 | 0.103 |
| DIV | 3.958 | 1.726 | 0.084 | 3.827 | 1.631 | 0.103 |
| Adj.ER | 0.470 | 0.592 | 0.554 | 0.485 | 0.609 | 0.542 |
| No.of cases | 1601 | | | 1601 | | |
| Adj.R-Square | 43.3% | | | 43.1% | | |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported next to the regression coefficients.

## Model 6.13Sale (continued from the previous page...)

**Wald test of the significance of valuation differential between each pair of specific segments included in Model 2 and Model 4**

| segments | Model 2 p-value | Model4 p-value |
|---|---|---|
| PBTA VS PBTB | 0.098 | 0.039 |
| PBTA VS PBTC | 0.004 | 0.006 |
| PBTA VS PBTD | 0.554 | 0.224 |
| PBTA VS PBTDA | 0.924 | 0.487 |
| PBTA VS PBTE | 0.223 | 0.656 |
| PBTA VS PBTF | 0.851 | 0.405 |
| PBTA VS PBTG | 0.763 | 0.515 |
| PBTA VS PBTH | 0.607 | 0.161 |
| PBTA VS PBTI | 0.018 | 0.002 |
| PBTB VS PBTC | 0.005 | 0.002 |
| PBTB VS PBTD | 0.158 | 0.131 |
| PBTB VS PBTDA | 0.092 | 0.068 |
| PBTB VS PBTE | 0.022 | 0.019 |
| PBTB VS PBTF | 0.102 | 0.082 |
| PBTB VS PBTG | 0.128 | 0.075 |
| PBTB VS PBTH | 0.235 | 0.387 |
| PBTB VS PBTI | 0.556 | 0.574 |
| PBTC VS PBTD | 0.000 | 0.000 |
| PBTC VS PBTDA | 0.000 | 0.000 |
| PBTC VS PBTE | 0.003 | 0.000 |
| PBTC VS PBTF | 0.000 | 0.000 |
| PBTC VS PBTG | 0.000 | 0.000 |
| PBTC VS PBTH | 0.003 | 0.001 |
| PBTC VS PBTI | 0.000 | 0.000 |
| DPBT VS PBTDA | 0.316 | 0.291 |
| PBTD VS PBTE | 0.001 | 0.007 |
| PBTD VS PBTF | 0.422 | 0.442 |
| PBTD VS PBTG | 0.610 | 0.289 |
| PBTD VS PBTH | 0.893 | 0.485 |
| PBTD VS PBTI | 0.015 | 0.011 |
| PBTDA VS PBTE | 0.002 | 0.018 |
| PBTDA VS PBTF | 0.804 | 0.703 |
| PBTDA VS PBTG | 0.648 | 0.971 |
| PBTDA VS PBTH | 0.585 | 0.279 |
| PBTDA VS PBTI | 0.000 | 0.000 |
| PBTE VS PBTF | 0.003 | 0.014 |
| PBTE VS PBTG | 0.002 | 0.033 |
| PBTE VS PBTH | 0.069 | 0.035 |
| PBTE VS PBTI | 0.000 | 0.000 |
| PBTF VS PBTG | 0.814 | 0.751 |
| PBTF VS PBTH | 0.643 | 0.327 |
| PBTF VS PBTI | 0.000 | 0.000 |
| PBTG VS PBTH | 0.698 | 0.259 |
| PBTG VS PBTI | 0.004 | 0.001 |
| PBTH VS PBTI | 0.202 | 0.500 |

**Table 6.13MV (One year lagged MV-deflated model)**

**Profit-making firms**

| | Dividend & non-Div firms | | | | | | Dividend firms only | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Controlling for segment-level losses | | | | | | Controlling for segment-level losses | | |
| | Model 1 | | | Model 2 | | | Model 3 | | | Model 4 | | |
| | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value | Coeff. | t-ratio | P-value |
| Intercept | 0.891 | 21.398 | 0.000 | 0.876 | 20.987 | 0.000 | 0.887 | 20.743 | 0.000 | 0.878 | 20.414 | 0.000 |
| NEGMV | -0.504 | -14.16 | 0.000 | -0.496 | -14.177 | 0.000 | -0.484 | -13.18 | 0.000 | -0.480 | -13.147 | 0.000 |
| 1/MV | 37.211 | 0.149 | 0.881 | -157.690 | -0.655 | 0.512 | -109.92 | -0.307 | 0.759 | -344.079 | -0.804 | 0.421 |
| BV | 0.257 | 5.170 | 0.000 | 0.242 | 4.778 | 0.000 | 0.214 | 4.104 | 0.000 | 0.210 | 3.965 | 0.000 |
| PBTA | 0.881 | 1.361 | 0.173 | 1.041 | 1.594 | 0.111 | 0.939 | 1.416 | 0.157 | 1.069 | 1.592 | 0.111 |
| PBTB | 2.698 | 2.982 | 0.003 | 3.076 | 2.553 | 0.011 | 2.688 | 2.836 | 0.005 | 3.267 | 2.645 | 0.008 |
| PBTC | 1.275 | 3.380 | 0.001 | 1.329 | 3.481 | 0.000 | 1.068 | 2.701 | 0.007 | 1.117 | 2.801 | 0.005 |
| PBTD | 1.474 | 4.009 | 0.000 | 1.494 | 4.047 | 0.000 | 1.538 | 4.040 | 0.000 | 1.564 | 4.001 | 0.000 |
| PBTDA | 2.169 | 5.763 | 0.000 | 2.372 | 6.249 | 0.000 | 2.212 | 5.584 | 0.000 | 2.406 | 5.903 | 0.000 |
| PBTE | 2.185 | 4.742 | 0.000 | 2.216 | 4.777 | 0.000 | 2.224 | 4.678 | 0.000 | 2.267 | 4.703 | 0.000 |
| PBTF | 2.057 | 4.423 | 0.000 | 2.046 | 4.435 | 0.000 | 2.078 | 4.175 | 0.000 | 2.083 | 4.133 | 0.000 |
| PBTG | 1.783 | 2.861 | 0.004 | 1.955 | 3.069 | 0.002 | 1.840 | 2.846 | 0.004 | 1.938 | 2.866 | 0.004 |
| PBTH | 2.686 | 2.647 | 0.008 | 2.923 | 2.800 | 0.005 | 2.923 | 2.789 | 0.005 | 2.981 | 2.790 | 0.005 |
| PBTI | 2.929 | 7.120 | 0.000 | 3.155 | 7.801 | 0.000 | 2.944 | 7.106 | 0.000 | 3.113 | 7.320 | 0.000 |
| PREST | 1.670 | 4.091 | 0.000 | 1.577 | 3.930 | 0.000 | 1.531 | 3.685 | 0.000 | 1.489 | 3.618 | 0.000 |
| DPBTB | | | | -1.234 | -0.866 | 0.386 | | | | -1.966 | -1.224 | 0.221 |
| DPBTC | | | | 0.487 | 0.185 | 0.853 | | | | 2.649 | 1.114 | 0.265 |
| DPBTD | | | | 2.142 | 3.080 | 0.002 | | | | 1.731 | 2.425 | 0.015 |
| DPBTDA | | | | -3.161 | -2.852 | 0.004 | | | | -4.331 | -4.571 | 0.000 |
| DPBTE | | | | 5.985 | 0.822 | 0.411 | | | | 5.762 | 0.774 | 0.439 |
| DPBTF | | | | 5.599 | 4.856 | 0.000 | | | | 5.421 | 2.588 | 0.010 |
| DPBTG | | | | -6.580 | -3.725 | 0.000 | | | | -2.354 | -0.452 | 0.651 |
| DPBTH | | | | -2.279 | -0.379 | 0.705 | | | | 1.088 | 0.207 | 0.836 |
| DPBTI | | | | -3.660 | -5.664 | 0.000 | | | | -6.788 | -2.051 | 0.040 |
| PBT*f(mv) | -0.003 | -0.133 | 0.894 | 0.003 | 0.106 | 0.916 | 0.001 | 0.046 | 0.963 | 0.005 | 0.209 | 0.834 |
| DIV | -1.328 | -1.494 | 0.135 | -1.182 | -1.336 | 0.182 | -0.846 | -0.862 | 0.389 | -0.861 | -0.888 | 0.375 |
| Adj.ER | 0.606 | 1.887 | 0.059 | 0.720 | 2.367 | 0.018 | 0.697 | 2.258 | 0.024 | 0.833 | 2.846 | 0.004 |
| No.of cases | 1344 | | | 1344 | | | 1293 | | | 1293 | | |
| Adj.R-Square | 16.8% | | | 17.7% | | | 15.4% | | | 15.8% | | |

**Table 6.13MV (continued from the previous page...)**

**Wald test of the significance of valuation differential between each pair of specific segments included in Model 2 and Model 4**

| SEGMENTS | Model 2 p-value | Model4 p-value |
|---|---|---|
| PBTA VS PBTB | 0.109 | 0.089 |
| PBTA VS PBTC | 0.641 | 0.940 |
| PBTA VS PBTD | 0.462 | 0.441 |
| PBTA VS PBTDA | 0.040 | 0.0474 |
| PBTA VS PBTE | 0.074 | 0.079 |
| PBTA VS PBTF | 0.135 | 0.151 |
| PBTA VS PBTG | 0.237 | 0.280 |
| PBTA VS PBTH | 0.079 | 0.079 |
| PBTA VS PBTI | 0.001 | 0.002 |
| PBTB VS PBTC | 0.142 | 0.075 |
| PBTB VS PBTD | 0.170 | 0.143 |
| PBTB VS PBTDA | 0.545 | 0.462 |
| PBTB VS PBTE | 0.464 | 0.401 |
| PBTB VS PBTF | 0.383 | 0.318 |
| PBTB VS PBTG | 0.367 | 0.288 |
| PBTB VS PBTH | 0.919 | 0.848 |
| PBTB VS PBTI | 0.946 | 0.896 |
| PBTC VS PBTD | 0.569 | 0.121 |
| PBTC VS PBTDA | 0.001 | 0.000 |
| PBTC VS PBTE | 0.012 | 0.002 |
| PBTC VS PBTF | 0.077 | 0.022 |
| PBTC VS PBTG | 0.242 | 0.133 |
| PBTC VS PBTH | 0.097 | 0.054 |
| PBTC VS PBTI | 0.000 | 0.000 |
| DPBT VS PBTDA | 0.001 | 0.001 |
| PBTD VS PBTE | 0.020 | 0.028 |
| PBTD VS PBTF | 0.122 | 0.161 |
| PBTD VS PBTG | 0.346 | 0.452 |
| PBTD VS PBTH | 0.130 | 0.136 |
| PBTD VS PBTI | 0.000 | 0.000 |
| PBTDA VS PBTE | 0.646 | 0.694 |
| PBTDA VS PBTF | 0.385 | 0.409 |
| PBTDA VS PBTG | 0.411 | 0.365 |
| PBTDA VS PBTH | 0.567 | 0.551 |
| PBTDA VS PBTI | 0.016 | 0.036 |
| PBTE VS PBTF | 0.680 | 0.668 |
| PBTE VS PBTG | 0.627 | 0.552 |
| PBTE VS PBTH | 0.467 | 0.468 |
| PBTE VS PBTI | 0.018 | 0.039 |
| PBTF VS PBTG | 0.880 | 0.815 |
| PBTF VS PBTH | 0.376 | 0.369 |
| PBTF VS PBTI | 0.009 | 0.021 |
| PBTG VS PBTH | 0.358 | 0.321 |
| PBTG VS PBTI | 0.029 | 0.038 |
| PBTH VS PBTI | 0.814 | 0.895 |

## Table 6.14TA (TA-deflated model)

### Profit-making firms

| | Basic model Model 1 | PBT seg x = PBTA Model 2 | PBT seg x = PBTB Model 3 | PBT seg x = PBTC Model 4 | PBT seg x = PBTD Model 5 | PBT seg x = PBTDa Model6 | PBT seg x = PBTE Model 7 |
|---|---|---|---|---|---|---|---|
| Intercept | 0.350 | 0.350 | 0.359 | 0.360 | 0.359 | 0.354 | 0.342 |
| t-ratio | 6.320 | 6.323 | 6.428 | 6.489 | 6.451 | 6.391 | 6.131 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| NEGMV | -0.376 | -0.369 | -0.377 | -0.366 | -0.382 | -0.379 | -0.381 |
| t-ratio | -8.267 | -8.155 | -8.377 | -8.141 | -8.335 | -8.376 | -8.353 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1/TA | 3.444 | 3.436 | 3.375 | 3.411 | 3.424 | 3.415 | 3.468 |
| t-ratio | 3.248 | 3.233 | 3.130 | 3.196 | 3.223 | 3.193 | 3.278 |
| p-value | 0.001 | 0.001 | 0.002 | 0.001 | 0.001 | 0.001 | 0.001 |
| BV | -0.349 | -0.346 | -0.368 | -0.341 | -0.342 | -0.354 | -0.349 |
| t-ratio | -2.844 | -2.806 | -3.058 | -2.784 | -2.786 | -2.900 | -2.837 |
| p-value | 0.004 | 0.005 | 0.002 | 0.005 | 0.005 | 0.004 | 0.005 |
| PBT | 5.350 | 5.376 | 5.346 | 5.446 | 5.418 | 5.499 | 5.453 |
| t-ratio | 6.636 | 6.645 | 6.607 | 6.712 | 6.634 | 6.587 | 6.773 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| PBT seg x | - | -2.979 | 3.594 | -4.299 | -0.826 | -0.675 | 1.554 |
| t-ratio | - | -2.333 | 0.961 | -6.719 | -2.163 | -1.803 | 2.300 |
| p-value | - | 0.020 | 0.336 | 0.000 | 0.031 | 0.071 | 0.021 |
| DPBT seg x | - | - | -4.266 | -3.192 | 4.973 | -0.933 | 0.491 |
| t-ratio | - | - | -1.017 | -0.673 | 1.665 | -0.579 | 0.211 |
| p-value | - | - | 0.309 | 0.501 | 0.096 | 0.563 | 0.833 |
| PBT*f(ta) | 0.480 | 0.473 | 0.484 | 0.465 | 0.461 | 0.462 | 0.440 |
| t-ratio | 2.378 | 2.335 | 2.366 | 2.299 | 2.267 | 2.281 | 2.220 |
| p-value | 0.017 | 0.020 | 0.018 | 0.021 | 0.023 | 0.023 | 0.026 |
| DIV | 6.818 | 6.787 | 6.647 | 6.718 | 7.175 | 7.002 | 6.757 |
| t-ratio | 4.296 | 4.266 | 4.132 | 4.228 | 4.556 | 4.451 | 4.251 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Adj.ER | 0.546 | 0.543 | 0.556 | 0.605 | 0.529 | 0.554 | 0.522 |
| t-ratio | 0.915 | 0.908 | 0.934 | 1.020 | 0.896 | 0.909 | 0.878 |
| p-value | 0.360 | 0.364 | 0.350 | 0.308 | 0.370 | 0.363 | 0.380 |
| No. of cases | 1670 | 1670 | 1670 | 1670 | 1670 | 1670 | 1670 |
| Adj. R-Square | 40.3% | 40.3% | 40.5% | 40.7% | 40.4% | 40.4% | 40.4% |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported below the regression coefficients.

## Table 6.14TA (continued from previous page...)

| | PBT seg x = PBTF Model 8 | PBT seg x = PBTG Model 9 | PBT seg x = PBTH Model 10 | PBT seg x = PBTI Model 11 | PBT seg x = PBTABC* Model 12 | PBT seg x = PBTD1* Model 13 |
|---|---|---|---|---|---|---|
| Intercept | 0.350 | 0.348 | 0.349 | 0.264 | 0.355 | 0.367 |
| t-ratio | 6.292 | 6.287 | 6.297 | 4.954 | 6.433 | 6.633 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| NEGMV | -0.377 | -0.374 | -0.377 | -0.370 | -0.359 | -0.385 |
| t-ratio | -8.258 | -8.193 | -8.381 | -8.836 | -7.710 | -8.468 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1/TA | 3.445 | 3.442 | 3.447 | 2.596 | 3.388 | 3.333 |
| t-ratio | 3.249 | 3.239 | 3.248 | 2.526 | 3.139 | 3.072 |
| p-value | 0.001 | 0.001 | 0.001 | 0.012 | 0.002 | 0.002 |
| BV | -0.349 | -0.357 | -0.349 | -0.129 | -0.344 | -0.358 |
| t-ratio | -2.839 | -2.906 | -2.828 | -1.167 | -2.827 | -2.981 |
| p-value | 0.005 | 0.004 | 0.005 | 0.243 | 0.005 | 0.003 |
| PBT | 5.343 | 5.369 | 5.346 | 3.666 | 5.314 | 5.500 |
| t-ratio | 6.543 | 6.654 | 6.617 | 4.855 | 6.579 | 6.473 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| PBT seg x | 0.106 | 0.587 | -0.026 | 3.791 | -2.600 | -0.917 |
| t-ratio | 0.174 | 1.077 | -0.020 | 5.476 | -2.171 | -2.626 |
| p-value | 0.862 | 0.282 | 0.984 | 0.000 | 0.030 | 0.009 |
| DPBT seg x | 0.893 | -14.702 | -13.302 | -7.855 | 1.519 | 0.233 |
| t-ratio | 0.158 | -6.534 | -0.644 | -2.924 | 0.729 | 0.117 |
| p-value | 0.874 | 0.000 | 0.519 | 0.003 | 0.466 | 0.907 |
| PBT*f(ta) | 0.481 | 0.466 | 0.481 | 0.764 | 0.484 | 0.465 |
| t-ratio | 2.374 | 2.280 | 2.379 | 3.814 | 2.396 | 2.267 |
| p-value | 0.018 | 0.023 | 0.017 | 0.000 | 0.017 | 0.023 |
| DIV | 6.817 | 6.883 | 6.846 | 7.268 | 7.039 | 7.608 |
| t-ratio | 4.285 | 4.342 | 4.300 | 4.703 | 4.490 | 4.908 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Adj.ER | 0.554 | 0.518 | 0.548 | 0.537 | 0.607 | 0.558 |
| t-ratio | 0.929 | 0.866 | 0.918 | 0.942 | 1.029 | 0.926 |
| p-value | 0.353 | 0.387 | 0.358 | 0.346 | 0.304 | 0.355 |
| No. of cases | 1670 | 1670 | 1670 | 1670 | 1670 | 1670 |
| Adj. R-Square | 40.2% | 40.3% | 40.2% | 44.0% | 40.6% | 40.7% |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported below the regression coefficients.

## Table 6.14Sale (Group Sale-deflated model)

### Profit-making sample

| | Basic model<br>Model 1 | PBT seg x = PBTA<br>Model 2 | PBT seg x = PBTB<br>Model 3 | PBT seg x = PBTC<br>Model 4 | PBT seg x = PBTD<br>Model 5 | PBT seg x = PBTDa<br>Model6 | PBT seg x = PBTE<br>Model 7 |
|---|---|---|---|---|---|---|---|
| Intercept | 0.221 | 0.221 | 0.234 | 0.228 | 0.209 | 0.227 | 0.186 |
| t-ratio | 5.846 | 5.850 | 6.134 | 6.016 | 5.034 | 5.949 | 5.125 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| NEGMV | -0.582 | -0.581 | -0.582 | -0.562 | -0.578 | -0.583 | -0.569 |
| t-ratio | -7.463 | -7.366 | -7.506 | -7.227 | -7.450 | -7.494 | -7.576 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1/Sale | 2.001 | 2.000 | 1.823 | 1.967 | 2.018 | 1.988 | 1.857 |
| t-ratio | 1.574 | 1.571 | 1.567 | 1.546 | 1.582 | 1.563 | 1.477 |
| p-value | 0.116 | 0.116 | 0.117 | 0.122 | 0.114 | 0.118 | 0.140 |
| BV | 0.364 | 0.364 | 0.368 | 0.357 | 0.372 | 0.356 | 0.425 |
| t-ratio | 2.661 | 2.661 | 2.694 | 2.606 | 2.701 | 2.555 | 2.928 |
| p-value | 0.008 | 0.008 | 0.007 | 0.009 | 0.007 | 0.011 | 0.003 |
| PBT | 6.280 | 6.281 | 6.024 | 6.460 | 6.201 | 6.371 | 6.117 |
| t-ratio | 5.314 | 5.313 | 5.031 | 5.449 | 5.389 | 5.225 | 5.180 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| PBT seg x | - | -0.237 | 4.564 | -4.949 | 0.791 | -0.489 | -1.676 |
| t-ratio | - | -0.133 | 1.181 | -6.497 | 0.948 | -0.967 | -3.057 |
| p-value | - | 0.894 | 0.238 | 0.000 | 0.343 | 0.334 | 0.002 |
| DPBT seg x | - | - | -1.801 | -6.015 | -1.727 | -1.916 | -0.544 |
| t-ratio | - | - | -0.476 | -0.515 | -0.548 | -0.867 | -0.068 |
| p-value | - | - | 0.634 | 0.606 | 0.584 | 0.386 | 0.946 |
| PBTf(sale) | 0.008 | 0.008 | 0.028 | -0.001 | 0.010 | 0.006 | 0.026 |
| t-ratio | 0.145 | 0.144 | 0.479 | -0.014 | 0.190 | 0.101 | 0.453 |
| p-value | 0.885 | 0.886 | 0.632 | 0.989 | 0.849 | 0.919 | 0.651 |
| DIV | 3.958 | 3.957 | 3.364 | 4.061 | 3.795 | 4.011 | 4.939 |
| t-ratio | 1.917 | 1.916 | 1.587 | 1.989 | 1.818 | 1.939 | 2.441 |
| p-value | 0.055 | 0.055 | 0.113 | 0.047 | 0.069 | 0.053 | 0.015 |
| Adj.ER | -0.253 | -0.254 | -0.191 | -0.200 | -0.213 | -0.251 | -0.137 |
| t-ratio | -0.267 | -0.268 | -0.203 | -0.212 | -0.226 | -0.263 | -0.148 |
| p-value | 0.789 | 0.789 | 0.839 | 0.832 | 0.821 | 0.793 | 0.883 |
| No. of cases | 1670 | 1670 | 1670 | 1670 | 1670 | 1670 | 1670 |
| Adj. R-Square | 36.3% | 36.3% | 36.6% | 36.7% | 36.3% | 36.3% | 36.6% |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported below the regression coefficients.

**Table 6.14Sale (continued from the previous page...)**

| | PBT seg x = PBTF Model 8 | PBT seg x = PBTG Model 9 | PBT seg x = PBTH Model 10 | PBT seg x = PBTI Model 11 | PBT seg x = PBTABC* Model 12 | PBT seg x = PBTD1* Model 13 |
|---|---|---|---|---|---|---|
| Intercept | 0.222 | 0.217 | 0.221 | 0.190 | 0.220 | 0.215 |
| t-ratio | 5.834 | 5.599 | 5.837 | 5.401 | 5.853 | 4.993 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| NEGMV | -0.582 | -0.581 | -0.580 | -0.558 | -0.578 | -0.580 |
| t-ratio | -7.439 | -7.411 | -7.377 | -7.586 | -7.066 | -7.477 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1/Sale | 2.001 | 1.965 | 1.813 | 1.369 | 2.184 | 2.008 |
| t-ratio | 1.573 | 1.540 | 1.432 | 1.101 | 1.659 | 1.579 |
| p-value | 0.116 | 0.124 | 0.152 | 0.271 | 0.097 | 0.114 |
| BV | 0.365 | 0.359 | 0.367 | 0.382 | 0.364 | 0.370 |
| t-ratio | 2.651 | 2.605 | 2.528 | 3.019 | 2.654 | 2.613 |
| p-value | 0.008 | 0.009 | 0.011 | 0.003 | 0.008 | 0.009 |
| PBT | 6.281 | 6.364 | 6.290 | 4.542 | 6.239 | 6.220 |
| t-ratio | 5.316 | 5.328 | 5.321 | 3.884 | 5.192 | 5.267 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| PBT seg x | 0.039 | 0.737 | -1.013 | 4.353 | -0.212 | 0.217 |
| t-ratio | 0.068 | 1.033 | -0.495 | 4.432 | -0.095 | 0.363 |
| p-value | 0.946 | 0.302 | 0.621 | 0.000 | 0.925 | 0.717 |
| DPBT seg x | 7.604 | -19.599 | -8.953 | -7.833 | 3.368 | -0.803 |
| t-ratio | 1.080 | -3.578 | -2.282 | -1.152 | 1.362 | -0.292 |
| p-value | 0.280 | 0.000 | 0.023 | 0.249 | 0.173 | 0.771 |
| PBTf(sale) | 0.008 | 0.003 | 0.005 | 0.075 | 0.010 | 0.010 |
| t-ratio | 0.138 | 0.046 | 0.097 | 1.311 | 0.172 | 0.176 |
| p-value | 0.890 | 0.963 | 0.923 | 0.190 | 0.864 | 0.860 |
| DIV | 3.950 | 4.019 | 4.122 | 5.136 | 4.058 | 3.896 |
| t-ratio | 1.913 | 1.942 | 2.014 | 2.543 | 1.962 | 1.855 |
| p-value | 0.056 | 0.052 | 0.044 | 0.011 | 0.050 | 0.064 |
| Adj.ER | -0.246 | -0.248 | -0.253 | -0.195 | -0.246 | -0.244 |
| t-ratio | -0.260 | -0.263 | -0.267 | -0.218 | -0.260 | -0.259 |
| p-value | 0.795 | 0.792 | 0.789 | 0.827 | 0.795 | 0.796 |
| No. of cases | 1670 | 1670 | 1670 | 1670 | 1670 | 1670 |
| Adj. R-Square | 36.2% | 36.3% | 36.4% | 39.2% | 36.3% | 36.2% |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported below the regression coefficients.

## Table 6.14MV (One year lagged MV-deflated model)

### Profit-making firms

| | Basic model Model 1 | PBT seg x = PBTA Model 2 | PBT seg x = PBTB Model 3 | PBT seg x = PBTC Model 4 | PBT seg x = PBTD Model 5 | PBT seg x = PBTDa Model6 | PBT seg x = PBTE Model 7 |
|---|---|---|---|---|---|---|---|
| Intercept | 0.925 | 0.922 | 0.926 | 0.920 | 0.935 | 0.918 | 0.927 |
| t-ratio | 22.832 | 22.605 | 22.893 | 22.425 | 23.009 | 22.297 | 22.792 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| NEGMV | -0.512 | -0.508 | -0.511 | -0.511 | -0.511 | -0.511 | -0.512 |
| t-ratio | -14.209 | -14.312 | -14.165 | -14.183 | -14.189 | -14.312 | -14.169 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1/MV | 216.226 | 192.026 | 237.066 | 199.792 | 207.239 | 155.446 | 236.588 |
| t-ratio | 0.931 | 0.834 | 0.953 | 0.863 | 0.889 | 0.691 | 1.005 |
| p-value | 0.352 | 0.405 | 0.341 | 0.388 | 0.374 | 0.489 | 0.315 |
| BV | 0.233 | 0.239 | 0.232 | 0.238 | 0.234 | 0.235 | 0.226 |
| t-ratio | 4.949 | 4.997 | 4.880 | 5.013 | 5.003 | 4.978 | 4.719 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| PBT | 2.065 | 2.098 | 2.042 | 2.141 | 2.100 | 2.035 | 2.108 |
| t-ratio | 6.077 | 6.158 | 5.941 | 6.076 | 6.172 | 5.850 | 6.211 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| PBT seg x | 0.000 | -1.035 | 0.670 | -0.561 | -0.645 | 0.262 | 0.434 |
| t-ratio | 0.000 | -1.632 | 0.568 | -2.145 | -3.358 | 1.189 | 1.514 |
| p-value | 0.000 | 0.103 | 0.570 | 0.032 | 0.001 | 0.235 | 0.130 |
| DPBT seg | 0.000 | 0.000 | -0.144 | -0.762 | 2.301 | -2.654 | 2.651 |
| t-ratio | 0.000 | 0.000 | -0.108 | -0.410 | 4.603 | -2.441 | 0.434 |
| p-value | 0.000 | 0.000 | 0.914 | 0.682 | 0.000 | 0.015 | 0.664 |
| PBT*f(mv) | -0.024 | -0.026 | -0.022 | -0.024 | -0.027 | -0.020 | -0.028 |
| t-ratio | -1.053 | -1.146 | -0.969 | -1.079 | -1.223 | -0.878 | -1.234 |
| p-value | 0.292 | 0.252 | 0.333 | 0.280 | 0.221 | 0.380 | 0.217 |
| DIV | -1.297 | -1.286 | -1.312 | -1.333 | -1.010 | -1.365 | -1.350 |
| t-ratio | -1.439 | -1.427 | -1.451 | -1.474 | -1.125 | -1.522 | -1.495 |
| p-value | 0.150 | 0.154 | 0.147 | 0.140 | 0.261 | 0.128 | 0.135 |
| Adj.ER | 0.600 | 0.586 | 0.608 | 0.621 | 0.578 | 0.620 | 0.598 |
| t-ratio | 1.807 | 1.756 | 1.837 | 1.875 | 1.754 | 1.889 | 1.807 |
| p-value | 0.071 | 0.079 | 0.066 | 0.061 | 0.079 | 0.059 | 0.071 |
| No. of cases | 1344 | 1344 | 1344 | 1344 | 1344 | 1344 | 1344 |
| Adj. R-Square | 15.1% | 15.1% | 15.0% | 15.1% | 15.5% | 15.2% | 15.1% |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported below the regression coefficients.

**Table 6.14MV (continued from the previous page...)**

| | PBT seg x = PBTF Model 8 | PBT seg x = PBTG Model 9 | PBT seg x = PBTH Model 10 | PBT seg x = PBTI Model 11 | PBT seg x = PBTABC* Model 12 | PBT seg x = PBTD1* Model 13 |
|---|---|---|---|---|---|---|
| Intercept | 0.928 | 0.922 | 0.924 | 0.894 | 0.917 | 0.929 |
| t-ratio | 22.841 | 22.732 | 22.819 | 22.428 | 22.241 | 22.194 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| NEGMV | -0.513 | -0.509 | -0.512 | -0.507 | -0.509 | -0.513 |
| t-ratio | -14.240 | -14.213 | -14.150 | -14.288 | -14.298 | -14.190 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1/MV | 225.023 | 194.241 | 204.272 | 33.125 | 213.635 | 189.882 |
| t-ratio | 0.947 | 0.841 | 0.880 | 0.145 | 0.874 | 0.818 |
| p-value | 0.344 | 0.401 | 0.379 | 0.885 | 0.382 | 0.413 |
| BV | 0.235 | 0.225 | 0.227 | 0.258 | 0.244 | 0.231 |
| t-ratio | 4.977 | 4.787 | 4.598 | 5.603 | 5.080 | 4.860 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| PBT | 2.080 | 2.068 | 2.076 | 1.677 | 2.146 | 2.143 |
| t-ratio | 6.109 | 6.099 | 6.045 | 4.898 | 6.002 | 6.091 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| PBT seg x | 0.071 | 0.031 | 0.627 | 1.326 | -0.539 | -0.180 |
| t-ratio | 0.211 | 0.068 | 0.708 | 4.560 | -2.054 | -0.997 |
| p-value | 0.833 | 0.946 | 0.479 | 0.000 | 0.040 | 0.319 |
| DPBT seg x | 6.380 | -9.375 | -4.434 | -3.315 | 1.075 | -3.203 |
| t-ratio | 6.413 | -5.363 | -0.709 | -5.661 | 1.915 | -2.870 |
| p-value | 0.000 | 0.000 | 0.479 | 0.000 | 0.055 | 0.004 |
| PBT*f(mv) | -0.024 | -0.024 | -0.024 | -0.003 | -0.025 | -0.026 |
| t-ratio | -1.088 | -1.071 | -1.078 | -0.134 | -1.126 | -1.163 |
| p-value | 0.276 | 0.284 | 0.281 | 0.893 | 0.260 | 0.245 |
| DIV | -1.379 | -1.144 | -1.261 | -0.989 | -1.309 | -1.208 |
| t-ratio | -1.517 | -1.285 | -1.396 | -1.130 | -1.452 | -1.347 |
| p-value | 0.129 | 0.199 | 0.163 | 0.259 | 0.147 | 0.178 |
| Adj.ER | 0.624 | 0.587 | 0.600 | 0.640 | 0.607 | 0.614 |
| t-ratio | 1.903 | 1.767 | 1.811 | 1.986 | 1.829 | 1.855 |
| p-value | 0.057 | 0.077 | 0.070 | 0.047 | 0.067 | 0.064 |
| No. of cases | 1344 | 1344 | 1344 | 1344 | 1344 | 1344 |
| Adj. R-Square | 15.1% | 15.4% | 15.0% | 16.9% | 15.1% | 15.2% |

White adjusted (heteroskedasticity-consistent) t-ratios and p-values are reported below the regression coefficients.

# CHAPTER 7

# SUMMARY & CONCLUSIONS

## 7.1 RESEARCH OBJECTIVES AND RESEARCH METHODS

This study comprises an empirical investigation of the value relevance and pricing of specific firm-level and segment-level financial statement information reported by UK multi-segment firms in the annual reports. In the UK, the accounting standards specify that firms which are geographically or industrially diversified disclose some basic financial information on each material segment. The issue of usefulness of the segment-level reporting for security valuation and, hence, the value relevance of this information, is one of the focal concerns of this study. The investigation focuses on whether the operations of a cross-section of UK multi-segment firms, reported from segments operating in specific geographic locations or industries, are perceived by investors to have differential association with (or relative contributions to) the equity market value of the entire firm. In addition, this study concerns the issues of value relevance and pricing of specific consolidated or firm-level accounting information. It also identifies and explores factors and contexts that impact on these relationships. The study seeks to provide the empirical evidence on:

(i) the relationships (in terms of value relevance and pricing) between the firm's equity market value and firm-level financial statement information, such as contemporaneous equity book value, earnings and dividends;

(ii) the existence (or the lack of it) of relationships between the firm's segment-level financial information and the entire firm's equity market value; and

(iii) the relative valuation patterns of segments with specific geographic or line-of-business profiles.

Alongside the segment-related results, this study provides further empirical evidence on the broader issues, including: (i) the value relevance of consolidated financial statement information reported by UK publicly traded firms over the period from 1987 to 2002; (ii) the adequacy of the UK segment reporting accounting standard SSAP 25; and (iii) the quality of segment disclosures in the UK. A brief summary of finding is presented in section 7.2.

The study adopts the positivist methodology, in that it mainly relies on the empirical knowledge as the primary reliable and valid form of knowledge. To some extent, the basic valuation model, employed in this study for capturing the empirics of the relationships in question, represents a fusion of valuation frameworks developed and utilised in earlier studies [e.g., Edwards and Bell (1961), Peasnell (1981, 1982), Ohlson (1989, 1995), Rees (1997), Garrod and Rees (1998), Wysocki (1998)].

In its basic analytical form, the employed consolidated-level valuation model expresses the equity market value of the firm as a linear function of thee value drivers: equity book value, earnings for ordinary, and dividends for ordinary shareholders. When transformed into the regression format, to allow the empirical testing of the firm-level relationships, this model is deflated by a scale proxy and appended with additional control and dummy variables. To investigate the segment-level relationships, the earnings for ordinary variable is further disaggregated into its segment-level elements. This approach allows the testing of the difference in value contribution of earnings from different geographic or industrial segments.

## 7.2 MAIN FINDINGS

Empirical findings reported in this study can be divided into three sections: (i) firm-level valuation; (ii) geographic segment valuation; and (iii) business segment valuation.

### 7.2.1 Firm-level results

The behaviour of the explanatory power of the valuation model, which is a measure of the composite value relevance of the firm-level value drivers, appears to be distinctively influenced by such factors as the firms' industry and time periods. For example, the accounting numbers reported by firms operating in the *Financial* sector explain twice as much of the cross-sectional variation of equity market value as similar information reported by firms operating in the *Services* sector.

The composite value relevance of accounting numbers has not been stable throughout the sample period (1987-2002). By and large, the results suggest that the value drivers included in the model have become gradually more value relevant over the first half of reported period. In the second half, however, there has been a sharp reversal of this trend, with the value relevance reaching the all times' low in year 1999.

Among other contexts, affecting the combined informativeness of the value drivers is the sign of the reported earnings and book values. In general, the explanatory power of the regression is lower when firms report losses (i.e., negative earnings) and/or negative book value. This suggests that the negative financial results are perceived by the market to have lower degree of persistence. Finally, the value relevance of the accounting numbers is higher for firms that trade at a discount to book value, and when the dividend paying firms are compared to the non-dividend firms.

The value relevance and pricing of specific value drivers is found to be highly contextual. For example, negative earnings are not capitalised, while positive earnings are always positively related to value. Furthermore, the magnitude of the earnings coefficient varies across the industries, being particularly large in the services and trade-related sectors, and much smaller in the finance, construction and agriculture related sectors. Another interesting finding is that reported profits tend to have little or no valuation role for firms trading at a discount to book value.

For firms that report losses the book value of equity becomes the most value relevant factor, and serves as the value anchor. In the normal circumstances, however, book value appears to be the least important value driver, and becomes completely irrelevant when it has a negative sign (i.e., when the firm is in financial distress).

Contrary to the predictions of the dividend displacement theory, results indicate that dividends are positively priced. In situations where firms report losses and/or negative book values, dividends become the key value driver. However, there are circumstances when dividends play contrasting roles: they are positively (negatively) priced when firms trade at a premium (discount) to book value. In addition, there is some indication that the pricing of dividends can vary sharply across industries. There has also been some peculiar reversal in the pricing of dividends over the sample period.

### 7.2.2 Geographic segment valuation results

Overall, the results suggest that the geographically diversified firms are valued at a premium in relation to domestic firms. The stock market appears to price the earnings reported by the diversified firms higher than those reported by domestic companies. However, a significantly higher and positive capitalisation of dividends is observed for the domestic firms, while dividends paid by multinationals appear value-irrelevant.

When the firm-level financial results are disaggregated into two broad geographical segments, domestic and foreign, the domestic segment has always a higher pricing. However, when the generic foreign segment is disaggregated into specific foreign segments, no longer the UK segment remains the highest relative contributor to the value of the firm.

Results indicate that the relative pricing of operations reported from different geographic locations has not been static. During the early economic periods (pre-1994 or pre-1996) segmental profits reported from the *America* segment had the highest capitalisation. The domestic operations had the second-highest pricing. However, during the more recent economic period (1994-1997) the UK segment was associated with the highest relative contribution to firm value. Perhaps the most interesting results are those related to the most recent economic period (1998-2002). In this period, none of the profits reported from the foreign segments are value-relevant. This time-related change is, perhaps, the reflection of the dynamics of the changing economic prospects in various parts of the world, and/or investors' sentiments and perceptions.

Although no direct tests have been carried out, there is some evidence of association between the pricing of geographic segments and the degree of popularity of specific geographic locations. Across all tests the *Middle East & Africa* segment always comes last in the valuation ranking, and in many tests has a negative association with firm value. This segment represents the most rare investment location for the UK multinationals. *Asia* is the second-least priced segment and the second least-popular investment location. *America* and *Europe* have higher relative pricing and, correspondingly, are more popular foreign investment locations.

### 7.2.3 Business segment valuation results

On the firm-level, there is some empirical evidence that the industrially diversified firms have lower valuation than the focused firms. These results contrast to those of the geographically diversified firms, which are found to be more valuable than the domestic firms. The rest of the key firm-level results (such as the pricing of the firm-level earnings, book values and dividends, as well as the valuation implications of specific contexts) for the sample of industrially diversified firms are qualitatively similar to those of the entire sample.

There is considerable variation of the value relevance of segmental earnings among business segments operating in different industries. Thus, the segments operating in the Hi-Tech and knowledge-intensive sectors (e.g., *IT*, *Telecommunication services*, etc.) have the highest pricing and relevance to the value of the firm. Segments involved in the services-related operations have the second-highest pricing and value relevance, after the *IT* sector.

In contrast, the 'old' or less knowledge-intensive sector segments, such as *Agriculture, Mining, Basic Industries* and *Utilities*, are associated with the lowest relative contribution to the equity market value of the firm. Segments operating in the remaining economic sectors are in the middle range of valuation.

Somewhat interesting is the finding on the valuation of dividends. They are positively prised and have incremental information content when the firm-level model is used for the business-segment reporting firms. However, when earnings are disaggregated into business segment elements, the dividend coefficient loses its statistical significance. This, possibly, implies that the segment-disaggregated earnings represent a better summary of value-relevant (forward looking) information, which overrides the information contained in the dividends.

Finally, all business segment-level results remain robust to addition test designs, where the basic regression has been deflated by alternative scale-proxies.

By and large, empirical tests suggest that segment-level accounting data communicate value relevant information, which is often incremental to the consolidated-level data. In particular, segment disclosures have incremental information content in situations where on the consolidated level the firm reports losses (which are not priced), while on the disaggregated level profits are reported for some of the disclosed segments. Nevertheless, geographic segment reports are, on average, relatively more informative (value relevant) than the business segment reports. This, perhaps, reflects the relatively higher level of discretion allowed to firms by the business segment reporting requirements section of SSAP 25, when identifying, grouping and reporting line-of-business operations.

## 7.3 KEY FINDINGS

- The extent of value relevance and the pricing of book value, earnings and dividends are dependent upon: the sign of reported earnings and book values: the value of the book-to-market ratio; the economic time-periods; the dividend status of the firm; the firm's industrial affiliation;
- Industrially diversified firms have lower valuation than focused firms, while geographically diversified firms have higher valuation than domestic firms;
- Geographic and line-of-business segment data are, by and large, value relevant and have incremental information content, particularly when firms report firm-level losses.
- Earnings related to most geographic segments and some business segments have differential relative pricing. For example, the *Services* and *IT* sector-related segment operations are priced statistically higher than other segments. However, neither the pricing of specific segments, nor their value relevance remains constant over time.
- Overall, segmental information, disclosed in accordance with SSAP25 requirements, appears to be of limited value relevance, as perceived by the stock market.

## 7.4. MAIN CONTRIBUTIONS

The empirical findings reported in the study might contribute to our knowledge and understanding of the complex relationships existing between the market's perception of the equity value and the specific firm-level and segment-level accounting fundamentals. There are several aspects to the contributions of this research.

**First,** this study contributes to the academic literature by filling some of the gaps in the market based accounting research area. It improves understanding of the role and importance of the corporate segmental information to the stock market. On the level of segmental analysis this study extends the previous studies (see Chapter 2) in several respects. I have investigated both dimensions of the corporate diversification and segment disclosures of the UK firms: geographic and line-of-business. In addition to testing differential valuation of 'domestic' vs. 'foreign' operations, I have investigated the relative pair-wise valuations across all geographic segment locations (i.e., *UK, Europe, America, Asia, Middle East and Africa*). A similar pair-wise approach is used to assess differential value contributions associated with segments operating in specific industries. Another feature of this study is that it uses a longer time period and tests the impact of a wider range of valuation-affecting contexts. This study also provides evidence on the specificity of the value relevance of key firm-level financial value drivers of the UK firms, subject to such factors as economic periods, industry of the firm and its financial health.

**Second,** apart from the contributions to the academic literature, the findings of this study might be of practical interest to the UK bodies and institutions involved in the process of the development of accounting standards. The study argues and presents evidence to suggest that the segment reporting standard, SSAP 25, is not entirely adequate for ensuring that the segment-level financial information, disclosed by firms, is value relevant (i.e., useful for investors) and is of good quality (i.e., comparable across different firms and over time). The Accounting Standards Board might consider using the reported empirical evidence on the usefulness of segmental data to make further improvements to some of the principles and requirements of the Statement of

Standard Accounting Practice no. 25. In particular, the business segment reporting section of SSAP 25 could be appended with an additional clause that would require firms to report the 2, 3 or 4-digit Standard Industrial Classification (SIC) code or the FTSE Global Classification System code for each business segment. This would make business segment information comparable both cross-sectionally and over time. In addition, SSAP 25 could be appended by requiring firms to present the basis for the computation of the reported segmental net assets (NAs) and profit before tax (PBTs). This will help the analyst to substantiate the quality of the reported NA and PBT numbers, making them more informative, hence, value relevant.

**Third,** this study might offer the firms' finance officers, who make decisions on the content of segmental disclosures, valuable insights into how the segment information is perceived by investors and capitalised into the share price. The knowledge of the market's perception of the segment-level information and markets valuation of specific segments can help the firm's managers tailor the segmental report more adequately. The segment information contained in the report might be structured and disclosed in such way that it would be positively perceived by the market and reflected in the value of the firm. In other words, the reporting of the segment-level financial information could be optimised, to minimise the adverse reception of this information by investors.

**Finally,** both the results and the model development sections of this study may contribute to the work of financial analysts. On the modelling level, analysts may find some of the modelling tools and approaches, examined in Chapter 3, appropriate for factoring them into their own valuation techniques/methods. On the value driver or valuation factor-level, the empirical results might be used for determining factors which should be given more weight or controlled for (under certain conditions or valuation contexts), when developing the value estimates for a company or its segments. In addition, results that expose the dynamics of the changing relative valuation of specific geographic locations or lines-of-business, as perceived by the market, might have practical implications for decisions concerning portfolio allocation and investment management.

## 7.5 LIMITATIONS OF THE STUDY

In an empirical accounting study that uses a valuation model as the major analytical tool, the results and conclusions would, by and large, depend on how close the employed model reflects reality. From the methodological point of view, more than one model class might be appropriate for addressing a given research question. The task of model class selection, its development and justification is always a challenging exercise. What unites all possible model-based approaches is the lack of universal consensus.

The model employed in this study is not necessarily the only possible pathway for addressing the research question. In chapters 2 and 3 I have argued that the employed basic model is the most adequate, given the specifics of the research question and availability of data. Nevertheless, much of the empirical results might still be influenced by some choices and assumptions, which are necessary to make when operationalising the model. Among the choices which have to be made are:

(i) the appropriate regression-representation of the analytical model: linear vs. non-linear regressions;

(ii) the regression estimation technique (e.g., OLS, GLS, WLS, rank regressions, etc.), which usually requires knowledge of the loss function;

(iii) the alternative methods for dealing with the effect of cross-sectional differences in scale on the estimated regression parameters. This, for example, might necessitate deflation of the model by a scale proxy, which, in turn, would require to decide on the 'best' scale proxy; and

(iv) the definition and identification of over-influential cases and/or outliers, and how to deal with the outliers;

The availability and reliability of the firm-level and, specifically, segment-level financial statement data is another limiting factor for this study. Some of the variables, required by the analytical model, are not readily available and/or cannot be imputed. In addition, the available segment-level data, collected from the Extel database, often appear to be inconsistent, cross-sectionally and longitudinally incomparable, and, in general, has low quality (i.e., contain multiple errors which are difficult to trace). In addition, the implicit ambiguity in the segment reporting standard SSAP 25 contributes to these problems, as it is unclear to what extent the disclosed segmental data reflects the firm's actual segmental organisation.

These data-related problems have 'bottlenecked' the initial analytical model, and, at times, necessitated the use of a simpler model, as has been applied in this study. Nevertheless, in the course of this study numerous tests for the sensitivity of the results to various estimation techniques, outlier definitions and scale factors have been performed, and the main results and findings have been found robust.

## 7.6 DIRECTIONS FOR FUTURE RESEARCH

In light of the findings and limitations, this research can be extended in several directions.

*Work on valuation model:* this might include further empirical testing of the basic model's performance using different definitions of the loss function, or different alternative *ad hoc* explanatory or dependent variables, scale factors, non-linear model specifications, treatment of influential observations and outliers.

*Work on value relevance of firm-level financial information:*

- empirical analysis of value relevance of additional forward-looking firm-level accounting fundamentals, with special attention to specific contexts;
- further examination of the determinants of the pronounced time-related changes in the value relevance of accounting fundamentals, and valuation significance of specific firm-level accounting numbers.

*Work on value relevance of segment-level financial information:* further identification and investigation of the determinants of differential valuation of operations reported from specific line-of-business or geographical segments.

## REFERENCE


1. Ajinkya B., 1980, 'An Empirical Evaluation of Line of Business Reporting', *Journal of Accounting Research*, Vol.18(2), pp.343-361.

2. Akbar S., Stark A., 2003a, 'Deflators, Net Shareholder Cash Flows, Dividends, Capital Contributions and Estimated Models of Corporate Valuation', *Journal of Business Finance and Accounting*, Vol.30 (9&10), p. 1211.

3. Akbar S., Stark A., 2003b, 'Discussion of Scale and the Scale Effect in Market-Based Accounting Research', *Journal of Business Finance and Accounting*, Vol. 30 (1&2), pp. 57-72.

4. Ali A., Zarowin P., 1992, 'The Role of Earnings Levels in Annual Earnings-Returns Studies', *Journal of Accounting Research*, Vol. 30, pp.286-296.

5. Arnold J., Moizer P., 1984, 'A Survey of the Methods used by UK Investment Analysts to Appraise Investments in Ordinary Shares', *Accounting and Business Research*, Vol. 14, pp. 195-207.

6. Association for Investment Management and Research (AIMR), 1993, Financial Reporting in the 1990s and Beyond. Charlottesville, VA: AIMR.

7. Balakrishnan R., Harris T., Sen P., 1990, 'The Predictive Ability of Geographic Segment Disclosures', *Journal of Accounting Research*, Vol. 28 (2), pp. 305-325.

8. Baldwin B., 1984, 'Segment Earnings Disclosure and the Ability of Security Analysts to Forecast Earnings Per Share', *The Accounting Review*, Vol. 59(3), pp.376-389.

9. Ball R., and Brown P., 1968, 'An Empirical Evaluation of Accounting Numbers', *Journal of Accounting Research*, Vol. 6 (2), pp159-178.

10. Banz R., 1981, 'The Relationship Between Return and Market Value of Common Stocks', *Journal of Financial Economics*, Vol. 9 (March), pp. 3-18.

11. Barnea A., Lakonishok J., 1980, 'An Analysis of the Usefulness of Disaggregated Accounting Data for Forecasts of Corporate Performance', *Decision Sciences*, Vol. 11, pp. 17-26.

12. Barth M., Beaver W., Landsman W., 1998, 'Relative Valuation Roles of Equity Book Value and Net Income as a Function of Financial Health', *Journal of Accounting and Economics*, Vol. 25, pp. 1-34.

13. Barth M., Clinch G., 2001, 'Scale Effect in Capital Market Accounting Research', Working paper, Stanford University, (January).

14. Bartov E., Lynn S., Ronen J., 'Returns-Earnings Regressions: A Synthesis Approach', AAA Annual Meeting 2001 (Refereed conference paper), American Accounting Association, Atlanta, USA, August 2001.

15. Basu S., Douthett E., Lim S., 2000, 'The Usefulness of Industry Segment Information', Working Paper, City University of New York.

16. Bens D., Monahan S., 2002, 'Disclosure Quality and the Excess Value of Diversification', Working paper, University of Chicago.

17. Berger P., Ofek E., 1995, 'Diversification's Effect on Firm Value', *Journal of Financial Economics*, Vol.37, pp. 39-65.

18. Berger P., Ofek E., Swary I., 1996, 'Investor Valuation of the Abandonment Option', *Journal of Financial Economics*, Vol. 42, pp. 257-287.

19. Bernard V. L., 1987, 'Cross-Sectional Dependence and Problems in Inference in Market-Based Accounting Research', *Journal of Accounting Research*, Vol. 25(1), pp.1-48.

20. Biddle G., Seow G., 1991, 'The Estimation and Determinants of Associations Between Returns and Earnings: Evidence from Cross-industry Comparisons', *Journal of Accounting, Auditing and Finance*, Vol. 6, pp.183-232.

21. Boatsman J., Behn B., Patz D., 1993, 'A Test of the Use of Geographic Segment Disclosures', *Journal of Accounting Research*, Vol. 31, pp.46-64.

22. Bodnar G, Tang C., Weintrop J., 1999, 'Both Sides of Corporate Diversification: The Value Impact of Geographic and Industrial Diversification', Working Paper, John Hopkins University, (December).

23. Bodnar G, Tang C., Weintrop J., 2003, 'The Value of Corporate International Diversification', Working Paper, John Hopkins University, (July).

24. Bodnar G., Weintrop J., 1997, 'The Valuation of Foreign Income of US Multinational Firms: A Growth Opportunities Perspective', *Journal of Accounting and Economics*, Vol. 24, pp.69-97.

25. Brief R., Zarowin P., 'The Value Relevance of Dividends, Book Value and Earnings', Working Paper, Leonard N. Stern School of Business, New York University.

26. Brown L., Hagerman R., Griffin P., Zmijewski M., 1987, 'Security Analyst Superiority Relative to Univariate Time Series Models in Forecasting Quarterly Earnings', *Journal of Accounting and Economics*, Vo. 9(1), pp. 61-87.

27. Brown S., Lo K., Lys T., 1999, 'Use of R2 in Accounting Research: Measuring Changes in Value Relevance Over the Last Four Decades', *Journal of Accounting and Economics*, Vol. 28(2), pp. 83-115.

28. Buhner R., 1987, 'Assessing International Diversification of West German Corporations', *Strategic Management Journal*, Vol.8, pp.25-37.

29. Burgstahler D., Dichev I., 1997, 'Earnings, Adaptation, and Equity Value', *The Accounting Review*, Vol. 72, pp.187-215.

30. Capstaff J., Paudyal K., Rees W., 1995, 'The Accuracy and Rationality of Earnings Forecasts by U.K. Analysts', *Journal of Business Finance and Accounting*, Vol. 22, pp. 69-87.

31. Chang J., 1999, 'The decline in value relevance of earnings and book values', Working Paper, University of Pennsylvania.

32. Chauvin K., Hirschey M., 1993, 'Advertising, R&D Expenditures and the Market Value of the Firm', *Financial Management*, Vol. 4, pp.128-140.

33. Chen P., Zhang G., 2003, 'Heterogeneous Investment Opportunities in Multiple-Segment Firms and the Incremental Value Relevance of Segment Accounting Data', *The Accounting Review*, Vol. 78, No. 2, pp. 397-428.

34. Christie A., 1987, 'On Cross Sectional Analysis in Accounting Research', *Journal of Accounting and Economics*, Vol. 9, pp. 231-58.

35. Christophe S., 1999, 'The Value of Earnings Surprises from Foreign and Domestic Operations: A Non-Symmetric ERC Perspective', Working Paper, George Mason University.

36. Collins D., 1975, 'SEC Product-line Reporting and Market Efficiency', *Journal of Financial Economics*, Vol. 2 (2), pp. 125-164.

37. Collins D., 1976, 'Predicting Earnings with Sub-Entity Data: Some Further Evidence', *Journal of Accounting Research*, Vol. 14 (1), pp. 182-193.

38. Collins D., Kemsley D., Lang M., 1998, 'Cross-Jurisdictional Income Shifting and Earnings Valuation', *Journal of Accounting Research*, Vol. 1998, no.3, pp. 209-230.

39. Collins D., Kothari S., 1989, 'An Analysis of the Inter-temporal and cross-sectional determinants of earnings response coefficients', *Journal of Accounting and Economics*, Vol. 11, pp.143-181.

40. Collins D., Maydew E., Weiss I., 1997, 'Changes in the Value-Relevance of Earnings and Book Values Over the Past Forty Years', *Journal of Accounting and Economics*, Vol.24, pp.36-67.

41. Collins D., Pincus M., Xie H., 1999, 'Equity Valuation and Negative Earnings: The Role of Book Value of Equity', *The Accounting Review*, Vol. 74, pp. 29-61.

42. Collins D., Simonds R., 1979, 'SEC Line of Business Disclosure and Market Risk Adjustments', *Journal of Accounting Research*, Vol. 17 (2), pp.352-383.

43. Comment R., Jarrell G., 1995, 'Corporate Focus and Stock Returns', *Journal of Financial Economics*, Vol. 37, pp67-87.

44. Conover T., Conover J., Karafiath I., 1994, 'Equity Market Performance of US Multinational Companies, the 1982 Closure of the Mexican FEX Market, and Accounting Disclosures of Political Risk', *Advances in International Accounting*, Vol.7, pp. 145-169.

45. Core J., Guay W., Van Buskirk A., 2003, 'Market Valuations in the New Economy: an Investigation of What Has Changed', Journal of Accounting and Economics, Vol. 34, pp.43-67.

46. Danbolt J., Rees W., 2002, 'The Valuation of European Financial Firms', *Review of Accounting and Finance*, Vol.1, No.1, pp.5-24.

47. Donnelly R., and Walker M., 1995, 'Share Price Anticipation of Earnings and the Effect of Earnings Persistence and Firm Size', *Journal of Business Finance and Accounting*, Vol. 22, pp.5-18.

48. Dontoh A., Radhakrishnan S., Ronen J., 'Information Content of Stock Price and Earnings: Evidence on Increased Noise in Stock Price Relative to Earnings', Working paper, New York University, 2001.

49. Doupnik T., Robert R., 1990, 'Geographic Area Disclosures and the Assessment of Foreign Investment Risk for Disclosure in Accounting Statement Notes', *The International Journal of Accounting*, Vol. 25 (4), pp.252-267.

50. Duru A., Reeb D., 2002, 'International Diversification and Analysts' Forecast Accuracy and Bias', *The Accounting Review*, Vol. 77 (2), pp.415-433.

51. Dye R., 1986, 'Proprietary and Nonproprietary Disclosures', *Journal of Business*, Vol.56, no.2, pp. 331-366.

52. Easton P., 1998, 'Discussion of Revalued Financial, Tangible, and Intangible Assets: Association with Share Prices and Non-Market-Based Value estimates', *Journal of Accounting Research*, Vol.36, pp. 235-52.

53. Easton P., Harris T., 1991, 'Earnings as an Explanatory Variable for Returns', *Journal of Accounting Research*, Vol. 29, pp. 19-36.

54. Easton P., Harris T., Ohlson J., 1992, 'Aggregate Accounting Earnings Can Explain Most of Security Returns', *Journal of Accounting and Economics*, Vol. 15, pp. 119-142.

55. Easton P, Sommers G., 2003, 'Scale and Scale Effects in Market-Based Accounting Research', *Journal of Business Finance and Accounting*, Vol.30 (1) 2003.

56. Edwards E., Bell P., 1961, 'The Theory and Management of Business Income', Berkeley, CA, University of California Press.

57. Elsharkawy A., Garrod N., 1997, 'The Impact of Investor Sophistication on Price Responses to Earnings News', *Journal of Business Finance and Accounting*, Vol. 23, pp. 221-236.

58. Emmanuel C., Garrod N., Frost C., 'Segment and Consolidated Financial Statements: The Complementary Twins', in S. J. Gray and A. G. Coenenberg

(eds) International Group Accounting: International Harmonization and the Seventh EEC Directive (Croom Helm, 1988).

59. Emmanual C., Pick R., 1980, 'The Predictive Ability of U.K. Segment Reports', *The Journal of Business Finance and Accounting*, Vol. 7(2), pp. 201-218.

60. Emmanuel C., Garrod N., 1992, 'Segment Reporting: International Issues and Evidence', Prentice Hall-ICAEW.

61. Emmanuel C., Garrod N., 1999, 'On Segment Identification, Relevance and Comparability', Working Paper, Department of Accounting and Finance, University of Glasgow.

62. Emmanuel C., Garrod N., 2002, 'On the Relevance and Comparability of Segmental Data', *Abacus*, Vol. 38 (2), pp. 215-234.

63. Emmanuel C, Garrod N, Frost C., 1989, 'An Experimental Test of Analysts' Forecasting Behaviour', *British Accounting Review*, Vol. 21, pp. 119-126.

64. Emmanuel C., Garrod N., McCallum C., Rennie E., 1999, 'The Impact of SSAP 25 and the 10% Materiality Rule on Segment Disclosure in the UK', *British Accounting Review*, Vol. 31, pp. 127-149.

65. Errunza V., Senbet L., 1981, 'The Effects of International Operations on the Market Value of the Firm: Theory and Evidence', *Journal of Finance*, Vol. 36 (2), pp. 401-417.

66. Fama E., French K., 1992, 'The Cross-Section of Expected Stock Returns', *The Journal of Finance*, Vol.47 (2), pp.427-465.

67. Fatemi A., 1984, 'Shareholder Benefits from Corporate International Diversification', *Journal of Finance*, Vol. 39 (5), pp. 1325-1344.

68. Feltham G., Ohlson J., 1995, 'Valuation of Clean Surplus Accounting for Operating and Financial Activities', *Contemporary Accounting Research*, Vol. 11, 689-731.

69. Foster G., 1975, 'Security Price Revaluation Implication of Sub-Earnings Disclosure', *Journal of Accounting Research*, Vol. 13 (2), pp.283-292.

70. Francis J., Schipper K., 1999, 'Have Financial Statements Lost Their Relevance', *Journal of Accounting Research*, Vol. 37(2), pp.319-352.

71. Frankel R., Lee C., 1998, 'Accounting Valuation, Market Expectation and Cross-Sectional Stock Returns', *The Journal of Accounting and Economics*, Vol. 25, pp. 283-319.

72. Garrod N., Emmanuel C., 1987, 'An Empirical Analysis of the Usefulness of Disaggregated Accounting Data for Forecasts of Corporate Performance', *Omega*, No. 5, pp. 371-382.

73. Garrod N., Rees W., 1998, 'International Diversification and Firm Value', *Journal of Business Finance and Accounting*, Vol.25 (9&10), pp.1255-1281.

74. Garrod N., Rees W., 1999, 'Forecasting Earnings Growth Using Fundamentals and Price', Working Paper, University of Glasgow.

75. Giner B., Reverte C., 1999, 'The Value Relevance of Earnings Disaggregation Provided in the Spanish Profit and Loss Account', *European Accounting Review*, Vol. 8, pp.1-21.

76. Givoly D., Hayn C., D'souza J., 1999, 'Measurement Errors and Information Content of Segment Reporting', *Review of Accounting Studies*, Vol. 4, pp.15-43.

77. Grant R., 1987, 'Multinationality and Performance Among British Manufacturing Companies', *Journal of International Business Studies*, Vol.18, no.3, pp.79-89.

78. Gray S., 'Information Disclosure and the Multinational Corporation', (Wiley, 1984).

79. Green J., Stark A., Thomas H., 1996, 'UK Evidence on the Market Valuation of Research and Development Expenditures', *Journal of Business Finance and Accounting*, Vol. 23 (2), pp. 191-216.

80. Hand J., Landsman W., 1999, 'The Pricing of Dividends in Equity Valuation', Working Paper, University of North Carolina.

81. Hayes R., Lundholm R., 1996, 'Segment Reporting to the Capital Market in the Presence of a Competitor', *Journal of Accounting Research*, Vol. 34 (2), pp.261-279.

82. Hayn C., 1995, 'The Information Content of Losses', *Journal of Accounting and Economics*, Vol. 20, pp. 125-154.

83. Healy P., Palepu K., 1993, 'The Effect of Firm's Financial Disclosure Strategies on Stock Prices', *Accounting Horizons*, Vol. 7, no.1, pp.1-11.

84. Heckman C., 1985, 'A Financial Model of Foreign Exchange Exposure', *Journal of International Business Studies*, Vol. 16 (2), pp. 83-99.

85. Herrmann D., 1996, 'The Predictive Ability of Geographic Segment Information at the Country, Continent, and Consolidated Levels', *The Journal of International Financial Management and Accounting*, Vol. 7(1), pp. 50-73.

86. Herrmann D., Thomas W., 1997, 'Geographic Segment Disclosures: Theories, Findings, and Implications', *The International Journal of Accounting*, Vol. 32 (4), pp. 487-501.

87. Herrmann D., Thomas W., 2000, 'A Model of Forecast Precision Using Segment Disclosures: Implications for SFAS No. 131', *Journal of International Accounting, Auditing and Taxation*, Vol. 9 (1), pp.1-18.

88. Herrmann D., Inoue T., Thomas W., 2001, 'The Relation Between Incremental Subsidiary Earnings and Future Stock Returns in Japan', *Journal of Business Finance and Accounting*, Vol. 28, no.9&10, pp.1115-1139.

89. Hirschey M., 1985, 'Market Structure and Market Value', *Journal of Business*, Vol.58, pp.89-98.

90. Hirschey M., Spencer S., 1992, 'Size Effects in the Market Valuation of Fundamental Factors', *Financial Analyst Journal*, Vol.48, No.2, pp. 91-95.

91. HMSO Companies Act 1985, (HMSO, 1985).

92. Hussain S., 1997, 'The Impact of Segment Definition on the Accuracy of Analysts' Earnings Forecasts', *Accounting & Business Research*, Vol. 27(2) pp. 145-156.

93. Kinney R., 1971, 'Predicting Earnings: Entity Versus Subentity Data', *Journal of Accounting Research*, Vol. 10 (1), pp. 127-136.

94. Kochanek R., 1974, 'Segmental Financial Disclosure by Diversified Firms and Security Prices', *Accounting Review*, Vol. 49 (2), pp.245-258.

95. Kormendi R., Lipe R., 1987, 'Earnings Innovation, Earnings Persistence and Stock Returns', *Journal of Business*, Vol. 60, pp. 323-345.

96. Kothari S., 1992, 'Price-Earnings Regressions in the Presence of Price Leading Earnings', *Journal of Accounting and Economics*, Vol. 15, pp. 173-202.

97. Kothari S., Sloan R., 1992, 'Information in Prices about Future Earnings: Implications for Earnings Response Coefficients', *Journal of Accounting and Economics*, Vol. 15, pp. 143-172.

98. Kothari S., Zimmerman J., 1995, 'Price and Return Models', *Journal of Accounting and Economics*, Vol. 20, pp. 155-192.

99. Lang L., Stulz R., 1994, 'The Tobin's q, Corporate Diversification, and Firm Performance', *Journal of Political Economy*, Vol.102, no. 6.

100. Lee C.M.C, 1999, 'Accounting-Based Valuation: Impact on Business Practices and Research', *Accounting Horizons*, Vol. 13(4), pp.413-425.

101. Leftwich R., 1974, 'U.S. Multinational Companies: Profitability, Financial Leverage and Effective Income Tax Rates', Survey of Current Business, May 1974, pp.27-36

102. Lev B., Zarowin P., 1999, 'The Boundaries of Financial Reporting and How to Extend Them', *Journal of Accounting Research*, Vol. 37(2), pp.353-386.

103. Lin Y., Peasnell K., 2000, 'Fixed Asset Revaluation and Equity Depletion in the UK', *Journal of Business Finance & Accounting*, Vol. 27 (3&4), pp.359-394.

104. Lins K., Servaes H., 1999, 'International Evidence on the Value of Corporate Diversification', *Journal of Finance*, Vol. 54 (6), pp. 2215-2239.

105. Lipe R., 1986, 'The Information Contained in the Components of Earnings', *Journal of Accounting Research*, Vol. 24 (3), pp37-64.

106. Lo K., and Lys T., 2000, 'The Ohlson Model: Contribution to Valuation Theory, Limitations and Empirical Applications', *Journal of Accounting, Auditing and Finance*, Vol.15, pp. 337-67.

107. Maddala G., 1990, 'Introduction to Econometrics', Macmillan. New York. NY.

108. Marietta-Westberg J., Sierra G., 'Specification Issues for Cross-Sectional Applications of the Ohlson Model', Working Paper, Michigan State University, 2000.

109. Modigliani F., Miller M., 1958, 'The Cost of Capital, Corporate Finance and the Theory of Investment', *American Economic Review*, Vol. 48 (June), pp.261-297.

110. Morck R., Yeung B, 1991, 'Why Investors Value Multinationality', *Journal of Business*, Vol. 64 (2), pp. 165-187.

111. O'Hanlon J., 1995, 'Return/Earnings Regressions and Residual Income: Empirical Evidence', *Journal of Business Finance and Accounting*, Vol. 22(1), pp. 53-66.

112. O'Hanlon J., Peasnell K., 'Wall Street' Contribution to Management Accounting: Stern Stewart EVA Financial Management System', *Management Accounting Research*, Vol. 1998 (9), pp. 421-444.

113. Ohlson J., 1989, 'Accounting Earnings, Book Value, and Dividends: the Theory of the Clean Surplus Equation (Part I)', Columbia University Working Paper. Reprinted in Brief P., and Peasnell K., 1996. Clean Surplus: a Link Between Accounting and Finance, New York and London, Garland Publishing.

114. Ohlson J., 1995, 'Earnings, Book Values and Dividends in Equity Valuation', *Contemporary Accounting Research*, Vol. 11, pp. 661-687.

115. Ou J., Sepe J., 2002, 'Analysts Earnings Forecasts and the Roles of Earnings and Book Value in Equity Valuation', *Journal of Business Finance and Accounting*, Vol. 29(3&4), pp. 287-316.

116. Peasnell K., 1981, 'On Capital Budgeting and Income Measurement', *Abacus*, Vol.17(1), pp. 52-67.

117. Peasnell K., 1982, 'Some Formal Connections Between Economic Values and Yields and Accounting Numbers', *Journal of Business Finance and Accounting*, Vol. 9(3), pp.361-381.

118. Penman S., 1998, 'Combining Earnings and Book Value in Equity Valuation', *Contemporary Accounting Research*, Vol. 15, pp.291-324.

119. Piotroski J., 1999, 'The Impact of Newly Reported Segment Information on Market Expectations and Stock Prices', Working Paper, University of Chicago.

120. Prather-Stewart J., 1995, 'The Information Content of Geographic Segment Disclosures', in T.S., Doupnik (ed.), Advances In International Accounting, Vol. 8., (Greenwich, CT: JAI Press), pp. 31-45.

121. Preinreich G., 1936, 'The Fair Value and Yield of Common Stock', The Accounting Review, March, pp. 317-329. reprinted in Brief P., and Peasnell K., 1996. Clean Surplus: a Link Between Accounting and Finance, New York and London, Garland Publishing.

122. Prodhan B., 1986, 'Geographical Segment Disclosure and Multinational Risk Profile', *Journal of Business Finance and Accounting*, Vol. 13(1), pp. 15-38.

123. Prodhan B., Harris M., 1989, 'Systematic Risk and the Discretionary Disclosure of Geographical Segments', *Journal of Business Finance and Accounting*, Vol. 16(4), pp. 467-492.

124. Ramesh K., Thiaggarajan R., 1995, 'Inter-temporal Decline in Earnings Response Coefficients', Working Paper, Northwestern University, Evanston, IL.

125. Rayburn J., 1986, 'The Association of Operating Cash Flow and Accruals with Security Returns', *Journal of Accounting Research*, Vol. 24 (3), pp. 112-154.

126. Rees W., 1997, 'The Impact of Dividends, Debt and Investment on Valuation Models', *Journal of Business Finance and Accounting*, Vol. 24(7&8), pp. 111-1140.

127. Rees W., 1999a, 'Influence on the value Relevance of Equity and Net Income in the U.K.', *Managerial Finance*, Vol.25, No.12.

128. Reinganum M., 1981, 'Misspecification of Capital Asset Pricing: Empirical Anomalies Based on Earnings Yields and Market Values', *Journal of Financial Economics*, Vol.9 (March), pp. 1-46.

129. Reinganum M., 1982, 'A Direct Test of Roll's Conjecture on the Firm Size Effect', *Journal of Finance*, Vol.37, pp.27-35.

130. Roberts C., 1989, 'Forecasting Earnings Using Geographical Segment Data: Some UK Evidence', *Journal of International Financial Management and Accounting*, Vol. 1 (2), pp. 130-151.

131. Roberts C., Gray S., 'Segment Reporting' in C. Nobes and R. Parker (eds) Issues in Multinational Accounting (Philip Allan, 1988), pp.103-123.

132. Sambharya R, 1995, 'The Combined Effect of International Diversification and Product Diversification Strategies on the Performance of U.S.-Based Multinational Corporations', *Management International Review*, Vol.35, no.3, pp.197-218.

133. Senteney D., 1991, 'An Empirical Investigation of Structural Changes in the Equity Security Return Generating Process of Multinational Enterprises Relative to Geographical Area Disclosures: Some Additional Evidence', Akron Business and Economic Review, pp. 78-87.

134. Senteney D., Bazaz M., 1992, 'The Impact of SFAS 14 Geographic Segment Disclosures on the Information Content of US-based MNEs' earnings releases', *The International Journal of Accounting*, Vol. 27, pp. 267-279.

135. Senteney D., Bazaz M., 2002, 'The Impact of Geographic and Business Segment Diversification Upon Investor's Perceptions of Earnings of US-Based Multinational Enterprises', *Review of Accounting and Finance*, Vol.1(2), pp.71-86.

136. Servaes H., 1996, 'The Value of Diversification During the Conglomerate Merger Wave', *Journal of Finance*, Vol. 51, No.4., pp.1201-1225.

137. Silhan P., 1992, 'Simulated Mergers of Existent Autonomous Firms: A New Approach to Segmentaion Research', *Journal of Accounting Research*, Vol. 20 (1), pp. 255-262.

138. Silhan P., 1983, 'The Effects of Segmenting Quarterly Sales and Margins on Extrapolative Forecasts of Conglomerate Earnings: Extension and Replication', *Journal of Accounting Research*, Vol. 21(1), pp. 341-347.

139. Silhan P., 1984, 'Company Size and the Issue of Quarterly Segment Reporting', *Journal of Accounting and Public Policy*, Vol. 3(3), pp. 185-198.

140. Simonds R, Collins D., 1978, 'Line of Business Reporting and Security Prices. An Analysis of a SEC Disclosure Rule: A Comment', *Bell Journal of Economics*, Vol. 9(2), pp.646-658.

141. Stark A., Thomas H.,1998, 'The Empirical Relationship Between Excess Market Value and Residual Income: Some UK Evidence', *Management Accounting Research*, Vol.9, pp. 445-60.

142. Stowe J., Robinson T., Pinto J., McLeavey D, 'Analysis of Equity Investments: Valuation', Association for Investment Management and Research, AIMR 2002.

143. Strong N., Walker M., Harding Z., 1996, 'Price Models and Earnings Response Coefficients', Working Paper, University of Manchester.

144. Thomas W., 2000, 'The Value-Relevance of Geographic Segment Earnings Disclosures Under SFAS 14', *Journal of International Financial Management and Accounting*, Vol. 11(3), pp.133-155.

145. Tse S., 1989, 'Attributes of Industry, Industry Segment and Firm-Specific Information in Security Valuation', *Contemporary Accounting Research*, Vol. 5, no. 2, pp.592-614.

146. Verrecchia R., 1983, 'Discretionary Disclosure', *Journal of Accounting and Economics*, Vol. 5 (December), pp. 179-194.

147. Walker M., 1997, 'Clean Surplus Accounting Models and Market Based Accounting Research: A Review', *Accounting and Business Research*, Vol. 27, pp. 341-355.

148. Wilson P, 1986, 'The Relative Information Content of Accruals and Cash Flow Combined Evidence at the Earnings Announcement and Annual Report Release Date', *Journal of Accounting Research*, Vol. 24 (3), pp.165-200.

149. Wysocki P., 1998, 'Real Options and the Informativeness of Segment Disclosures', UMBS Working Paper, November.