Essays on current issues affecting banks and pensions

A thesis presented

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ABSTRACT

The 2008 financial crisis had a significant impact on financial institutions. Banks have been in the limelight when some of them were liquidated and pensions funds have not been immune to the effects of the financial crisis. In the wake of the financial crisis, governments, regulators and political commentators have pointed an accusing finger at the securitization market - even in the absence of a detailed statistical and economic analysis. The eight years leading up to 2008 saw a rapid growth in the use of securitization by UK banks. We aim to identify the reasons that contributed to this rapid growth. The time period (2000 to 2010) covered by our study is noteworthy as it covers the pre-financial crisis credit boom, the peak of the financial crisis and its aftermath.

We also investigate how the banks have gone about their fund-raising in support of their investment without signalling the value of the bank to the investors. This involves critical financing decisions about their main financing sources: Debt and equity issuance. We attempt to establish which decision banks have taken in the recent years. We do this by analysing financial data of banks in the US for the period 2001 to 2011. We examine how banks choose between the financing instruments available at a given time and in different financial contexts. This provides evidence regarding the difference between financing options available for investment opportunities that banks have at a given time. Thus, we show that internal finance is preferred to external finance, and that the theory regarding the impact of asymmetric information holds for banks on financing decisions as modelled by Myers and Majluf (1984). The steep drop in financial markets in 2008 coupled with the ongoing economic recession has also posed immediate challenges for pensions funds. We therefore consider how safe the pension funds are in the current period of high stock market volatility. We use the case of the Dutch pension funds since it is ranked to be the best managed pension funds in the world. The pension risk for the firms together with the market risk will give an idea of the impact of market volatility on pension asset allocation. It is expected that most firms who allocated a large percentage of their assets to equity were negatively affected by the stock market crash. Hence, pension funds are safe investing elsewhere other than in equities despite the high returns.

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1.0 INTRODUCTION

There has been a number of innovations in the financial market. The 2008 financial crisis has brought a number of them in the limelight. One main innovation is securitization. This thesis looks at how banks participated in securitization. In addition to securitization, is the main concern of how bank raise their capital, hence our closer look at the bank capital structure. Finally, the ripple effect of financial crisis affects other financial institutions. We therefore consider how the pension funds were affected by the financial crisis.

1.1 SECURITIZATION

Securitization is a financial technique that pools assets together and, in effect, turns them into a tradeable security. The securitization market outside the U.S. has grown in a piecemeal but often innovative fashion. In the UK, in the early 1990s, there was a general downturn in new mortgage business and house sales following a severe property prices downturn and economic recession. This led to a downturn in the mortgage securitization market and to early pressure for the market to diversify (Fabozzi and Kothari, 2008).

1.1.1 Definition of Securitization

Although securitization is widely discussed in the legal and financial literature, no uniform definition has emerged that satisfactorily describes it. There is no particular legal meaning for securitization and, like many new financial terms, it is often used to mean a variety of things (Shenker and Colletta, 1991). Securitization is the process by which individual assets, which on their own may be difficult to sell or even to attach a value to, are aggregated into

securities that can be sold in the financial markets (Levinson, 2002). Financial institutions and businesses of all kinds use securitization to realize immediately the value of a cash-producing asset. Hence, we can describe securitization as the financial practice of pooling various types of contractual debt such as residential mortgages, commercial mortgages, loans or credit card debt obligations and selling the consolidated debt as bonds, pass-through securities, or Collateralized Mortgage Obligation (CMOs), to various investors, (Fabozzi and Kothari, 2008). The principal and interest on the debt, underlying the security, is paid back to the various investors regularly. Securities backed by mortgage receivables are called MBSs, while those backed by other types of receivables are Asset-Backed Securities (ABS).

Securitization is also refers to the pooling and repackaging by a special purpose entity of assets or other credit exposures that can be sold to investors[1]. Securitization involves the use of superior knowledge about the expected financial behavior of particular assets, as opposed to knowledge about the expected financial behaviour of the originator of the chosen assets, with the help of a structure to finance the assets more efficiently (Fabozzi and Kothari, 2008). Therefore, securitization is a financing mechanism. It transfers financial assets from their owner (Originator), to a Special Purpose Entity (SPE) that, in turn, funds the acquisition by issuing publicly rated securities to various parties (investors).

1.1.2 Why securitization?

The prediction by Greenbaum and Thakor (1987) was also backed by Benveniste and Berger (1987), who suggested that securitization is able to transfer risks from risk-averse investors to risk-neutral investors, and achieve Pareto Optimality[2] eventually. By doing so, it is more favourable to securitize the better assets through off-balance sheet transactions, and keep the more risky assets on the balance sheets. The studies by Greenbaum and Thakor (1987), suggested that securitization provides means to reduce risk, diversify portfolios and fund

[1]Definition by the Office of the Comptroller of the Currency (OCC), the Federal Deposit Insurance Corporation (FDIC), the Federal Reserve Board (Board), and the Office of Thrift Supervision (OTS), Attachment OCC 2002-22.

[2]Also known as "Pareto efficiency", it is an economic state where resources are allocated in the most efficient manner. This is obtained when a distribution strategy exists where one party's situation cannot be improved without making another party's situation worse. Pareto efficiency does not imply equality or fairness.

both operations and new assets. They argue that by reducing the funding yield premiums and the "excess" equity cushions entailed in traditional lending, securitization offers lower cost financing. Pennacchi (1988) also found that funding through loan sales is less expensive for banks compared with traditional equity or deposit financing due to lower costs associated with required capital. This study showed that, in the presence of asymmetric information, pooling assets and issuing multiple financial claims with different risk characteristics against the pool cash flow enables the issuer to increase its expected revenue. Flannery (1994), and Lockwood et al. (1996) considered the role of securitization in mitigating the underinvestment problem of financial intermediaries. Lockwood et al. (1996) also suggested that the cash inflow from the ABS issue can be used to retire existing debt, which, in turn, reduces interest expense and increases reported earnings.

With each potential benefit comes a potential drawback for investors: Firstly, the repackaging process may lead to a lack of transparency or a delegation of the due diligence process to other parties (such as the originating bank itself - which has its best interests at heart and not those of the investors - or a ratings agency); secondly, the diversification of idiosyncratic risk may be illusory in the sense that default correlations are low in good economic times but may become very high in a credit-crunch or a recession; thirdly, there may be a perception of liquidity in a bull market but, in fact, liquidity in the market dried-up abruptly and completely in the summer of 2007. Chapter 3 covers in detail the reason that might have led banks to participate or not to participate in securitization.

1.2 BANK CAPITAL STRUCTURE

Capital structure refers to the way a firm -and in our case a bank- finances its investment projects through some combination of equity, debt, or hybrid securities, as Myers and Majluf (1984). A bank's capital structure is then the composition or 'structure' of its liabilities.

The first attempt to explain the relationship between capital structure and bank value was provided by Modigliani and Miller (1958) suggest. Their model is well known as "capital structure irrelevance" which means the firm's capital structure does not affect its value. Thereafter, models with fewer restrictions in their assumptions were used to examine the

relationship between capital structure and firm's value. They showed that debt would cause the value of a firm to rise by the amount of the capitalized value of the tax shield. Therefore, firms should employ as much debt as possible in order to maximize their value.

1.2.1 Equity holders and Debt holders

In line with our study, there are two papers, Heinkel and Zechner (1990) and Hirshleifer and Thakor (1989) in which the asset substitution problem is considered; i.e., the incentive of levered equity holders to choose risky, negative net-present-value investments. Hirshleifer and Thakor (1989) showed how managers or firms have an incentive to pursue relatively safe projects out of reputational considerations. Several properties of the debt contract have important implications for determining capital structure. These are the bankruptcy provision, convexity of payoffs of levered equity, the effect of debt on managerial equity ownership, and the relative insensitivity of debt payoffs to firm performance.

Hirshleifer and Thakor (1989) considered a study where a manager has a choice of two projects, where each project has only two outcomes; success or failure. Failure means the same for both projects, but from the point of view of the shareholders, the high-risk-high-return project yields both higher expected returns and higher returns if it succeeds. Suppose that from the point of view of the manager's reputation, however, success on the two projects is equivalent, i.e., the managerial labour market can only distinguish "success" or "failure." Thus the manager maximizes probability of success while shareholders prefer expected return. If the safer project has a higher probability of success, the manager will choose it even if the other project is better for the equity holders. This behaviour of managers reduces the agency cost of debt. Thus, if managers are susceptible to such a reputation effect, the firm may be expected to have more debt than otherwise. Hirshleifer and Thakor (1989) argue that managers of firms more likely to be takeover targets are more susceptible to the reputation effect. Such firms can be expected to have more debt, ceteris paribus. Conversely, firms that have adopted anti-takeover measures will use less debt, other things being equal.

1.2.2 The Theory of Capital Structure

A basic model of capital structure determination has derived from the with-taxes Modigliani and Miller (1958) model with expansion to incorporate the financial distress costs of debt. This traditional static trade-off theory can be characterized by the assumption that capital structure is optimized with management weighing up the relative advantage of the tax-shield benefits of debt against the increased likelihood of incurring debt-related bankruptcy costs (Myers, 1984).

Heinkel and Zechner (1990) obtained results similar to Myers and Majluf using a slightly different approach. They show that when the information asymmetry concerns only the value of the new project, there can be overinvestment, i.e., some negative Net Present Value (NPV) projects will be taken. The reason is that full separation of firms by project NPV is impossible when the only observable signal is whether the project is taken. The equilibrium involves pooling of firms with projects of various NPV with the equity issued by all such firms being priced at the average value. Firms whose projects have low NPV will benefit from selling overpriced equity. This may more than compensate for a negative project NPV. The result is a negative cut-off NPV such that all firms with project NPV above the cut-off accept the project.

A significant group examined in the empirical literature has sought to distinguish which of the two main theories best explains capital structure practice. While the theories in their basic form do lead to a set of 'precisely opposite' predictions (Barclay and Smith, 1999), there is increasing recognition that neither theory is able, independently, to explain the complexity encountered in practice. This is particularly true when seeking a unified theory to explain the broader array of corporate financial policy choices (Barclay and Smith, 1999). Fama and French (2002) assessed whether the partial adjustment model and the speed of adjustment are useful tools for capital structure research. Specifically, they examined the speeds of adjustment to target capital structure observed at the rebalancing points as well as between such points. They find that the speeds of adjustment tend to be higher at the rebalancing points than between such points, with the highest speeds of adjustment observed in years with dual (debt and equity) transactions, consistent with the argument that firms

are likely to use these transactions for rebalancing. Their results are inconsistent with the premise of the partial adjustment model. Their results also show that a significant fraction of debt issues and reductions (20%–40%) and an even larger fraction of equity issues and repurchases (50%–60%) were associated with adjustments away from the target.

With regard to further empirical work, it seems essential that empirical studies concentrate on testing particular models or classes of models in an attempt to discover the most important determinants of capital structure in given environments. Capital structure decisions can concern value creation process (1) influencing efficient investments decisions according to the existence of conflict of interest between managers and firm's financial stakeholders (shareholders and debt holders) and (2) affecting the relationship with non-financial stakeholders, as suppliers, competitors, customers, etc.

Frank and Goyal (2003) studied the extent to which the Pecking Order Theory of capital structure provides a satisfactory account of the financing behaviour of publicly traded American firms over the 1971 to 1998 period. Their analysis had three elements. First, they provided evidence about the broad patterns of financing activity. This offered an empirical context for the more formal regression tests. It also served as a check on the significance of external finance and equity issues. Secondly, they examined a number of implications of the Pecking Order Theory in the context of Shyam-Sunder and Myers' (1999) regression tests. Finally, they checked on whether the Pecking Order Theory received greater support among firms that face particularly severe adverse selection problems. We look in detail at the bank capital structure in Chapter 4.

1.3 PENSION FUNDS AND ASSET ALLOCATION

Pension fund asset levels in most countries continued to show strong growth throughout 2010, returning almost to pre-crisis levels, according to a 2011 OECD report[3]. This is evident in Figure 1.1 below. Both economic and financial indicators showed signs of further recovery but the outlook for future economic growth in developed economies remains uncertain and sluggish. In the past two decades (1990 - 2010) , funds have been confronted with financial

[3]http://www.oecd.org/dataoecd/63/61/48438405.pdf

crises, tightening regulation, a maturing participant base, decreasing treasury yields and increasing demands for transparency and accountability. Moreover, most defined benefit funds (DB), which guarantee benefits to members are underfunded and have fewer assets than the pension promises.

A few studies have also shown that strategic asset allocation dominates portfolio performance. In particular, strategic asset allocation is shown to explain more than 90 percent of the variability in pension fund returns over time, while the additional variation explained by market timing is less than 5 percent. This is considered by Blake et al (1999). They note that stockmarket timing is shown to cause an average loss of 20–66 basis points per year. In their study they found a negative correlation between asset class returns and net cash flows to the corresponding asset class, which points to rebalancing. In addition, they noted that the asset allocation for UK pension funds drifts toward asset classes that performed relatively well, in line with a free-float strategy. Apparently, UK pension funds partly rebalance their investments in response to different returns across asset categories, Blake et al (1999). Hence, the degree of rebalancing versus free float in pension fund asset allocation remains an open question[4].

We can note that there has been almost no analysis in the literature, either theoretical or empirical, about how the risk level of a pension plans is affected by the stock market volatility. Jin et al (2006) paper mentioned above is the closest to our research goal. The authors are concerned about the firms' equity risk and whether it reflects the risk in pension scheme. We extend the model used in their research to examine how the stock market movement affects the pensions.

Andonov, A,. et.al. (2012) assessed and analyzed the three components of active management (asset allocation, market timing and security selection) in the performance of pension funds. Using security selection they explained most of the differences in pension fund returns. Large pension funds in their sample on average provided value to the clients after accounting for all investment-related costs, both before and after risk-adjusting. The active management components in their study exhibited significant liquidity limitations, which are important in all asset classes, including equity and fixed income. Security selection outper-

[4]http://www.pensions-institute.org/

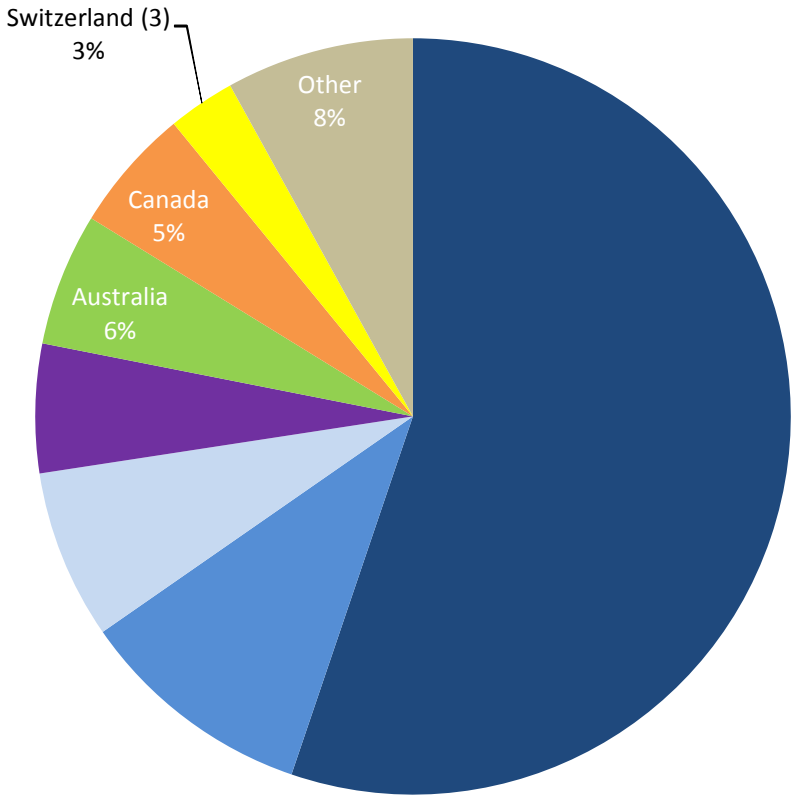

Figure 1: Figure 1.1: Geographical distribution of pension fund assets in OECD countries, 2010 as a % of total OECD, Source: OECD data

formance is largely driven by momentum trading, Andonov, A,. et.al. (2012). Accounting for momentum reduces the security selection and offsets most of the positive risk-adjusted returns from market timing and asset allocation changes. Larger pension funds will always realize economies of scale in their relatively small allocation to alternative asset classes, like private equity and real estate. However, in equity and fixed income markets they experience substantial liquidity-related diseconomies of scale.

1.4 AN OUTLINE OF THIS THESIS

This thesis is arranged in the following order. The next chapter looks at the past research in this areas - banks securitization, bank capital structure and pension fund asset allocation. There is vast amount of literature on securitization, while past studies under capital structure concentrates on non-financial institutions. Chapter 3 is essentially a study on the determinants of bank securitization. We show that securitization has been significantly driven by liquidity reasons. In addition, we observe a positive link between securitization and banks' credit risk. Chapter 4 deals with the bank capital structure. As far as we know, this study is among the first to look at this issue of which decision banks take to raise funds for their investment projects. In chapter 5, we investigate how safe the pension funds are today in the current period of high stock market volatility. Finally, chapter 6 summarizes the main findings of this thesis and chapter 7 considers future research and extensions.

2.0 LITERATURE REVIEW

In this chapter we summarise research into bank securitization, bank capital structure and pension funds asset allocation.

2.1 LITERATURE REVIEW ON BANK SECURITIZATION

The quantum of literature that investigates the motives for the use of the securitization market has been growing in number. Attention seem to be drawn to the characteristics that make financial institutions more likely to securitize. Donahoo and Shaffer (1991) suggested that depository institutions securitize to reduce reserve and capital requirements. They argue that the so called "regulatory capital arbitrage" is not the only incentive to engage in securitization, but also increased economies of scale, reduced costs of debt financing, and better diversification of funding sources. Minton et al. (2004) and Calomiris and Mason (2004) provided an empirical test of the regulatory arbitrage hypothesis against the efficient contracting hypothesis, which suggests that securitization lowers the cost of debt finance. The evidence from both studies supports the efficient contracting view. In particular, Minton et al. (2004) find that unregulated finance companies and investment banks are more likely to securitize than commercial banks, and that risky and highly leveraged financial institutions are more likely to engage in securitization than the safer ones. They find that poor performing risky institutions are more likely to securitize. Bannier and Hänsel (2007) also found consistent results using data on collateralized loan obligations (CLO) transactions by European banks from 1997 to 2004. In particular, they find that securitization-active banks are large, lowly performing institutions with high credit risk and low liquidity. Their results

indicate that banks are more likely to securitize when they face lower direct and indirect costs and when they can gain larger benefits. They also find evidence that banks securitized to modify their asset portfolio, taking up riskier profit opportunities.

2.1.1 Empirical Studies on Securitization

The empirical literature on securitization have examined the effects of securitization on the issuing banks with slightly different focuses. One of the aspects analyzed is the quality of assets securitized, and the ensuing impact on bank risks. Using data on Canadian banks for the period between 1988 and 1998, Dionne and Harchaoui (2003) found a risk-increasing effect of securitization. The authors suggest that current regulation encourages banks to shift to more risky assets while securitizing their low risk assets. They also find that, in response to regulatory capital incentives, lenders retain riskier loans in their portfolios while selling safer loans onto the secondary market.

The second aspect studied in this strand is the implicit recourse commonly provided by the originating bank and the resulting risk and performance implications for the issuer. In particular, Higgins and Mason (2003) and Calomiris and Mason (2004) argued that risk remains with the securitizing banks as a result of implicit recourse. They find that risk retention by banks varies with type of securitization and is relatively low in case of mortgages, while relatively high for revolving loans such as credit loans. This showed evidence of implicit recourse in credit card securitizations using a model of fraud losses on US bank data from 2001 to 2006. In particular, they show that banks that securitize credit card receivables are more likely to claim fraud losses; and banks with poorly performing securitization portfolios are more likely to claim fraud.

A few authors focus on the reinvestment of securitization proceeds. Cebenoyan and Strahan (2004) found evidence suggesting that banks use risk-reducing benefits of securitization to engage in more profitable, but higher risk, activities and to operate with greater financial leverage. Franke and Krahnen (2005) argued that the combined effect of retaining the first loss piece and selling senior tranches to investors should result in an efficient risk allocation due to reducing the bank's exposure to extreme risks and hence have a positive

impact on the bank solvency. However, their empirical analysis shows that banks use the risk reduction achieved through securitization to take on new risks. Krahnen and Wilde (2006) showed that, under certain assumptions on banks reinvestment behaviour and capital structure choice, the issue of collateralized debt obligations (CDOs) in true sale transactions can lead to an increase in the issuing intermediary's systematic risk. Based on a dataset of European CDOs, Haensel and Krahnen (2007) showed that securitization tends to increase the systematic risk of the issuing bank.

Jiangli and Pritsker (2008), on the other hand, suggested a positive role for mortgage securitization and relate the current turmoil in mortgage credit and securitization markets to recent excesses in those markets. Using US bank holding company data from 2001 to 2007, the authors evaluate empirically how the insolvency risk, leverage and profitability of securitizers would change if banks had to take the securitized assets back onto their balance sheet and find that mortgage securitization reduces bank insolvency risk, increases bank leverage and profitability.

Purnanandam (2009) also provides consistent evidence, showing that US banks used the proceedings from securitizations to issue loans with higher than average default risk. In particular, the evidence shows that US banks using credit risk transfer (CRT) techniques to a larger extent before the 2007 Subprime crisis had significantly higher mortgage charge-offs after the crisis.

Recent studies by Mian and Sufi (2009), and Keys et al. (2009) found evidence that in the last decade US banks securitized their worst mortgage loans. We can therefore, note that there has not been a large number of empirical studies which have tried to shed some light on why banks use securitization. Cardone-Riportella et al. (2010) is a notable exception. They used a Logit regression model applied to data on 408 Spanish banks to investigate the causes of the growth of securitization in Spain. Their results show that liquidity and the search for improved performance are the decisive factors for securitization, whilst they find very little evidence supporting credit risk transfer and regulatory capital arbitrage as motivating reasons.

This review reveals that the literature provides mixed evidence on the impact of securitization on the performance of the issuing bank. Our study contributes to the current debate

and advances the existing literature by evaluating the impact of accessing the securitization market on banks' cost of funding, credit risk, and profitability employing a propensity score matching approach.

2.2 LITERATURE REVIEW ON BANK CAPITAL STRUCTURE

The models surveyed in this section have identified a large number of potential determinants of capital structure. The empirical work so far has not, however, sorted out which of these are important in various contexts. The theory has identified a relatively small number of "general principles." The empirical evidence is largely consistent with the theory, although there are a few instances where the evidence seems to contradict certain models.

We identify two main empirical approaches that have been used to obtain evidence on factors that affect corporate financing decisions. The first approach, adopted in the majority of the studies, seeks to explain observed capital structures in terms of the factors felt likely to be important, usually using cross-sectional regression methods. With a few exceptions, UK cross-sectional studies (Bevan and Danbolt, 1998) and panel regression studies (Antoniou et al., 2002) generally found similar relationships to those found in the US. Antoniou et al. (2002) showed that firms in three European countries (including the UK) adjust their debt ratios to attain target structures, but at different speeds, suggesting that environmental and traditions are also important determinants.

The robust observation from these studies indicate specific difficulties for theory, particularly the negative relationship between debt ratio and profitability. This is consistent with the logic of pecking order theory but inconsistent with trade-off theory; the negative investment opportunity set observation supports Trade-off theory but not Pecking Order Theory. Thomson (2003) identifies several key features of firms that seem to be related to debt ratios across a wide range of environments and through time: size (+), earnings variability (+), asset tangibility (+), profitability (–), investment opportunity set (–) and industry. He found the evidence on tax influence to be weak, perhaps reflecting the endogeneity between tax rates and financing choice.

Bevan and Danbolt (2004) focused on the difficulties in measuring gearing and found

that debt determinants appear to vary significantly between short-term and long-term components of debt. The pecking order theory prediction that there should be a negative relationship between the dividend payout ratio and investment. In a UK replication and extension of the Shyam-Sunder and Myers (1999) test of pecking order against trade-off theory, found mixed evidence, with neither theory being dominant. Overall, the evidence for the UK (as for the US) is somewhat inconclusive. While various individual factors can be identified as important, neither of the two major theories is capable independently of adequately explaining the outcomes of firms' financing decisions in practice.

More studies have begun to focus on dynamic aspects of capital structure such as whether, as implied in the trade-off theory, firms engage in capital structure rebalancing.

2.2.1 Trade-off theory

The optimal debt level of a firm is determined by the benefits of debt and the cost of the debt. Firms will balance their benefits and cost of debt to choose their debt level in the way that maximizing the firm's market value (Myers, 1984). The main benefit of debt financing is the "tax shield". Tax shield allows firms to pay lower tax because the interest of the debt capital is deducted in the taxable income. Bankruptcy cost is one of the costs of debt. It incurs with the perceived probability that the firm cannot deal with its debt obligations. Risky firms have higher bankruptcy costs, thus risky firms borrow less.

2.2.1.1 Agency Cost Model The agency cost model was first introduced by Jensen and Meckling (1976). According to this model, there is conflict between a firm's owners and its managers. Harris and Raviv (1990) suggested that the conflict between firm's owners and managers arises because managers do not totally own the firm. Typically, managers of firms are hired by firm's owners to act as their agents and have the authority to use the firm's resources for the owner's benefit. However, instead of maximizing the firm's value and owner's benefit, managers are more interested in their own benefit which may differ from the owner's benefit. They will act in their own interests for higher salaries, job security, perquisites or even direct exploitation of the firm's cash. The differences of interest between

managers and a firm's owner may sometimes even oppose each other. The firm's owners may want to prevent the benefit transfer by the managers, who have the authority to manager the firm. Therefore, the owners may try to prevent the benefit transfer by external monitor, such as supervision by independent directors. These kinds of monitoring and control methods involve cost, the cost is called agency cost. Hence, the optimal capital structure under the agency cost model is the balance between the benefits of debt and the cost of debt. Firms will choose their own capital structure which minimize its total agency cost.

2.2.2 Pecking Order Model

The pecking order theory ([Myers, 1984] and [Myers and Majluf, 1984]) argues that, due to asymmetric information, firms adopt a hierarchical order of financing preferences so that internal financing is preferred over external financing. If external financing is needed, firms first seek debt funding. Equity is only issued as a last resort. In the words of Myers (1984, p. 585): "you will refuse to buy equity unless the firm has already exhausted its debt capacity"—that is, unless the firm has issued so much debt already that it would face substantial additional costs in issuing more."

Myers, in his 1977 study, was the first to point out the possibility that high debt relationships can stimulate managers to reject positive net present value projects, which ends up decreasing firm value. The presence of "risky" debt, that shows a lower market value than the nominal one, has a particularly negative influence on firms' investment choices. Myers' (1977) analysis is based on the concept that a firm's value is made up of assets in place and growth opportunities (based on the future ability to make profitable investments). Growth opportunities are compared to options, whose present value is a result of not only the expected cash flow, but also the probability that the firm actually takes advantage of them. In other words, the value of growth opportunities depends on investments made at the manager's (decision makers) discretion, who has the power to exercise these options

The way that the assets in place are financed, and thus the way the firm's capital is structured, influences the ability to create and take advantage of growth opportunities, since in this manner pressure is put on the quality of the firm's decision making. Myers (1977)

showed that when there is risky debt managers who act in shareholder interest tend to follow a biased decision making process, that leads them to reject profitable investments that could offer positive net worth to the firm's value. In other words, shareholders of firms who have risky debt are not willing to finance projects, thus taking on the cost, that would exclusively or mostly benefit the firm's debt holders. In these cases, the net present value of the project, while positive, would allow the debt's market value to rise up to the corresponding nominal value, without producing other benefits for the shareholders. In fact, risky debt would act as a sort of "tax" on the profits derived from the new investments, since most of the value created would only serve to allow debt holders to recover their loan.

The pecking order model (Myers (1984) and Myers and Majluf (1984)) and its extensions (Lucas and McDonald, 1990) are based on the idea of asymmetric information between firm's managers and investors. Managers know more about the firm's true value than outside investors. To maximize the wealth of existing shareholders, managers avoid issuing undervalued new shares to finance new projects. Thus, issuing new equity is interpreted as a negative signal, in the sense that the equity is being overvalued. This negative signal results in the decline of stock price. The relation between the issue of new shares and the decline of stock price is confirmed in several studies.

De Jong et al., (2011), test the static trade-off theory against the pecking order theory. They focus on an important difference in prediction: the static trade-off theory argues that a firm increases leverage until it reaches its target debt ratio, while the pecking order yields debt issuance until the debt capacity is reached.

2.2.3 Determinants of capital structure

In seeking to model the wide diversity of capital structure practice, a number of additional factors have been proposed in the literature. First, the use of debt finance can reduce agency costs between managers and shareholders by increasing the managers' share of equity (Jensen and Meckling, 1976) and by reducing the 'free' cash available for managers' personal benefits. It may also encourage managers to perform better in order to reduce the likelihood of bankruptcy, which is costly for managers. Conflicts between debt-providers and sharehold-

ers arise because the debt contract gives shareholders an incentive to invest sub-optimally in very risky projects. This implies an agency cost of using debt finance. Jensen and Meckling (1976) argue that an optimal capital structure can be obtained by trading off the agency costs of debt against the benefit of debt, in what might be termed an extended trade-off model.

Second, Myers and Majluf (1984) argued that, under asymmetric information, equity may be mispriced by the market. If firms finance new projects by issuing equity, underpricing may be so severe that new investors gain more of the project NPV to the detriment of existing shareholders. This may lead to an 'underinvestment' problem since such projects will be rejected even if the NPV is positive. This underinvestment can be reduced by financing the project using a security that is less likely to be mispriced by the market. Internal funds involve no undervaluation and even debt that is not too risky will be preferred to equity. Myers (1984) referred to this as the pecking order theory of capital structure. The description follows earlier empirical work by Bevan and Danbolt (2002), in which they observed that managers preferred to fund investment initially from retained profits rather than use outside funds. This preference led firms to adopt dividend policies that reflected their anticipated need for investment funds, policies which managers were reluctant to substantially change. If retained profits exceeded investment needs then debt would be repaid. If external finance was required, firms tended first to issue the safest security, debt, and only issued equity as a last resort.

2.2.3.1 Market-to-book According to Myers (1977), firms with more assets in place should more easily be financed through debt than firms with growth opportunities, which would present a naturally low leverage ratio. In fact, firms with high growth opportunities, whose valuation depends on intangible assets and expected returns, do not presumably finance their projects issuing debt since they are subject to high financial distress costs and their intangible assets have no value in the event of bankruptcy. Under these conditions, firms avoid issuing equity because much of the value created by investment would be used to offset the creditors' position (underinvestment problem). On the other hand, firms with growth opportunities, with less collateral assets, experience more problems when they are

in the presence of risky projects, because creditors see that as a way to expropriate wealth from themselves (the asset substitution problem of Jensen and Meckling, 1976).

2.2.3.2 Profitability The traditional theory of capital structure theorizes a positive relationship between profitability and leverage. Modigliani and Miller (1958) pointed out that a company may opt for debt in order to take advantage of tax shields. Jensen (1986) concluded that profitable firms might issue debt whenever a firm's corporate control is ineffective. The Pecking order theory of Myers (1984) and Myers and Majluf (1984) took the opposite point of view on this issue. A firm that is generating profits will retain earnings, avoiding asymmetric information costs. The rule is to issue safe securities. Internal funds are better than external funds and only, as a final resort, should a firm issue stock. The decision to issue stock is interpreted negatively by the market, and even when a firm opts for external finance, the market sees debt financing with collateral assets as the most logical decision. Thus, a negative relationship between profitability and leverage is expected. In general, empirical results concerning the relationship between profitability and leverage support the Pecking order hypothesis (Rajan and Zingales, 1995).

2.2.3.3 Size Leverage is expected to be positively influenced by size. The most plausible reason to explain such a relationship is bankruptcy costs (Rajan and Zingales, 1995). This mean that, first, large firms have, on average, lower bankruptcy costs – this type of costs are in, general, more fixed – than small firms. Second, large firms have in principle more diversified portfolios, with less probability of bankruptcy. Third, financial institutions, because they have less information about a small firm, need to allocate more resources concerning the firm's monitoring, and penalize it by asking for higher interest rates. Although the vast majority of research shows a positive relationship between size and leverage, such as Rajan and Zingales (1995), Titman and Wessels (1988) reveals the opposite results .

Our study is closely related to the work by Rajan and Zingales (1995) who investigated the determinants of capital structure choice by analyzing the financing decisions of public firms in the major industrialized countries. They found that the factors identified by previous studies – profitability, leverage target ratios, debt ratio and bank specific characteristics –

are as important in determining the cross- section of capital structure in U.S. firms as they affect the firm leverage in other countries as well.

The model we use in our study follows closely that of Panno et.al., (2003) who investigated the empirical determinants of capital structure decisions of firms, and tried to provide some contributions that helped to fill the existing gap between theory and empirical evidence. Their article included a descriptive model of the choice between equity and long-term debt for the firms based in UK and Italy. They found that the firms in both countries were able to allow their gearing ratios to vary significantly around the target ratio. These findings suggest that firms do not identify a strict, single optimal capital structure ratio as such, but rather a range over which their capital structures are allowed to vary. We use their binary model idea to examine the choice between debt and equity sources of finance for the US banks

Similarly, Reint and Florian (2010) in their paper, "The Determinants of Bank Capital Structure" used large U.S. and European banks data during the period 1991 to 2004 to show that mispriced deposit insurance and capital regulation were not the main determinants of capital structure. They found that the individual bank characteristics are ultimately the most important determinant of banks' capital structures and that banks' leverage converges to target set for individual or specific bank and that will be consistent for a long period of time. Reint and Florian, (2010) failed to address the capital structure decision. Their study extended empirical work on capital structure theory in three ways. First, it examined a much broader set of capital structure theories, many of which had not previously been analyzed empirically. Second, since the theories had different empirical implications in regard to different types of debt instruments, the authors analyzed measures of short-term, long-term, and convertible debt rather than an aggregate measure of total debt. Third, the study uses a factor-analytic technique that mitigates the measurement problems encountered when working with proxy variables.

2.3 PENSION FUNDS AND ASSET ALLOCATION

There has been great interest in research on pension market issues since the 1980's. The following subsections considers this past work, starting with the most recent one on relationship between the pensions and stock market, pension risk and share prices, in addition to pension asset allocation.

2.3.1 Pension funds and stock market performance

Jin et al (2006) in their paper examined the empirical question of whether the equity risk of U.S. firms as measured by beta, from the Capital Asset Pricing Model reflects the risk of their pension plans. They note that pension plan assets and liabilities are off-balance sheet, and are often viewed as segregated from the rest of the firm, with its own trustees. Their empirical findings are consistent with the hypothesis that equity risk does reflect the risk of the firm's pension plan.

Franzoni and Martin, (2006), argue that the market significantly overvalues firms with severely underfunded pension plans. These companies earn lower stock returns than firms with healthier pension plans for at least 5 years after the first emergence of the underfunding. The low returns are not explained by risk, price momentum, earnings momentum, or accruals. Further, the evidence suggests that investors do not anticipate the impact of the pension liability on future earnings, and they are surprised when the negative implications of underfunding ultimately materialize. Finally, underfunded firms have poor operating performance, and they earn low returns, although they are value companies. Their results and findings note that investors have failed to realize that an underfunded pension will eventually hurt earnings. So when earnings finally do take a hit the stock gets punished.

Coile et al (2006) investigated the relationship between stock market performance and retirement behaviour, paying particular attention to the boom and bust periods of the late 1990s and early 2000s. The authors begin by noting reasons to be sceptical between stock market performance and retirement. First, retirement rates did not rise during the market boom of the late 1990s, even after adjusting for the effect of the strong economy. Second, as

the sustained market decline only began in September 2000, the retirement response in late 2000 would had to have been very largely to drive a two-point reduction for the year as a whole. The authors compare the effect of the stock market on the retirement behaviour of individuals likely to have been differentially affected by changes in the market.

Alestalo and Puttonen (2006) presented evidence for Finnish pension funds. They find that pension funds with younger members have a higher equity exposure, and pension funds with a more mature age profile hold a higher share of fixed income instruments.

Webb (2007) has argued that agency conflicts between shareholders and pension plan holders will affect both dividend and investment policies, since firms with large pension deficits who are acting in the interests of their shareholders will be more inclined to pay out cash flows and to either underinvest (due to a debt-like overhang of pension liabilities) or invest in risky projects (due to risk-shifting). Cocoa and Volpin (2007) discover some evidence of risk-shifting in a sample of UK firms.

Bikker, J.A. et.al (2007) paper is the first to examine the impact of stock market performance on the investment policy of pension funds. They find that stock market prices influence the asset allocation of Dutch pension funds. In the short term, outperformance of equities over bonds and other investment categories automatically results in a higher actual equity allocation (and vice versa), as pension funds do not continuously rebalance their investment portfolios. Their findings suggest that the investment policies of pension funds are partially driven by the cyclical performance of the stock market. Investment policies of large funds deviate from that of small funds: they hold more equity and their equity allocation is much more strongly affected by actual equity returns, reflecting less rebalancing. The largest funds react highly asymmetrically to positive excess equity returns, adjusting their portfolios by significantly more than 100%, reflecting 'overshooting' of free floating, or positive feedback trading. Apparently, managers of large funds demonstrate great risk tolerance, particularly in bull markets.

The negative relationship between age and equity exposure in the portfolio is usually derived under the assumption that human capital is close to risk-free, or at least is not correlated with capital return. Benzoni et al. (2007) put forward that in the short run, this correlation is indeed low, while in the longer run, labour income and capital income are highly

co-integrated, since the shares of wages and profits in national income are almost constant. This finding implies that the risk profile of young workers' labour income is equity-like and that they should therefore hold their financial wealth in the form of safe bonds to offset the high risk exposure in their human capital. Therefore, Benzoni et al. (2007) and Cocco et al. (2005) suggested that the optimal equity share in financial assets is hump-shaped over the lifecycle: cointegration between human capital and stock returns dominates in the first part of working life, whereas the decline in human capital accounts for the negative age-dependency of optimal equity holdings later in life.

As the contribution of Benzoni et al. (2007) are still in discussion among academics, we only follow the recommendations of the original contribution in this field.

One of the recent studies on pension information is by Cardinale, M., (2007) who empirically tested pensions and corporate bond spreads. Cardinale considered corporate bond data of U.S. companies for the 2001-2004 period where unfunded pension liabilities are incorporated in credit spreads. This study is limited to US pensions and not much has been extended to other pension plans in the world. Klumpes and Kevin (2007) had a study to examine the impact of pension reforms. They considered how the new U.K. pension accounting regulations significantly increase the exposure of the balance sheets of U.K. firms to volatilities in pension fund valuations. Their results suggest that unexpected changes in interest rates have a differential effect on a firm's sources of pension, financial, and core earnings. Klumpes and Kevin fall short of covering the impact of the stock market on the pensioners' investment.

Rauh (2009) finds that US firms with poorly funded pension plans, and thus the greatest incentives to risk shift, are more likely to invest in safe assets such as government bonds and cash. He suggests that risk-shifting is dominated by risk-management incentives to avoid costly financial distress. Franzoni (2009) examines the stock price reaction to mandatory pension contributions, and finds a larger fall in stock prices for those firms that are a priori financially constrained. Overall, he reports that overinvestment is the more significant problem for large firms, but underinvestment is more characteristic of smaller firms.

2.3.2 Pension risk and share prices of the pension sponsoring firms

Feldstein and Seligman (1981) was one of the earliest studies to investigate the effect of a firm's pension deficit on it's share price. They found, using a sample of US manufacturing firms, that the emergence of a deficit is incorporated rapidly into the share price, in the sense that the share price is reduced (relative to tangible assets) by the per share size of unfunded pension liabilities. Feldstein and Mørck (1983) show that company share prices reflect pension plan surpluses as well as deficits, and that the financial markets 'see through' the manipulation of pension liabilities considered above and instead value the pension liabilities of all firms at a common standard discount rate, very close to the average used across all firms.

Bodie and Papke (1992) is the one paper to provide considerable empirical evidence that the equity market valuation of firms takes into account the difference between the value of pension plan assets and its liabilities, i.e., the pension surplus or deficit (if that difference is negative). There is earlier work by Feldstein and Seligman (1981), where they find results consistent with the conclusion that share prices fully reflect the value of unfunded pension obligations, so the market correctly takes into account pension liabilities when valuing a company — a one dollar change of pension funding status will change the share price by one dollar (both relative to the firm's market value).

Carroll and Niehaus (1998) found in a parallel test of debt market recognition of the value of the pension surplus or deficit, by empirically examining the positive relation between funding of defined-benefit pension funds and debt ratings. Furthermore, in both equity and debt markets, there seems to be an asymmetric pattern in the impact of changes in pensions assets and liabilities on the market value of the firm and on debt ratings: while each dollar increase in liabilities lowers the market value of the firm by about a dollar, an equal increase in pension assets raises the firm's market value by less than a dollar. This is consistent with the view that, while an under-funded pension liability should be fully reflected as a corporate liability, over-funded pension assets are not entirely a corporate asset, due to the difficulty of converting an overfunded pension plan's assets into unburdened corporate assets. Moreover, Ibbotson and Kaplan (2000) noted that in line with the efficient-market theory, evidence

shows that pension funds are unsuccessful in exploiting market timing to generate excess returns.

Alier and Vittas (2000) investigated the impact of the volatility of investment returns on replacement rates in the context of personal pension plans. The authors' findings suggest that overconcern about the impact on replacement rates of short-term volatility in stock markets may not be warranted.

Vrinda Gupta (2006), analysed whether employees with a defined benefit pension scheme perceive risk to their expected income in retirement while forming their opinions about the long-term business success of their employer. They use a dataset of pension risk indicators for FTSE 100 companies and data from employees' opinion in the UK to show that employees do seem to care about the level of funding of their benefits.

2.3.2.1 The choice between asset classes Campbell and Viceira (2002) provided extensive theoretical analysis on strategic asset allocation. They provide an approach different from the static mean–variance analysis, as they recognize that many investors seek to finance a stream of consumption over their lifetime. The book shows that long-term inflation-indexed bonds are riskless assets for long-term investors and that stocks can be safer assets for long-term investors than for short-term investors. A long-term investor may be willing to hold higher proportion of stocks and inflation-linked bonds, and less cash, than a short-term investor.

Campbell and Viceira (2002) noted that empirical work on long-term portfolio choice has lagged far behind existing theoretical literature. Perhaps for this reason, there has been very slow diffusion of understanding from academic literature to institutional investors, asset managers, financial planners, and households.

The surveys on pension fund asset allocation shows that studies have been carried out in the US market. Papke (1991) reported some interesting data on the asset allocations of US private pension funds, both for defined benefit and defined contribution plans. The main findings for the defined benefits plans were that larger single employer plans hold about 60% in fixed income securities and 20% in equities; and smaller single employers invest 50% and 20%, respectively.

Healey and Rozenov (2004) studied the 200 largest defined benefit pension funds in the United States. They found that equity allocation increased its share from 48% in 1991 to 57% in 2001. They also reported that funds were increasingly allocating to alternative investments, real estate, enhanced indexed equities, and bonds.

Blake et al. (1998) reported asset allocation and performance of more than 300 UK pension funds. They found that the allocation practices of funds have remained rather steady from 1986 to 1994. Notable observation was the high allocation to equities (78%) with only 14% in fixed income. However, the Blake et al. (1998) study concentrated on performance rather than asset allocation. Therefore, it remains somewhat unclear why UK pension funds invest so much more in equities than their US counterparts.

The debate over an optimal asset allocation for a pension fund has two extreme views. One view states that bonds are the only way to match assets with liabilities, while the contradicting view recommends equity exposures. Equity and fixed income are generally the biggest investment classes in pension funds.

2.3.2.2 Fixed income Bodie et al. (1999) argued that a pension fund, with a financially sound sponsor corporation, should not invest in equities at all. A fully funded pension fund should only invest in fixed income assets and, thus, minimize the additional contributions. However, it is found that pension funds generally invest around 40% to 60% of their portfolio in equities. Bodie et al. (1999) find three reasons for these equity investments. First, a sponsor sees the defined benefit fund more like the defined contribution fund: a sponsor may believe that a successful strategy may lead to extra benefits and tries to maximize benefits paid to employees. Second, a sponsor believes in market timing and security selection ability. Third, a sponsor in financial distress may have an incentive to invest in riskier assets, as there is the federal pension insurance.

According to Blake (2001), fixed income investments are encouraged by regulators simply because the discount rate used in pension liability calculation by actuaries and accountants is based on bond yields. This means that in order to avoid the short-term mismatch between assets and liabilities, pension fund asset allocation should be more heavily weighted towards bonds. In the US, pension funds have a special tax treatment and this gives them the

incentive to create an asset mix with a large spread between pre-tax and after-tax returns. Therefore, tax reasons drive pension funds to invest more in bonds than in equities (Bodie et al., 1999). For a fully funded healthy pension fund, Bodie (1988) recommends investments only in taxable fixed income securities. In Finland, pension funds do not have any special tax treatment with respect to fixed income securities.

2.3.2.3 Equity Black (1989) studied the role of equities in the portfolio of a pension fund. Stocks are used to achieve higher expected returns, and, therefore, meet the pension obligation in the future, while helping to lower expected pension costs. Black acknowledges that some managers think about bonds as the only answer to hedge their pension liabilities. However, equities also should be viewed as a hedge against a potential increase in pension liabilities. Equities particularly hedge against the risk of salary inflation, which causes an increase in liabilities. Black states that stock prices and the expected rate of inflation move in tandem. This is called an 'economic' view of liabilities.

Black (1989) divided pension liability into two categories: a narrow view and a broad view. Both of these liability types act like a security. The narrow liability is defined as a present value of all vested benefits for current employees. Hence, it is only tied to past and current, while not including the future. However, the narrow liability is only a snapshot of the current work force, and, hence, the narrow liability is changing all of the time. Hedging for the type of narrow liability is mainly performed using interest rate hedging methods and, therefore, the narrow view suggests investing in bonds to hedge the liabilities.

According to Black, the broad liability is the present value of all benefits to be paid, and therefore it is always greater than the narrow liability. The broad liability is the narrow liability plus salary increases, benefits to be accrued, changes in the benefits and additions to the workforce. In most cases, the broad view suggests investing in stocks is superior. Also Chun et al. (2000) argue that a growing company typically should have more equity investments, and less bonds or real-estate investments, due to the higher expected rate of return of equity.

Peskin (1997) argued that a pension fund's equity exposure is critical to the future contribution cost. The equity exposure varies between pension funds. If a pension fund's

liabilities do not act like bonds (i.e. the relationship between bonds and liabilities is volatile), then a fund should have greater equity exposure.

2.3.2.4 Real estate Chun et al. (2000) studied the pension plan real estate investment within an asset/liability framework. In the US, pension funds seem to hold a low proportion of real estate in their portfolios, and the study finds that real estate investment is more limited than one would expect on the mean–variance basis. The main result of the study is that real estate is not highly correlated with pension plan liabilities and that the main role of real estate is to hedge against the risk of inflation.

Hudson-Wilson et al. (2003) gave several reasons why every investor should consider real estate as a part of their portfolio. When their reasoning is applied to the pension fund world, real estate seems to be an essential part of a pension fund's portfolio. Pension funds are usually risk-sensitive investors: they have great concern for capital preservation, a moderate actuarial target rate of return, and they have known liabilities. Also, the hedge against inflation is important to defined benefit pension funds because their future benefit payments happen in real terms. In addition, pension funds have a heavy demand for cash and some liquidity requirements in order to satisfy the liability stream.

2.4 MOTIVATION AND CONTRIBUTION TO THE EXISTING LITERATURE

The past studies have indicated that securitization has been perceived as one of the most prominent developments in the international financial markets in recent decades, Duffie (2008). Therefore the recent turbulences in financial markets which underline the importance of understanding asset securitization, a process that allows banks to fund their credit growth and, potentially, to shed off credit risk and to arbitrage capital requirements. We contribute to the extant literature by performing an analysis of UK banks, focussing principally on whether it is the need for liquidity (i.e. the funding of their balance sheets), or the desire to engage in regulatory capital arbitrage or the need for credit risk transfer that has led to UK banks securitizing their assets.

We show that securitization has been significantly driven by liquidity reasons. In addition, we observe negative effects on Tier 1 capital ratios and a positive link between securitization and banks' credit risk. We interpret these latter findings as evidence that UK banks which engaged in securitization did so, in part, to transfer credit risk and that, in comparison to UK banks which did not use securitization, they had more credit risk to transfer in the sense that they originated lower quality loans and held lower quality assets. We show that banks which issued more asset-backed securities before the financial crisis suffered more defaults after the financial crisis.

The impact of financial crisis on banks also excites the study how banks have adjusted in the process of raising their capital, Myers and Majluf (1984). We therefore examine the determinants of banks issuing debt or equity. The results from our study on bank capital structure provide evidence of interesting differences between the two key choices of financing options for the available investment opportunities that banks would have at a given time. This will be consistent with the main prescriptions of the more recent developments of capital structure theory; on the whole where there is support for positive effects of size and profitability of given financial institutions playing part. We expect the results to show that internal finance is preferred to external finance and also develop a theory regarding the impact of asymmetric information on the financing decision as modelled by Myers and Majluf (1984). The evidence documents the similarities between banks' and non-financial firms' capital structure may be greater than previously thought. Specifically, this paper establishes novel and interrelated empirical facts. Hence the capital structure study seeks to explain why banks may choose different mixes of debt and equity to finance their operations. The US Banks considered in the data sample represent a special case because of certain unique features in the industry, including a federal safety net and extensive regulation. The financial crisis of the 2008-2009 provided another set of special circumstances in which banks needed to raise capital. The preference banks have shown for issuing preferred shares in the private market in favor of government financing can be viewed through the lenses of capital structure theories.

After 2008 - 2009 financial crisis, it has been a difficult time for pension fund manager. There have been few asset classes that would generate strong performance. This has been

complicating asset allocation decisions to the point of paralysing investors[1]. Therefore, we study the impact of stock market volatility study on pension funds asset allocation. We use the case of the Dutch pension funds, since it is ranked to be the best managed pension fund in the world. The data of the share prices and pension data for the companies listed on the Amsterdam Exchange index (AEX) are used for our analysis. We look at the allocation of pension funds assets and liabilities and the effect the stock volatility has had on them. We use the data to calculate the market risk, measured by the beta or systematic risk of the operating assets.

[1]http://www.financialnews.com/2013

3.0 WHY DO UK BANKS SECURITIZE?

3.1 INTRODUCTION

Securitization has been perceived as one of the most prominent developments in the international financial markets in recent decades.

In this study we consider securitization as the process by which heterogenous and illiquid credit-risky assets (e.g. bank loans) or instruments (e.g. a portfolio of bonds or credit default swaps) are pooled and repackaged into marketable securities; where risks related to these assets or instruments are separated from the transferrer's (i.e. the originator's) own credit and operating risk, and where securities are issued to investors which are designed for the specific risk tolerance profile of such investors. Therefore, we define securitization as the whole process whereby a bank or other financial institution issues marketable securities backed by the cash flows from a pool of underlying assets or instruments.

Securitization has significantly changed the liquidity transformation role traditionally performed by banks. Moving of a policy of banks from "originate and hold" to "originate, repackage and sell" model has made large parts of previously illiquid loans, potentially liquid. Prior to the 2007-2009 financial crisis, the general view was that securitization led to an overall improvement of financial stability by spreading the risks among many investors (Duffie, 2008). Securitization can be broadly divided into two categories: Mortgage-Backed Securities (MBS) and the asset backed securities (ABS), which are non-mortgage securities. Securitization has become an important financial instrument around the globe with development of the Asset-backed securities (ABS).

3.1.1 A Brief History on Securitization

Securitization originated in the 1920s when mortgage insurance companies sold guaranteed mortgage participation certificates for pools of mortgage loans. Investors actively traded these certificates until the real estate market crashed during the 1929 Great Depression. Whole Business Securitization (WBS) arrangements, where senior creditors of an insolvent business effectively gained the right to control the company. first appeared in the United Kingdom in the 1990s, and became common in various Commonwealth legal systems.

Many banks experienced severe disintermediation[1] caused by a series of breakdowns and crises occurring during the 1960s and 1970s, such as the collapse of Bretton Wood System, two energy crises and high inflation rates. The idea of securitization was therefore put forward by several investment banks (Thakor, 1987). With the support from the US government, Ginnie Mae issued the first MBS in 1970, and at a later stage, both Fannie Mae and Freddie Mac entered the field. Throughout the 1980s securitization grew in popularity to become a widely recognized, cost effective financing alternative to traditional bank sources. By the mid-80s securitization had been extended to ABS through financial innovation, such as automobile loans, credit-card receivables, second mortgages and home-equity loans.

Securitization only reached Europe in the late 1980s, when the first securitizations of mortgages appeared in the UK. As the result of the credit crunch precipitated by the sub-prime mortgage crisis, the market for bonds backed by securitized loans was very weak in 2008 unless the bonds were guaranteed by a federally backed agency. As a result interest rates rose for loans that were previously securitized such as home mortgages, student loans, auto loans and commercial mortgages (Fabozzi and Kothari, 2008).

Securitization has evolved from its tentative beginnings in the late 1970s to an estimated $10.24 trillion in the US and $2.25 trillion in Europe as of the 2nd quarter of 2008 when the financial crisis was experienced. In 2007, ABS issuance amounted to $3.455 trillion in the US and $652 billion in Europe[2].

[1] This is where funds from savings banks were removed and placed into short-term investments on which the interest-rate yields are higher.

[2] AFME/ESF Securitization Data Report; www.sifma.org/

3.1.2 Asset-Backed Securities Market

According to the Securities and Exchange Commission (SEC) in the US, ABSs are securities that are backed by a discrete pool of self-liquidating financial assets. Asset-backed securitization is a financing technique in which financial assets, in many cases themselves less liquid, are pooled and converted into instruments that may be offered and sold more freely in the capital markets, (Fabozzi and Kothari, 2008).

The financial crisis has brought asset information to the centre of concern of market participants and regulators. Asset-backed securitization, in general received partial blame for the paucity of liquidity on bank balance sheets and the consequent credit crunch. After the ABS market fell to near inactivity in 2009, the US federal government's Term Asset-Backed Securities Loan Facility (TALF), provided backing and a boost to the issuance of asset-backed securitization. The nature of ABS makes it difficult for them not to be relatively illiquid, which has resulted in unbearable levels of market risk for most investors (Trujillo, 2010). Their apparent liquidity before the crisis was a mirage, produced by a market in continuous expansion, fed by Special Purpose Vehicles (SPVs), Conduits, and other low capitalized term-transformation vehicles. Too high expectations have been placed on information enhancement as a means of restoring ABS markets. Investors are concerned mainly with how the ongoing reforms will be implemented.

In this study, we look into development of the ABS market in the last decade and the possible consequences of the suggested reforms, since there could be excessive expectations on the capacity of such enhancements - information and disclosure - to restore ABS markets[3].

3.1.3 Asset Backed Securities (ABS) and securitization

Securitization as a financial instrument has had extremely significant impact on the worlds financial system. Since the 1930s, securitization has become one of the most important and abiding innovations to emerge in financial markets. 1997 through to 2004 witnessed growing industrial emphasis on risk management and investors were no longer just seeking to maximise the amount of return on their portfolios but were looking to set strategies on

[3]The appendix gives more details on ABS and securitization

the basis of when and how these returns would manifest across their portfolios. This desire on the part of investors was further perpetuated by the bursting of the dot.com bubble in 2001. However, as investors flocked to safer pastures in the form of corporate bonds, the fixed income market became saturated, credit spreads tightened and high quality corporate bonds became scarce thereby making portfolio diversification extremely difficult, Fabozzi and Kothari, (2008).

There is an array of creative financing techniques that have been have been outcome of modern financial innovation, which have included asset securitization. Issuers reap many advantages by securitizing assets rather than keeping them on their books. For example, by packaging their portfolios of credit card receivables as securities, major commercial banks, have been able to reduce the amount of capital they would otherwise have to maintain under new, stringent capital guidelines mandated by bank regulators. As the leading bank issuer of credit cards, Citibank has also emerged as the largest issuer of securities backed by credit card receivables,Thakor, (1987).

Investor acceptance of asset-backed securities has grown as the market matured. Consequently, these securities now trade at interest-rate spreads over Treasury bills that make them a relatively low-cost source of funding for many companies. Credit card-backed securities, which in 1991 represented the largest single category of new issues (41 percent of the dollar volume), have settled into a trading range of 65 to 105 basis points (0.65 to 1.05 percentage points) over Treasury with comparable maturities. Issues collateralized with auto debt, the second-biggest market component (30 percent), trade at a spread of just 60 to 80 basis points, while offerings supported by home equity loans, the third largest (21 percent) category, move in a range of 120 to 160 basis points.

Not surprisingly, asset-backed securities evolved out of the mortgage-backed securities market, which developed in the 1970s when interest rates surged and thrift institutions found themselves saddled with residential mortgages that were earning less than what they were paying for deposits. Compared with mortgage-backed securities, asset-backed issues have been relatively unaffected by swings in interest rates. The reason is that the car loans and other loans backing the securities have shorter maturities than mortgages, and therefore people are less likely to re-finance when interest rates fall, Dionne and Harchaoui (2003).

In that respect, asset-backed securities resemble non-callable bonds. Asset-backed securities enable depository institutions, finance companies, and other corporations to "liquefy" their balance sheets (i.e., raise cash by borrowing against assets) and develop new sources of capital. Assets such as credit cards, automobile loans, and home equity loans are packaged as the collateral for intermediate-term (i.e., maturity of one to five years) securities and sold in the public markets or as private placements. In its purest form, securitization is a means by which non-banks can directly raise funds from capital market lenders to finance their assets or projects which did not conform to the mainstream lending models of banks. The participants in this market were traditionally small poorly rated entities and, as such, in mainstream markets would have been subject to severe costs associated with the issuance of debt. As an alternative therefore, such an organization would securitize its investments, sell an AAA-rated tranche (say 90% of the underlying pool), a BBB-rated tranche (say 8% of the pool) and retain an unrated first loss security of the remaining 2% and retain rights to the excess cash flows. Given the above mentioned nature of the market, non-bank participants were not in direct competition with banks. However, all this changed over the last ten years as structured finance grew and non-banks began lending to mainstream borrowers. Moreover, banks also started adopting this structured finance model as it provided them with a means through which to leverage equity and increase lending without requiring additional capital. We can see this in the following Figure 3.1, shows the drop in whole securitization activity as from 2007 to 2009. The Figure shows (a) bars representing non-retained issuance proxied by issuance eligible for inclusion in underwriting league tables. The Line includes total retained issuance proxied by issuance not eligible for inclusion. While (b) Residential mortgage-backed securities (RMBS), (c) Commercial mortgage-backed securities and (d) Other asset-backed securities which includes auto, credit card and student loan ABS.

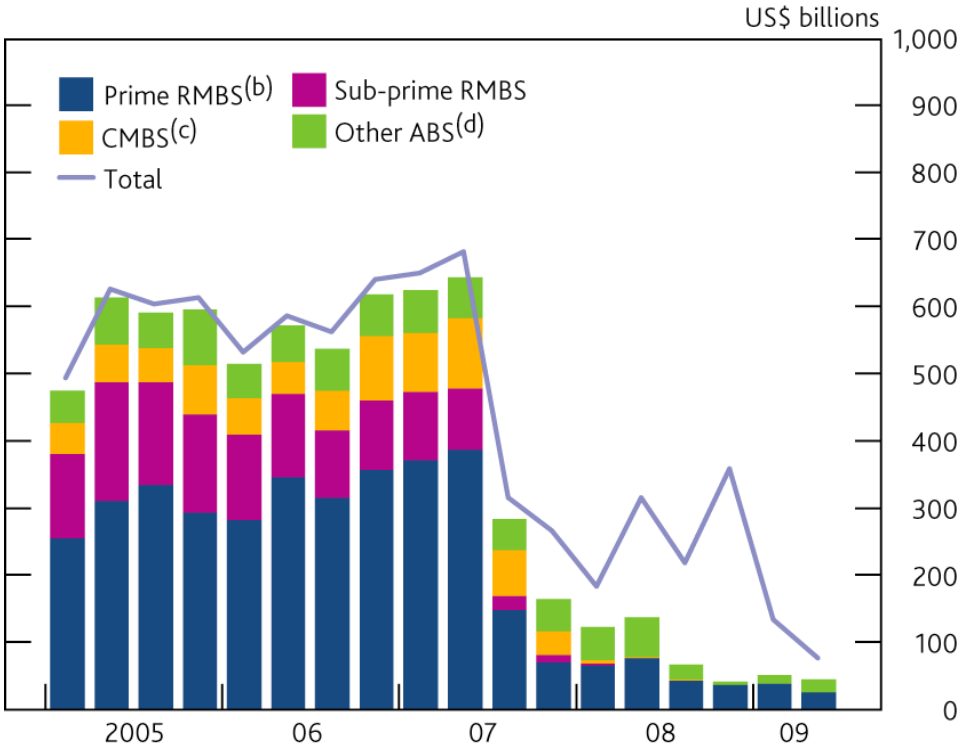

Figure 3.1: Global issuance of asset-backed securities; Source: Dealogic.

3.1.4 Asset Backed Securities Market

Securitization is a financing process where illiquid assets (mortgages, credit cards and student loans) are pooled and converted into liquid liabilities which are then sold in the capital market to raise (cheap) funds. The issuer uses these financing vehicles to raise cash which is then used to expand its balance sheet. Generally, the securitization of asset backed securities (ABS) is handled by a so called special purpose vehicle (SPV), which issues tranches of different risk [4]. The SPV will create and also sell the securities. It follows that, if the SPV has a separate balance sheet from the assets's originator; the latter can remove the risky assets from the balance sheet and free capital for further investments.

Supposing that the asset's originator is a financial institution with mortgages (i.e. illiquid assets) on the balance sheet, and assuming the return on alternative investments being very

[4]Tranches with the first lien (senior tranche) rated AAA and riskier tranches called junior tranches. Generally originators retain junior tranches such as equity tranches.

high, the securitization process allows the originator to free capital which can be used to gain extra return[5]. We can picture this through the quarterly collateral issuance of securities in US and Europe as shown in the following Figures 3(a) and 3(b). In all the figures, the volumes denominated in euro and the US volumes converted from dollar to euro based on the \$/€ exchange rates as of quarter-end.

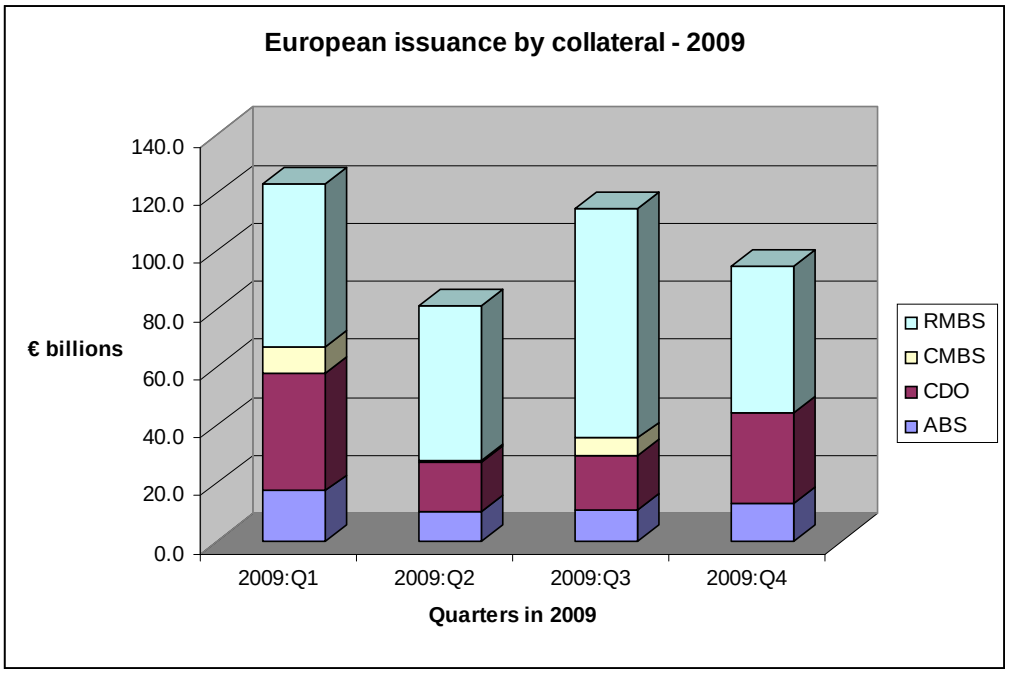

Figure 3.2(a): European ABS issuance by collateral. Source: SIFMA

[5]It is surprising that, given the importance of securitization, very few empirical studies have attempted to explain the reasons of securitization. Indeed, very important questions have not received, in my view, the necessary attention. For example, has securitization been mainly used as a financing tool or rather for regulatory arbitrage ?

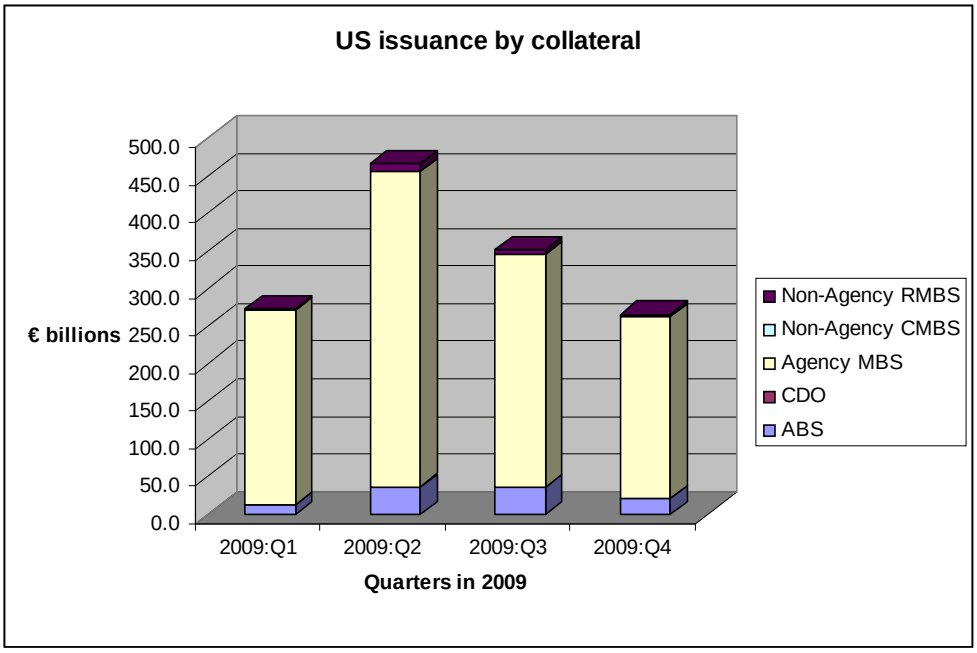

Figure 3.2(b): US ABS issuance. Source: Securities industry and financial markets association

The European ABS issuance in the data used includes auto, credit card, leases, loans, receivables while the European CDO issuance numbers only include euro-denominated issuance regardless of the country of collateral. We note that a substantial percentage of CDOs are backed by multi-jurisdictional collateral, and historical CDO issuance totals have been revised due to periodic updates of the sector.

The US ABS issuance includes auto, credit card, home equity, student loan, equipment leases, manufactured housing, and other historical ABS issuance totals have also been revised due to periodic updates of the sector. The US CDO issuance numbers only include US-denominated issuance regardless of the country of collateral and may therefore include European transactions which are denominated in US dollars and the historical CDO issuance totals have also been revised due to periodic updates of the sector.

The ABS market has been growing very fast in US and also Europe, as can be seen in Table 1.1. The combined annual total for USA and Europe between 2005-07 reached $3.8 trillion, falling to about $2 trillion[6] in 2008.

[6]European securitization outstandings totaled EUR 1.88 tn as of 31 December 2009, EUR 1.74 tn, EUR 1.29 tn and EUR 1.11 tn as of end 2008, 2007 and 2006, respectively.

Table 3.1 : ABS issuance trend 2006 - 2009. Sources: ECB 2009, 2008, 2007 and 2006 Annual Reports

	2006	2007	2008	2009
Average ABS eligible	€ 0.5 trillion	€ 0.7 trillion	€ 1.1 trillion	€ 1.3 trillion
Average value of assets put forward	€ 930 billion[1]	€ 1,101 billion[2]	€ 1,579 billion	€ 2,034 billion
Average share of ABS	12%	16%	28%	23%
Overall ABS amount submitted	€ 112 billion	€ 176 billion	€ 442 billion	€ 468 billion

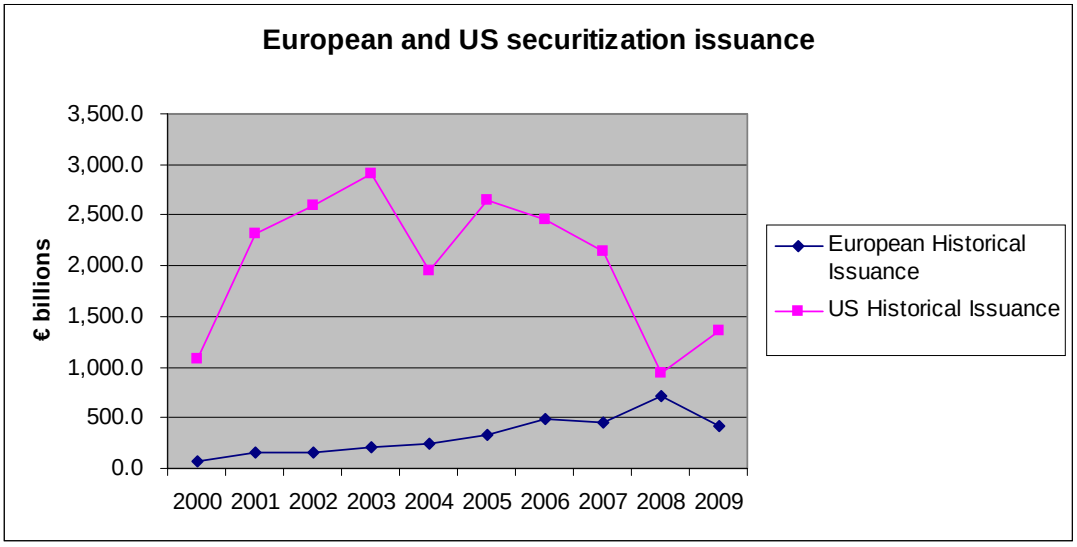

Figure 3.3: European and US securitization issuance. Source: SIFMA

From Table 3.1 and Figure 3.3, we can note that securitization market has been the most exciting and fastest growing sector in the financial markets before the financial crisis. In fact while most people may believe equities and all issues related are the primary driving forces of the major global financial centres, this could not be further from the truth. Over the past ten years structured finance has witnessed phenomenal growth.

The market has been particularly dynamic not only in USA and UK but also in other

1Figure subsequently revised to EUR 906 billion
2 Figure subsequently revised to EUR 1,148 billion

countries such as Canada. Figure 3.3 above and Figure 3.4 a below shows how the securitization market has been in the last decade. It seems that the market was doing well in the US between 2000 and 2006, with the only dip in 2004. Surprisingly the trend has been interesting in Europe, where the issuance of securities has been on the increase till last year, 2009. It can be noted that the securitization market in Europe has still been growing which can be affirmed by the issuance totals shown Figures 3.4 and 3.5, including Table 3.2, show the total value of collateral issued last year in Europe compared to those issued in US during the same period. Although public opinion has been focusing on what went wrong with securitization, there are many economic benefits associated with it. For example, it is widely recognized that securitization helps banks to re-allocate credit risk outside the banking system to entities which are more equipped to manage this risk. Thus securitization helps banks to effectively manage credit and liquidity risk[7].

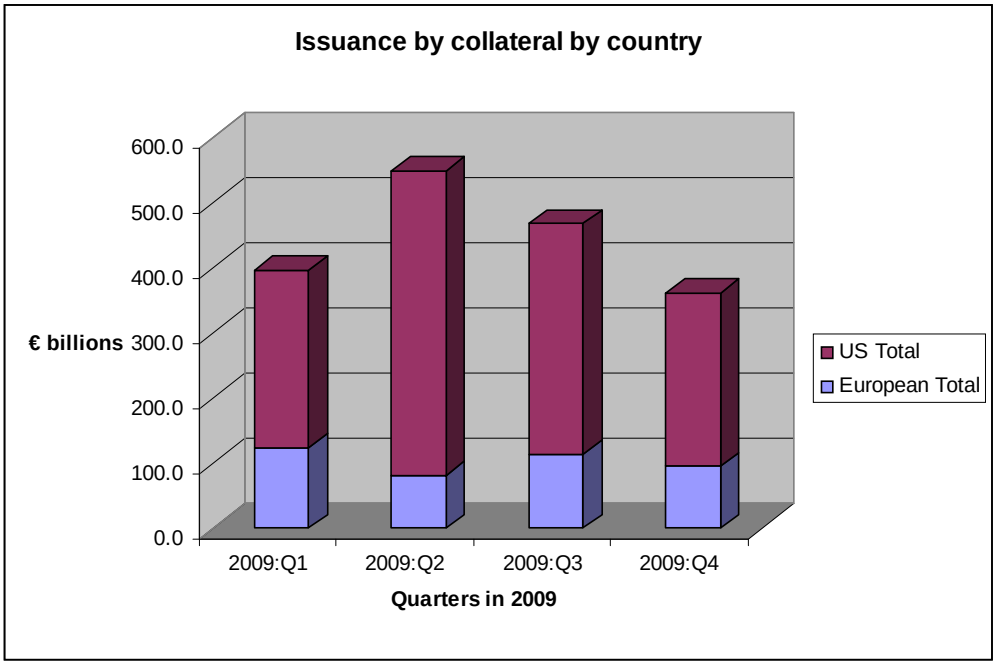

Figure 3.4; Issuance by country. Source: SIFMA

[7]One reason why this has not happened is that during the boom, banks themselves became big holders of ABS issued by other entities and held these securities on their balance sheets. For example at the middle of 2006 banks held about 51% of all financial institutions' exposure to the mortgage market (IMF, 2008). Most of the banks holding these securities were ill-equipped to properly evaluate them and have in place a sounded system of risk management.

Table 3.2; ABS issuance - collateral, deals and interest. Source: Bloomberg

Bloomberg ABS — ABS ISSUANCE — Page 2 of 7

$ Billion 2008-2010

	Aug 10	Jul	Jun	May	Apr	Mar	Feb	Jan	Dec	Nov	Oct	Sep	YTD '10	'09	'08
TOTAL	7.4	9.8	7.2	11.7	7.3	12.3	11.9	7.2	15.0	15.7	12.2	26.4	75	184	219
Collateral															
CARD	-	.5	1.0	1.8	.5	.7	1.1	-	3.0	.6	.3	10.7	6	47	59
AUTO	5.6	3.1	3.5	7.5	3.2	5.3	8.8	5.6	1.6	8.8	7.6	10.7	43	66	49
HOMEQ	.2	.6	-	.0	-	-	-	.2	-	-	-	-	1	-	1
MANUF	-	-	-	-	.1	-	-	-	-	-	-	-	0	-	-
STDLN	1.1	3.8	.9	1.2	1.3	2.9	1.6	.8	2.8	1.4	.4	-	14	21	28
OTHER	.5	1.8	1.8	1.2	2.1	3.4	.4	.6	7.6	4.8	3.8	5.1	12	49	82
Deal Structure															
SEQ	4.5	4.6	4.5	7.6	5.1	7.5	5.4	3.9	3.0	12.2	6.2	10.4	43	71	46
CAM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HB/SB	-	.1	.1	1.8	.1	.8	1.0	1.5	3.0	.1	2.4	10.4	5	45	57
"SUB"	.8	.5	.4	.8	.3	.6	1.2	.2	.9	.6	1.3	1.4	5	14	14
Other	2.2	4.5	2.1	1.4	1.9	3.4	4.2	1.6	8.1	2.8	2.5	4.5	21	54	78
Interest Method															
FLT	2.2	4.7	2.1	3.1	1.8	4.7	5.7	3.0	8.1	3.2	5.7	14.0	27	95	134
Other	5.3	5.1	5.1	8.5	5.5	7.6	6.1	4.2	6.9	12.5	6.7	12.8	47	89	61

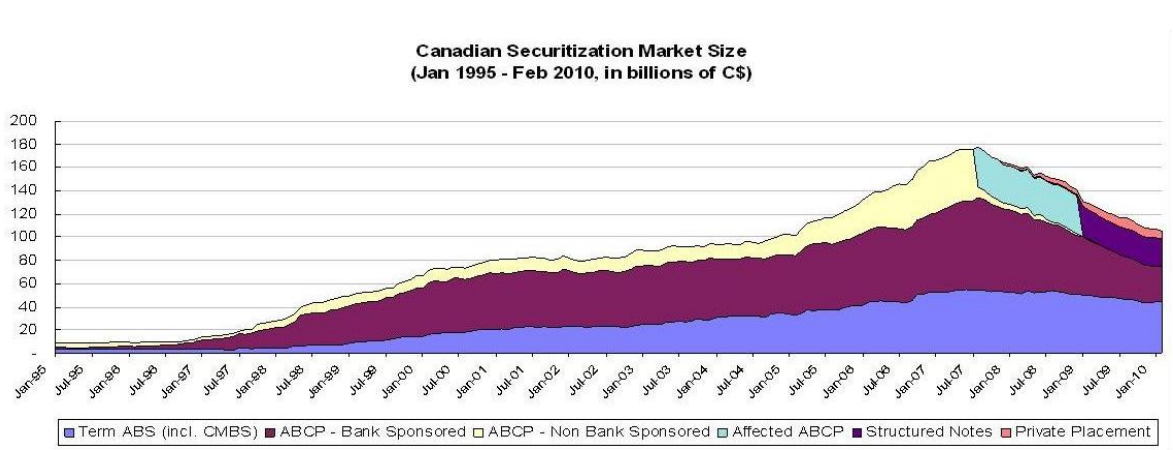

Figure 3.5: Canadian securitization market size. Source; Canadian National bank

3.1.5 The Collapse of the ABS Market

The current crisis in US and Europe has followed a pattern that has played out for decades. The crisis was preceded by excessive borrowing and a speculative bubble across different asset classes. Investors (particularly unsophisticated investors) were so confident in the securitization market to be willing to buy Subprime mortgages or very complex instruments such as CDOs which they did not understand. We can suggest that the CDOs are still a

small proportion of the securities issued in the ABS market, based on three credit rating agencies (CRAs) that track the issuance of CDO securities 3 years ago (after the peak of financial crisis), 2009 in both US and Europe yielding to a data summarized in the following picture, Figure 3.6(a)

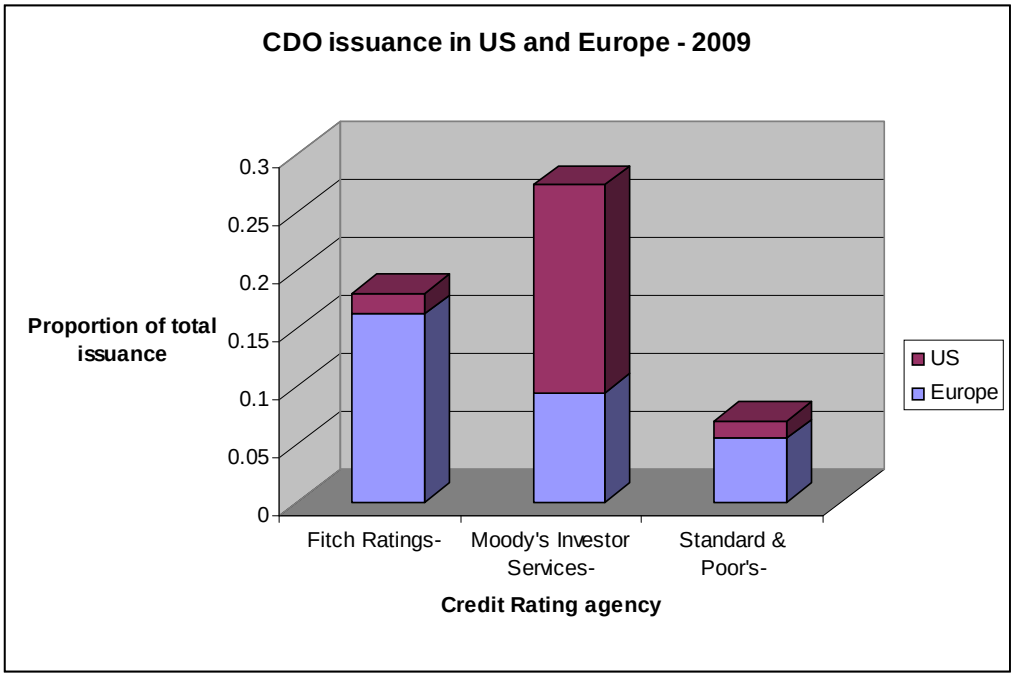

Figure 3.6(a): CDO issuance in US and Europe. Sources: Bloomberg, JP Morgan, Merrill Lynch, RBS, Thomson Financial, SIFMA

From the summer of 2007, as a consequence of the Subprime crisis in the US, the ABS market suffered large losses, with the mortgage market being the one hardest hit. Probably the turning point of the crisis was the collapse of Lehmann Brothers,. which hit hard an already shaky financial system. As a result spreads on securitized products soared and market activity across different segments of the market stopped suddenly. In this context the ABS market started shrinking even more, with bond issues backed by residential mortgages being the most affected. To help restore liquidity in the market and support the ABS security market, in November 2008 the Fed introduced the Asset Backed Securities Loan Facility (TALF). Since the introduction of TALF[8] spreads have largely dropped from historical high

[8]In effect, with the institution of the TALF, the Fed has acted as a lender of last resort as financial institutions were no longer able to raise funds using the securatisation market. Smaller non-banks lenders

of 2008. Figures 3.6(b) and 3.6(c) show how the global ABS market reacted in 2008 and 2009.

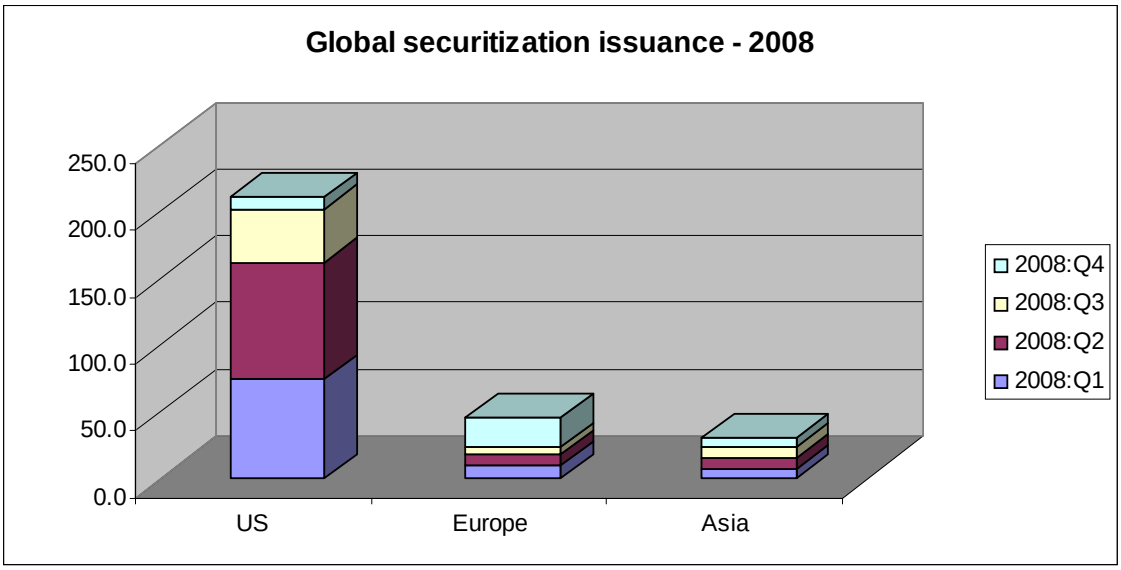

Figure 3.6(b): Global securitization issuance. Sources: Bloomberg, JP Morgan, Merrill Lynch, Thomson Financial, SIFMA

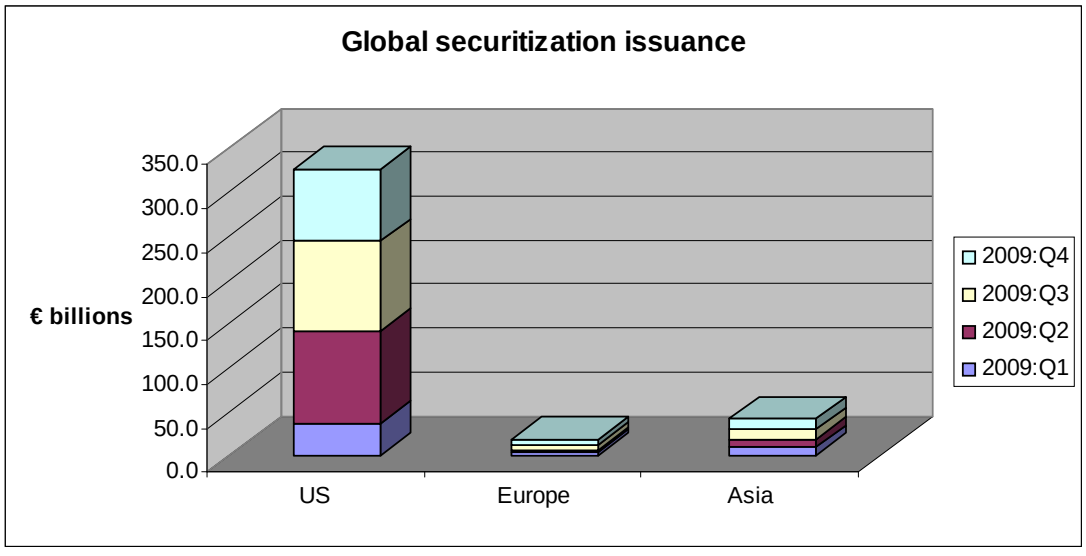

Figure 3.6(c): Global securitization issuance. Sources: Bloomberg, JP Morgan, Merrill Lynch, Thomson Financial, SIFMA

ABS dealers as well as banks held ABS structures on their balance sheets and were

have been the ones most affected since they could not have access to the TALF.

unable to sell them simply because there were no buyers at all. Investors were now "flying" towards quality assets such as Treasury bills and similar securities. Following the collapse of Lehmann Brothers investors became even more reluctant to enter in the ABS market. 'In such an illiquidity market, it was very challenging to obtain a reasonable price for these securities[9]. Given the high degree of illiquidity in the ABS market, economists have proposed different approaches to deal with this problem.

3.1.6 The Process of Securitization

The process of securitization can be described as follows. First, an entity (the originator) desiring financing identifies an asset that is suitable to use. Loans or receivables are common examples of payment streams that are securitized. Second, a special legal entity or Special Purpose Vehicles ("SPV") is created and the originator sells the assets to that SPV. This effectively separates the risk related to the original entities operations from the risk associated with collection. When done properly the loans owned by the SPV are beyond the reach of creditors in the case of bankruptcy or other financial crisis; i.e. the SPV is bankruptcy remote.

Next, to raise funds to purchase these assets the SPV issues asset-backed securities to investors in the capital markets in a private placement or pursuant to a public offering. These securities are structured to provide maximum protection from anticipated losses using credit enhancements like letters of credit, internal credit support or reserve accounts. The securities are also reviewed by credit rating agencies that conduct extensive analyses of bad-debts experiences, cash flow certainties, and rates of default. The agencies then rate the securities and they are ready for sale - usually in the form of mid-term notes with a term of three to ten years. Finally, because the underlying assets are streams of future income, a Pooling and Servicing Agreement establishes a servicing agent on behalf of the security holders. The services generally include: mailing monthly statements, collecting payments and remitting them to the investors, investor reporting, accounting, collecting on delinquent accounts, and conducting repossession and foreclosure proceedings.

[9]We shall discuss in the next sections the relationship between asymmetry, security liquidity and the ABS price.

Chart 3.1(a) shows a typical process of securitization as illustrated by Kothari (2006). We illustrate differently it in Chart 3.1(b), which shows the three main participants in securitization - the Originator, the Special Purpose Entities (SPEs) and the Investors. The credit enhancer in Chart 3.1(b) is the entity that reduces the overall credit risk of a security issue by providing senior subordinate structure, over-collateralization or a cash collateral. The Originator (seller) is an entity making loans to borrowers or having receivables from customers. SPE, also referred to as Special Purpose Vehicle (SPV), is the entity which buys assets from originator and packages them into security for further sale.

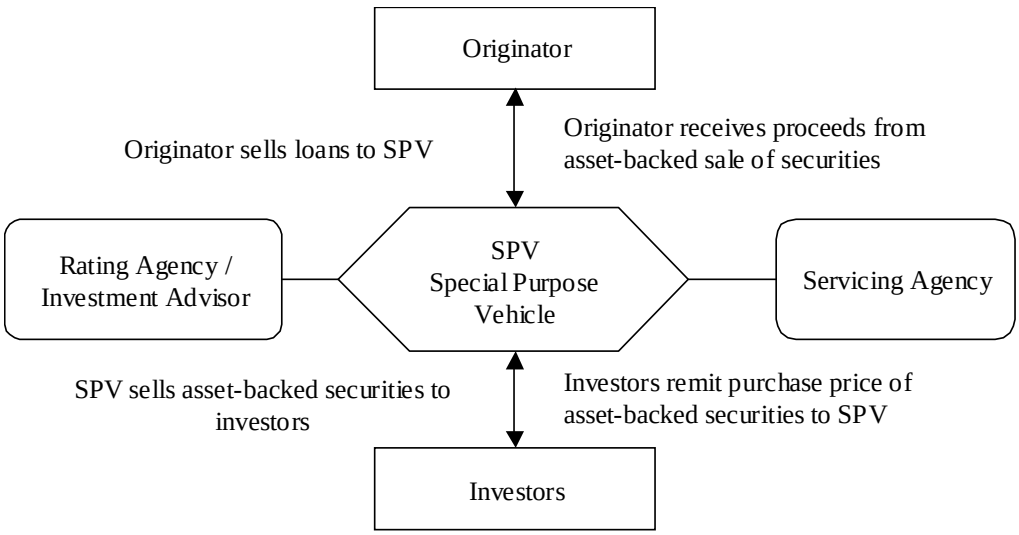

Chart 3.1 (a): Securitization process, Source: Kothari (2006)

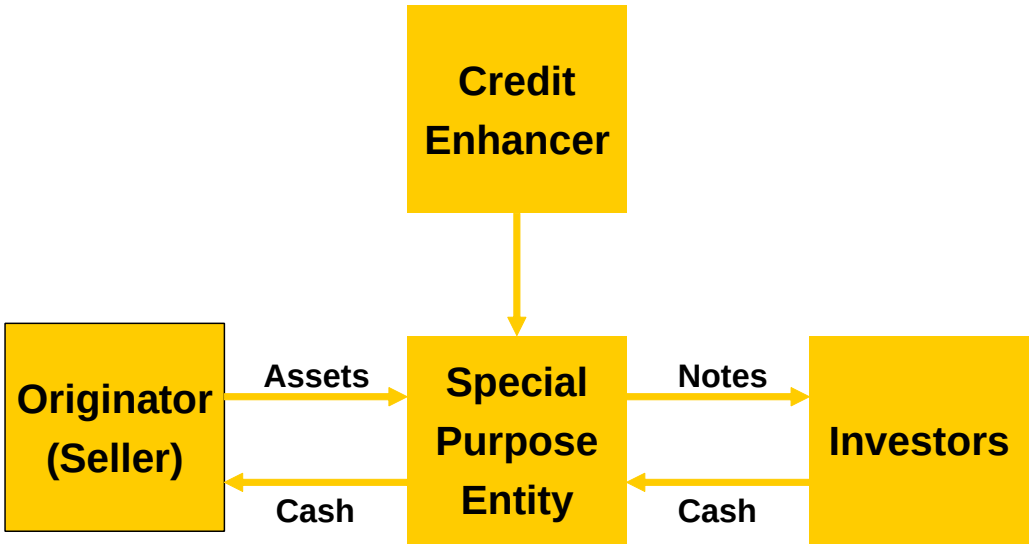

Chart 3.1(b): Process of securitization; Source: Author's illustration

3.1.7 Theoretical Reviews on Securitization

A general review of the reasons for securitization is found in Carlstrom and Samolyn (1993). An informational asymmetric model by Greenbaum and Thakor (1987), predicted that banks will securitize their best assets, retaining their worst. They analyzed the effect of the adverse selection on asset structure of financial institutions, and showed that if the financial institution possesses private information about its assets which are not available to investors, then the institution is better off if it sells and securitizes better quality assets and keeps worse quality assets on its books and finance them with deposits. Their study showed that not only the asset structure matters, but also it indicated the suitability of securitization in transforming the asset structure.

In terms of wealth creation in the process of securitization, several researches mainly focused on the US market. Lockwood et al. (1996) was one of the first papers directly testing the effects on the sellers' share prices by using the event study methodology with a sample size of 294 ABS. They showed that strong banks experience wealth gain while weak banks experience wealth loss at the time of the ABS announcement. Subsequently, Thomas (1999) came to the opposite conclusion of significant positive abnormal returns for banks' shareholders, although the returns decrease with the creditworthiness of shareholders. This

point was backed by Solano et al. (2006), which also found abnormal returns on the Spanish market.

3.1.8 Benefits of Securitization

It is worthwhile to note that the benefits of securitization can be generally classified into six main areas - means of funding, re-capitalization process, risk management, operating efficiencies, option for the rating agency and finally the management of financial statements. Table 3.2 below shows the benefits' classes in the first column and description of the benefits in the second column.

Benefit	Description
Efficient Means of Funding	■ Provides access to triple-A funding regardless of the credit rating of the seller/servicer ■ Offers a cost competitive source of funds relative to many traditional debt alternatives ■ Demonstrates an alternative source of funding assets to the rating agencies and the equity market ■ Provides perfect match funding for the assets ■ Values asset portfolios at market value as opposed to book value
Re-capitalization Purposes	■ Often reduces capital requirements, enabling capital to be redeployed to fuel growth ■ Achieves greater borrowing capacity through the higher leverage obtained in selling assets through debt financing ■ Off-balance sheet financing may provide borrowing flexibility ■ Increases balance sheet liquidity, facilitating future originations
Risk Management	■ Generates risk-free fee income from continued servicing of assets ■ Allows for the transfer of credit risk in the portfolio ■ Provides match funding for amortizing assets as principal payments on the assets amortize the outstanding securities ■ Diversifies funding sources

Table 3.2: Benefit of securitization; Source: Author's summary

Benefit	Description
Operating Efficiencies	■ Facilitates asset and capital management – the issuer would be positioned to either sell or retain assets ■ Allows for expansion of servicing volume at the margin thereby reducing per cost of servicing ■ Provides increased control over asset pricing as a result of the market discipline provided by a securitization program
Rating Agencies	■ Demonstrates ability to access alternative liquidity ■ May provide for capital preservation ■ Initiates rating agency discussions beyond the corporate ratings group
Management of Financial Statements	■ May constitute a sale of assets for financial reporting purposes ■ Facilitates acceleration of income, if strategically desired ■ May improve net interest margin of on-balance sheet assets ■ *Improves financial ratios (i.e., ROA, ROE) related to balance sheet assets* ■ May constitute debt treatment of receivables financing for tax purposes

Table 3.2 (continued): Benefit of securitization; Source: Author's summary

We can therefore summarize the advantages of securitization as presented in the discussed literature:

- Primarily it changes relatively illiquid assets into liquid ones.
- It is a means for an entity to access future incomes while transferring non-collection risk to others.
- It allows entities to raise money in capital markets at interest rates comparable to, or lower than, other generally available sources of funds. The limited-recourse nature of this financing is preferable to debt financing, which can involve personal guarantees on a borrower's principals.
- Securitized monies are not treated as debt so it is off-balance sheet financing. This can favourably affect leverage and the debt-to-equity balance sheet ratio.
- Finally, securitization diversifies financing sources and allows companies to plan long-term projects and investments.

From the point of view of the originating banks, there are three potential benefits to be gained by securitization: Firstly, the repackaging and sale of the banks' loans results in an inflow of cash and hence securitization enables the bank to fund itself; secondly, the transfer

of credit risk to a third party - this means that, even if a bank has already lent substantially to a particular borrower or group of borrowers (for example, within a specific geographical region or sector of the economy), it can continue to lend to this same group (perhaps, for relationship reasons) because the transfer of credit risk, via securitization, reduces the issuing bank's concentration risk; thirdly, securitization may reduce the banks' regulatory capital requirements.

3.1.9 Disadvantages of securitization

Like every financial structure, a securitization structure also can have his disadvantages, such as: First, the synchronisation of the interest generated by the pool and the interest paid to the investors is a very arduous and tedious process. Secondly, the transfer of mortgages may be difficult for legal, regulatory or tax reasons. In the Netherlands and in other European countries such transactions have to satisfy the requirements of regulatory authorities. The complexity of the transaction requires a very highly sophisticated documentation, which covers every potential risk. Then, numerous participants and opinions as well as the voluminous documentation are very time consuming and costly. Finally, there are disadvantages for the assignor. These include; the cost of the operation and the complexity of the procedure especially when considering the number of interveners and the costs of the financial engineering compared to those of a more classic financing operation, Kothari, (2006).

The process whereby a bank securitizes its loans and sells them onto third parties is usually termed the "originate-to-distribute" (OTD) model (as opposed to the traditional "loan-and-hold" model of using deposits to finance loans and holding the loans until maturity). For part of our empirical analysis (section 3.5), we will draw a distinction between asset-backed securities (ABSs) and collateralised debt obligations (CDOs). The former repackage the originating bank's assets (i.e. loans) while the latter repackage the bank's liabilities or synthetic instruments such as a portfolio of bonds or credit default swaps.

Anticipating our main conclusions, we show that:

1. The main driver of securitization has been liquidity i.e. the need for banks to fund their balance sheets.

2. Funding has been of greater importance in driving the issuance of ABSs than in driving the issuance of CDOs. For CDOs, regulatory capital has also been an important driver.

3. Banks which securitized tended to be larger than those which did not.

4. Those banks which had more rapid growth of their loan books, were more reliant on wholesale interbank funding and had a larger gap between the size of their loan books and their deposits were more likely to securitize.

5. Banks which securitized tended to have lower quality loan books.

6. Banks which securitized tended to have a greater proportion of non-performing loans in the aftermath of the financial crisis.

7. Large banks were the ones for which securitization was an important factor to explain profits while smaller ones were the ones whose balance sheets were most highly exposed to changes in the securitization market.

3.1.10 Trend in global securitization

Before the development of the securitization market, banks were essentially portfolio lenders using deposits to finance loans and holding the loans until maturity (the "loan-and-hold" model). Thus loans were funded principally by deposits, and sometimes by debt, which was a direct obligation of the bank (rather than a claim on specific assets). Since the 1970s, the securitization market has grown exponentially with the aggregate securitization volumes exceeding $2.08 trillion worldwide (as of December 31, 2005). The securitization market in Europe was rather undeveloped until the late 1990s. After that,, there was a significant increase in securitization activity. This increase may be linked to factors such as the greater integration of European financial markets as well as a shift towards a more market-based financial system. Figure 3.7 shows the growth of the European and US securitization market between 2000 and 2010. The European securitization market reached its peak in 2008 i.e. at the start of the financial crisis.

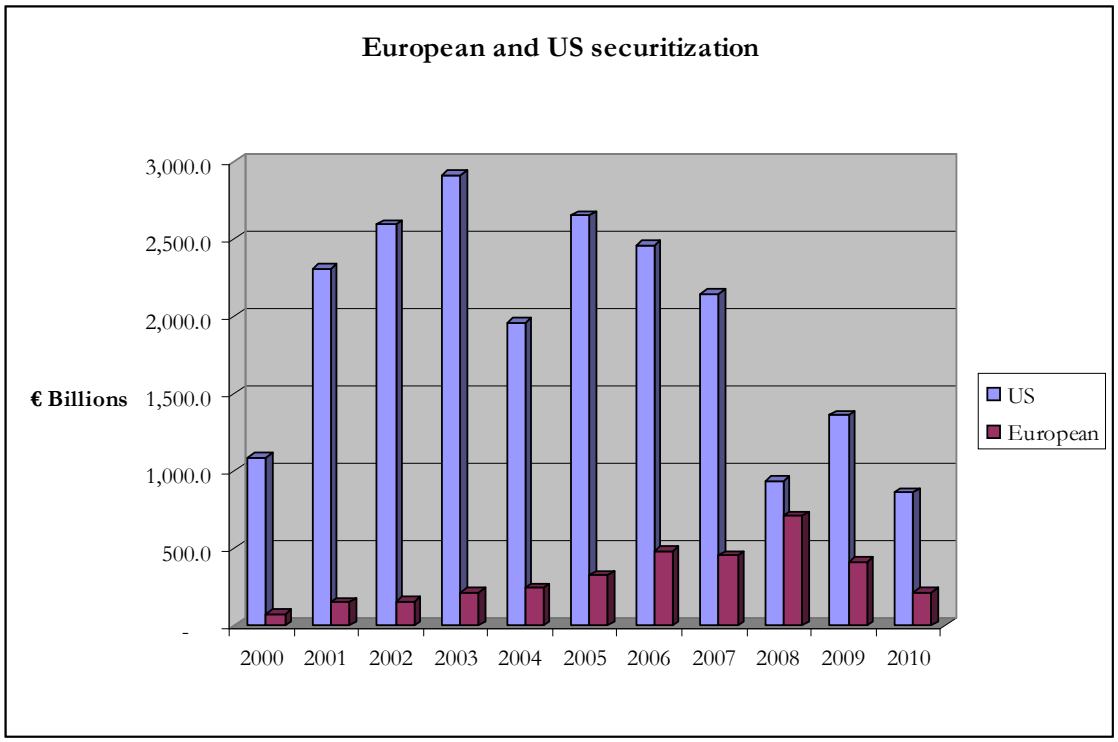

Figure 3.7: Total securitization in Europe and US between 2000 - 2010 Source - SIFMA

3.1.11 UK securitization market

Securitization in the UK has been on the increase since the end of 1990s (see Figure 9). Between 2002 and 2008, there was a dramatic increase in securitization activity. Since then, there has been an almost equally dramatic contraction.

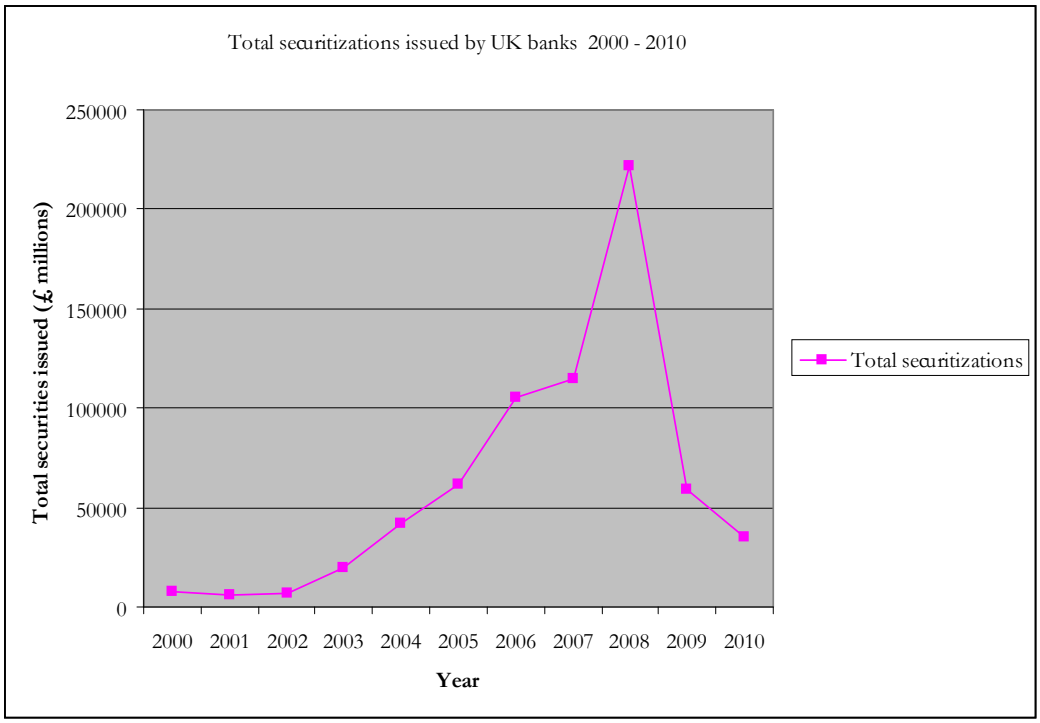

Figure 3.8: UK bank securitization 2000 - 2010; Source SIFMA

Since 2008, some regulators and political commentators have blamed securitization as being one of the main catalysts for the financial crisis. A popular viewpoint has been that banks have embraced securitization mainly for regulatory capital arbitrage [10]. Until recently, under the Basel I framework (Jackson et al. (1999)), the minimum capital that banks needed to retain was a very rough function of the level of risk held on their balance sheets. For example, a loan to a borrower needed 8% of capital, no matter what the risk of the borrower. In 1999 banking supervisors engaged in a thorough revision of the capital regulatory framework. This led to the Basel II framework in which the capital requirements of banks were thought to be better aligned with the risk profile of their portfolios. Thus banks were expected to hold a higher level of capital for loans granted to higher-risk borrowers. As a consequence of the 2007-2008 financial crisis, regulators are now discussing ways to implement a new regulatory (Basel III) framework to account for the main drawbacks of the Basel II framework.

[10]Regulatory capital arbitrage is any transaction that has little or no economic impact on a financial institution while either increasing its capital or decreasing its regulatory capital requirement.

The rest of this chapter is organized as follows. In the remainder of this section, we discuss the trends in global securitization, paying specific attention to the UK. In section 2, we review the extant literature. In sections 3 and 4, we describe the data, methodology used in this study and results, section 5 discusses policy implications of our findings for regulators and monetary authorities and section 6 has the robustness analysis whilst section 7 concludes.

3.2 RELATED STUDIES ON SECURITIZATION

In this section, we review the extant literature on securitization.

DeMarzo and Duffie (1999) and DeMarzo (2005) conducted a theoretical analysis of securitization. These papers build a model for security design which, although not specifically designed for the securitization market, fit important applications such as asset-backed securities. They show that liquidity (a bank's need to fund its balance sheet) is an important driver for security design.

There has not been a large number of empirical studies which have tried to shed some light on why banks use securitization. Cardone-Riportella et al. (2010) is a notable exception. They use a Logit regression model applied to data on 408 Spanish banks to investigate the causes of the growth of securitization in Spain. Their results show that liquidity and the search for improved performance are the decisive factors for securitization, whilst they find very little evidence supporting credit risk transfer and regulatory capital arbitrage as motivating reasons. This result is consistent with the predictions of the DeMarzo and Duffie (1999) model (i.e. the desire for low-cost funding incentivizes the growth of the securitization market).

Hänsel and Krahnen (2007) investigate whether the use of credit derivatives affects the risk taken by large banks. Using a unique data-set of European Collateralized Debt Obligations (CDOs), they find that the issuance of CDOs tends to raise the systematic risk (equity beta) of the issuing bank. They also perform a cross-sectional analysis to identify the determinants of the change in systematic risk and find that equity beta increases significantly if the issuing bank is financially weak (low profitability and high leverage). Overall, their

findings suggest that credit securitization goes hand in hand with an increase in the risk appetite of the issuing bank.

Dionne and Harchaoui (2008), using data for Canadian banks, investigate the effects of securitization (rather than the reasons for it) on the risks incurred by the banks. They conclude that there is a positive relation between securitization and banks' risk (defined to include interest rate risk, market risk, liquidity risk and credit risk, as well as systemic risks). Furthermore, they empirically show that securitization has a negative impact on Tier 1 capital[11]. Although this study makes an important contribution to the empirical literature, it does not address the fundamental question of why Canadian banks use securitization in the first place.

Affinito and Tagliaferri (2008) investigate the determinants for loan securitization in Italy using data for Italian banks over the period 2000 to 2006. They show that, although securitization is a composite decision, capital requirements play a driving role, suggesting that Basel I may have created perverse regulatory incentives to move exposures off the balance sheet. The empirical results confirm the widespread opinion that bank securitization was a mechanism to engage in regulatory capital arbitrage. The main issue with that study is that, compared with other countries such as the USA, the UK and Spain, securitization in Italy has never been a widespread phenomenon. Indeed, Italian banks have mainly used customers' deposits to finance their loan positions and the securitization market has been concentrated in the hands of a very small percentage of Italian banks. Therefore, the main conclusion of Affinito and Tagliaferri (2008) might not be applicable in other countries.

Purnanandam (2011) investigates the originate-to-distribute (OTD) model of bank lending in the US and concludes that lack of borrower screening, coupled with leverage-induced risk-taking, contributed significantly to the sub-prime mortgage crisis.

Loutskina and Strahant (2009) consider the volume of jumbo mortgage originations relative to non jumbo originations and find that it increases with bank holdings of liquid assets and decreases with bank deposit costs. This result suggests that the increasing depth of the mortgage secondary market fostered by securitization has reduced the effect of a lender's

[11]Tier 1 capital is the core measure of a bank's financial strength from a regulator's point of view. It is composed of core capital, which consists primarily of common stock and disclosed reserves (or retained earnings), but may also include non-redeemable non-cumulative preferred stock.

financial condition on credit supply. Uzun and Webb (2007), using a panel of 112 banks in the US which use securitization and a matched panel of banks which did not use securitization, find that bank size is a significant determinant of whether a bank securitized its loans and it is negatively related to the bank's capital ratios[12]. This provides some support for the hypothesis that securitization is linked to regulatory capital arbitrage.

To summarize, we conclude that there is still mixed evidence of why banks use securitization.

3.2.1 Link between the existing literature and our study

Despite the size of the securitization markets and the popular viewpoint that securitization partially led to the financial crisis, there have been only a few studies which have tried to shed some light on why banks used securitization and the effect of the OTD business model on banks' balance sheets after the financial crisis. In this chapter, we attempt to address these issues using a unique dataset for UK banks. We seek to determine whether the liquidity motive is the dominant one or, on the other hand, whether it is the regulatory capital arbitrage or the credit risk transfer reasons that drove the increased securitization by UK banks before the financial crisis. We focus on the UK since it can be regarded as the securitization laboratory of the world. In fact, many of the securitization products widely used by the financial industry across the world have been developed in the UK. Furthermore, the UK securitization market is the largest market in Europe.

In contrast to most other studies that have considered the aggregate securitization (i.e. including both ABSs (assets) and CDOs (liabilities)) of banks, we split securitization into two separate categories - ABSs and CDOs - reflecting that these two different classes of securitization may serve different purposes.

If investors, banks, regulators and politicians are to make informed decisions about the

[12]These are ratios measuring a bank's financial stability, where, as a general rule, the higher the ratio the better the bank's financial position. A standard capital ratio is:
Total Capital Adequacy Ratio which is defined as Tier 1 Capital plus Tier 2 Capital divided by risk-weighted assets (see section 3.2.2).

future of our financial system, then we need the answer to the question: "Why do banks securitize"? This is the question we address here.

3.3 DESCRIPTION OF THE DATA

The data-set used in this study, is constructed using Bloomberg and Bankscope, covering the securitization market in the UK during the period 2000 to 2010. This data-set includes annual accounts[13] for 690 UK banks. The (annual) data-set covers commercial banks, real estate and mortgage banks, investment banks, securities firms, investment and trust corporations, specialized governmental credit institutions, Islamic banks, non-banking credit institutions, all types of bank holdings in the UK, micro-financing institutions, private banking institutions, asset management institutions, retail finance companies, clearing and custody institutions, group finance companies and corporative banks. It is worthwhile to note that 484 banks (70% of the total sample considered) have survived between 2000 to 2010. Table 3.3 shows the composition of our data-set (over the period 2000-2010) by specialization:

[13]Both the consolidated and unconsolidated statements are used to screen the banks on Bankscope.
Only one bank (Investec group) had aggregated statement with no companion, 74 banks had statements of a mother bank integrating the statements of its controlled subsidiaries or branches with no unconsolidated companion, 200 had statements of a mother bank integrating the statements of its controlled subsidiaries or branches with an unconsolidated companion, 456 were banks with statements not integrating the statements of the possible controlled subsidiaries or branches of the concerned bank with no consolidated companion.

Table 3.3: The number of UK banks per specialisation for period 2000 - 2010

This table shows that the number of bank with respect to the classification in a given year. For example there were 41 banks in 2000 and increased to 46 in 2001, 50 commercial banks in 2010 there are 225 commercial banks. This is also gives the total number of commercial banks in our time period. The totals per column give the total number of banks in a given year considering all classifications.

Bank	Year											
Specialization	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Commercial	41	46	50	59	64	72	84	87	102	198	225	225
Real estate & Mortgage	11	11	13	13	14	17	20	25	29	64	82	82
Investment	11	12	14	15	16	16	17	18	23	62	70	70
Securities	9	10	11	12	13	15	18	18	32	64	69	69
Savings	2	2	2	2	2	2	2	2	2	7	7	7
Other classification[14]	33	41	43	49	58	65	74	79	104	190	237	237
Total	107	122	133	150	167	187	215	229	302	595	690	690

The largest single group of banks are commercial banks (225 banks), while savings banks (7 banks) are the smallest group. The other groups of banks are real estate and mortgage banks (82 banks), investment banks (70 banks) and securities firms (69 banks). The remaining 237 banks are all included under other specializations. A number of commercial banks and securities firms had their last information available for the year 2008, which is, perhaps, an indication of the effect of the financial crisis on the banking sector.

The UK based banks include 92.61% foreign banks while 7.39% being the British owned banks. The list of British owned banks is quite short as British banking has been highly consolidated. The list[15] of the banks reduced to 6% in 2008. This is accounted by the nine banks that were acquired or had mergers. Northern Rock was one of the banks that was nationalized by the UK Government, while Bradford & Bingley and Alliance & Leicester

[14] This include the Islamic banks, cooperative banks, non-banking credit institutions, bank holdings, central banks, micro-financing, private banking and asset management banks, finance companies, specialized governmental credit institutions, and multilateral government banks.

[15] http://www.fsa.gov.uk/library/other_publications/banks

were acquired by Santander. This was followed by a single bank acquisition in 2009 and 2010. Hence only 5.65% of the UK based banks in 2011 are British owned banks.

3.3.1 UK bank data

We divide the data-set into two main sub-samples. The first sample contains data for banks that recorded at least one securitization activity during the period 2000-2010. The second group contains data for banks that did not use securitization at all. We note that 527 banks issued securities at least once between 2000 to 2010. Table 3.4 shows the percentage[16] of banks using securitization. We can see that the highest percentage of securitization activity was recorded by investment banks; 97% of the total number of investment banks securitized at least once between 2000 and 2010. Commercial banks have the lowest percentage (71%)[17]. The high proportion of real estate and mortgage banks, securities firms, investment banks and even savings banks involved in securitization, suggests that most UK banks have been actively involved in securitization in the last decade. Hence, with the current securitization trend, UK banks may no longer be deposit takers with a "loan-and-hold" business model but instead have become originators of loans and issuers of securities with an "originate-to-distribute" business model. Two of the main contributions of this thesis are to shed some light on what caused the change in business model and how the change impacted on banks' default rates after the financial crisis.

[16]The percentage of securitizing banks:
$\frac{\text{Number of securitizing commercial banks in 2000}}{\text{total number of commercial banks in 2000}} = \frac{27}{41} = 66\%$

[17]The total percentage of banks securitizing within the given bank specialisation is calculated as follows
$\frac{\text{Total number of securitizing commercial banks between 2000 and 2010}}{\text{total number of commercial banks between 2000 and 2010}} = \frac{159}{225} = 71\%$

Table 3.4: The percentage composition of UK banks that securitized for period 2000 - 2010

This table shows the percentage of banks using securitization. The percentage of securitizing banks is computed as the number of securitizing banks at a given time divided by the number of banks considered in the data at the same time. The formula is given as follows

$$\frac{\text{Total number of securitizing commercial banks between 2000 and 2010}}{\text{total number of commercial banks between 2000 and 2010}} * 100\%$$

Bank	Year											
Specialisation	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
Commercial	27	30	33	36	38	43	50	52	60	132	159	159
	66%	60%	75%	33%	40%	63%	58%	67%	53%	75%	100%	71%
Real state & Mortgage	10	10	11	11	12	14	17	21	23	55	69	69
	91%	0%	50%	0%	100%	67%	100%	80%	50%	91%	78%	84%
Investment	11	12	12	13	14	14	15	16	21	60	68	68
	100%	100%	0%	100%	100%	0	100%	100%	100%	100%	100%	97%
Securities	9	10	10	10	11	12	12	12	23	50	55	55
	100%	100%	0%	0%	100%	50%	0%	0%	79%	84%	100%	80%
Savings	1	1	1	1	1	1	1	1	1	6	6	6
	50%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	86%
Other specializations	28	33	35	38	43	48	55	58	74	130	170	170
	85%	63%	100%	50%	56%	71%	78%	60%	64%	65%	85%	72%
Total	86	96	102	109	119	132	150	160	202	433	527	527
	80%	67%	55%	41%	59%	65%	64%	71%	67%	79%	90%	76%

3.3.2 Definition of Variables:

The total amount of securitization[18] for each bank is constructed from the reported information in the Bankscope database (which comes from banks' annual accounts) on an annual

[18]This is the sum of securities (i.e. Asset-Backed Securities (ABSs) and Collateralized Debt Obligations (CDOs)) issued by each bank and is constructed from the reported information in the Bankscope database on an annual basis for the period 2000 to 2010.

basis for the period 2000 to 2010.

In the first part of this study, we build on Cardone-Riportella et al. (2010) and consider variables which are good proxies for funding (i.e. liquidity risk), regulatory capital arbitrage and credit risk transfer.

We now discuss these proxies in detail.

3.3.2.1 Funding as motivator for securitization Some of the empirical studies cited earlier find that funding (liquidity risk) is an important driver of securitization, (L_i, $i = 1$ to 6). We study the effect of six different measures of liquidity on whether banks chose to securitize or not.

The first proxy for liquidity that we use is the Interbank Ratio. This is defined as the money lent to other banks divided by the money borrowed from other banks (all our proxies are expressed as a percentage). If one views customer deposits as core funding, i.e. a stable source of funds, then a measure of the liquidity risk that banks face is the degree to which banks rely on interbank (i.e. wholesale money-market) funding. The Interbank Ratio is shown in the formula below (money due from banks divided by money due to banks - here, due means the money owed irrespective of whether the time of payment has arrived or not):

$$\text{Interbank Ratio} = \frac{\text{Due from Banks}}{\text{Due to Banks}} \times 100 \tag{L1}$$

An Interbank Ratio greater than 100, means that the bank is a net liquidity provider to the rest of the banking sector i.e. the bank is a net placer rather than a net borrower of funds in the market and therefore it is more liquid. An Interbank Ratio smaller than 100 implies that the bank is a net liquidity buyer. For the largest banks in the world, the average interbank ratio is 74.6% (see table 5). These large banks, in aggregate, are net borrowers from the interbank market, relying on smaller banks, postal savings banks and credit unions, etc., to supply them with the funding necessary to support their loan portfolios.

In the second proxy, we consider the ratio of liquid assets to deposits and short term funding. The numerator is computed from all reserve assets (and hence implicitly assumes

that all are equally liquid). This ratio can be considered as a deposit run off ratio since it is a proxy for what percentage of customer deposits and short term funding could be met if they were withdrawn suddenly. The higher this ratio, the more liquid the bank is and the less vulnerable it is to a classic run on the bank. The world average ratio is 21% (see table 5).

$$\text{Liquid Assets / Deposits \& Short - term Funding} = \frac{\text{Liquid Assets}}{\text{Customer \& Short - term Funding}} \times 100 \tag{L2}$$

This ratio is the total amount of liquid assets available divided by the sum of deposits and borrowing.

The fourth proxy for liquidity is the ratio of net loans to deposits and short term funding. This is often called reserves-to-deposits. In this ratio, all loans are considered equally illiquid (which is clearly a strong assumption). A higher ratio indicates a less liquid bank. The world average of loans to deposits is about 68.5% (see table 5).

$$\text{Net Loans / Deposits \& Short - term Funding} = \frac{\text{Loans}}{\text{Customer \& Short - term Funding}} \times 100 \tag{L4}$$

The ratio of net loans to total assets indicates what percentage of the assets of the bank are tied up in loans. The higher the ratio the less liquid the bank is.

This is a similar ratio to the previous one. The main difference is that the denominator is now replaced by total deposits and borrowing.

$$\frac{\text{Loans}}{\text{Customer \& S.T. funding + Other funding - total liability \& equity - subordinate debt}} \times 100\% \tag{L6}$$

3.3.2.2 Regulatory Capital Arbitrage The second group of variables that we consider (a total of seven) are proxies for regulatory capital arbitrage, (C_j, $j = 1$ to 7).

Capital funds are defined as the sum of equity capital, hybrid capital and long-term subordinated debt. The ratio of capital funds to customer and short term funding is defined

as below.

$$\frac{\text{Equity + Hybrid capital + subordinate debt}}{\text{Customer funding \& S.T. funding}} \times 100\% \tag{C1}$$

We also consider the ratio of capital funds to net loans. The ratio is given by:

$$\frac{\text{Equity + Hybrid capital + subordinate debt}}{\text{Net Loans}} \times 100\% \tag{C2}$$

This ratio is a measure of the general financial soundness of the capital structure. The higher the ratio, the better is the solvency position of the bank.

$$\text{Cap Funds / Total Assets} = \frac{\text{(Equity + Hybrid capital + Subordinated debt}}{\text{Total liability + Equity}} \times 100 \tag{C3}$$

This leverage ratio is simply another way of looking at the equity funding of the balance sheet and is an alternative measure of capital adequacy.

$$\frac{\text{Equity}}{\text{Total liability \& Equity - Hybrid capital - subordinate debt}} \times 100\% \tag{C4}$$

The equity to total assets ratio measures the amount of equity protection that a bank has in place against loan impairment. The higher this ratio, the more protection the bank has. The ratio is computed as:

$$\text{Equity / Total Assets} = \frac{\text{Equity}}{\text{Total Liability \& Equity}} \times 100 \tag{C5}$$

Tier 1 ratio measures shareholder funds plus perpetual non cumulative preference shares as a percentage of risk weighted assets and off balance sheet risks as measured under the Basel rules. This should be at least 4%.[19]. Tier I Capital is the actual contributed equity plus retained earnings. It is used to describe the capital adequacy of a bank (it is its core

[19]The Basel I agreement stipulated that Tier 1 capital should be a minimum of 4% although anecdotal evidence suggests that most investors will generally require a ratio of 10% or more in the aftermath of the financial crisis. The proposal in Basel III will increase Tier 1 capital during the January 2015 phase, from 4% to 6%.

capital). Generally, shareholders' equity and retained earnings are referred to as "Core" Tier 1 capital [20]. This ratio is given by:

$$\text{Tier 1 Capital / Risk - weighted Assets} = \frac{\text{Tier 1 Capital}}{\text{Risk - weighted Assets}} \times 100 \tag{C6}$$

The final variable that we consider is the Total Capital Adequacy Ratio. This is the sum of Tier 1 + Tier 2 capital divided by risk weighted assets[21]. (expressed as a percentage). Under the Basel II and III frameworks, this ratio should be at least 8%. It is calculated internally by the bank in question. The Total Capital Adequacy Ratio is a measure of the amount of a bank's core capital expressed as a percentage of its assets weighted by its credit exposure and is calculated as:

$$\text{CAR} = \frac{\text{Tier 1 capital} + \text{Tier 2 capital}}{\text{Risk - weighted assets}} \tag{C7}$$

3.3.2.3 Credit risk transfer Credit risk is the risk that a counter-party will default or delay payment on an obligation or that the value of a flow of payments will decline due to an adverse movement in the counter-party's credit rating. Securitization offers banks the opportunity to transfer credit risk to third parties. We consider six credit risk ratios, (R_k, $k = 1$ to 6).

These are loans that may not be recovered and are not covered by equity. This indicates the weakness of the loan portfolio relative to the bank's capital. The higher this percentage, the worse is the bank's position.

[20] This include: common stockholders' equity, perpetual preferred stock, redeemable securities of subsidiary trusts, accumulated net gains on cash flow hedges, intangible assets, goodwill, other disallowed intangible assets, investment in certain subsidiaries among others

[21] Risk-weighted assets are a bank's assets weighted according to credit risk. Some assets, such as debentures, are assigned a higher risk than others such as government bonds. Banks' assets are classified and grouped in five categories according to credit risk, carrying risk weights of zero (for example, home country sovereign debt), twenty, fifty, eighty and up to one hundred percent (the latter category has, for example, most corporate debt). Banks with an international presence are required to hold capital equal to 8% of risk-weighted assets.

This ratio is a measure of the amount of total loans which are doubtful. The lower the ratio, the better the quality of the assets.

$$\text{Non performing loans/Gross loans} = \frac{\text{Non performing loans}}{\text{Gross loans}} \times 100 \tag{R2}$$

This ratio shows the relationship between the loan loss and the net interest income over the same period.

The fourth ratio we consider is the loan loss reserve to gross loans. This ratio indicates how much of the total portfolio has been provided for but not charged off. It is a reserve for losses expressed as percentage of total loans. The higher the ratio, the poorer the quality of the loan portfolio.

$$\text{Loan Loss Reserve / Gross Loans} = \frac{\text{Loan Loss Reserve}}{\text{/ Gross Loans}} \times 100 \tag{R4}$$

These are loans that may not be recovered and are not covered by reserves. It shows what percentage of the bank's capital would be written off if the accumulated impairment reserves were 100% of impaired loans and how vulnerable a bank's capital ratio would be as a result.

These are loans that may not be recovered and are not covered by reserves. It shows what percentage of the bank's capital would be written off if the accumulated impairment reserves were 100% of impaired loans and how vulnerable a bank's capital ratio would be as a result.

We define a charge-off as a debt that has been determined uncollectible by the original creditor, usually after the debtor has become seriously delinquent. Charge-offs often occur after six months of non-payment.

$$\text{Net Charge Offs/Average Loans} = \frac{\text{Year - to - Date Charge Offs - Year - to - Date Recoveries}}{\text{Year - to - Date Average Loans}} \times 100\% \tag{R6}$$

The net charge-off to average loans ratio indicates what percentage of the loan portfolio has been cancelled by the balance sheet as it is considered definitely not recoverable. The lower the ratio, the better is the bank's position.

For control purposes, we also include a general characteristic of the originating entity in the analysis as an additional regressor, namely the size of the bank. We analyze the impact of bank size, which we measure as the natural logarithm of the bank's total assets.

3.3.3 The methodology

The main objective of this chapter is to correctly identify and measure the significant determinants behind the securitization behavior of UK banks. In the literature, some authors (Sagarra, M. et.al, 2012) in their study on the determinant factors of securitization by Spanish banks, use the most parsimonious model. They choose their model in order to avoid those variables that do not add relevant information. They did this by entering the variables into the model in a stepwise fashion. The process was done by finding the best fitting equation model, using the maximum likelihood method. In order to obtain the final model with the stepwise process they started with a base model, that only composed by the control variables (i.e. size and year dummies). Next they added all the variables from each group of determinants, one by one, while seeking a reduction of the likelihood ratio (i.e., -2 log likelihood value) and controlling for a substantial improvement of the chi square value, depending on the degrees of freedom considered for the new variables entered in each model.

The final model that Sagarra, M. et.al, (2012) finally arrived at, is similar to the model we use in this chapter. Their model considered is the same variables defined above. They had S being the dependent variable and refers to the bank asset securitization, while the group of explanatory variables is composed by proxy variables for the four main determinants of securitization, and by the group of control variables.

$$S_{i,t} = b_0 + b_1 \cdot CapitalRatio_{i,t-1} + b_2 \cdot LoanLossProvisions/NetInterestRevenue_{i,t-1} + \quad (3.5)$$

$$b_3 \cdot NetLoans/(Dep + STFunding)_{i,t-1} + b_4 \cdot CIR_{i,t-1} +$$

$$b_5 \cdot Size(LnTA)_{i,t-1} + b_6 \cdot Banktype_{i,t} + b_7 \cdot Year_{i,t} + \epsilon_{i,t}$$

Mazzuca and Battaglia, (2011) in the study on effects of bank securitization on the performance of Italian banks adopt the following multiple regression model:

$$y_{it} = \beta x_{i,(t-1)} + \epsilon_{i,t} \tag{3.6}$$

where the dependent variable, y_{it} ,represented by banks' plain profitability measures, a risk-adjusted performance measure and a risk indicator – is a function of different groups of regressors including some control variables – all lagged one year. Furthermore, all bank-specific characteristics refer to $(t-1)$ in order to avoid endogeneity bias. Despite that the model enabled them to get the determining factors to measure the bank performance, it was only suitable to the research aims: whether the securitization leads to wealth effects for the bank's profitability and which effects the securitization produces in terms of banks' risk. This is not similar to our bivariate research question, hence the multivariate regression was not our choice of model.

The two main literature that considered reasons of banks securitization in Spain, took a bivariate model approach for their study. Martin-Oliver and Saurina (2007) in the study of why Spanish banks securitized their assets considered two Probit models. First they considered a Probit regression where the variable to be explained (COVEREDBOND) is a dummy worth 1 if the bank has issued a covered bond during the year, and zero otherwise. They expected that liquidity variables would play a role in explaining such a decision and, at the same time, they expected both risk profile and solvency variables to play no role since Spanish covered bonds, when issued, did not allow for risk transfer or capital relief. The second Probit model was where the variable to be explained (ABS) is a dummy worth 1 if the bank has securitized assets that year, different from covered bonds, and zero otherwise. They also expected that liquidity variables would play a role in explaining such a securitization while, at the same time, there was room for risk profile and solvency to be significant given that the bank can use the securitization to transfer risk and to reduce capital requirements.

This model approach was also taken by Cardone-Riportella, et al (2009). Although they considered the logistic regression.

Based on the model considered in the past studies we have narrowed our variables to those in the Sagarra, M. et.al, (2010) final fitting equation model and Cardone-Riportella (2009). For this reason, we do not enter the variables into the model in a stepwise fashion as Sagarra, M. et.al (2010) did since their process was to find the best fitting equation model, using the maximum likelihood method. Our main drive is that we want to explore which are the factors behind the decision of securitizing assets in banks. Hence, the analysis of the dependent variable is a dichotomous one, taking the value 1 in case the entity has securitized for a specific year, and the value 0 in case it has not securitized that year.

3.3.3.1 Logistic regression Logistic regression (also known as the logistic model) is a form of regression which is used when the dependent variable is dichotomous (in this case, to securitise or not) and the independent variables are of any type. It is normally employed when the object is to obtain a function that would serve to predict whether an observation belongs to a particular group, or else when the object is to analyse the influence of a series of independent variables on the dependent variable (in our case, the bank's characteristics that may influence its decision to securitise or not).

We decided to use the logistic model since it is a qualitative response model in which the dependent variable is an indicator of a discrete choice, a "yes or no" decision. In general, conventional regression methods are inappropriate in these cases. Almost none of the qualitative response models can be consistently estimated with linear regression methods (Greene, 2007) and in most cases,the method of estimation is maximum likelihood. in each case, We construct the logic model that link the decision or outcome of bank's choice to securitize, at least in the spirit of regression. Our approach is to analyze in the general framework of probability models:

$$Prob(\text{sec } occurs) = Prob(Y = \text{sec}\, uritization) = F[relevant\ effects, parameters] \quad (3.7)$$

With data on the variable of interest and a set of covariates (the possible determinants of securitization), we are interested in specifying a relationship between the former and the latter. Hence it is a regression like approach for explaining a binary (0/1) dependent variable. We believe that the that a set of factors that determine securitization are all together in a vector x, in order to explain the decision, we therefore have:

$$\Pr(Y = 1|x) = F(x, \beta) \quad (3.8)$$

$$Prob(Y = 0|x) = 1 - F(x, \beta)$$

The set of parameters β reflects the impact of changes in x on the probability. The problem at this point is to devise a suitable model for the right-hand side of the equation. One possibility is to retain the familiar linear regression,

$$F(x, \beta) = x'\beta \quad (3.9)$$

Since

$$E[y|x] = F(x, \beta) \quad (3.10)$$

We can construct the logic regression model,

$$y = E[y|x] + (y - E[y|x]) = x' + \epsilon. \quad (3.11)$$

Our requirement, then, is a model that will produce predictions of the main determinants of securitization, consistent with the underlying binary model theory in equation (3.11)

above. Therefore we consider the following Cumulative Distribution Function (CDF) for a Logit model:

$$\Pr\left(Y_i = 1 \mid L_i, C_j, R_k, \alpha, \beta_i\ , \gamma_j\ , \delta_k\ \right) = \frac{\exp(\alpha + \sum_{i=1}^{6} \beta_i\ L_{i,t-1} + \sum_{j=1}^{7} \gamma_j\ C_{j,t-1} + \sum_{k=1}^{6} \delta_k\ R_{k,t-1})}{1 + \exp(\alpha + \sum_{i=1}^{6} \beta_i\ L_{i,t-1} + \sum_{j=1}^{7} \gamma_j\ C_{j,t-1} + \sum_{k=1}^{6} \delta_k\ R_{k,t-1})} \tag{3.12}$$

where if bank i, $i = 1, 2..., N$ securitized over the period under consideration, $Y_i = 1$, otherwise $Y_i = 0$. We let $L_{i,t-1}$ denote the funding ratios, $C_{j,t-1}$ denote the regulatory capital ratios and $R_{k,t-1}$ denote the credit risk transfer ratios described above. The general model we estimate can be written as in equation (3.13) below.

$$Y_{i,t} = \alpha + \sum_{i=1}^{6} \beta_i\ L_{i,t-1} + \sum_{j=1}^{7} \gamma_j\ C_{j,t-1} + \sum_{k=1}^{6} \delta_k\ R_{k,t-1} \tag{3.13}$$

$$p = \Pr(Y_i = 1 \mid L_i, C_j, R_k, \alpha, \beta_i\ , \gamma_j\ , \delta_k\ ) = \frac{e^{Y_i}}{1 + e^{Y_i}} = \frac{1}{1 + e^{-Y_i}}. \tag{3.14}$$

All explanatory variable in equation (3.6), are lagged one period to avoid potential problems of endogeneity. The relationship between the dependent variable Y_i and the probability p that a bank records a securitization activity over a period of one year is given equation (3.7).

To deal with potential problems of endogeneity we have performed all the analyses taking the explanatory variables or regressors with a one-period lag. On the other hand, since we are using panel data for our estimations, all the models are run using random effects to deal with the unobserved heterogeneity across entities that the explanatory variables cannot capture. A simple model assumes that the regression constant is the same for all cross-sectional units. However, it is likely that we need to control the "individual" character in each entity. One problem with fixed effect estimations is that it is no longer possible to separate, in discrete choice models, the parameters accompanying the regressors in the likelihood function from the parameters of the effects (in case of being fixed, they are dummies and, therefore, they come with their respective parameters). Under these circumstances we cannot obtain consistent (unbiased) estimators.

Table 3.5 shows the expected signs for the explanatory variables in the model above. We expect that the first three ratios measuring liquidity (interbank ratio, liquid assets to deposits and short term funding and liquid assets to total deposits and borrowing) should make a negative contribution to the probability of securitization while we expect that the remaining three ratios should make a positive contribution. The regulatory capital ratios are all expected to be negative while the credit risk transfer ratios and the control variable representing banks size are all expected to be positive.

Table 3.5: Expected sign for the model

In this table, we have the expected signs of the explanatory variables. (+) implies the positive contribution of the variable to the securitization process while (-) implies negative contribution

Variable	Expected sign
Funding	
Interbank ratio	(-)
Liquid assets/Customer deposits & ST funding	(-)
Liquid assets/Total deposits & borrowing	(-)
Net loans/Deposits & ST funding	(+)
Net loans /Total assets	(+)
Net loans/Total deposits & Borrowing	(+)
Capital regulation	
Cap.Funds/Deposits & ST funding	(-)
Cap.Funds/Net loans	(-)
Cap. Funds / Total assets	(-)
Equity/Liabilities	(-)
Equity/Total assets	(-)
Tier 1 Ratio	(-)
Total capital ratio	(-)
Risk transfer	
Impaired loans/Equity	(+)
Impaired loans/ Gross loans	(+)
Loan loss prov. / Net int.Rev	(+)
Loan loss Res. / Gross loans	(+)
Unreserved impaired loans /Equity	(+)
Net charge-off/Average Gross loans	(+)
Size	
Log total assets	(+)

3.4 RESULTS

3.4.1 Descriptive statistics

We start with some descriptive statistics of our sample of UK banks (there are 690 banks in total) which we split into two sub-samples: banks that securitized at least once during the period 2000 to 2010 (a total of 527 banks - see Table 3.6a) and those that did not participate in securitization at all during the period 2000 to 2010 (consisting of 163 banks - see Table 3.4b).

We make some general observations. We note that the Interbank Ratio (L_1) is lower in banks that did not securitize their assets (42.2% for non securitizing banks against 73.6% for securitizing). The Interbank Ratio for both samples are significantly less than 100. Hence, UK banks, in aggregate, are net liquidity buyers. We may be able to interpret this result as tentative evidence that banks turn to securitization as a source of funds.

The mean percentage of liquid assets to deposits and short term funding (L_2) is 53.9% for banks that are involved in securitization compared to 59.7% for those that did not securitize. This may suggest that UK banks are, generally, highly liquid (the ratios are higher than the world average ratio, 21%-see table 5)[22]. The ratio is lower for banks that used securitization. The other liquidity ratios (net loans to deposits and short-term funding) give similar results. Again, these results may tentatively suggest that UK banks are using securitization to raise funds. It is also important to note that the ratios for both groups of banks are less than the world ratio (68.5%) which would confirm the high liquidity of UK banks in comparison to the world average.

We now consider the credit risk transfer ratios. We start with the loan loss reserve to gross loans (R_4). This ratio is 5.1% for banks that use securitization compared with 1% for banks that do not use it. The world average (see Table 3.7) is 2%. This may indicate that the quality of loans issued by UK banks that securitize are not, in general, of good quality, and thus banks may resort to securitization in order to transfer credit risk.

The non-performing loans to the gross loans ratio (R_2) is 5% for banks that use secu-

[22]Table 5 shows the world averages values of ratios available in Bank-scope. 30,052 banks have been used from north America, Asia, Eastern Europe, Western Europe, Middle East, Africa, Oceania.

ritization versus 0.38% for banks that did not use it. Again, this result may suggest that securitization is used as a way to transfer credit risk. Banks that did not securitize have a lower ratio which may imply that their assets are of higher quality. Finally, we consider the regulatory capital ratios. Banks that use securitization (see Table 3.6 (a)) have, on average, a lower Total Capital Adequacy Ratio (C_7) than those that do not (see Table 6 (b)) use it (3.8% against 4.6%). It is also important to note that in both cases, the ratio is significantly lower than the minimum 8% expected under Basel II. Both the two groups (i.e. banks that use securitization and those that do not use) have lower Tier 1 ratio (C_6) than the required Basel II's minimum requirement of 4%. We note that under Basel III the Tier 1 ratio is expected to be 6% and also that the sample includes the security firms and other non- bank financial institutions that are not bound to Basel regulation. The equity to total asset ratio (C_5) is lower for banks that use securitization than banks that do not use it (22% versus 29%). Thus, banks using securitization seem to have a lower cushion or protection than banks that do not use it. Banks which use securitization are, on average, larger (7.6 against 5.4) than those which do not.

Table 3.6 (a): Descriptive statistics, banks using securitization,

For total of 527 banks that securitized at least once during the period 2000 to 2010

	Mean	Std.Dev	Skewnesss	Kurtosis
Funding				
Interbank ratio	73.56	153.07	3.17	14.27
Liquid assets/Customer deposits & ST funding	53.85	118.47	5.36	35.30
Liquid assets/Total deposits & borrowing	42.27	101.04	5.73	41.04
Net loans/Deposits & ST funding	51.75	84.35	5.11	39.19
Net loans /Total assets	33.01	32.56	0.49	1.75
Net loans/Total deposits & Borrowing	33.08	49.63	5.36	66.33
Capital regulation				
Cap.Funds/Deposits & ST funding	19.29	80.40	6.39	44.19
Cap.Funds/Net loans	23.79	77.02	6.79	60.73
Cap. Funds / Total assets	8.13	16.91	3.59	17.04
Equity/Liabilities	55.58	142.93	3.60	16.54
Equity/Total assets	22.07	34.01	1.11	25.59
Tier 1 Ratio	2.48	6.53	3.53	18.42
Total capital ratio	3.82	12.71	11.39	190.29
Risk transfer				
Impaired loans/Equity	10.35	38.36	7.65	82.08
Impaired loans/ Gross loans	1.27	5.28	11.37	177.31
Loan loss prov. / Net int.Rev	16.39	58.00	1.20	61.89
Loan loss Res. / Gross loans	1.39	5.07	8.58	92.93
Unreserved impaired loans /Equity	5.14	19.69	7.09	72.88
Net charge-off/Average Gross loans	0.18	0.88	8.54	91.64
Size				
Log total assets	7.66	2.49	0.48	3.28

We have the descriptive statistics of the explanatory variables for number of securitizing banks, N=527.

Table 6 (b): Descriptive statistics, banks not using securitization

Total of 163 Banks that did not participate in securitization at all during the period 2000 to 2010

	Mean	Std.Dev	Skewnesss	Kurtosis
Funding				
Interbank ratio	42.23	145.11	4.36	23.23
Liquid assets/Customer deposits & ST funding	59.68	115.38	4.33	26.49
Liquid assets/Total deposits & borrowing	27.04	53.23	3.13	17.37
Net loans/Deposits & ST funding	5.74	30.34	3.16	29.74
Net loans /Total assets	1.00	3.19	4.52	26.32
Net loans/Total deposits & Borrowing	5.96	28.70	5.71	38.93
Capital regulation				
Cap.Funds/Deposits & ST funding	10.52	63.60	10.84	130.06
Cap.Funds/Net loans	25.31	99.40	6.49	50.35
Cap. Funds / Total assets	4.94	13.36	4.71	27.59
Equity/Liabilities	52.18	115.88	3.17	13.19
Equity/Total assets	29.04	34.13	0.87	2.68
Tier 1 Ratio	1.01	8.66	11.86	151.95
Total capital ratio	4.58	45.31	12.86	171.49
Risk transfer				
Impaired loans/Equity	1.53	11.88	10.52	123.67
Impaired loans/ Gross loans	0.38	2.25	6.71	49.73
Loan loss prov. / Net int.Rev	5.74	30.34	3.16	29.75
Loan loss Res. / Gross loans	1.00	3.19	4.52	26.32
Unreserved impaired loans /Equity	4.62	59.82	13.56	185.16
Net charge-off/Average Gross loans	0.39	2.55	8.04	72.67
Size				
Log total assets	5.46	2.32	0.36	2.72

Table 3.7: World average values for the ratios (Bankscope)

Total of - Banks that from selected continents and countries, in addition to the whole world; the period 2000 to 2010

Variable	China	Japan	Rest of Asia	Europe	North America	Australia	World average
Asset quality							
Loan loss reserve/Gross loans	1.70	2.20	1.90	2.20	1.40	0.90	2.00
Loan loss reserve/Impaired loans	11.00	64.60	112.80	77.80	185.00	255.90	70.00
Impaired loans/Gross loans	15.50	3.40	1.70	2.80	0.80	0.40	2.90
Loan loss provisions/Net interest revenue	23.70	52.20	25.10	13.80	9.20	7.30	16.20
Capital adequacy							
Basel Tier 1 capital/Risk assets	8.50	5.80	8.60	8.20	9.70	7.30	8.10
Basel total capital/ Risk assets	10.10	11.10	11.90	11.60	13.40	10.20	11.80
Equity/Total assets	3.80	4.00	7.60	4.10	8.20	7.30	5.00
Profitability and efficiency							
Return on average assets	0.40	0.20	1.00	0.50	1.10	0.90	0.60
Return on average equity	11.60	4.60	12.60	12.00	13.60	12.90	11.80
Net interest margin	2.20	1.00	2.90	1.30	2.90	2.30	1.70
Expense ratio	45.10	54.10	51.50	63.70	63.80	56.70	61.20
Liquidity							
Interbank ratio	205.10	98.10	196.10	76.40	46.50	85.20	74.60
Net loans/Deposits and Short term funding	65.30	62.10	74.80	68.40	70.00	100.60	68.50
Liquid assets/Deposits and short term funding	10.50	8.80	22.70	23.50	27.50	8.90	21.00

3.4.2 Analysis of multicollinearity

We perform an analysis of multicollinearity for the explanatory variables we use in the sample. We study the matrix of correlations, Table 3.8 (a) below, which indicates that the coefficients of bivariate correlation are all close to zero, except for that between Tier 1 ratio and Total capital ratio, which has a value of 0.6383, which is still not very close to 1. We subsequently confirm this dependence through an analysis of multicollinearity. The Variance

Inflation Factor[23] (VIF) for Tier 1 ratio reaches a value of 1.24 and 1.12 for the Total capital ratio. As a result, we can use all the ratios for the analysis, whose values for the majority of cases, are close to 1 as shown in Table 3.8(b) below.

The correlation matrix, in Table 3.8(a), shows that the explanatory variables are uncorrelated. This gives an evidence that the results in the Probit and Logit models considered earlier are free from any influence of the variables being similar. It also shows that there is not prove of observed multicollinearity despite the sheer number if variables used in the model. We use the following initials to represent the variables.

Thus, IR - the Interbank ratio, LA /D&ST F - the liquid assets/Dep &ST Funding, LA/D& B - the Liquid assets/Dep & Bor, NL /TA - the Net loans/Total assets, N L/D &ST F - the Net loans/Dep &ST funding, N Loans/T.Dep &Bor - the Net loans/Tot Dep &Bor, C F/TA - the Cap Funds/Total Assets, CF/D &ST F - the Cap Funds/Dep &ST funding, CF/NL - the Cap Funds/Net loans, E/TA - the Equity/Total Assets, E/L - the Equity/Liabilities, Tier 1 R - the Tier 1 Ratio, TCR - the Total Capital ratio, IL/GL - the Impaired loans/Gross loans, IL/E - the Impaired loans/Equity, LLP/NIRev - the Loan loss prov/Net. Int Rev, LL/GL - the Loan loss reserve/Gross loans, UR IL/E - the Unreserved impaired loans/Equity, NCO/AG L - the NCO/Average Gross loans.

[23]Variance Inflation Factors (VIF) measure how much the variance of the estimated coefficients are increased over the case of no correlation among the X variables. If no two X variables are correlated, then all the VIFs will be 1. If VIF for one of the variables is around or greater than 5, there is collinearity associated with that variable. The easy solution is: If there are two or more variables that will have a VIF around or greater than 5, one of these variables must be removed from the regression model.

Table 3.8(a); Matrix of correlation,

	CF/NL	E/TA	E/L	Tier 1 R	TCR	IL/GL	IL/E	LLP/NIRev	LL/GL	UR IL/E	NCO/AG L
CF/NL	1.0000										
E/TA	-0.0648	1.0000									
E/L	-0.0140	0.5042	1.0000								
Tier 1 R	0.0115	-0.1278	-0.0849	1.0000							
TCR	0.0110	-0.0898	-0.0318	0.6383	1.0000						
IL/GL	0.4547	-0.0921	-0.0487	0.0848	0.0792	1.0000					
IL/E	0.0567	-0.1887	-0.1226	0.1484	0.1574	0.4739	1.0000				
LLP/NIRev	-0.0590	-0.0736	-0.0449	0.0734	0.0826	0.1866	0.2246	1.0000			
LL/GL	0.1565	-0.0369	-0.0209	0.0525	0.0478	0.2199	0.1147	0.1161	1.0000		
UR IL/E	0.0816	-0.1629	-0.1029	0.1485	0.1525	0.5243	0.8962	0.1464	0.0794	1.0000	
NCO/AG L	-0.0306	-0.0577	-0.0485	0.0483	0.0477	0.1903	0.0538	0.2672	0.1936	0.0251	1.0000
Total assets	0.0228	-0.1475	-0.0920	0.1447	0.1547	0.1131	0.2606	0.0871	0.0235	0.2405	0.0264

3.4.3 Variance inflation factors

Looking at correlations only among pairs of predictors shown in the correlation matrix is limiting. It is possible that the pairwise correlations are small, and yet a linear dependence exists among three or even more variables. That's why we can use the variance inflation factors (VIF) to help us detect multicollinearity. As the name suggests, a variance inflation factor (VIF) quantifies how much the variance is inflated. As shown in the Table 3.8(b), all values are less than 3, indicating lack of multicollinearity. This is also affirms the lack of multicollinearity.

Table 3.8(a) : VIFs of the explanatory variables

Funding	
Interbank ratio	1.39
Liquid assets/Customer deposits & ST funding	1.68
Liquid assets/Total deposits & borrowing	1.41
Net loans/Deposits & ST funding	2.73
Net loans /Total assets	1.99
Net loans/Total deposits & Borrowing	2.01
Capital regulation	
Cap.Funds/Deposits & ST funding	1.53
Cap.Funds/Net loans	1.33
Cap. Funds / Total assets	1.10
Equity/Liabilities	1.25
Equity/Total assets	1.11
Tier 1 Ratio	1.24
Total capital ratio	1.12
Risk transfer	
Impaired loans/Equity	1.22
Impaired loans/ Gross loans	1.28
Loan loss prov. / Net int.Rev	1.26
Loan loss Res. / Gross loans	1.27
Unreserved impaired loans /Equity	1.25
Net charge-off/Average Gross loans	1.31
Size	
Log total assets	1.07

We have the descriptive statistics of the explanatory variables for number of securitizing banks, N=527.

3.4.4 Empirical results

Following Cardone-Riportella et al. (2010) (but note that we use more variables than in that study), we fit the model in Equation (1) using a Logit model. Before proceeding with the estimation of the model, we test for evidence of correlation amongst the variables in the model and find no evidence that multicollinearity is a problem in our data. Table 3.9 shows the results of our empirical analysis. Five out of the six liquidity ratios are statistically significant and generally with the expected sign. The Interbank Ratio (L_1) and the liquid assets to customer deposits and short term funding (L_2) are statistically significant (at 5% and at 10%) and have the expected sign. Net loans to deposits and short term funding (L_4) is significant (at 10%) with the expected sign. Net loans to total assets (L_5) and net loans to total deposits and borrowing (L_6) are statistically significant but do not have the expected sign. We now turn to the regulatory capital ratios. The Tier 1 ratio (C_6) and the Total Capital Adequacy Ratio (C_7) are significant and both have the expected sign. Size is statistically significant in each case.

Table 3.9: Logit Models;

This table shows the signs and magnitude of the coefficient of overall results from the Logit model , of the probability that the bank participates in securitization or not.

*significance at 1%; **significance at 5%;***significance at 10%.

	Coefficient	Probability
Funding		
Interbank ratio	-0.922	0.03**
Liquid assets/Customer deposits & ST funding	-0.002	0.02**
Liquid assets/Total deposits & borrowing	0.001	0.54
Net loans/Deposits & ST funding	0.002	0.09***
Net loans /Total assets	-0.071	0.09***
Net loans/Total deposits & Borrowing	-0.778	0.04***
Capital regulation		
Cap.Funds/Deposits & ST funding	-0.001	0.20
Cap.Funds/Net loans	-0.002	0.12
Cap. Funds / Total assets	0.017	0.11
Equity/Liabilities	-0.005	0.58
Equity/Total assets	0.002	0.36
Tier 1 Ratio	-1.161	0.03**
Total capital ratio	-0.225	0.01*
Risk transfer		
Impaired loans/Equity	0.53	0.21
Impaired loans/ Gross loans	0.01	0.33
Loan loss prov. / Net int.Rev	0.07	0.46
Loan loss Res. / Gross loans	0.04	0.15
Unreserved impaired loans /Equity	0.02	0.58
Net charge-off/Average Gross loans	0.00	0.28
Size		
Log total assets	0.73	0.01*
R^2	0.78	

The Logit model suggests that liquidity is the most important driver of securitization in the UK while it generates weaker evidence that UK banks have used securitization for regulatory capital arbitrage and for credit risk transfer.

Overall the results in Table 6, using the Logit model, confirm our expectations (see table 3). We expect a higher probability that a bank will securitize when the Interbank Ratio is lower or when the size of the loans issued by the bank are large relative to the bank's deposits and short-term funding (i.e. the bank is less liquid). To further check these results we now use a Binary Probit model. Results are reported in Table 6, left-hand-side panel.

Overall, the Binary Probit model is supportive of the hypothesis that liquidity is an important factor. Three of the liquidity ratios are significant (at 10%) and all have the expected sign.

However, there is now evidence that regulatory capital arbitrage and credit risk transfer cannot be neglected[24]. Four out of the seven regulatory capital arbitrage ratios are now significant (and all four have the expected sign) and two of those are significant at 5%. Four out of the six credit risk transfer ratios are now significant (and all four have the expected sign) and two of those are significant at 1%.

3.4.5 Results using ABS and CDO data

In this section we refine our definition of securitization and split the data by separately considering ABSs and CDOs. Limited somewhat by data availability, we now use data for 231 banks issuing ABSs and for 335 banks issuing CDOs. Cardone-Riportella et al. (2010) remark that since CDOs are related to the banks' portfolio of liabilities, credit risk transfer should not to be a motivating factor for these securities while it should be an important factor for ABSs[25].

The ABS and CDO markets in the UK both grew substantially in the five years prior to 2008 to become some of the largest in the world: this merits an investigation into the

[24]We have also repeated the same empirical exercise by estimating a special case of the model where we consider one variable at a time. The results (unreported for brevity but available on request) were qualitatively unchanged.

[25]However, we believe that this remark is too strong. In fact, CDOs, especially synthetic CDOs, are also used as credit risk transfer vehicles.

determinants of such growth. We follow broadly the same approach as in the previous section. However, we now use fewer variables (four as proxies for liquidity, four as proxies for regulatory capital arbitrage and three as proxies for credit risk transfer) - mainly to reflect the availability of data. Firstly, we consider ABSs for which our data-set consists of 231 banks. Table 3.10 shows the empirical results. We, initially, discuss the results of the Logit model. When we split the data down the ABS and CDO dimensions, it seems that the need for funding may be a less significant factor. The Interbank Ratio (L_1) is no longer significant and two of the three ratios which generate significant coefficients do not have the expected sign. Turning to the regulatory capital ratios, the Tier 1 ratio (C_6) and the Total Capital Adequacy Ratio (C_7) are significant at 5% and both have the expected sign. The Binary Probit model shows qualitatively similar results but the Interbank Ratio is not highly significant. The credit risk transfer ratios are insignificant for the Logit model but two out of three are significant (Impaired Loans/Equity (R_1) at 10% (but not with the expected sign) and Loan Loss reserve/ Gross Loans (R_4) at 5%) when the Probit model is used. Thus, there is now evidence that risk transfer seems also to be a motivating factor for the growth of the market for ABSs in the UK. Thus, regulatory capital arbitrage does seem to play an important role while there is some empirical evidence that ABSs have also been used to transfer credit risk.

Table 3.10: ABS Market.

This are results from Logit model considering 231, with fewer variables - mainly to reflect the availability of data (four as proxies for liquidity, four as proxies for regulatory capital arbitrage and three as proxies for credit risk transfer)

*significance at 1%; **significance at 5%;***significance at 10%.

Funding	Coefficient	Probability
Interbank ratio	-0.045	0.52
Liquid assets/Customer deposits & ST funding	-0.018	0.10***
Net loans/Deposits & ST funding	-0.012	0.02**
Net loans /Total assets	-0.016	0.09***
Capital regulation		
Cap.Funds/Net loans	-0.019	0.49
Equity/Total assets	0.039	0.48
Tier 1 Ratio	-0.102	0.03**
Total capital ratio	-0.039	0.02**
Risk transfer		
Impaired loans/Equity	-0.016	0.89
Impaired loans/ Gross loans	-0.098	0.90
Loan loss Res. / Gross loans	-0.168	0.57
Size		
Log total assets	0.147	0.07
R^2	0.68	

We now turn to CDOs for which our data-set consists of 335 banks covering the period 2004-2010.

Table 11 shows the empirical results for CDOs. We, initially, discuss the Logit model. Although funding seems, once again, to be an important driver of CDO growth in the UK, regulatory capital arbitrage seems also important in understanding the growth of these financial securities. Two out of four regulatory capital ratios are statistically significant (Capital funds/Net loans (at 5%) and Tier 1 ratio (at 10%)) but only one of these is correctly signed

(Tier 1 ratio). The Binary Probit model reinforces the previous results. Thus, although the search for cheap funding seems to be relevant, the growth of CDOs in the UK may have also been driven by regulatory capital arbitrage. This is an important and new result with possible policy implications for governments and regulators. Credit risk transfer does not seem to be a motivating factor for the large expansion of the issuance of these securities in the UK.

Table 3.11: CDO

This table shows the empirical results for CDOs for which our data-set consists of 335 banks covering the period 2004-2010.

*significance at 1%; **significance at 5%;***significance at 10%.

Funding	Coefficient	Probability
Interbank ratio	-0.017	0.044**
Liquid assets/Customer deposits & ST funding	-0.002	0.104***
Net loans/Deposits & ST funding	0.015	0.616
Net loans /Total assets	-0.013	0.090
Capital regulation		
Cap.Funds/Net loans	0.011	0.025
Equity/Total assets	0.039	0.782
Tier 1 Ratio	-0.067	0.032
Total capital ratio	-0.012	0.119
Risk transfer		
Impaired loans/Equity	0.087	0.093
Impaired loans/ Gross loans	0.039	0.541
Loan loss Res. / Gross loans	-0.021	0.516
Size		
Log total assets	0.012	0.101***
R^2	0.75	

The differences between the factors driving the growth of the ABS and CDO markets are best captured by comparing and contrasting tables 7 and 8. They show that the twelve variables we consider produce adjusted R-squared values of around 87% to 91%. The differences are that regulatory capital arbitrage is somewhat more important for CDOs than for ABSs whereas funding and credit risk transfer are somewhat more important for ABSs than for CDOs.

The size of the bank seems to be a determinant factor to explain the growth of securitization in the UK regardless of the methodology used. This is also a noteworthy result. To put it another way, large banks (perhaps, too-big-to-fail or the so-called G-SIFIs (Global Systemically Important Financial Institutions)) are more likely to securitize - and this remark applies to ABSs and (even more so to) CDOs.

Summarizing the empirical results reported above, we conclude that i) the search for funding is the predominant reason why UK banks used the securitization market (this result is also in line with theoretical models such as DeMarzo and Duffie (1999) and DeMarzo (2005)) and ii) regulatory capital arbitrage and credit risk transfer have also played an important role and therefore these factors cannot be neglected. The latter result contrasts with some of the empirical papers cited earlier which find the search for funding being the only driver of securitization[26].

3.4.6 Inside the ABS market

Structuring an ABS deal involves different people at different levels of the chain. For example the originator of the loans, mortgages etc.(i.e. banks, credit card issuers) pools the assets. The pool is then sold to a special purpose vehicle (SPV). The SPV will act as an intermediary between the originator of the pool and the ABS issuer. Investors will finally buy the tranches offered on the market. The different people along the chain are indeed likely to have different information about the security. For example, the ABS issuer can have better information about the price of the security. The same information is likely to be unavailable to the investors[27].

To simplify the discussion, suppose that there are only two parties involved in structuring an ABS deal, namely, the issuer and the investor[28]. We assume that the issuer possesses more information about the security than the investor. The informational advantage may

[26]However, these studies do not refer to the UK market but rather the Spanish and Italian markets.

[27]Issuers in the ABS market are generally investment banks, which have the know-how to better price the securities. Investors are generally pension funds or even retail banks. However, asymmetric information can also be due to rating agencies valuing the security. For example, generally, banks ask more than one rating company to rate a structure; they have then the option to buy the best rate. Information about the credit ratings of all the agencies involved are normally not disclosed to the public.

[28]This general assumption has no implication for our analysis.

consist, for example, in private information about the future cash flow of the security or sophisticated models to price it. Thus, there is a degree of asymmetric information between the issuer and the investor[29]. Suppose that the issuer has a very high preference for liquidity and uses the securitization market to raise cheap funds[30]. In such a context, the investor may rationally anticipate that the issuer will sell a greater amount of the security when investor's private information implies a lower value of the security (lemon problem[31]). It follows that the investor will rationally offer a lower price for the security. Retention in this case is a credible signal (i.e. the signal is a financial decision which conveys information). In fact, we have assumed that the issuer has a high preference for liquidity. Thus, the asymmetric information gives rise to "liquidity cost"[32]. We have used the De Marzo and Duffie (1999) model to further investigate this issue. The demand function for the security is depicted in Figure 3.10.

[29]That is the investor knows that the issuer has private information about the security which are unavailable to it.

[30]This might be due to profitable investments in the market.

[31]The lemon problem occurs because of information asymmetry between the buyer and the seller (i.e. the seller has more information about the product being sold than the buyer). Thus, the buyer uses the quantity of the product being sold by the seller as a signal of the quality of the product itself.

[32]This happens as the issuer has a high preference for liquidity given the available investment opportunities.

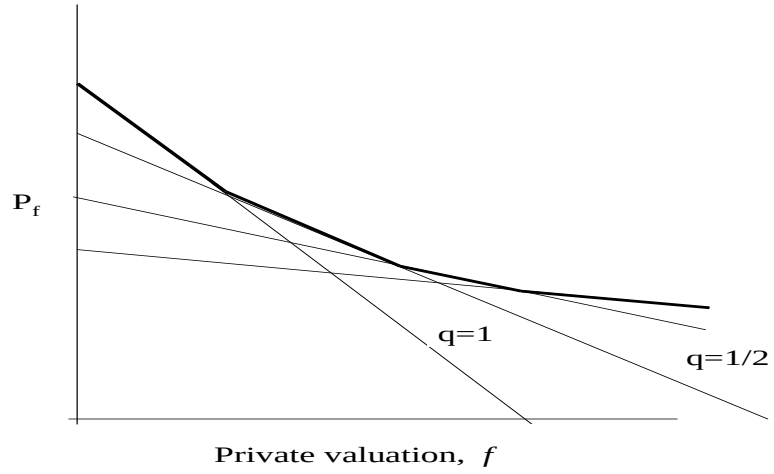

Figure 3.10: Decreasing and convex profit function. Source; Author's illustration

Figure 3.10 above shows that the demand function is decreasing and convex when price of security, P_f is plotted against private valuation, f. Investors are naturally concerned about the security that they are being offered since they anticipate that the seller has private information that they do not know. Thus, the price of the security will be higher, the larger the proportion (q) of the security retained by the seller on the balance sheet. The optimal quantity of the security offered by the issue is decreasing. This is consistent with the fact that the issuer will sell less of the security, when its expected payoff is higher. Thus, there is an endogenous relationship between the quantity of the security put on sale and its market price. Furthermore, from this graph it appears that there is a direct link between the degree of asymmetry in the market, liquidity and the security price. We shall investigate this issue further in the next section.

3.4.7 Rescuing ABS Markets

Figure 3.11(a) below shows the profit from securitization from different face values of the debt issued. The profit is plotted for different degrees of asymmetry, ranging from low

asymmetry ($m = 1\%$) to high asymmetry ($m = 14\%$). We have used the DD (1999) model to simulate the profit.

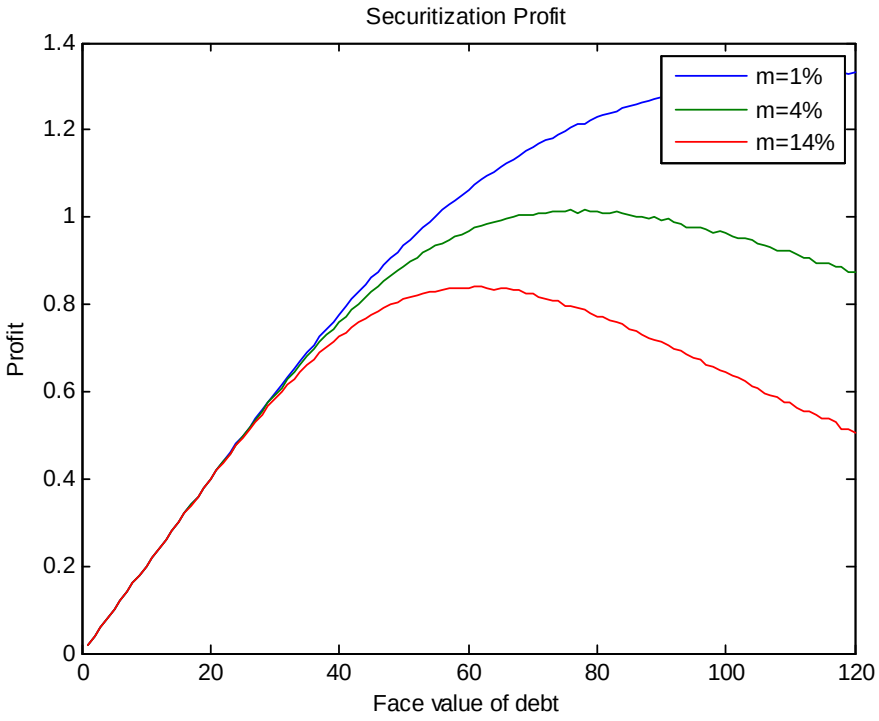

Figure 3.11(a): Securitization profit, Source; Matlab simulation

It is clear that the profit from securitization falls as the "lemon" problem becomes worse. Indeed when m is very high (i.e. the degree of asymmetry is very high), the issuer will have to retain a larger proportion of the security and thus the issuer faces higher holding costs[33].

There are two important things which can be learned from Figure 3.11(a). Firstly, when the "lemon" problem is very persistent (as happens during a financial crisis), any marginal proportion of the security put on sale in the market is likely to have a substantial impact on its market price (and thus on the issuer profit). On the other hand if the lemon problem is not very serious ($m = 1\%$), the issuer may issue bonds with large face value ($d = \infty$). In this case, we have a pure pass-through security.

Figure 3.11(a) is important to better understand the economic implications of most of the regulatory proposals being discussed these days. In fact, different proposals have been

[33]The issuer will be forced to post more capital against the security and therefore issuer will have less capital available for investments.

suggested to reform and re-start the ABS market; for example, the White Paper (2010) proposed by the Association of Mortgage Investors, the SEC (2010) and the EU proposals.

Among the many different things proposed in the SEC (2010) document, following the EU approach, we would like to discuss a few which, in our view, are very important. The SEC (2010) document proposes that a fixed retention proportion (5%) of the security should be retained on the issuer's balance sheet. This is the so called "skin in the game". The risk retention approach is aimed to distinguish those securities which are of a sufficient quality while avoiding the reliance on ratings. In other words, the issuer puts his money at stake with the investors and consequently this will constitute an incentive to issue higher quality securities. It is very likely that this proposal may have a substantial impact on the ABS market liquidity in the future. It is difficult to understand how five percent (or indeed any floor) can be selected. Furthermore, following our discussion in the previous section, the proportion (q) of the asset sold to investors constitutes a credible signal which the (uninformed) investor can use to infer about the private information available to the issuer[34]. Of course a much higher degree of market transparency would probably make this signal useless. However, the impact on the market profitability overall is probably underestimated.

The SEC also proposes the so called new disclosure rules for the ABS market. ABS issuers, instead of relying on "principles" based disclosure, will have to report specific information for each asset in the pool. This data should be made available by the issuers to the public after filing of a computer program[35]. Given the importance of these proposals, we shall discuss them further in the next sections.

3.4.8 Proposals in ABS markets

Thus, the proportion of the security retained by the issuer constitutes a credible signal (i.e. the investor observes the proportion of the security put on sale by the issuer and the investor

[34]Issuers in the past have already held a proportion of the issued security on their balance sheets. However, generally, the proportion retained was a small proportion and therefore it would have been unlikely to drive the issuer to focus on the quality of the loans. However, given the high appetite for high yield in the past fifteen years, the incentive for the issuer to sell the retained security was very high.

[35]The SEC goes much further than that, to also suggest that this information should then regularly be updated when assets in the pool change, etc...

uses this information to infer about the quality of the security). For example in Figure 3.11(b) below, it is optimal for the issuer to issue debt with face value 60. The issuer's profit will then be equal to 0.91%. Suppose now that the proportion of the security retained by the issuer is fixed by regulation so that the issuer can only issue debt with face value equal to 40. In this simple case the issuer's profit would drop[36] to 0.74%. That is a significant drop in the securitization profit. Will such a drop in the revenue from securitization impact on the market as a whole? This is an important question to address before taking any decision on setting a floor. Thus, the proposal of a 5% floor (see SEC, 2010)[37] is likely to hit the issuer hard but there is no evidence that it will lead to higher quality securities.

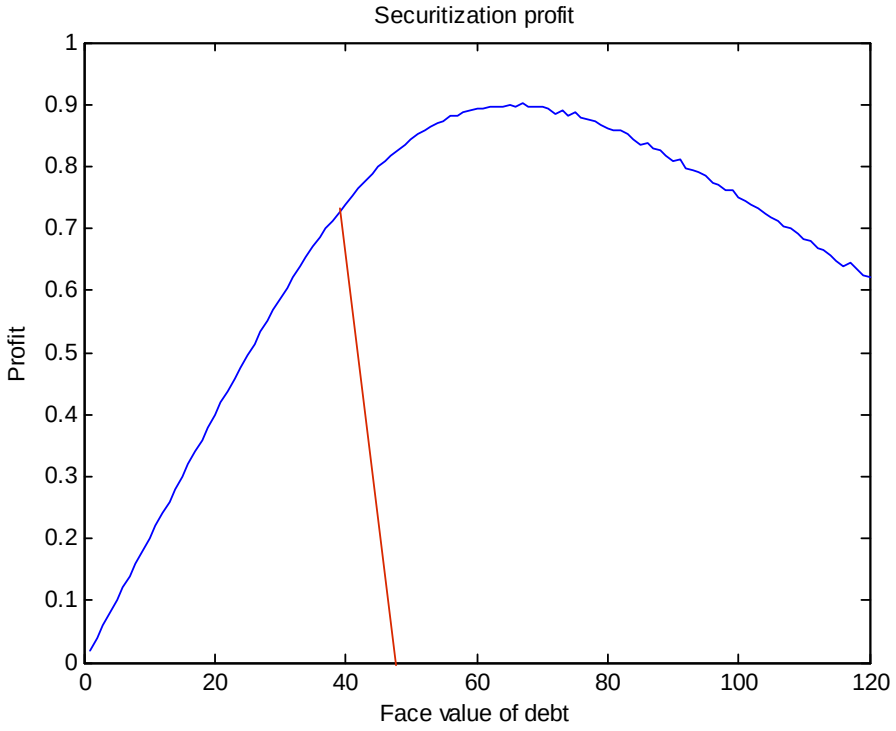

Figure 3.11(b): Securitization profit. Source: Matlab simulation

As a way to make the ABS market more transparent, the SEC[38] proposes new disclosure rules for ABS issuers, the rationale being that more transparency in this market is in the interest of both investors and issuers. As mentioned above the SEC proposal favours the

[36]The red line in Figure A8(b) shows the sharp drop in the profit in this case.
[37]http://www.sec.gov/about/secpar/secpar2010.pdf
[38]http://www.sec.gov/about/secpar/secpar2010.pdf

institution of a "machine-readable, standardized format that is useful to investors and the market" (SEC, 2010). The SEC requires, for each asset (loan) in the pool the disclosure of specific data relating to the terms of the asset, obligor[39] characteristics etc.

We believe that such a degree of disclosure is unnecessary and is likely to impact negatively on the market. To see this, consider Figure A8(c) below.

3.4.9 Securitization and Originate-To-Distribute Model on Banks' defaults

We examine the role of credit risk transfer in greater depth by considering what happened to banks, using the Originate-To-Distribute Model (OTD) model, in the aftermath of the 2007 financial crisis. The empirical results in the previous section show that, at least in part, UK banks used the securitization market to transfer credit risk. However, at the onset of the financial crisis in the summer of 2007, the securitization market suddenly became frozen and therefore banks were unable to further securitize their assets. This would have left them with considerable credit risk that they were unable to transfer to third parties - at exactly the time that banks were facing dramatically increased funding and credit risks. In order to quantify this, we follow Purnanandam (2011) and estimate the effect of the OTD model on banks' ABS and CDO annualised default rates using the following bank fixed-effect model:

$$default_{it} = \mu_i + \eta_1 \text{after}_t + \eta_2 \text{after}_t * \text{preotd}_i + \sum_{k=1}^{k=K} \theta_k X_{it} + \epsilon_{it} \tag{3.15}$$

The dependent variable in equation (3.8) above measures the default rate of the portfolio of bank i in year t. Following Purnanandam (2010), we use net charge-offs (net of recoveries) as a proxy for the default rate[40]. The intercept μ_i is the bank fixed effect, while X_{it} is a vector of bank characteristics[41]. The variable $preotd_t$ is a time invariant variable measuring the extent of the bank's participation in the Originate-to-distribute (OTD) market. This is measured by the volume of CDOs (or ABSs) originated by a bank between 2004 to 2010

[39] An individual or company that owes debt to another individual or company (the creditor), as a result of borrowing or issuing bonds, also called debtor.

[40] Due to data limitation we cannot use non-performing assets. Net charge-off indicates the percentage of the asset issued by the bank that may have been finally written off the book. Thus it is an appropriate proxy for the default rate.

[41] We use some of the same variables used before.

scaled by the bank's position in CDOs (or ABSs) at the beginning of the year. The variable $after_t$ is a dummy variable taking the value one in the period after the financial crisis began and zero otherwise. Thus, the coefficient on this variable captures the time trend in default rate before and after the financial crisis[42]. The coefficient on the interaction term (i.e., $after_t * preotd_i$) measures the change in net charge-offs around the crisis period across banks with varying intensities of participation in the OTD market prior to the crisis. Thus, η_2 measures the change in default rate for banks that originated loans primarily to sell them to third parties, as compared with the corresponding change for banks that originated loans primarily to retain them on their own balance sheets.

3.4.10 OTD model Results

Tables 3.12(a) and 3.12(b) present the empirical results of the model in equation (3.8).

[42]We consider the period 2004 to 2007 as the period before the financial crisis while 2008 - 2010 as the period after the financial crisis.

Table 3.12(a): Default rate for ABS issued 2004 -2010

Using 231 banks, this table shows the coefficients measuring the default rate of the portfolio of bank i in year t.

*significance at 1%; **significance at 5%;***significance at 10%.

	Coefficient	Probability
η_1	0.14	0.011*
η_2	0.58	0.096
Funding		
Interbank ratio	0.26	0.013**
Net loans /Total assets	0.42	0.002*
Capital regulation		
Cap.Funds/Net loans	0.40	0.180
Tier 1 Ratio	0.22	0.004*
Risk transfer		
Impaired loans/Equity	0.02	0.050**
Impaired loans/ Gross loans	0.01	0.847
Size		
Log total assets	0.03	0.045**
R^2	0.82	

Table 3.12(b): Default rate for CDOs issued period 2004 - 2010

Using 335 banks to measure the default rate of the portfolio of bank i in year t.

*significance at 1%; **significance at 5%;***significance at 10%.

	Coefficient	Probability
η_1	0.03	0.002*
η_2	0.01	0.088***
Funding		
Interbank ratio	0.26	0.003*
Net loans /Total assets	0.00	0.870
Capital regulation		
Cap.Funds/Net loans	0.40	0.003*
Tier 1 Ratio	0.22	0.001*
Risk transfer		
Impaired loans/Equity	-0.02	0.084***
Impaired loans/ Gross loans	-0.08	0.014**
Size		
Log total assets	0.01	0.059***
R^2	0.77	

We note that η_1 is significant at 1% both in the case of ABSs and CDOs. This tells us that the financial crisis has been a contributing factor to the increase in default rates suffered by UK banks. η_2 is also statistically significant and positive. This means that the banks that were using an OTD model before the financial crisis, were the ones to suffer the most from defaults after the financial crisis. We remark that the η_2 coefficient is much larger for ABSs (0.5778) compared to CDOs (0.0142). This indicates that banks had a much larger proportion of ABSs written off after the financial crisis (compared to CDOs). Finally, banks that used the OTD (Originate-to-distribute) model (as opposed to the traditional "loan-and-hold" model) before the financial crisis were the ones to suffer the most (in terms of defaults) after the financial crisis. We attribute this to the fact that the market for ABSs was frozen abruptly in the summer of 2007 and hence they were unable to sell off their securitized loans

and suffered the consequences.

3.4.11 Profitability of UK banks that securitized

As we have already remarked, UK banks have been heavily involved in the securitization market. In this section we aim to investigate how the securitization market has impacted on banks' profitability in the UK. We split banks into two groups - the first group consists of commercial and savings banks and the second group consists of investment and real estate banks. Closely following Jiangli and Pritsker (2008), we consider the following linear model for a measure of profitability, Rate of Return on Operating Assets (RROA):

$$RROA_{it} = \phi_i + \sum_{s=1}^{4} \varphi_{is} M_{is} + \lambda \sum_{g=1}^{2} \omega_{is} G_{ig} \tag{3.16}$$

where $RROA_{it}$ is the profitability ratio Rate of Return on Operating Assets for bank i at a given year t, M_{is}, $s = 1,2,3,4$, are measures of securitization considered in the study (ABSs and CDOs issued, total assets and Loans) and G_{ig}, $g = 1, 2$, represents the group classification of the banks that securitized and where the parameter λ takes the value 1 for the group of commercial and savings banks and 0 for the group of investment and real estate banks.

We start with the results presented in the first four rows of Table 3.13 (which do not differentiate between the type of bank but, instead, differentiate on whether the bank securitized or not). The results in Table 3.13 indicate that large banks are the ones for which securitization is more important to explain profits. Furthermore, all the coefficients on the variables used are significant and with the correct sign. More interesting is that the measure, relating to total assets, is larger for the securitizing banks (50.59%) than for the non securitizing (1.42%). This may imply that banks which securitized depended on securitization to increase their overall profits.

The size of the coefficients on the variables used in Table 3.10 is generally larger for commercial and savings banks as opposed to investment and real estate banks. This result shows that commercial and savings banks were more exposed to the securitization market than investment and real estate banks (i.e. their balance sheets were more sensitive to

changes in the conditions of the securitization market). Therefore, while investment banks were the ones for which securitization was more important to explain profits, commercial and savings banks are the ones more exposed to price fluctuations in this market[43] - and, of course, the price fluctuations were greatest during the financial crisis.

Table 3.13: Profitability of UK banks 2004 -2010

Using 690 total banks data set - sum-total of securitizing and non-securitizing banks,

we analyse the impact of profitability of the probability of securitizing or not securitizing, for $\lambda = 0$

*significance at 1%; **significance at 5%;***significance at 10%.

	Securitizing banks		Non securitizing banks	
Variable	Coefficient	Probability	Coefficient	Probability
ABS	0.03	0.004*		
CDO	0.22	0.002*		
loans	0.64	0.011*	0.02	0.008*
total assets	0.51	0.003*	0.01	0.001*

we analyse the impact of profitability of the probability of securitizing or not securitizing, for $\lambda = 1$

Variable	Coefficient	Probability	Coefficient	Probability
ABS	0.42	0.003*	0.02	0.001*
CDO	0.50	0.001*	0.49	0.002*
loans	0.20	0.003*	0.00	0.004*
total assets	072	0.001*	0.69	0.001*

3.5 POLICY RELEVANCE OF OUR RESULTS

Central banks are expected to continue accepting ABSs as collateral in their funding operations for the foreseeable future. Hence, our empirical findings have potentially significant policy implications for regulators and central banks.

[43]To account for endogeneity between bank's profitability and securitization, we have also repeated the empirical exercise in Table 10 using GMM but results were qualitatively unchanged.

The key result we observed is that liquidity is the most important driver of securitization for UK banks, ahead of regulatory capital arbitrage and credit risk transfer. This is not to underestimate the motivating influence of the latter two factors, but it does put in perspective the value of securitization as a funding tool in the financial markets. The other key result we noted was the higher probability that a bank will securitize when its interbank ratio is lower (that is, when it is a net borrower from the interbank market).

In the first instance we conclude that securitization will remain an important technique for funding purposes. The emphasis on bank funding models in the post-2008 environment is for a reduced reliance on unsecured short-term wholesale funding, and greater reliance on customer deposits and secured long-term wholesale funds. It is reasonable to expect that securitization markets will form part of the latter, either in the form of ABSs or Covered Bonds.

The Basel III and FSA liquidity regimes place a greater emphasis on secured funding, which banks are addressing by embarking on "asset enablement" programmes, to ensure that sufficient collateral is available for use in secured funding transactions. Our findings suggest that it is imperative for banks with interbank ratios lower than 100% to make asset enablement a priority. The long-term significance of this is considerable: some banks will have to modify their business models substantially before they are in a position to originate only assets that are viable for use as secured collateral. Banks that are not able to do this, and still wish to run customer loan-deposit ratios greater than 100%, will remain net borrowers from the interbank market. In the long run this will add substantially to their costs, because their liquid asset buffer requirement will be higher.

The other side of this is the impact on the bank funding model. As the share of encumbered assets grows as banks move to secured funding, including securitization, the position of senior unsecured and subordinated debt holders worsens as the encumbrance ratio worsens and the loss-given-default value in a bankruptcy event rises higher. This has implications for the long-term viability of unsecured long-term debt from an investor perspective, and will result in higher unsecured funding costs. Ultimately, the requirements of the Basel III Liquidity Coverage Ratio (LCR) and Net Stable Funding Ratio (NSFR) suggest that banks will need to continue to employ securitization as part of their long-term liquidity funding

strategy.

Regulators may need to provide incentives for banks to invest in ABS tranches to ensure that non-bank investors continue to remain engaged in the market. If a transaction is not undertaken for risk transfer purposes, the originator can retain the junior tranche but mezzanine tranches may not find institutional investors and have to be placed with banks. The regulatory capital risk weighting on these tranches may be a disincentive for banks to purchase them.

For securitization to produce any regulatory capital benefit requires that banks demonstrate "significant risk transfer" arising from the transaction. Therefore if the primary motivation for the structure is to transfer credit risk, rather than raise funding or generate regulatory capital arbitrage, it would be more appropriate to consider a synthetic securitization. This would avoid the need to find cash investors for the deal.

We remarked above that regulators may need to provide incentives for banks to invest in ABS tranches. Other incentives or disincentives are also possible: In 2010, the UK government introduced a tax on banks proportional to their volume of short-term wholesale funding as a mechanism to try to reduce their reliance upon it. It is worthy of note that the savings rate of UK citizens is rather lower than that of citizens in Germany and Italy, for example, and much lower than that in Asian countries such as Japan and China. The UK government might consider tax incentives for UK citizens to save a greater proportion of their incomes. This would have the effect of increasing the pool of savings which might be deposited with UK banks. Tax incentives to encourage private saving might be politically easier to implement than incentives for banks to issue or invest in ABS tranches.

3.6 ROBUSTNESS ANALYSIS

In this section we present robustness checks on the main results presented above. Firstly, to account for possible outliers, we use robust regression (see Tables 3.14(a) to 3.14(c). Secondly, we have considered two dummy variables in the model. The two dummy variables enable us to see how the characteristic of a bank (commercial bank or savings bank) affects its decision to securitize its loans. We start with CDOs (see table 3.14(a)). The results in

Table 3.14(a) confirm what we reported earlier: While the search for funding is an important element in explaining the growth of the securitization market in the UK, regulatory capital arbitrage and risk transfer cannot be neglected. All the coefficients have the expected sign. While both the two dummy variables are significant, in Table 3.14(b), savings banks seem to be the ones more willing to implement a liability securitization program. This result is in line with the analysis of Cardone-Riportella et al. (2010) for Spanish banks and in line with the results in Table 10.

Table 3.14 (a): Robust regression,

change in R^2 (base of 0.82), found when only two factors from each group are considered in the model. This table show the change in R^2 when we introduce the

factors one after the other.

	Coefficient	Change in R^2
Funding		
Interbank ratio	-0.908	-0.14
Liquid assets/Customer deposits & ST funding	-0.002	-0.08
Liquid assets/Total deposits & borrowing	-0.002	-0.11
Net loans/Deposits & ST funding	0.001	0.27
Net loans /Total assets	-0.065	0.00
Net loans/Total deposits & Borrowing	-0.765	-0.31
Capital regulation		
Cap.Funds/Deposits & ST funding	-0.002	0.00
Cap.Funds/Net loans	-0.003	0.00
Cap. Funds / Total assets	0.032	0.00
Equity/Liabilities	0.003	0.10
Equity/Total assets	0.007	-0.52
Tier 1 Ratio	-0.164	-0.30
Total capital ratio	-0.097	-0.19
Risk transfer		
Impaired loans/Equity	-0.554	0.01
Impaired loans/ Gross loans	0.091	0.15
Loan loss prov. / Net int.Rev	0.074	0.00
Loan loss Res. / Gross loans	0.004	0.00
Unreserved impaired loans /Equity	0.024	-0.33
Net charge-off/Average Gross loans	0.037	-0.26
Size		
Log total assets	0.753	0.02

*significance at 1%; **significance at 5%;***significance at 10%.

We now turn to the ABS market. Results in Table 3.14(c) are in line with results in Table 3.14 (b). Furthermore, it is noteworthy that neither of the two dummy variables are now significant, Table 11(b). In addition to the robustness results reported in this section, we have used a battery of additional tests (Panel OLS with fixed effects - reported in table 3.14(b) and (c) below.

Table 3.14 (b): CDO robust regression variables

Panel OLS fixed effects regression results

*significance at 1%; **significance at 5%;***significance at 10%.

Funding	Coefficient	Probability
Interbank ratio	-0.19	0.055*
Liquid assets/Customer deposits & ST funding	0.08	0.046
Net loans/Deposits & ST funding	0.50	0.000*
Net loans /Total assets	0.66	0.004*
Capital regulation		
Cap.Funds/Net loans	-0.06	0.001*
Equity/Total assets	-0.09	0.047*
Tier 1 Ratio	-0.11	0.000*
Total capital ratio	-0.44	0.001*
Risk transfer		
Impaired loans/Equity	0.06	0.000
Impaired loans/ Gross loans	-0.58	0.000
Loan loss Res. / Gross loans	-0.19	0.051
Size		
Log total assets	0.03	0.001*
R^2	0.59	

Table 3.14 (c): ABS robust regression variables.

Panel OLS fixed effects regression results		
Funding	Coefficient	Probability
Interbank ratio	-0.43	0.002***
Liquid assets/Customer deposits & ST funding	0.13	0.048
Net loans/Deposits & ST funding	0.27	0.000*
Net loans /Total assets	-0.03	0.585
Capital regulation		
Cap.Funds/Net loans	-0.01	0.070***
Equity/Total assets	0.30	0.000
Tier 1 Ratio	-0.53	0.074*
Total capital ratio	-0.86	0.000*
Risk transfer		
Impaired loans/Equity	-0.02	0.074
Impaired loans/ Gross loans	0.42	0.106
Loan loss Res. / Gross loans	-0.89	0.589
Size		
Log total assets	0.70	0.000*

*significance at 1%; **significance at 5%;***significance at 10%.

3.7 CONCLUSION

This study has analysed the reasons why UK banks securitize or did not securitize during the period before the 2007 financial crisis. We have shown that the search for liquidity (i.e. the need to fund their balance sheets) has been the principal motive for UK banks to securitize. We have also shown that regulatory capital arbitrage and credit risk transfer have played a role, albeit a smaller one, in the decision of banks to securitize. We have shown that banks which issued more asset-backed securities (ABSs) before the financial crisis suffered more

defaults after the financial crisis. We attribute this to the fact that the market for ABSs was frozen abruptly in the summer of 2007 and hence they were unable to sell off their loans and suffered the consequences as the credit-crunch and the global financial crisis took their toll on the quality of the banks' loan books.

Finally, we showed that large banks were the ones for which securitization was more important to explain profits while commercial and savings banks were the ones whose balance sheets were the most exposed (and highly sensitive) to changes in the conditions of the securitization market.

As Cardone-Riportella et al. (2010) note in their study, since the credit-crunch started in the summer of 2007, "more and more banks have been seen to underwrite their own securitization programs in order to use them as a guarantee to obtain funding from the European Central Bank (ECB)". Already extant securitized bonds have been used in a similar fashion. Although such funding will require substantial "haircuts", the fact that the ECB, and other central banks, will accept ABSs as collateral in return for funding strengthens the motivation to understand why banks securitize and what the consequences are.

4.0 HOW DO US BANKS RAISE FUNDS FOR THEIR VALUE-CREATING INVESTMENTS; DEBT OR EQUITY?

4.1 INTRODUCTION

Bank capital has been much in the news during the recent financial crisis. Banks have striven to reduce what they perceived to be excessive dependence on deposit-based funding by having recourse to market-based funding. Researchers have assumed, mainly as a matter of convenience when they are not primarily concerned about the bank's choice between debt and equity, (Admati, et.al., 2011) that banks hold the minimum capital level. But the question that arises today is: Where do banks raise or acquire the funds for their value-creating investments?

Theoretically, it is noted that internally-generated cash flow will be the dominant source of funding in all developed economies: Typically, 60-80% for US firms and 50-60% for the other OECD firms. The bulk of external funding is in the form of debt. Seasoned equity issues only account for 4-8% of external financing. Profits re-invested in a firm (retained earnings) is equivalent to a new equity issue each year. This keeps the leverage ratio[1] from rising too high with time, but bank profits everywhere are declining as a source of capital for large firms especially in US; it is much less so in Europe[2] and Japan, (Yermo and Severinson, 2010).

[1]This is the value of the firm's debt divided by the value of its total assets

[2]U.S. banks continue to be regulated under Basel I, which limits the size of bank balance sheets relative to their equity. European banks, on the other hand, have been regulated under Basel II, which jettisoned the total leverage ratio in favour of carefully calibrated risk weights for every exposure. As a result, U.S. banks have been incentivized to load up on risky assets that offered the highest returns at the lowest leverage, while European banks were incentivized to load up on less risky assets with low regulatory capital requirements, enabling them to maximize leverage. This is also why European banks love mortgages and U.S. banks like leveraged loans, why European banks like Triple-A and U.S. banks like Double-B.

The current financial crisis has challenged the bank financing process and highlighted three issues. First, as a result of the freezing of wholesale and interbank markets, there is a decreasing availability of funding. Secondly, there is a rising cost of bank funding, partly as a result of increased bank counterparty risk. Thirdly, there is shortening of funding maturities that challenges asset liability management (ALM) and profitability in the context of relatively flat or even inverted yield curves. During the current financial crisis, confidence in banks as debtors was eroded, risk aversion increased and investors such as money market and mutual funds have had to deal with their own liquidity difficulties (e.g. redemptions). The development of asset securitization played an important role during the decade 2001-2011, as it facilitated the expansion of the funding tools available to banks.

There are three implications that we get from this study[3]:

1. Issuing riskless securities[4] is better than issuing risky ones, such that with risk-free debt, no lemon enters the market. This considers the impact of the agency problem where the profit or gain by the owner-manager in their model can be less expensively resolved by issuing risk-free debt.
2. It is better to build up financial reserves (by restricting dividends, for example) so that higher proportions of capital needs can be supplied from internal sources: as internal funds increase, the average quality of the banks entering the market increases. This holds irrespective of the type of external financing.
3. When equity is issued, the stock price will fall. Since any project financed with external equity is viewed as a lemon, the perceived present value of the bank and, hence, its stock price will fall.

In this study, we borrow from the empirical literature on non-financial firms to explain the capital structure of large, publicly-traded banks (De Jong, et.al., 2011). We note that there are considerable similarities between the capital structures of banks and non-financial firms. We consider a number of interesting questions: Do banks behave as though they have target debt ratios? Do they have similar targets for the composition of their debt? Does

[3]Some of these implications are similar to those derived by Myers and Majluf (1984); although the rationales are totally different since we are considering banks while they considered firms.

[4]Although the banking industry is a risky industry, we refer to the triple-A debt to be the riskless security.

liquidity conditions of the banks and their economic and financial performance affect their choice of instruments? And are debt ratios influenced by other factors such as operating risk, bank size and the composition of their assets?

We will therefore consider the determinant factors for capital decision made by US banks. In spite of the continuing theoretical debate on capital structure, there is relatively little empirical evidence on how banks actually select between financing instruments at a given point in time.

In past studies on firms, capital structure has been seen to be either a firm's leverage ratio or it's capital ratio[5] (Rajan and Zingales, 1995). Using these concepts, we use a sample of US banks to find out how banks' capital structure has been improved. The theory on a firm's capital structure as also explained by Harris and Raviv (1990), indicates that large firms have more diversified sources of cash; thus, they are less likely to face a sudden cash shortfall. In general, these results are broadly supportive of the pecking order theory[6] and inconsistent with the trade-off theory[7].

The questions we attempt to answer in this study are: How do US banks raise their funds? Which option do banks consider viable: Debt or equity issuance to raise funds? Finally, does asymmetric information affect capital structure decisions?

The capital-structure[8] decision is one of the most fundamental issues in corporate finance. We find that bank debt-equity issuance is related to bank size, profitability, liquidity and asymmetric information. In addition, we find that bank leverage is an increasing function of both the number of banks and the number of non-bank financial institutions with which the bank has business relationships.

We have the following order in this chapter: Section 4.2 looks at the theoretical background regarding debt and equity financing sources; section 4.3 which the related past stud-

[5]This is the value of the firm's equity (often in the case of banks, it is seen as measure of regulatory capital) divided by the value of its assets.

[6]The Pecking Order Theory (1984) assumes that corporate managers are better informed and thus possess superior information concerning the true value and future prospects of the firm. The pecking order theory suggests that the firm will first use internal funds.

[7]According to the trade-off theory, firms with a debt ratio below the target ratio adjust their debt upward towards the target debt ratio, and firms with a debt ratio above the target ratio adjust their debt downward towards the target debt ratio.

[8]We define the capital structure as how the bank finances its overall operations and investments by using different sources of funds.

ies. We then cover the data description and methodology in section 4.4 and look at the results in section 5 before concluding in section 6.

4.2 CAPITAL STRUCTURE THEORIES

4.2.1 Firms and capital structure

Most firms have financial issues concerning either the capital structure (financing) or the capital budgeting (investment), Brealey, R. et.al. (2010). Capital budgeting decisions by firms involve long term investments needed by the firms. This often depends on the amount reported on the balance sheet from the fixed assets — both tangible and intangible assets. We can illustrate this in chart 4.1 below.

The financing decision by firms involves the way they need to raise funds for investment projects. This is affected by the figures on the balance sheet corresponding to the firms current liabilities, long term debt and the share holder equity. This is illustrated in chart 4.2 below. Capital structure is thus the key issue that follows closely on capital budgeting decision. This indicates how important it is for managers to make correct financing and investment decisions.

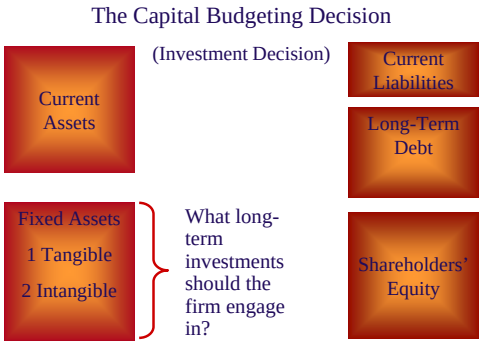

Chart 4.1: Firm investment decision,
Source: Ideas from Brealey (2010)

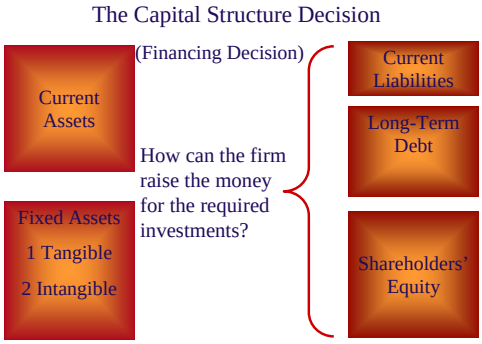

Chart 4.2: Firms financing decision.

Source; Ideas from Brealey (2010)

4.2.2 Banks and capital structure

The attention of the banks' capital structure has been of great interest especially with the current concern of the financial crisis. In 2008 and 2009 the U.S. government injected $235 billion of capital into the banking system as part of the Troubled Asset Relief Program[9] (TARP). This can also be seen in the work of Banyi, et.al (2010). The issue of capital structure for banks will often be linked to regulatory capital levels which have been too low for large US banks, especially the large bank organizations that create systemic risks. Therefore, financial economists have recently been paying attention to the factors that govern banks' capital choices. The reason is that, understanding bank capital decisions over the past 10-year period including the period of the recent crisis, can provide insights on how banks relate to other firms in making their finance raising decisions.

[9]The Troubled Asset Relief Program (TARP) is a program of the United States government to purchase assets and equity from financial institutions to strengthen its financial sector. It was signed into law by U.S. President George W. Bush on October 3, 2008. It was a component of the government's measures in 2008 to address the subprime mortgage crisis. The TARP program originally authorized expenditures of $700 billion and was expected to cost the U.S. taxpayers as much as $300 billion.

4.2.3 US bank debt and equity issuance trend

As we can clearly see from the graph in figure 4.1, debt[10] issuance activities was negatively affected, with both net issuance and debt instrument maturities decreasing in 2008. The corporate debt issuance has been on the rise from 2009 to 2011 but the other issuance — Asset Backed Securities (ABS) and Mortgage Backed Securities (MBS) — are still low. In parallel, investor demand for more short-term instruments such as certificates of deposit has increased. And while covered bonds initially appeared to be a viable replacement for off-balance sheet securitization, their issuance has also dried up in US.

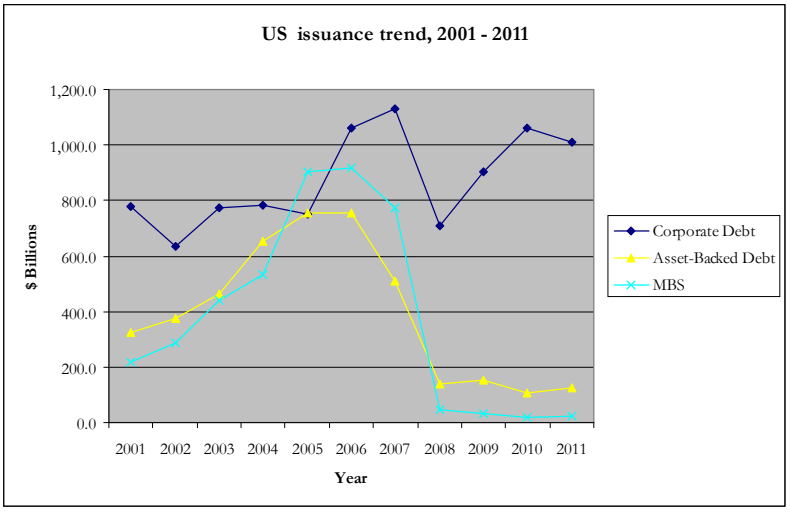

Figure 4.1: US banks debt issuance, Source: SIFMA

In the US, the implementation of government rescue plans has led to unsecured bonds and covered bonds competing with government guaranteed instruments. As the crisis has unfolded, all funding sources have gradually been affected. Banks previously relied mainly on wholesale funding; thus they have been able to change to more stable sources.

[10]Debt in this case is used to represent the bonds, collateralised loans and obligations, asset backed securities, mortgages and mortgage loans.

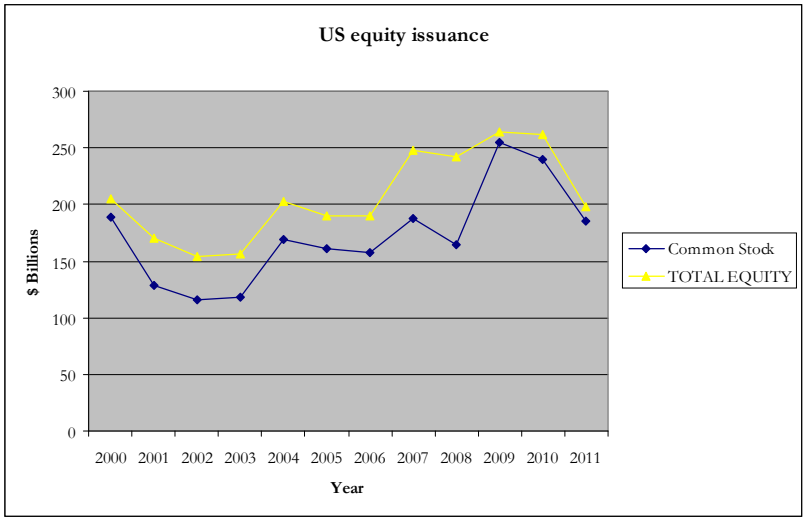

Figure 4.2: US banks equity issuance trend, Source: SIFMA

Capital markets represent sources for banks to raise long-term funds. These include bond and equity markets. Issuance equity has been on an upward trend for the period between 2000 and 2009. The downward trend between 2000 to 2003 can be attributed to the consequences of the dot com bubble. There was an upward trend till 2007, after which we had a drop in 2008 that can be seen to be due to the financial crisis. This has also affected the issuance as from 2009 where we can see a downward trend.

4.2.4 Pecking order theory

One of the most popular models of corporate financing decisions in capital structure literature is the pecking order theory also considered by Myers (1984). It is based on Myers and Majluf's (1984) argument concerning asymmetric information and its impact on the firms' capital structure. Myers (1984) argues that if managers know more than the rest of the market about their firm's value (information asymmetry), the market penalizes the issuance of securities (like equity) whose expected payoffs are crucially related to the assessment of such value. While banks may be special, in the first instance, banks are firms. Hence while the concepts mentioned in these subsections are based on firms, they are also applicable to

banks.

The changes in debt for the banks have played an important role in assessing the pecking order theory[11]. This is because the financing deficit is supposed to drive debt. The theory predicts that when investments exceed earnings, debt grows, and when earnings exceed investments, debt falls. Dividends are assumed to be sticky in the short term. The pecking order theory discussed in the following subsection, attempts to indicate the financing deficit as investments plus change in working capital plus dividends less internal cash flow. The theory predicts that in a regression of net debt issues on the financing deficit, the estimated slope coefficient should be one.

4.2.4.1 The factors that Pecking Order Theory is based on. The Pecking Order Theory assumes that managers will always act in the best interest of existing shareholders, (De Jong, et.al.,2011). It suggests that the behavior and actions of managers (especially financing decisions) constitute important signals to outsiders as regards managers' private beliefs. These assumptions of pecking order theory suggest that there is an order of preference for the firm of capital sources when funding is needed.

More profitable companies will therefore have less use of external sources of capital and may have lower debt-equity ratios. When internal funds are exhausted, the firm will then issue debt until it has reached its debt capacity. Only at this point will firms issue new equity. This theory also suggests that there is no target debt-equity mix for a firm. Hence there are three factors that the pecking order theory is based on and that must be considered by firms when raising capital (De Jong, et.al.,2011):

1. Internal funds are cheapest to use (no issuance costs) and require no release of private information.
2. Debt financing is cheaper than equity financing.
3. Managers tend to know more about the future performance of the firm than lenders

[11]We consider the situation where the banks prefer first to finance investment with retained earnings, then, when they need outside funding, they prefer to issue severe debt instead of equity. Thus, the capital structures are determined largely by the history of needs for external finance. Pecking-order theory explains negative intra-industry correlation between profitability and debt to equity ratio, and the negative share price reaction on announcement of an equity issue (i.e. information asymmetry).

and investors. Because of this asymmetric information, investors may make inferences about the value of the firm based on the external sources of capital the firm chooses to raise: Equity financing, when a firm is overvalued; and debt financing, when a firm is undervalued.

Hence we can say that pecking order theory of incremental financing decisions is the theory that uses asymmetric information to argue that firms prefer to fund their investments using internal finance, then (if internal finance is insufficient) by debt issues, and then (as a last resort) by equity issues. Therefore, the pecking order theory predicts that companies will recur to stock issuances only as a last resort, after cheaper alternatives (like internal cash, bank debt, or public debt) have been exhausted. Also, pecking order theory of capital structure can be a theory in which capital structure evolves as the cumulative outcome of past incremental financing decisions.

In other words, a firm management's superior information about the firm's assets and prospects (about the value of its risky securities) in relation to the market should generate a hierarchy of financing policies with a preference for internal over external finance and for debt over equity. According to this hierarchy, firms should finance new investments with the least information-sensitive securities, i.e., first with retained earnings, then with safe debt, then with risky debt, and finally, under duress, with equity.

4.2.4.2 Signaling effect of capital structure decision In corporate finance, asymmetric information refers to the notion that a firm's insiders, typically the managers, have better information on the value of their firm's assets and investment opportunities than do market participants. This asymmetry creates the possibility that the market will not price the firm's claims correctly, thus providing a positive role for corporate financing decisions. Ross (1977) designed a model that illustrates how mispriced equity gives managers the incentive to signal the market. The managers' private information becomes available through capital structure decisions. Ross (1977) suggests that the manager of a firm whose wages depend on current and future values of the firm will use debt to signal the quality of the firm (known only to him) to the market. The dependence of his wage on the current value of the firm gives him the incentive to signal, while a penalty in the case of bankruptcy dissuades

him from overstating the value. This is a confirmation that information asymmetry does affect the capital structure decisions of U.S. firms and hence US banks. Similarly, Leland and Pyle (1977) contend that the proportion of equity held by the owner-manager acts as a signal to the quality of the firm.

Market imperfections bring with it information costs. This is because with asymmetric information, leverage may reveal something about the existing firm. Market timing will involve managers taking advantage of superior information: issue equity when the firm is overvalued and issue debt when it is undervalued. Hence managers will use financing decisions to signal future prospects of firms. They issue equity to signal good growth opportunities (preserve financial flexibility), and issue debt when expected cash flows are strong and stable. This leads to the pecking order theory discussed earlier.

In a world of asymmetric information in which only the insiders know the quality of their firm, it is claimed that debt, even if it is risky, is more advantageous than equity because issuance of debt is less attractive to inferior firms (firms with relative lower total assets and market capitalization). The advantage of debt arises from the fact that it can keep unprofitable firms out of the market, thus improving the average quality of firms in the market, as is also mentioned by Myers and Majluf (1984). This advantage exists even if the firms cannot be perfectly sorted in the signaling equilibrium. The following figure 4.3 illustrates how managerial announcements change leverage, typically signalling information about the value of the firm. The figure shows that at a given original state of the firm, with debt to equity ratio, (D/E), the insider forecasted decision will affect the debt ratio depending on the nature of the decision made. When an insider has a revised forecast decision that gives good news (increase in value of the firm), it gives the scenario where the firm has the highest debt to equity, D/E_1 ratio. While for the revised decision that gives the bad news (expected losses by the firm), the firms debt to equity ratio is the lowest, D/E_2.

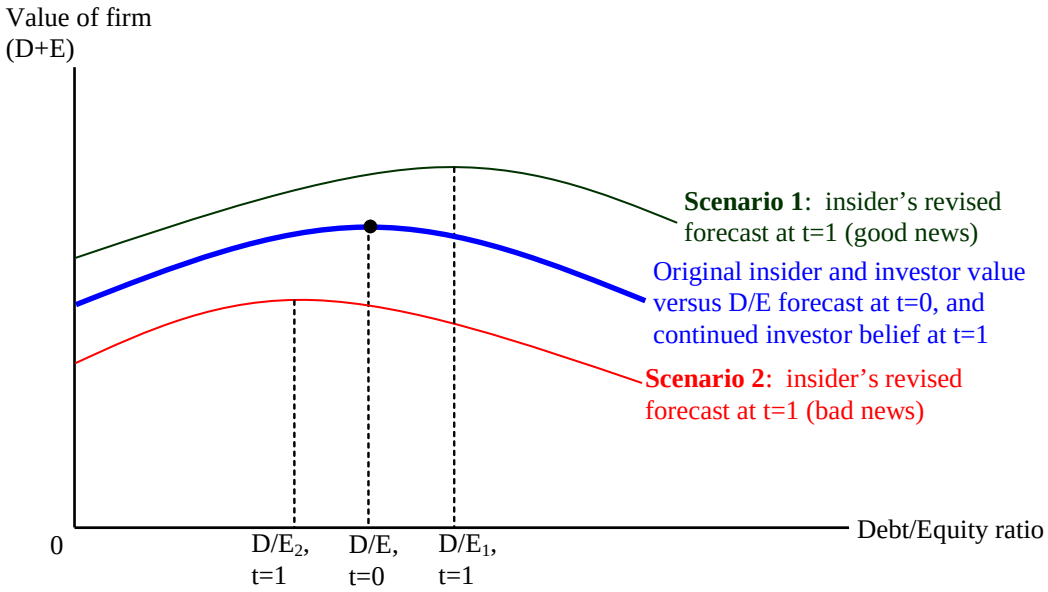

Figure 4.3: Asymmetric information and managerial signaling through capital structure. Source: Ideas from Myers and Majluf (1984)

4.2.5 Miller and Modigliani (MM) theories of capital structure

Modigliani and Miller (1958) established the foundation of capital structure theory. They demonstrated that in a market of fully informed investors (no taxes, and risk-free debt), the value of a firm and in particular, its equity value, is determined without regard to the firm's capital structure. In general, we would expect the market to place very heavy weighting on current and recent past earnings in forming expectations as to future returns. Hence if the owners of a firm discover a major investment opportunity which they feel would yield much more than the cost of capital, they might well prefer not to finance it through common stock at the then ruling price, because this price may fail to capitalize the new venture.

Miller and Modigliani (MM) assumed that a firm can separate the investing (capital budgeting) decision from the financing decision. The financing decision seeks to increase the value of the firm by selecting the best borrowing pattern for the firm. MM's first proposition assumes no taxes and concludes that capital structure is irrelevant. This first proposition indicates that it does not matter how the firm finances its operations since the value of

the firm remains unchanged and is based only on the investing choices of the firm. A zero dividend growth valuation model illustrates the intuition behind and the implications of this MM's first proposition. Thus, if the cost of capital is unchanged and cash flows are unchanged, then the value of the firm is unchanged, (Diamond, D. et.al.,2000).

4.2.5.1 The cost of capital MM's second proposition suggests that the firm's cost of equity (R_e) is a function of the required return on the firm's assets, weighted average cost of capital ($WACC$). We represent it, using ideas from Wachowicz and Horne (2004) in equation (4.1) by R_A, the cost of debt which also is related to the interest rate (R_d) and the debt (D) to equity (E) ratio.

$$R_e = R_A + (R_A - R_d) \times (\frac{D}{E}) \tag{4.1}$$

Equation (4.1) indicates that in the financial market scenario without taxes, the $WACC$, i.e. (R_A) is simply the weighted average of the cost of debt and the cost of equity. We illustrate this equation in Figure 4.4(a), which shows the relationship of a firm's assets weighted average cost of capital ($WACC$) or (R_A), the cost of debt (R_d) and the debt (D) to equity (E) ratio.

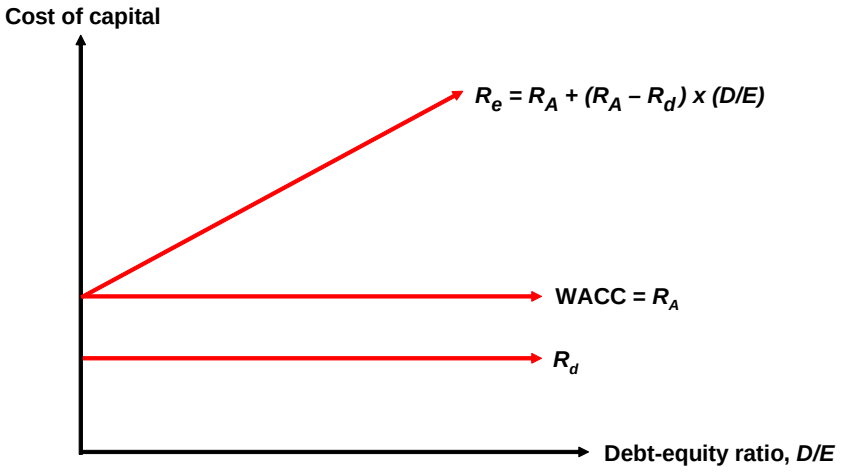

Figure 4.4 (a): Cost of capital on debt issuance

We note from the above graph that if a firm has no debt to issue, then the equity investor

will require only R_e, the cost of equity which depends on the business risk. As the firm uses debt, the equity cost increases due to the financial leverage risk premium. The graph shows that the cost of capital R_e of a firm increases in proportion to the debt to equity ratio ($\frac{D}{E}$). The debt adds value to the firm due to the interest deductibility (assume taxes only).

MM's second theory introduces corporate taxes. In this case, MM concludes, in Proposition I, that the optimal capital structure is 100% debt. Therefore, Figure 4(a) above, shows the MM theory without corporate taxes (the irrelevance of the model) where the cost of equity (R_e) rises in a prescribed manner to offset the lower cost of debt R_d producing $WACC$ that remains unchanged by the use of financial leverage.

4.2.5.2 The value of firm (levered, (V_L) and all equity, (V_U)). As the use of debt financing is increased, the cost of equity will rise; and so even if the earnings per share ratio is increased through the use of debt financing, that benefit is offset by a higher discount rate. Hence, from a shareholder wealth perspective, under the MM assumptions, financing strategy is irrelevant and because interest payments are tax-deductible, the value of a levered firm (V_L) increases with debt. Thus if taxes exist and interest expenses remain deductible, then debt adds value to the firm due to the tax shield. If $WACC$ remains the same regardless of the financial strategy used by the firm: $V_L = V_U$, is the value of an all-equity firm and financial strategy is irrelevant.

$$V_L = V_U + T_C \times B \tag{4.2}$$

where T_C is the corporate tax rate, B is the debt issued and hence ($T_C \times B$) represents the tax shield.

$$V_L = V_U + PV(Taxshield) \tag{4.3}$$

The present value (PV) of the tax-shield can be calculated as shown below. In a simple case, we assume that the firm has 100% likelihood of using the income deduction, all the variables are constant, the interest shield r_D is the same as the cost of debt or the discount, R_d and the firm will renew the debt forever (the tax shield will last forever). With these

assumptions the value of the tax shield is as shown, with ideas from Wachowicz and Horne (2004) in equation 4.4.

$$PV(Taxshield) = \frac{r_D D \tau_C}{r_D} = D\tau_C \tag{4.4}$$

where D is the dollar value of debt, r_D is the interest shield or also equal to the cost of debt and τ_C is the corporate tax rate. The impact of these on the value of the firm, V, when without issue of debt, V_U , and with funds from issued debt V_L, can be illustrated in a graphical form as shown in Figure 4.4(b) below. The figure shows that the actual value of the firm depends on the tax shield and the debt issued. The value of the firm at any given time will be V_U, when there is no debt issued. This value then rises till an optimal debt, B^* is issued; then a decrease in the firm's value is observed due to the financial distress costs.

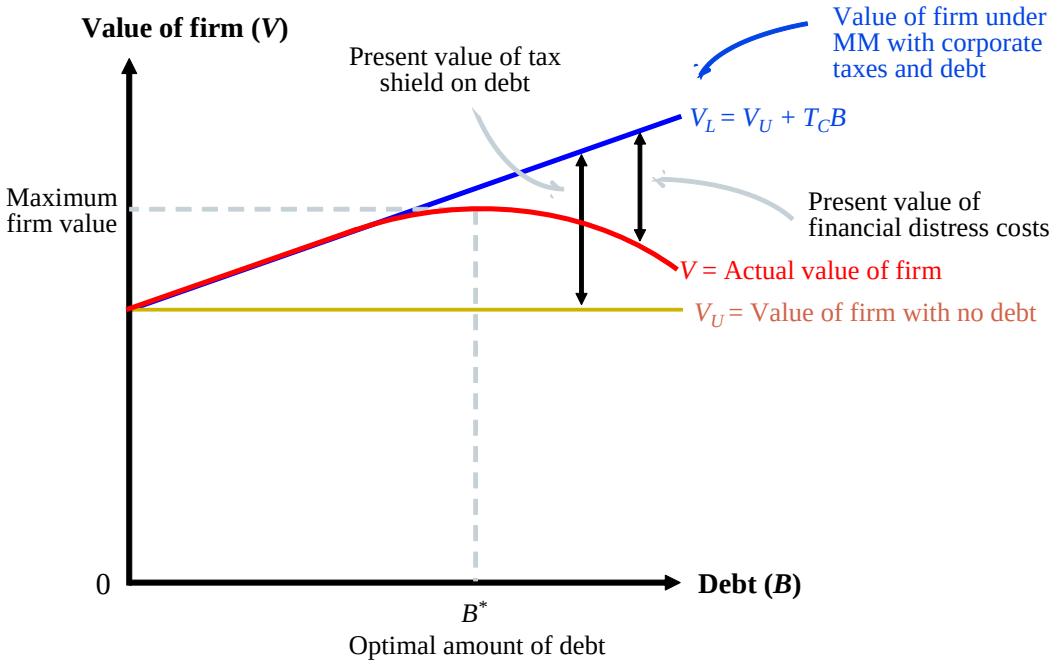

Figure 4.4 (b): Relationship between the value of the firm and debt issuance; Source : Wachowicz and Horne (2004)

MM implies that when the equity is underpriced, asymmetric information makes retained earnings and debt better financing tools than new equity as also illustrated by DeMarzo

(1988). DeMarzo (1988) does not discuss the potential implications of bankruptcy in their asymmetric information scenario. The larger a project's unrecognized NPV, the higher will be that limit, with all else equal. Firms with a higher level of unrecognized NPV will have more incentive to issue debt rather than new equity. In the Myers and Majluf (1984) model, managers will pass up positive NPV investments if the equity necessary to finance them is sufficiently underpriced by the market. Therefore, the decision to issue equity and invest will convey negative information to the market and the price will drop at the announcement. Myers and Majluf suggest that the under-investment problem can be avoided by issuing a security with less risk, a security that is less sensitive to mispricing (riskless debt, for example, cannot be mispriced). Given the under-investment problem, capital structure is driven by a hierarchy of preferences, or a pecking order discussed in an earlier subsection, for the issuance of new capital. Therefore this theory also shows that managers will prefer internal funding (or riskless debt) to risky debt, which, in turn, they prefer to equity.

4.2.6 Static trade-off theory

The Static trade-off model (predating the 1980s) — this include studies by Jensen and Meckling (1976) and Titman et.al.(1988) — does not incorporate information asymmetry. In reality, information asymmetry exists between corporate managers and outsiders. The static trade-off theory, which focuses on the benefits and costs of issuing debt, predicts that an optimal target financial debt ratio exists, which maximizes the value of the firm. The optimal point can be attained when the marginal value of the benefits associated with debt issues exactly offsets the increase in the present value of the costs associated with issuing more debt (Myers, 1984).

The high leverage observed for banks is closely related to what makes banks more special than firms in other industries. Unlike non-financial firms, banks' liabilities (e.g. demand deposits) are used as money and are as a safe store of savings (e.g. certificates of deposit) that can be called on at short notice. More recently, other types of bank liabilities, for example, asset-backed securities, have served as collateral for a host of financial transactions. This high leverage presents the most important challenge to the trade-off theory. It suggests

that firms prefer to use retained earnings to external finance, and that when external funds are required, debt is preferred to new equity (Myers and Majluf, 1984).

Figure 4.5 below illustrates the impact of firm's cost of equity R_e and debt R_d on MM with corporate taxes. The cost of equity rises throughout as more debt is added. The cost of debt rises at higher levels of debt and $WACC$ falls initially because the benefits of the tax-deductibility of interest expense outweigh the marginal increases in component costs; however, at higher levels of debt, the tax-advantage of debt is offset and the value of the firm falls when WACC starts to rise.

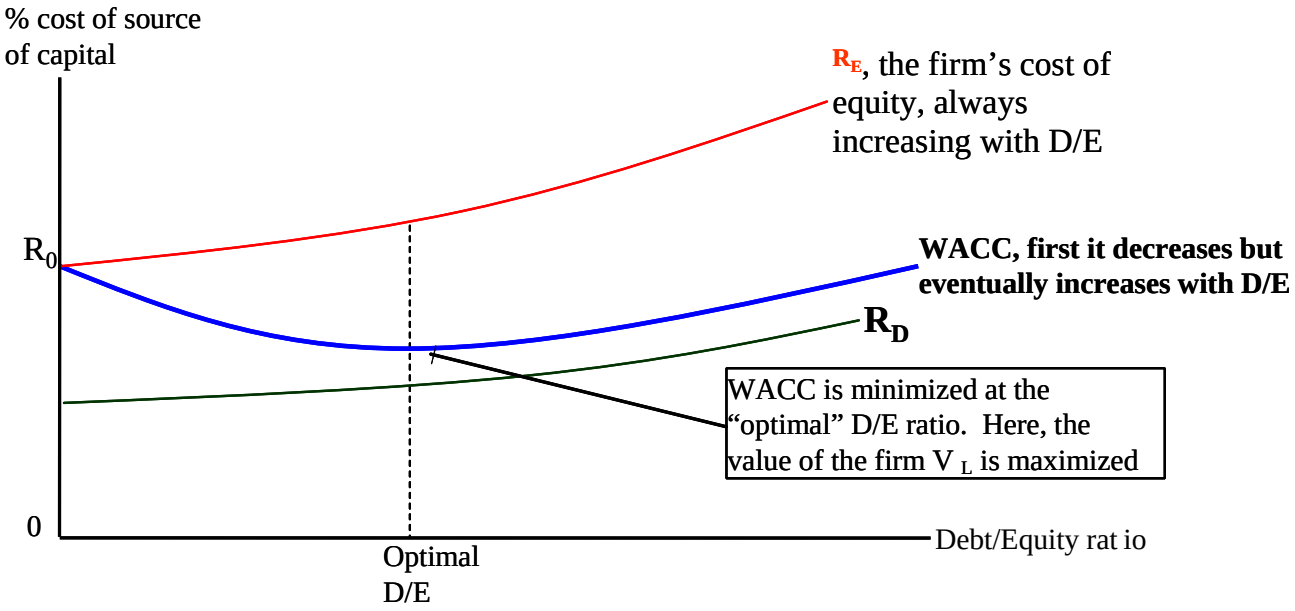

Figure 4.5: Cost of capital on debt issuance, under static trade-off theory; Source: Wachowicz and Horne (2004)

We can conclude from figure 4.5 above that $WACC$ is minimized at the optimal debt-to-equity ratio. The bonds are almost risk-free at low debt levels and that R_d is independent on leverage, while R_e increases linearly with debt-equity ratios; and the increase in expected return reflects increased risk. As firms borrow more, the risk of default rises and R_d starts to increase while R_e increases more slowly (because the holders of risky debt bear some of the firm's business risk). The minimum $WACC$ occurs where the stock price is maximized.

Thus, the same capital structure that maximizes stock price also minimizes the $WACC$. This affirms the statement "trade-off theory is that theory of capital structure based on a trade-off between tax savings and distress costs of debt and pecking order theory" is the theory where firms prefer to issue debt rather than equity if internal finance is insufficient.

Therefore the theory has been described to be static rather than dynamic with the taxes and contracting cost driving the firm value, Wachowicz and Horne, (2004). We can also note that optimal trade-off between cost of issuances will often be a benefit of capital structure. Then, the large, stable profitable firms will always have more debt, and the higher the costs of distress the lower debt to be issued. Finally, the lower the taxes, the lower the debt and the less (more) favorable tax treatment of debt (equity), the lower debt.

4.2.7 Financing decisions

The final capital structure adopted by banks is a function of the variables that theoretical models suggest they should be important. These include operating risk, bank size, asset composition and liquidity considerations. There are three financing methods that companies use: debt, equity, and hybrid securities.

Assuming that the primary financial goal of managers in a bank is shareholder wealth maximization, this translates to maximizing stock price. The value of any asset is the present value of the cash flow stream to owners. Most significant financing decisions are evaluated in terms of their financial consequences. Stock prices change over time as conditions change and as investors obtain new information about a company's prospects. In equilibrium, a stock's price should equal its "true" or intrinsic value. Intrinsic value is a long-term concept. To the extent that investor perceptions are incorrect, a stock's price in the short run may deviate from its intrinsic value.

4.2.8 Debt financing

Debt financing ranges from simple bank debt to commercial paper and corporate bonds. It is a contractual arrangement between a company and an investor, whereby the company pays a predetermined claim (or interest) that is not a function of its operating performance, but

which is treated in accounting standards as an expense for tax purposes and is therefore tax-deductible. The debt has a fixed life and has a priority claim on cash flows in both operating periods and bankruptcy. This is because interest is paid before the claims to equity holders. If the company defaults on interest payments, it will be declared bankrupt; its assets will be sold, and the amount owed to debt holders will be paid before any payments are made to equity holders. The basic feature of a debt is that it is a promise by the borrowing firm to repay a fixed amount of cash by a certain date, Dewatripont and Jean (1994). The sources of funding is through debt issues which comes in the form of bond issues or long-term notes payable. Short-term debt such as working capital requirements is also considered to be part of the capital structure. Figure 4.6 below shows the trend of the amount raised from debt issued by the top US banks (ranked by total assets). We realize that the banks have raised largest amounts through issue of debt. Citibank showed itself to be the greatest beneficiary of debt issuance where it raised the highest total of $240.5 billion till 2007, and its lowest total of $57 billion in the first part of 2012. JP Morgan reported highest amounts as from 2008 till 2012. There has been an upward trend in debt issues for the top banks. There is also a clear picture that debt issuance was lowest in 1999 -2000 period which could be due to the effects of the dot.com bubble. From 2001 we note an increasing trend with a drop seen in 2008 and a recent decline as from 2010 to date, which can be attributed to the financial crisis.

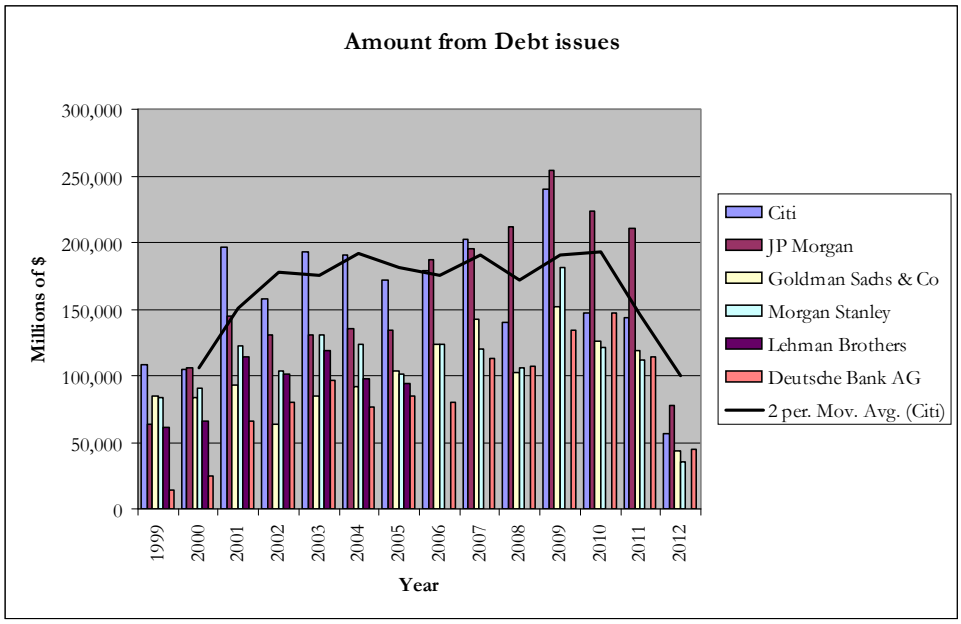

Figure 4.6: Amount raised from debt issuance; Source: Bloomberg

4.2.9 Equity financing

Like other firms, banks' decisions to issue securities are driven by the need for funding. The choice of instruments is made after taking into account a number of factors which include: bankruptcy costs, agency costs and taxes. In addition, since a bank's liability structure is regulated through capital adequacy standards, the issuance of debt and equity instruments may also be affected by the eligibility of these instruments as components of regulatory capital. Bank capital regulation supports equity issuance by requiring a minimum amount of common Tier 1 equity, while it only allows the use of a limited amount of bonds. Since banks need to meet the capital requirements on an ongoing basis and their ratings and funding costs are increasingly risk-sensitive under restricted deposit insurance, banks typically choose to hold a buffer above the minimum Tier 1 requirement[12]. This is the case even though equity issuance is more expensive than bond issuance.

Equity financing includes owners' equity, venture capital (equity capital provided to a private firm in exchange for a share ownership of the firm), common equity, and warrants

[12]The Tier 1 ratios of major international banks are typically 6%-12%.

(the right to buy a share of stock in a company at a fixed price during the life of the warrant). Unlike debt, equity financing is permanent in the company, its claim is residual and does not create a tax advantage from its payments as dividends are paid after interest and tax; it does not have priority in bankruptcy, and it provides management control for the owner.

US banks have raised funds through equity which is classified as common stock, preferred stock or retained earnings. Figure 7 below shows that the top US banks had an interesting equity issuance trend. Morgan Stanley is the top performing bank that depends on equity issuance where it raised a high of $32.5 billion in 2010; its lowest was $6 billion in first half of 2012. High amounts were raised between 1999-2001 and between 2009-2012. This could be due to the efforts that the American government made to counter the crises in 2000 and 2008.

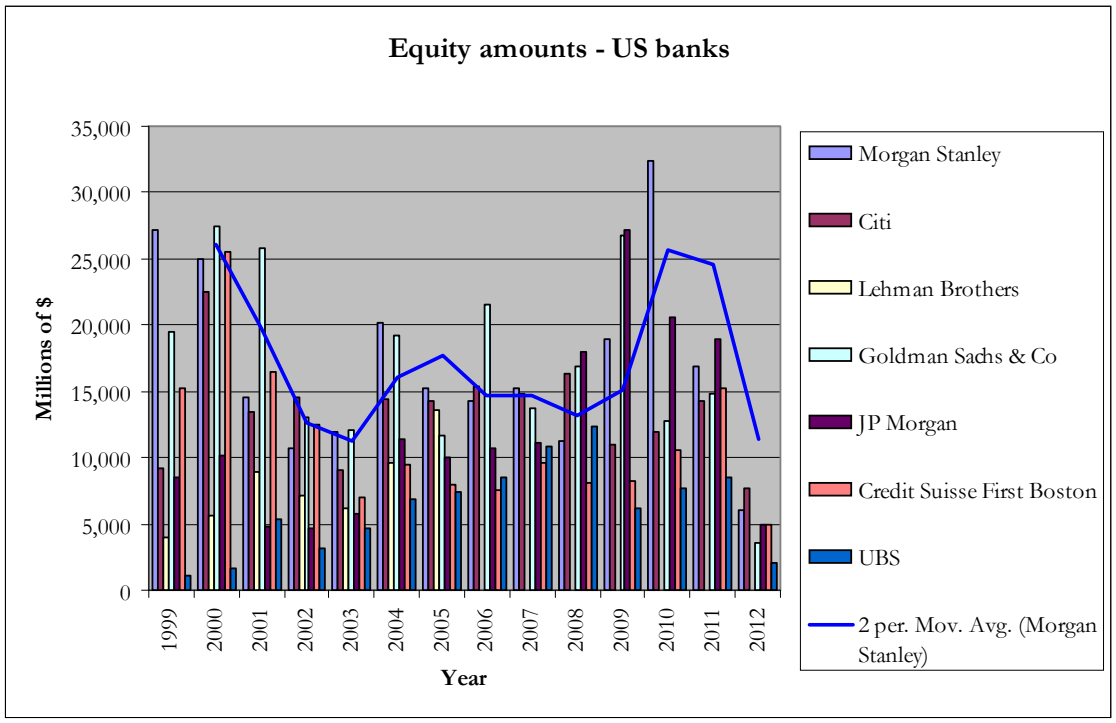

Figure 4.7: Amount raised from Equity issuance; Source: Bloomberg

There was an interesting trend of how the stock price and intrinsic value changed before the financial crisis in 2008 as shown in Figure 4.8 below. It can be seen that the stock was

over valued during periods: 1988-1995 and 2003-2008. The figure shows a bank's actual price and intrinsic value as estimated by its bank management over time, (Brigham and Houston, 2009). We note from the figure that the intrinsic value rises because the bank retains and reinvests earnings each year, which tends to increase profits. The intrinsic value jumped dramatically in 2003, when a research and development (R&D) breakthrough raised the management's estimate of future profits before investors had the information. The actual stock price tended to fluctuate with the estimated intrinsic value; but investor optimism and pessimism, along with imperfect knowledge about the true intrinsic value, led to deviations between the actual prices and intrinsic values.

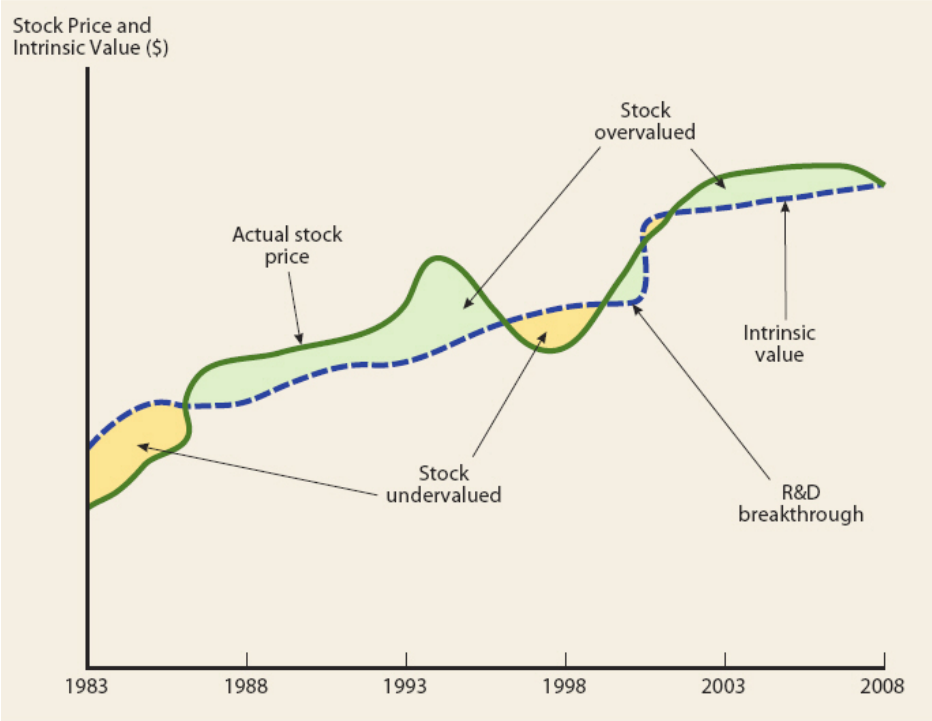

Figure 4.8: Stock Prices and Intrinsic Values before 2008 financial crisis; Source; Brigham and Houston (2009)

Maximizing the intrinsic value will maximize the average price in the long run, but not necessarily the current price at any time. The management might make an investment that lowers profits for the current year but raises expected future profits. If investors are not aware of the true situation, the stock price will be held down by the low current profit even

though the intrinsic value was actually raised.

4.2.9.1 Hybrid Securities Hybrid Securities are securities that share some characteristics with both debt and equity. They include, for example, convertible securities (defined as debt that can be converted into equity at a prespecified date and conversion rate), preferred stock, and option-linked bonds. MM demonstrated that, under a certain set of assumptions, the choice between any of these securities (referred to as capital structure or leverage) is not relevant to a company's valuation. The assumptions include: no taxes, no costs of financial distress, perfect capital markets, no interest rate differentials, no agency costs (rationality), and no transaction costs. These assumptions are, in fact, the main drivers of capital structure and gave rise to the trade-off theory of leverage.

4.2.10 Capital Structure and the bank asset value

We use (Myers and Majluf, 1984) to consider the bank asset value in relation to relation to capital structure. We start by assuming a "perfect world" status of the banks, based on the work of MM which shows that capital structure is irrelevant. MM first proposition [13] is based on the assumption of perfect capital markets. Perfect capital markets include characteristics such as no taxes, no transactions costs and that the lending and borrowing rate are the same.

Market imperfections include tax (US Tax Code):

Deductibility of interest leads to lower cost of debt ($R_d(1-t)$). Simple specification overvalues benefit and ignores personal taxes which decreases investors debt return and increases investors preference for equity. We also have contracting costs such that in imperfect markets, alternative ways to contract optimal behavior are necessary. The costs of financial distress will imply underinvestment (rejecting $NPV > 0$ projects). The benefits of debt include monitoring function, managing free cash flow problem (accepting $NPV < 0$ projects). Hence contracting costs and taxes are primary motives for static trade off theory debt as mentioned earlier.

[13] Proposition I: The market value of any firm is independent of its capital structure.We note that value is derived from market imperfections.

Capital Structure is irrelevant according to MM's first proposition. The best way to understand how capital structure creates value is to consider the financial market where capital structure does not create value. If this was true we would see random patterns of financing across banks. We would have a bank considering issuing debt and at the same ensuring that little effect is felt by the shareholders. In this case the assumption is such that if the bank issues debt, they will buy back an equivalent amount of stock. Therefore, it means that any change in capital structure will also affect the bank's investment opportunities. This is a key motivation on what decision the bank considers to raise funds.

4.3 RESEARCH ON CAPITAL STRUCTURE

Capital structure has been considered by many other researchers since the work of Modigliani and Miller, (1958). Capital structure research can be divided into two major groups:

(a) Studies done to consider the determinants of capital structure and thus the motivating factors for the firms to have capital structure decisions. Subsequent researchers have systematically examined the effects of relaxing various conditions determining capital structures.

(b) The second group has covered the theories explaining capital structures. Despite inevitable differences of opinion among researchers in this second category, the current consensus is that the empirical evidence is consistent with the trade-off model in which firms choose a target leverage ratio to which they actively adjust over some period of time.

Furthermore, alternative views in which firm managers make financing decisions with little or no thought of hitting a target leverage ratio have received little empirical support to date. But even its proponents recognize that the standard model has limited power to explain firm capital structure decisions for the last 50 years.

The works of Baxter and Cragg (1970), may be regarded as the first empirical studies that directly investigated the debt-equity financing decision. They found that banks which are small, that have high price-to-earning ratios and have high leverage, are more likely to

issue equity. However, their evidence on coverage ratios[14] and risk was weak, conflicting and non-significant. It is also worth noting that Martin and Scott (1974) found that a high payout, low profitability and a high proportion of fixed assets, all tended to indicate a debt issue. They also found in their study of UK firms that market conditions play a highly significant role in determining the probability that a firm will issue debt, thus indicating that equity issues are more likely to follow market rises, as they will also tend to follow periods of unusually high residual returns on the bank's shares. These studies provided evidence that companies appear to make their choice of financing instrument as if they have target levels of debt in mind. The results are consistent with the notion that these target debt levels are themselves a function of company size, bankruptcy risk and asset composition.

In addition, Marsh (1982) did an empirical study of security issued by UK companies between 1959 and 1974 focusing on how companies select between financing instruments at a given point in time. This showed that UK companies are heavily influenced by market conditions and the past history of security prices in choosing between debt and equity. On the whole, the empirical studies have identified a general tendency to try to determine and maintain a well defined long-term target debt level, of course the pattern displayed by the actual debt level over time is not steady in the short-run, but fluctuates around the target level in response to timing considerations and capital markets conditions. It is in fact expensive to retire either debt or equity once issued.

Titman and Wessels (1988) analyzed the explanatory power of some of the recent theories of optimal capital structure. Their study extended empirical work on capital structure theory in three ways. First, it examined a much broader set of capital structure theories (effect on debt ratios arising from non-debt tax shields, volatility, collateral value, or future growth of a firm), many of which had not previously been analyzed empirically. Second, since the theories had different empirical implications in regard to different types of debt instruments, the authors analyzed measures of short-term, long-term, and convertible debt rather than an aggregate measure of total debt. Third, their study used a factor-analytic technique that mitigates the measurement problems encountered when working with proxy variables. Their

[14]This is a measure of a company's ability to meet its financial obligations. The higher the coverage ratio, the better the ability of the enterprise to fulfill its obligations to its lenders.

results suggested that firms with unique or specialized products have relatively low debt ratios. They also found that smaller firms tend to use significantly more short-term debt than larger firms. Their model explained virtually none of the variation in convertible debt ratios across firms and found no evidence to support theoretical work that predicted that debt ratios are related to a firm's expected growth, non-debt tax shields, volatility, or the collateral value of its assets. However, they found some support for the proposition that profitable firms had relatively less debt relative to the market value of their equity.

The impact of equity issuance was considered by Korajczyk et al. (1991) who found that a firm's stock price experiences significant abnormal rises on average prior to its issuing equity. In addition, they found that equity issues are clustered after earnings announcements and that the extent of the price drop at the announcement increases insignificantly with time.

Close to our US sample data study, is the work by Rajan and Zingales (1995) who investigated the determinants of capital structure choice by analyzing the financing decisions of public firms in the major industrialized countries. They found that the factors identified by previous studies — profitability, leverage target ratios, debt ratio and bank specific characteristics are as important in determining the cross-section of capital structure in U.S.firms as they affect the firm leverage in other countries as well. Despite all the interest findings, banks and financial institutions were not included in their sample.

In addition to earlier works on the Static Trade-off Theory and the Pecking Order Theory (Myers, 1984; Myers and Majluf, 1984), Andrew (2003) also considered the "trade-off" and "pecking order" theories. These two theories could be the most influential approaches to understanding firms' capital structure decisions. The paper adopts two approaches to examining capital structures using firm-level panel data for firms in both Spain and the United Kingdom. First, he examines debt ratios and finds them to be decreasing in cash flow or profitability and increasing in the investment. The results are consistent with the pecking order approach and generally inconsistent with the trade-off approach suggesting behaviour consistent with the existence of a hierarchy of finance faced by firms in Spain and the United Kingdom. Although he considers the aspects of the two different financial systems such that they find some modest evidence for the Spain based firms. They note that the bank-based financial system, has some evidence that the effects of debt ratio are weaker for larger firms

and for firms with equity held by financial institutions. While for the United Kingdom, a market-based financial system, they found the tendency to issue debt is compared to that for issuing new equity and found to be more sensitive to financial characteristics of the UK based firms.

Panno (2003) investigated the empirical determinants of capital structure decisions of firms, and tried to provide some contributions that help to fill the existing gap between theory and empirical evidence. Their article included a descriptive model of the choice between equity and long-term debt for firms based in UK and Italy. He found that firms in both countries were able to allow their gearing ratios to vary significantly around the target ratio. These findings suggest that firms do not identify a strict, single optimal capital structure ratio as such, but rather a range over which their capital structures are allowed to vary.

Frank and Goyal (2004) examined the relative importance of factors in the leverage decisions of publicly-traded U.S. firms from 1950 to 2000. They considered the most reliable factors that were median industry leverage that would give a positive effect on leverage; market-to-book ratios that would have a negative effect on leverage; the collateral that has a positive effect; firm profits which would have negative effects on leverage; dividend paying which would have positive effects; firm size measured by the natural logarithm of total assets, would have positive effects and expected inflation would also have a positive effect. They find that shocks to equity value are followed by offsetting actions in the debt market.

Halov and Heider (2005) advanced a new version of the pecking order theory. They argued that when there is greater asymmetric information about risk than bank asset value, debt is characterized by a more severe adverse selection problem and hence firms would only issue equity. They showed that as asset volatility increases, firms use equity rather than debt to finance their deficits. Thus, the conventional pecking order may be more appropriate in explaining the financing behaviour of mature firms[15] as these may have more asymmetric information about value. Kayhan and Titman (2007), in showing that firms behave as if they

[15]Mature firm also called mature company is a company at the stage in its life cycle when it grows at the rate of the economy at large. This is marked by earnings growth (or shrinkage) in line with most of the rest of the economy. Mature companies often pay higher dividends than those in a growth industry or a transition industry.

have a target debt ratio, provided further literature on determinants of capital structure. Their evidence suggested that the need for investment, cash flows, and stock returns lead to transitory deviations from leverage targets, but firms gradually undo these deviations.

Antonios et al.(2008) in their paper aimed at investigating the determinants of choice between private and public debt for British and German listed companies. They found out the presence of a few similarities in the debt-mix structure of German and British firms. Although they are closer to the objective of our study, they did not look at equity as source of funding for the firms.

Reint and Florian (2010) in their paper, "The Determinants of Bank Capital Structure" use large U.S. and European banks data during the period 1991 to 2004 to show that mis-priced deposit insurance and capital regulation were not the main determinants of capital structure. They found that the individual bank characteristics are ultimately the most important determinant of a bank's capital structure and that a bank's leverage converges to a target set for an individual or specific bank and that will be consistent for a long period of time. They failed, however to address the capital structure decision — the choice of financing a bank will prefer to raise funds.

4.4 MODEL SPECIFICATION

The most influential model[16] we consider in this study is Stewart Myers's pecking-order model, in which firms finance investments out of cash whenever possible, sell debt only if cash flows are too low, and sell new equity only as a last resort. According to this view, a firm's leverage ratio increases when its cash flows drop and it is compelled to issue new

[16]An alternative model would have been Dynamic Trade off model. The limits of the Dynamic Tradeoff Model. The empirical importance of industry effects and of other variables that might be interpreted in ways that have little to do with a tradeoff between tax savings and the costs of financial distress, for example, firm size, firm profitability, or market-to-book value, limits our confidence in the dynamic tradeoff model. Furthermore, in a capital structure literature, Lemmon, M.L., et.al.(2008), it is highlighted the limited explanatory power of the model. Lemmon and his co-authors found that, even including industry effects, the traditional model explains, at most, 30 percent of the variation in firms' capital structures; an economist would say that the model has limited power to explain the data. Perhaps more important, Lemmon and his co-authors find that firm fixed effects have a lot more explanatory power than all of the traditional factors put together. A fixed effect is a persistent factor associated with a particular firm: We know it's there, and we know that it helps explain the firm's choice of capital structure; we just don't know what it is.

debt[17] to finance expenditure, and its leverage ratio declines when cash flows increase and internal funds build up. In contrast to the assumption of trade-off models, a firm manager in a pecking-order type world will make no attempt to actively adjust toward some target. A descriptive model of the choice between equity and long-term debt is developed. The coefficients of the model are estimated using Logit analysis.

The model

We noted earlier that banks may decide both to raise short-term debt and thus draw down liquid funds or sell new long-term securities when faced with the need of raising funds. In this study, we attempt to model the choice the bank would make between equity and debt issuance. This will cover especially those cases in which banks resort to the long-term capital market. Since past empirical investigations seen in section 4.3 above, have shown that in several instances the sales of debt and stocks tend to occur at discrete intervals and in relatively large amounts, the actual choice of instrument is of great interest.

Beginning with Titman and Wessels (1988), then Rajan and Zingales (1995) and more recently Frank and Goyal (2004), the empirical corporate finance literature has converged to a limited set of variables that are reliably related to the leverage of non-financial firms. Leverage is positively correlated with size and collateral, and is negatively correlated with profits, market-to-book ratio and dividends. The variables and their relation to leverage can be traced to various corporate finance theories on departures from the Modigliani-Miller irrelevance proposition.

Reint and Florian (2010), who looked at the determinants of capital structure only consider the following standard capital structure regression:

$$L_{ict} = b_0 + b_1 MTB_{ict-1} + b_2 \operatorname{Pr} of_{ict-1} + b_3 Ln(\operatorname{Si} ze_{ict-1}) + b_4 Coll_{ict-1} + b_5 Div_{ict} + c_c + c_t + u_{ict} \tag{4.5}$$

[17]Debt in this case is used to represent the bonds, collateralised loans and obligations, asset backed securities, mortgages and mortgage loans.

Their explanatory variables are the market-to-book ratio (MTB), profitability (Prof), the natural logarithm of size (Size), collateral (Coll) (all lagged by one year) and a dummy for dividend payers (Div) for bank i in country c in year t. The regression model they used included time and country fixed effects (ct and cc) to account for unobserved heterogeneity at the country level and across time that may be correlated with the explanatory variables. They found that the standard errors are clustered at the bank level to account for heteroscedasticity and serial correlation of errors as also indicated by Petersen, 2009. Although Reint and Florian (2010) defined the dependent variable as one minus the ratio of equity over assets in market values which therefore includes both debt and non-debt liabilities such as deposits; this model could only explain adequately the factors that influence the capital structure but it fails to give a reason for the possible choice of either equity or debt. Hence the need for binary model.

To control for potential heteroscedasticity problems the variables are deflated by the book value of total assets in accordance with Bevan and Danbolt (2000 and 2002). This study also uses White (1980) heteroscedasticity-consistent standard errors and covariance for mitigating heteroscedasticity in calculating the t-statistics. Rajan and Zingales (1995) estimated their regression by using maximum likelihood and a censored Tobit model. They argue that the ordinary least square (OLS) results are very similar to those results that are obtained using the alternative techniques. Bevan and Danbolt (2002) have confirmed these findings. As a result, we consider a different model from the common one used and discussed in previous studies.

Following the model ideas of Panno (2003) and De Jong et.al. (2011), we construct a binary model in such a way that it assumes the choice the banks make in the equity or debt issuance. The main assumption is such that bank j will only issue one type of fund source (either debt or equity) at a given point in time. This characterization may at first appear not completely realistic, since in principle banks might be willing (for various reasons) to issue both debt and equity at the same time. The decision to opt for a binary choice is to model the bank's financing decision, which relies on the necessity to differentiate between those banks that decided to resort to a particular financing option (say debt) from those which opted for the other financing instrument (say equity). This also helps to gain some

indication of the factors that could account for the particular decision they made.

Furthermore, before making the financing decision, the logistic model does not rule out the possibility that a bank which has just raised funds by issuing one financial instrument, can decide to issue other financial instrument. In the sample, there are banks that for the same year appear in both sides of the sample (debt and equity) indicating that they have made an issue of both debt and equity in the same year being considered, De Jong et.al. (2011).

Therefore we assume that a bank's choice of financing instrument will depend on a well defined set of characteristic variables. We consider the banks' debt ratios. Theory predicts that the composition of debt will depend on the bank's size, asset composition[18] and forecasts about future economic performances. Hence the explanatory variables in the model include liquidity variables, profitability variables and market condition variables. We will designate these variables for each bank j, at time lag $t-1$, as a vector $\underline{\mathrm{x}}_{jt-1}$. A significant role in the debt/equity choice played by these variables have been supported by both theory and previous empirical evidence.

Analytically, we assume that a bank's choice of financing instrument is a function of debt ratio in the following way

$$dr_{jt} = \underline{\mathrm{B}}'\underline{\mathrm{x}}_{jt-1} + u_{jt-1} \tag{4.6}$$

where dr_{jt} is the bank $j's$ desired debt ratio at time t, $\underline{\mathrm{x}}_{jt-1}$ is a vector of bank characteristics that include bank specific characteristics, Bs, dividend policy factors, Dp, and investment policy factors, Ip. These factors are related to the financing decision the bank would make at any given time $t-1$, $\underline{\mathrm{B}}'$ is the corresponding vector of coefficients, (θ_i, γ_j and δ_k) and u_{jt-1} is a stochastic error term. The general linear model in equation 4.5 can also be written as:

$$Y_{i,t} = \alpha + \sum_{i=1}^{5} \theta_i \, Bs_{i,t-1} + \sum_{j=1}^{2} \gamma_j \, Dp_{j,t-1} + \sum_{k=1}^{2} \delta_k \, Ip_{k,t-1} \tag{4.7}$$

[18]Asset composition can be defined as the proportion of the different financial instruments held by the bank in the total value of its assets.

In the above equation, all explanatory variables are lagged one period to avoid potential problems of endogeneity. We assume a linear model for the variables to be as in equation (4.5) above and then consider the binary choice model such that we have $\Pr(Z_{jt} = 1)$, the probability that bank j will issue debt at time t given that it will make an issue of either equity or debt, Panno (2003). Hence equation (4.5) then becomes

$$\Pr(Z_{jt} = 1) = \Pr(\underline{\mathrm{B}}'\underline{\mathrm{x}}_{jt-1} + u_{jt-1} < 0) \tag{4.8}$$

In this case if we look at a random sample composed of n banks at time t, and suppose that the first i issue equity while the remaining $n - i$ issue debt, the logarithmic likelihood function can be characterized as

$$\sum_{j=1}^{i} \log_e[\Pr(\underline{\mathrm{B}}'\underline{\mathrm{x}}_{jt} + u_{jt} < 0)] + \sum_{j=i+1}^{n} \log_e[1 - \Pr(\underline{\mathrm{B}}'\underline{\mathrm{x}}_{jt} + u_{jt} < 0)] \tag{4.9}$$

The value of this likelihood function depends on the vector of parameters $\underline{\mathrm{B}}'$. The vector of maximum likelihood estimators $\hat{\mathrm{B}}'$, which we are interested in, is obtained by estimating the parameters $\underline{\mathrm{B}}'$ using the Logit model (or, with another transformation, the Probit model).

The relationship between the dependent variable Z_i and the probability p that a bank records a debt issuance activity over a period of one year is given by:

$$p = \Pr(Z_i = 1 \mid Bs_i, Dp_j, Ip_k, \theta_i\ , \gamma_j\ , \delta_k\ ) = \frac{e^{Z_i}}{1 + e^{Z_i}} = \frac{1}{1 + e^{-Z_i}}. \tag{4.10}$$

In specifying the relationship between Z, and X , we can write the Logit model by considering the following Cumulative Distribution Function (CDF) for the Logit model:

$$\Pr(Z_{jt} = 1 \mid X_k\ ) = \frac{\exp(\alpha + \sum_{i=1}^{5} \theta_i\ Bs_{i,t-1} + \sum_{j=1}^{2} \gamma_j\ Dp_{j,t-1} + \sum_{k=1}^{2} \delta_k\ Ip_{k,t-1})}{1 + \exp(\alpha + \sum_{i=1}^{5} \theta_i\ Bs_{i,t-1} + \sum_{j=1}^{2} \gamma_j\ Dp_{j,t-1} + \sum_{k=1}^{2} \delta_k\ Ip_{k,t-1})} \tag{4.11}$$

where if bank i, $i = 1, 2..., n$ issued debt over the period under consideration, $Z_i = 1$, otherwise $Z_i = 0$ and Z_i is assumed to depend on the j observable variables described above, represented by $\underline{\mathrm{x}}_{jt}$.

The Logit and Probit models above provide a way of quantifying the relationship between the characteristics of the banks and the probability of issuing one of the two financing instruments, Panno (2003). In this model, Z (the dependent binary random variable) represents a two-way option of the issue of either equity or debt. When debt is issued, Z equals 1 whereas when equity is issued Z equals 0. Thus the interesting analysis will be based on the value of the parameter P, the probability that Z equals 1 or $P = P(Z = 1)$. Z is assumed to depend on the observable variables.

4.5 DESCRIPTION OF VARIABLES

We divide the explanatory variables into four groups. The first group consists of variables that measure deviations from target debt levels. These variables, which include the bank dividend policy, give an idea about the importance of target debt levels in capital structure decisions (if for example an optimal capital structure is in some ways pursued by banks). For the target debt ratio, simple estimates were used, such as historical averages together with a second group of variables. This in addition to the leverage variables form our second group of variables. They are used in this model and have the sole function to act as proxies for the target ratios. The third class of variables include bank size, risk and asset composition. They are selected based either on theoretical grounds, Myers and Majluf (1984), or because previous empirical studies claim they are important determinants of debt ratios; Rajan and Zingales (1995), Bunn and Young (2004), Reint and Florian (2010). We introduce the last class of variables in order to test other possible relevant determinants of corporate capital structure. As theory often suggests these group of variables; the role of the profitability of the firm, and other variables such as the payout ratio, the number of directors and the price earning ratio are considered.

4.5.1 Bank specific characteristics (Bs)

4.5.1.1 Bank size and operation risk We consider the following as proxies for the debt ratio (leverage); the bank size (measured by total assets), the risk position of the bank

(measured by the beta) and the asset composition. In the model, bank size is measured by banks' total assets; we use *log total asset* as the variable which represents the natural logarithm of total assets.

The size of the firm should be positively related to the leverage ratio. The rationale for this theory is the evidence provided by Warner (1977) and Ang et al. (1982). This suggest that the impact of the direct costs of bankruptcy on borrowing decisions of large banks is negligible. It is also argued that larger banks are more diversified, have easier access to the capital markets, and borrow at more favourable interest rates. A further reason for smaller banks to have lower leverage ratios is that smaller banks are more likely to be liquidated when they are in financial distress. We expect a positive relationship between bank size and the debt (leverage) ratio.

The risk position of a bank is a potentially important determinant in the capital structure decisions of managers; the leverage ratio should be negatively related to the risks faced by the firm, as primarily determined by the variability and uncertainty of its sales and costs. The risk measurement is the beta or systematic risk of the bank, defined as the ratio of the covariance of the return of the bank with the market, and the variance of return of the market. A negative relationship is expected between the beta and the financial leverage. Risk taking banks will tend to issue equity rather than debt if they are in need of new funds. The variable in the model is *Beta*. The higher the proportion of assets in place, the higher one would expect a bank's long-term debt ratio to be.

A measure of asset composition is also included in the model. This is taken as the ratio of fixed to total assets. However, a high value in the fixed to total asset ratio may imply a low portion of the firm's current asset or in general the more liquid asset with respect to the long-term stock; this aspect may lead to an opposite relationship between asset composition and leverage. The variable in the estimation is *asset composition*.

4.5.1.2 Liquidity Empirical studies that cover different time periods, samples of firms, and countries indicate that a firm's leverage tends to be higher when a firm is larger. Rajan and Zingales (1995), Bunn and Young (2004), Reint and Florian (2010) all showed that when a firm has more tangible assets, had its market-to-book ratio — that is, the value of the firm's

stock divided by the book value of its assets — then its leverage will be always be lower. These researchers have interpreted these factors as evidence that concerns about financial distress play an important role in the firm's capital structure choice. Large firms have more diversified sources of cash, and thus, they are less likely to face a sudden cash shortfall. A firm's tangible assets include machines and inventories, assets that could potentially be sold much more easily than a firm's intangible assets: its trademarks, its reputation for quality, brand recognition, or the accumulated knowledge of its workforce. In the event of a decline in cash flows, a firm may be able to avoid default by selling some of its tangible assets. The market-to-book ratio is often interpreted as a measure of the firm's growth opportunities; for example, future investment activities that investors see as valuable and, thus, raise the firm's stock price but which are not yet embodied in assets in place.

Leverage is positively correlated with size and collateral, and is negatively correlated with profits, market-to-book ratio and dividends. It is important to note that the literature on what determines banks' target leverage ratios is relatively small, the samples and model specifications are different, and not all findings are consistent, (Flannery M, 1994). We focus primarily on those results that are consistent across studies and that pertain to leverage ratios or capital ratios (common equity/assets) measured at market prices.

Liquidity ratios are used mostly to judge a firm's ability to meet its short-term obligations. The liquidity ratio may have varied effects on the capital structure decision working in opposite directions. First, firms with higher liquidity ratios might support a relatively higher debt ratio, due to a greater ability to meet short-term obligations when they fall due. From these effects one should expect a positive relationship between a firm's liquidity position and its debt ratio. However, firms with greater liquid assets may use these assets to finance their investments. If this happens there will be a negative relationship between the firm's liquidity ratio and its debt ratio.

Moreover, the liquidity of the bank's assets can show the extent to which these assets can be manipulated by shareholders at the expense of bondholders. As a measure of the liquidity position of the banks under examination, the 'Current Ratio' is tested, defined as the ratio of current asset to current liabilities, the 'Cash Flow Margin' defined as the ratio of cash inflows earned for ordinary operations, plus depreciation, plus tax equalization, plus

overseas tax, to total sales. In the estimation the variables are respectively named *current ratio and cash flow margin.*

4.5.1.3 Profitability Myers (1984) pointed out that firms prefer retained earnings to be their main source of financing investment (the Pecking Order Theory of capital structure). The second preference is debt financing, and last, new equity issues, which might be due to the significant transaction costs of issuing new equity. It is suggested that the observed capital structure of firms will reflect their cumulative requirement for external financing. In this sense, the profitability of a bank gives it the ability to use retained earnings over external funds and we expect a negative association between the profitability of a bank and its debt ratio.

Another theory, according to MM, maintains that one could also expect a positive relationship between leverage and profitability, essentially because leveraging up increases the 'debt tax shield' and thus the gain from leverage is surely higher for more profitable firms with a higher marginal tax rate. In addition, a highly profitable bank will be characterized by a positive financial leverage, and this presumably creates an additional incentive to resort to debt financing. This interpretation predicts a positive relationship between leverage and profitability. The measure of profitability is 'Pre-tax Profit Margin', the ratio of pre-tax profit to total sales, named *pre-tax-profit margin* in the regression.

4.5.2 Dividend policy variables (Dp)

This describes how much dividends a bank is paying and how the bank chooses to arrange the actual dividend payment. All dividend payments are payments from the bank to the shareholder. The variables we consider include: Payout Ratio, included in part because past literature found it to be a useful discriminator, in part because it could have some explanatory power in the analysis of the debt-equity issue. If one assumes that banks attempt to minimize transaction costs in their joint financing and dividend policy decisions, one could reasonably expect a positive association between the payout ratio and debt issue. In the regression this variable is called *dividend payout*, and is defined as current ordinary dividends divided by

profit after tax.

The 'Number of Directors' instead was thought to be a simple but interesting way to assess the validity of agency predictions on the agency problem existing between shareholders and directors. On the one hand, one could expect leverage to be negatively related to the number of directors, essentially because directors may be pursuing the goal of creating 'financial empires' so they tend to favour equity issues, which make the bank bigger. On the other hand, agency theory suggests a positive relationship between leverage and the number of directors in order to mitigate the conflict between shareholders and managers, because increases in the proportion of the bank financed by debt increases the managers' share of the equity, and, this also reduces the 'free' cash available to the directors. In the estimation the variable is *number of directors*, and accounts for the number of executive and non-executive directors.

4.5.3 Investment policy (Ip)

The 'Reinvested Earnings' variable (*retained earning* in the model), is an indicator of internally generated funds. This variable might prove to be interesting in assessing the validity of the pecking order theory. The last variable, the price/earnings (P/E) ratio (defined as the ratio of the stock price to earnings per share) is meant to measure the price that investors are prepared to pay for each dollar earning. With the P/E variable one introduces a timing and market condition variable in the model, since the P/E ratio is meant to capture the market assessment of a bank. The P/E ratio variable should identify the tendency for equity issues to follow periods of strong share price performance. It is referred to as *price-earning ratio*.

4.5.4 Sample and data analysis

Our data comes from three sources - Bankscope, Bloomberg and Datastream. We obtain information about banks' balance sheets and income statements from the Bankscope database (of the Bureau van Dijk) and Bloomberg database. We then get information about banks' stock prices and dividends from Thompson Financial's Datastream database and Bloomberg.

Our sample starts in 2001 and ends in 2011. The starting point of our sample is determined by data availability in Bankscope. We decided on 2011 as the end point in order to include the effects of the banks' extensive use of off-balance sheet activities in the run-up to the Subprime bubble leading to the 2007–09 financial crisis. We focus only on the largest 135 listed and publicly traded commercial banks and 708 listed and publicly traded bank-holding companies in the United States, thus the sample consists of 7080 bank-year observations.

Special care has been taken to eliminate the survivorship bias inherent in the Bankscope database. Bureau van Dijk deletes historical information on banks that no longer exist in the latest release of this database. For example, the 2011 release of Bankscope does not contain information on banks that no longer exist in 2011 but did exist in previous years. We address the survivorship bias in Bankscope by reassembling the panel data set by hand from individual cross-sections using historical, archived releases of the database and also comparing with the Bloomberg data. We used the last release of every year from 2001 to 2011 to provide information about banks in that period only. For example, information about banks in 2001 in our sample comes from the December 2001 release of Bankscope. This procedure also allows us to quantify the magnitude of the survivorship bias: 12% of the banks present in 2001 no longer appear in the 2011 release of the Bankscope dataset.

4.5.5 Descriptive Statistics

Table 4.1 provides descriptive statistics for the variables we use in our data. Mean for log. total assets is 3.92 and the standard deviation is 4.08. Even though we selected only the largest publicly traded banks, the sample exhibits considerable heterogeneity in the cross-section. The largest bank in the sample is almost 15 times the size of the smallest. The assets of banks are typically 4 times as volatile as the profits of the banks (4.08% versus 0.98%). The cash flow margin of banks is 27.9% of assets, which is more than banks' profitability (15.8% of assets). Banks hold much less retained earning; 1.79 versus 3.92 mean of log total assets, respectively. We can note that log total equity is 53% of the debt to equity ratio, while log of total debt is 13.6% of the debt to equity ratio. The range indicates the largest difference in amount of equity issued by the banks, which is almost 12 times of the smallest

amount. While, the spread for the total debt issued is lower, the largest amount issued being 10 times the smallest amount. The mean beta is 0.52, which implies that US banking appears to have been relatively safe, based on the choice of funding for their investment during the sample period. This matches the earlier finding by Flannery et al. (2008).

Table 4.1: Descriptive statistics for the variables used in the model, N=708 banks, period 2001 - 2011

Variables	Mean	Std.Dev.	Skewness	Kurtosis	Range
Bank characteristics					
Log. total assets	3.9228	4.0805	0.3171	1.6430	14.6334
Beta	0.5161	0.7894	0.5047	6.6807	9.4797
Current ratio	4.9976	7.6447	2.6844	20.3652	80.5560
Cash flow margin	1.0949	1.9498	1.7915	6.1332	13.3575
Pre-tax profit margin	0.6202	0.9844	-1.4584	49.7760	21.5727
Dividend policy					
Price-earning ratio	14.0060	150.6110	14.5809	395.9550	5125.3530
Dividend payout	12.7075	65.2497	0.4865	93.9356	1642.4100
Investment policy					
Retained earnings	1.7911	2.6419	1.2790	3.7879	12.1246
Number of directors	12.5339	6.7615	0.0230	3.3202	35.0000
Leverage/Funding					
Debt-equity ratio	4.9976	7.6447	2.6844	20.3652	80.5560
Log total equity	2.6686	3.0210	07001	2.4538	12.3463
Log. total debt	0.6813	1.8604	2.9928	11.8692	10.7262

4.6 EMPIRICAL RESULTS

In this section we perform the Logit estimation models in equation (4.8) set out above. We use the data from the 708 US banks sample. Unlike Panno (2003), we would like to include all the variables mentioned earlier. Table 4.2 shows regression that tested the influence of asset composition on the financing decisions of banks. The variable has positive coefficient and

significant at 5% and 10% for the Logit and Probit models respectively. This is as expected where the predicted positive sign displayed shows that the higher the asset composition, the more likely a company is to issue equity.

Table 4.2: Logit estimation using 708 US banks, period 2001 - 2011

***, **, *as significance at 1%, 5% and 10% respectively

Variables	Logit	
Bank Specific characteristics (Bs)	θ_i	Probability
Log. total assets	0.5519^{***}	0.0102
Beta	0.1874^{**}	0.0318
Current ratio	0.0183^{***}	0.0035
Cash flow margin	0.2386^{**}	0.0191
Pre-tax profit margin	-0.1253^{***}	0.0006
Dividend policy (Dp)	γ_j	
Price-earning ratio	0.0103	0.5922
Dividend payout	-0.0925^{**}	0.0106
Investment policy (Ip)	δ_k	
Retained earnings	0.1083^{*}	0.0157
Number of directors	-0.0031	0.1963
Model Diagnostics		
R-squared	0.76926	
Adjusted R-squared	0.76891	

Table 4.2 above shows that all bank specific variables are significant. All but profitability variables are positive. This implies that the size, operation risk and leverage of the banks are determinant factors in bank's choice of financing sources. The large banks have high chances of issuing debt which is evident with the 55.19% and 53.18% values from the Logit and Probit models respectively. This agrees with the theory that smaller banks will choose to issue equity rather than debt. Hence large banks have better access to financial markets to raise long-term debt. The coefficients for the beta variable at 18.74% and 14.98% show that the banks operation risk also favours the banks choice to issue debt although the likelihood

is less than 50%. This could imply that risk taking banks, as predicted by a great part of financial theory, to be more likely to issue equity rather than debt, because of the uncertainty about the future economic and financial performance.

We also note that bank leverage coefficients (cash flow margin and current ratio) are positive. This is in support of the positive effect of the liquidity measures on bank's borrowing decisions. Hence it is consistent with the expectation ability of a bank to meet its short-term payments. Current ratio are much lower for both models, 1.83% and 1.75% but the cash flow margin coefficient values are much better, 23.86% and 25.71%. This is very much in support of the banks with a large positive liquidity position to issue debt and have a positive signal to the financial markets.

The banks with high profitability are expected to issue equity to raise funds. This is evident by the negative sign of the profitability (Pre-tax profit margin) coefficient in Table 4.2. The dividend policy variables are expected to have negative signs since they are in support of the equity issuance by banks. This can be seen from Table 4.2 where the dividend payout ratio is negative. This means that the banks issuing debt will have a decrease in dividend payout to the shareholders. Although the coefficient of price-earning ratio has a positive sign it is insignificant for the Logit model while being significant for Probit model at 10% significance level. Thus it cannot be used to draw any meaningful interpretation.

The coefficients for the investment policy variables have different signs. The retained earnings have positive signs and the values are 10.83% and 12.29% from the Logit and Probit models respectively. This means that the US-based banks in our sample are medium-retained earning banks that are highly-levered and actively use debt in funding the investment project. The coefficient for the number of directors has negative sign implying that more of the bank's management will favour the issuance of equity than debt.

Although the funding strategies of banks have changed substantially due to the financial market crisis, Table 4.2 indicates that US-based banks prefer to issue debt to equity since most of the banks are large and highly levered. The economic environment prior to the crisis favoured funding structures that were highly dependent on ample liquidity. When that liquidity unexpectedly ceased to be available, banks that relied heavily on market funding were forced to make significant adjustments, not only to their funding strategies, but also,

in some cases, to their business models.

4.7 DETERMINANTS OF CAPITAL STRUCTURE

In the previous section, we considered the factors that will influence the bank's choice of funding. Another concept that is much closer to choice of funding is the determinants of banks capital structure. We now use our sample of the 708 US based banks to examine the determinants of capital structure by considering the Reint and Florian (2010) standard capital structure regression model, in equation (4.9). We expect that the determinants of capital structure will be same as the characteristics that influence the choice of financing instrument chosen by the US banks above.

$$L_{ict} = \varphi_0 + \varphi_1 MTB_{it-1} + \varphi_2 PROF_{it-1} + \varphi_3 Ln(size_{it-1}) + \varphi 4 Coll_{it-1} + \varphi_5 Div_{it-1} + c_{t-1} \quad (4.12)$$

Where the dependent variable is the market leverage, which is one minus the ratio of equity over assets in market values. The explanatory variables[19] are the market-to-book ratio (MTB), profitability (Prof), the natural logarithm of total assets (Size), collateral (Coll), all lagged by one year and a dummy for dividend payers (Div) for bank i in year t. The regression includes time fixed effects (c_t) to account for unobserved heterogeneity across time that may be correlated with the explanatory variables. Standard errors are clustered at the bank level to account for heteroscedasticity and serial correlation of errors. The dependent variable is one minus the ratio of equity over assets in market values. It therefore includes both debt and non-debt liabilities such as deposits. The argument for using leverage rather than debt as the dependent variable is that leverage, unlike debt, is well defined. Leverage is a structure that increases the sensitivity of equity to the underlying performance of the bank.

[19]We follow Frank and Goyal (2004) in our definition of variables; where the Market-to-book ratio (MTB) = market value of assets/Book value of assets; Profits (Prof) = (pre-tax profit + interest expenses)/book value of assets; Size = book value of assets; Collateral (Coll) = (total securities + treasury bills + other bills + bonds + CDs + cash and due from banks + land and buildings + other tangible assets)/book value of assets; and Dividend dummy (Div)= one if the bank pays a dividend in a given year.

We obtain the OLS regression of equation (9) using the panel data of 708 US based banks obtained from Bankscope database for the period 2001 to 2011. We also add the dummy for the time fixed effects to control for any changes in the variables over the ten years of our study. We report the coefficients column 2 of Table 4.3 below. We compare the coefficients with the results of regressions for non-financial firms as reported in Rajan and Zingales (1995) and Frank and Goyal (2004). We note that, when making a comparison with these standard results, it is important to bear in mind that these studies first use long-term debt as the dependent variable and secondly they use much more heterogeneous samples (in size, sector and other characteristics, Frank and Goyal 2004, Table 1). Although bank's capital structure is different from non-financial firms' capital structure since it includes deposits, we facilitate comparisons with non-financial firms by reporting the result of estimating Equation (9) (using leverage as the dependent variable) in a sample of firms that are comparable in size with the banks in our sample. We therefore break down banks' leverage into deposits and non-deposit liabilities in our robustness analysis.

Table 4.3: Capital structure model with Market leverage as dependent variable; ***,**, * as significance at 1%, 5% and 10% respectively

Variables	Capital structure model	Reint & Gropp (2010)	Frank & Goyal (2004)	Rajan & Zingales (1995)
Market leverage	US based Banks	Table 5	Table 8	Table 9, US
M-T-BR	-0.9861**	-0.463***	-0.022***	-0.08***
Profits	-0.1254*	-0.141*	-0.104***	-0.60***
Log(Size)	-0.0188***	0.006***	0.021***	0.03***
Collateral	0.4582**	-0.003	0.175***	0.33***
Dividends	-0.0964**	-0.021***	-0.092***	
Time fixed effects	Yes	Yes		
R^2	0.8781	0.79	0.29	
Adjusted R^2	0.8767			

where M-T-BR represents market-to-book ratio.

Table 4.3 above shows the results of estimating equation (4.9). In the first column are the results of the our sample consisting of 708 traded banks in the U.S. while column 3 reproduces estimates from Table 5 of Reint and Florian (2010). They considered a sample of 200 largest publicly traded banks in the U.S. and the EU from the Bankscope database from 1991 to 2004. The fourth column reproduces estimates from Table 8 of Frank and Goyal (2004) and finally we compare with the coefficients in the fifth column which are reproduced estimates from Table 9 of Rajan and Zingales (1995).

We can note from Table 4.3 above that all coefficients are statistically significant, with log(size) being the our only variable that is significant at one percent level and the rest at 5% except coefficient corresponding to the profits, which is significant at the 10 percent level. MTB, PROF and Coll coefficients have the same sign as in the standard regressions of Rajan and Zingales (1995), while for Frank and Goyal (2004) the MTB and PROF are the only variables that have same signs. We can interpret the results to mean that banks' leverage depend negatively on MTB, profits, size and dividends, while depends positively on collateral at fixed time effects. We note that the banks with higher market-to-book ratios, higher profits and pay dividends are expected to hold less capital. This is because they can be expected to face lower costs of issuing equity. However, the banks in our sample hold more capital hence their leverage has a positive effect by the collateral. Thus 45.8% of the banks will have the leverage amount increased due to the issue collateral.

It follows that banks facing a higher cost of issuing equity should be less levered. According to the buffer view, the cost of issuing equity is caused by asymmetric information (as in Myers and Majluf, 1984). Dividend paying banks, with higher profits or higher market-to-book ratios can therefore be expected to face lower costs of issuing equity because they either are better known to outsiders, have more financial slack or can obtain a better price. The effect of bank size on the extent of buffers is ambiguous ex ante. Larger banks may hold smaller buffers if they are better known to the market. Alternatively, large banks may hold larger buffers if they are more complex and, hence, asymmetric information is more important. The size of buffers should also depend on the probability of falling below the regulatory threshold. If buffers are an important determinant of banks' capital structure, we expect the level of banks' leverage to be positively related to risk. Finally, there is no clear

prediction on how collateral affects leverage.

4.8 POLICY IMPLICATION

Capital structure dynamics through time might differ significantly from the predictions of trade-off theory. Trade-off theory is often presumed, for empirical tests, to predict that firms have target debt ratios to which leverage reverts over time. But if internal equity is less costly than external equity, optimal capital structure will be a function of internally-generated cash-flows and leverage can wander around without a specific target. Debt will tend to decrease when the firm has an internal cash surplus and increase when it has a cash deficit (the firm faces a trade-off between debt and retained earnings in the first case, but between debt and external equity in the second).

The banks in US and worldwide could end up using greater amounts of debt since the main benefit of increased debt is the increased benefit from the interest expense as it reduces taxable income. Interest expense rises and cash flow needs to cover the interest expense also rise. Banks that are debt issuers become nervous that they will not be able to cover their financial responsibilities with respect to the debt they are issuing.

The value of a bank's stock is but one part of the company's total value. The value of a bank comprises the total value of the bank's capital structure, including debt-holders, preferred-equity holders and common-equity holders. Since both debt-holders and preferred-equity holders have first rights to a bank's value, common-equity holders have last rights to a bank value, also known as a "residual value".

The cost differential between internal and external equity suggests that profitable banks, with internal cash, should have less leverage than firms that need external finance (holding all else constant). If banks lever up until the costs of financial distress outweigh the tax advantages of debt, banks with more internal equity will choose lower leverage. Although the traditional view of a firm's cost of capital is fairly straightforward, our results shows it has not been the same case for the banks. According to trade-off theory, a firm's cost of capital is a weighted average of the after-tax cost of debt and the cost of equity, hence the same could apply for banks. The relative weighting of the two is generally assumed to be

fairly constant, consistent with the notion that the bank has a target debt ratio.

A consequence of our result is the investment decisions should depend on a bank's internal cashflow. That is, the advantage of internal equity implies that the bank's investment-to-cash-flow sensitivity should be positive, consistent with empirical evidence (Fazzari, et al.,1988; Hoshi, et.al, 1991). The size of this effect will depend on whether the firm uses dividends or repurchases, on corporate and personal taxes. Our results imply that cost of capital is more complex than suggested by the traditional trade-off model.

We have shown that investment projects undertaken by a bank will involve cash flows that need to be appropriately discounted. The management always need to consider what the return the bank will receive on any given alternative investments that bear the same risks. Hence, proper calculations on the cost of capital that is measured by the opportunity cost of the funds used in the investments. The banks need to use the found rate of return as the discount rate to always compute the net present value of the investments. If the banks' assets have same risk as project evaluated and they are unlevered, then the bank will always need to use equity cost of capital as the equivalent cost of capital for the project the given project to be funded.

Banks' investment projects that produce steady cash flows and have easily redeployable assets that they can use as collateral (e.g. real estate) have high debt ratios. Risky projects by the banks with little current cash flows, and banks with intangible assets tend to have low leverage. Banks whose value consists largely of intangible growth options (high market-to-book ratios and heavy R&D spending) have lower leverage ratios.

The policy indication is that most profitable banks tend not to borrow as much, they rely on internally generated funds. This implies that in absence of neutral taxes and bankruptcy costs (and other imperfections), a banks asset value is independent of its capital structure and financing decisions are irrelevant. However, the current financial market is different since US taxes paid by banks have mainly been dependent on the debt/equity mix. In the presence of corporate taxes, with interest expenses being tax deductible, a banks asset value increases with its debt/equity ratio. Personal taxes favour equity over debt and partially offset the effect of corporate taxes. Bank asset values may be lost in bankruptcy, and leverage increases the likelihood. When bankruptcy is costly, there may exist an optimal capital structure with

a mixture of debt and equity.

4.9 ROBUSTNESS

In this section we present robustness checks on the main results presented above. Firstly, to account for the choice of the model, we use two different robust regressions: GMM and pooled OLS (see Tables 4.4). Secondly, we have considered the definition of the dependent variable, market leverage. We break down the leverage into deposits and non-deposit liabilities and check the impact on the results.

4.9.1 Pecking order theory, asymmetric information and bank capital structure

The results for the pooled OLS regressions are shown in column 2 of Table 4.4 below, while the results for the GMM analysis are shown column 3 of Table 4.4. The new version of the pecking order may be more appropriate in explaining the financing behaviour of small, young and/or high growth firms because these firms may have more asymmetric information about risk.

The results of pooled OLS regressions show that profitability, size, risk and tangibility variables have significant influence on debt issuance. These results are consistent with the results of fixed effect estimation with the exception that risk variable loses its significance. Our results are generally robust to time periods, but the significance of some variables changes over time. Profitability has a persistent and consistent negative relationship with debt ratios in all periods and under all estimation methods. This confirms the capital

structure prediction of the pecking order theory in a developed capital market.

Table 4.4: Pooled OLS and GMM coefficients;

***,**, * as significance at 1%, 5% and 10% respectively

Debt - Equity by US banks		
Explanatory variables	Pooled OLS	GMM
Asset composition	-1.0076	1.2160
Beta	0.0017	0.1425
Current ratio	0.1924^{*}	0.0193^{***}
Dividend pay out	-0.0017	-0.0002^{***}
Log total assets	0.5806^{***}	0.6172
Number of directors	-0.0040^{*}	-0.0045^{***}
Pre-tax profit	-0.0406^{*}	0.0013^{***}
Price-Earning ratio	0.0001^{***}	0.0001
Cash flow margin	0.0257^{**}	0.2754^{***}
Retained earning	0.1211^{**}	0.0144
Time fixed effects dummy	No	Yes
R^2	0.78727	
Adjusted R^2	0.78450	

4.9.2 Decomposing leverage

The dependent variable we considered earlier in section 4.6 comprised of market values that includes both debt and non-debt liabilities such as deposits. We considered using market leverage rather than debt as the dependent variable since unlike debt, leverage is well defined (Welch, 2007). We considered leverage as a structure that increases the sensitivity of equity to the underlying performance of the bank. Welch, 2007, suggests that the financial-debt-to-asset ratio is flawed as a measure of leverage, because the converse of financial debt is not equity. We therefore decompose the market leverage and fit the data to equation (4.11) considered earlier. The results in Table 4.5 below show the results of dependent variable

(Leverage) is either non-deposits liabilities or deposits divided by the market or book value of assets.

Table 4.5: Decomposing Market leverage;

***,**, * as significance at 1%, 5% and 10% respectively

Dependent variable	Non-deposit liabilities.	Deposits
Market leverage	coefficients	coefficients
Market-to-book ratio	-0.9874**	-0.9829***
Profits	0.0208*	0.7642***
Log(Size)	-0.0162***	0.0398***
Collateral	0.4707**	0.0964***
Dividends	-0.4066**	-0.2443***
Adjusted R^2	0.8526	0.8403

The signs of the coefficients in the regression using non-deposit liabilities are the same as in the previous leverage regressions, which is consistent with these banks having better access to debt markets. More profitable banks substituting away from deposits may be an indication of a larger debt capacity as they are less likely to default. risk and dividend payout status, since they are significant for either deposits or non-deposit liabilities.

Therefore the standard corporate finance style regression works well for the components of leverage for the given sample we considered. Although there is a drop in the adjusted R^2 from 85% and 84% in non-deposit liabilities and deposit composition of market leverage regressions. This is around 14-15% in regressions with the market leverage (deposits and non-deposit liabilities inclusive) used as the dependent variables. Except for profits, the signs of the estimated coefficients when the dependent variable is non-deposit liabilities are as before for total market leverage, in Table 4.3. But the signs are the opposite when the dependent variable is deposits.

4.10 CONCLUSION

We can conclude from this study that banks have been finding debt to be more advantageous than equity. Asymmetric information has also played a role by giving insiders the privileged position to know the quality of the bank. Hence placing the issue of debt is more attractive for larger banks even if it is risky. The result shows that debt issues can keep profitable banks in the market, improving the quality and value of the bank assets. This is also means that smaller banks have difficulty in issuing debt; hence they are kept out of the market. Therefore the banks capital structure decision balances the benefits of the funds raised for the various investments, benefits of interest tax shields against any bankruptcy costs.

The main result of our study is that when securities of a given bank are being underpriced by the market, the bank will prefer debt to equity. If we have risk free debt, then even undervalued banks would prefer debt to underpriced equity, similar to results by Myers and Majluf (1984). The results therefore hold that debt will be preferred to equity even if the debt is risky and that bank financial managers should use debt financing when faced with risky investments and only consider the equity financing when the bank assets are undervalued.

Empirical evidence reveals the market reaction following announcements that will change financial leverage. Therefore announcements of actions that decrease leverage result in stock price decreases, e.g., an equity for debt swap. While announcements of actions that increase leverage result in stock price increases, e.g., a debt for equity swap (such as a leverage recapitalization). Managerial announcements that change leverage will always signal information about the value of the firm.

5.0 IMPACT OF STOCK MARKET SLUMP ON PENSIONS — THE CASE OF THE NETHERLANDS.

5.1 INTRODUCTION

It worthwhile to note that the pensions industry's view of equities as the main source of portfolio growth has been of great interest after the financial market crisis. Despite an equity performance recovery of around 70% in UK, from the low point of 2009, pension schemes continue to display a desire to move away from the asset class. While equities will continue to play an important role in scheme portfolios, the focus for the future is on risk management through hedging and diversification. The "cult of the equity" is history for defined benefit schemes in most countries, (Cocco et al., 2005).

The steep drop in financial markets in 2008 coupled with the ongoing economic recession has posed immediate challenges for some public pension systems, particularly those that rely partly on equity investments. Most people today know that share prices are getting to levels lower than they were a decade ago, but few understand the main source of pension income has plunged to little more than a third of its level 20 years ago. Millions of savers have seen their dreams of a comfortable retirement dashed by falling share prices and rising life expectancy. As global stock markets fell during 2008 and into 2009, it was widely reported that investors had lost well over $2 trillion in retirement savings.[1] Indeed, from the market highs at the end of October 2007 through to January 31, 2009, the broad U.S. stock market lost 47%; European markets registered a loss of 56%; Asian markets lost 47%; and emerging stock markets lost 60%.[2] An important question arises: Has the "average" retiree

[1] According to an October 2008 study by the U.S. Congressional Budget Office

[2] Return sources for these statistics: U.S. stock market—MSCI Broad Market Index; European stock

(or worker) suffered irreparable loss? This has been a reason why thousands of pensioners in many countries find themselves forced by financial necessity to go back to work. The Office for National Statistics (ONS) labour market survey shows that in the UK in July, August and September of 2011 there was an extra 40,000 people over the retirement age of 65 who joined the work force, taking the total number to 823,000. This is the highest number since the ONS started keeping these figures[3] in 1992.

This chapter of our study presents a pension model geared to the typical pension contract in the Netherlands. It is based on a defined benefit/average earnings pension system. We note that the nominal benefits are guaranteed and indexation is intended. The model provides a framework for analysing adjustments to such factors as the asset mix, returns and the method of market indexation. The importance of uncertainty over interest rate movements and returns on shares is made explicit by means of stochastic and historical simulations would have been an interesting theoretical study of the pension asset mix.

The main aim of this chapter is to assess whether Dutch pension funds' investment policies was affected by the financial market crush. It is worthwhile to note that the strategic investment policy always reflects the objectives of the pension funds, while the actual asset allocation may depart from the objective as a result of asset price shocks, since pension funds do not continuously rebalance their portfolios (Bikker, et.al 2009). We therefore focus particularly on the allocation of equities and bonds as representing, respectively, risky and safe assets. The argument of the stock market volatility-dependent on equity allocation stems from optimal asset allocation and investing models (Campbell and Viceira, 2002; Cocco et al., 2005; Ibbotson et al., 2007). An important outcome of these models is that the proportion of financial assets invested in equity would decrease over the life-cycle, thereby increasing the proportion of the relatively safer bonds. As long as the correlation between labour income and stock market returns is assumed to be low, a young worker may better diversify away equity risk with their large holding of human capital.

Dutch pension funds effectively are collective savings arrangements, covering almost the entire population of employees. Pension funds often take the characteristics of their partici-

market—MSCI Europe Index; Asian stock market—MSCI Pacific Index; and emerging markets—MSCI Emerging Markets Index.

[3]http://www.investmentsense.co.uk/tag/office-for-national-statistics-figures-on-pension-age-workers/

pants on board in their decision-making on strategic investment allocation. We investigate whether – in line with the life-cycle saving and investing model – more mature pension funds pursue a more conservative investment policy, that is, whether they hold less equity in favour of bonds. An important feature of most Dutch pension funds is that they explicitly base their funding and benefit allocation decisions on intergenerational risk sharing, that is, nominal benefits are guaranteed, indexation is likely and pension premiums are adjusted, the latter two depending on the funding ratio.

According to the consultancy's latest quarterly research[4], only 13 of the FTSE 100 companies would have disclosed a surplus if they had a year-end of December 31 2012, compared to 16 which reported a surplus in their most recent annual report and accounts. Five FTSE 100 companies had total disclosed pension liabilities at the end of 2012 which were greater than their equity market value. These include International Airline Group, whose liabilities were almost five times their equity value, while BAE Systems and BT had disclosed liabilities more than double their market value. However, the total deficit of the FTSE 100's pension schemes fell from £58bn to £50bn – partly as a result of a rally in equity markets, but also because companies paid a combined £12.7bn into their DB pension schemes to help close the funding gap. Most significantly, BT made a deficit contribution of £1.9bn, but 63 other FTSE 100 firms also reported significantly deficit contributions in their most recent annual report and accounts. Pension schemes were continuing to de-risk and move away from investments in stocks and shares towards bonds. The average pension scheme asset allocation to bonds at the end of the 2012 stood at 56%, compared to 50% at the end of 2011.Three FTSE 100 companies reported they had changed the proportion of their assets invested in bonds by more than 10% over the year. The figures show that pension schemes were taking the opposite approach to the retail investment sector, where the 'great rotation' had seen investors move out of bonds into equities.

[4]www.theactuaries.com

5.1.1 Trend of global pension funds

The major global pension markets involve 13 countries (these are; Australia, Canada, Japan, Netherlands, Switzerland, United Kingdom (UK), United States of America (US), Brazil, France, Germany, Ireland, Hongkong, South Africa,) which had total pension assets of $26,496 billion at the end of 2010. This represented a 12% increase from the end value in 2009. Pension assets rose in all major pension markets except for Ireland (we could attribute this to the sovereign debt) and France (which we could attribute to the depreciation of the euro), as can be seen in Figure 5.1 below. The financial meltdown has thus had an impact on the pension market. This means that the factors affecting the economy and financial market also has an impact on the pension markets.

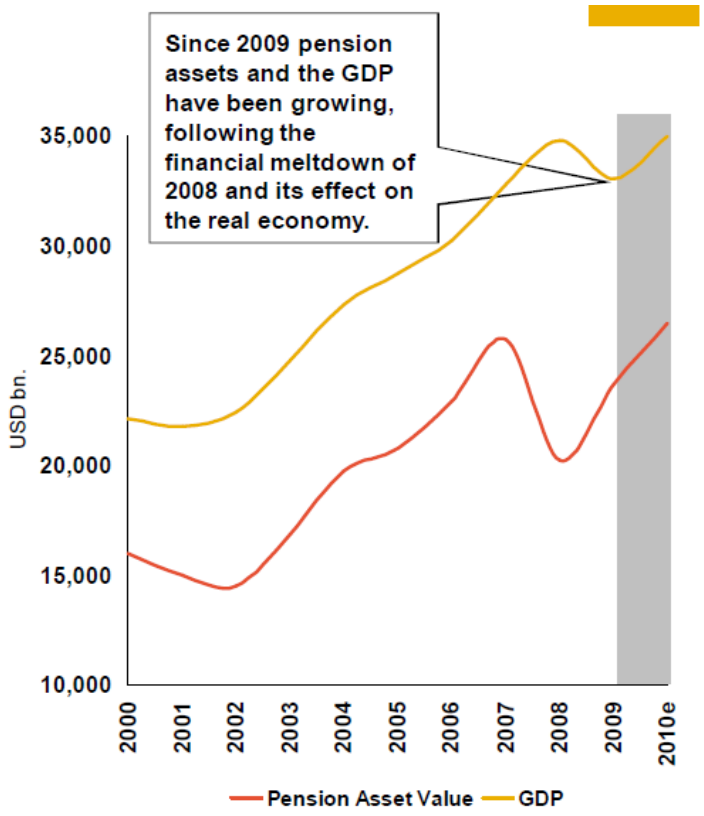

Figure 5.1; Global Pension asset value trend and the GDP, 2000 to 2010, Source: Tower Watson

The recent financial crisis has created an interest in pension fund investment and security.

This is because pension fund assets are invested in capital markets and as such are exposed to market risks. In addition, the pension fund is exposed to a variety of other risks, including longevity risk, inflation risk, liquidity risk and the sponsor's default risk. These risks relate to the mismatch of assets and liabilities. If all future cash outflows constituting the pension fund's liabilities are similar to the future cash inflows generated by its assets, then the mismatch risk is negligible. However, if such a match cannot be realized, then shortfalls or surpluses will occur in the future. This has led to development of a pension buy-out market as shown below in Figure 5.2 with respect to UK's FTSE index. We see from the graph that the market has been volatile. There is panic buying and selling whenever the market index falls or rises. Great losses that accompany this impulse buying and selling has affected portfolios involving pension funds.

Figure 5.2: FTSE All share total returns 1990 - 2011; Source: Data stream

5.1.2 The pensions assets trend in past decade

After posting record gains in the late 1990s, the stock market began to fall dramatically starting in the year 2000. The benchmark S&P 500 Index showed that the US stock market

for a twelve-month period lost one-quarter of its value and the NASDAQ Composite Index lost over sixty percent of its value. Considering that more workers in the world are exposed to the stock market now than ever before, this fall in the market will affect retirement schemes. However, the risks of equity holdings surfaced after the collapse of the stock market in 2000–02, which resulted in large losses for pension funds. We can see from Figure 5.3(a) below, how the FTSE share total returns had a number of large stock market corrections throughout the two decades. This reflected a 16.9% drop in 1992, 16.5% in 1994, 24.4% in 1998 the followed by very high drops of 46.45 and 45.6% in 2000-2003, 2007 - 2010 periods. The FTSE All-Share Index had a 53 basis point fall and 15-year gilt yields at the end of September 2011. It is also seen from Figure 5.3(b) that the pension assets and funds have been on the decline in the past ten years, the main concern being 2008, when it hit the lowest level. There has been a slight rise since then (2009 to 2010) hopefully due to the ongoing pension reforms that might have led to many countries changing their asset allocation strategies from equity based investment to bonds, real estate, cash and other assets. Reacting to decline, pension benefits were curtailed and contributions steeply increased.

Figure 5.3(a): FTSE all share returns between 1990 to 2011, Source: Data stream

Between December 2007 and December 2008, the S&P 500 index fell by over one-third. As a result, retirement accounts lost about $2.8 trillion, or 32 percent of their value (Soto 2008). Individual investors also lost substantial wealth in equities outside of retirement accounts. Urban Institute simulations show that the long-term effects of the 2008 stock market crash on retirement incomes will depend on the stock market's future performance, as well as investors' market exposure at the time of the crash, the amount and composition of their future contributions, the proportion of their retirement income coming from assets, and how many years they have to rebuild their assets. Pensions deficits for FTSE350 companies grew by 21% in September 2011 as falling bond yields and volatile stock markets were mitigated by a reduction in interest rate projections[5].

[5]The figures, from Mercer's Pensions Risk Survey, show the aggregate shortfall climbed to £64bn.

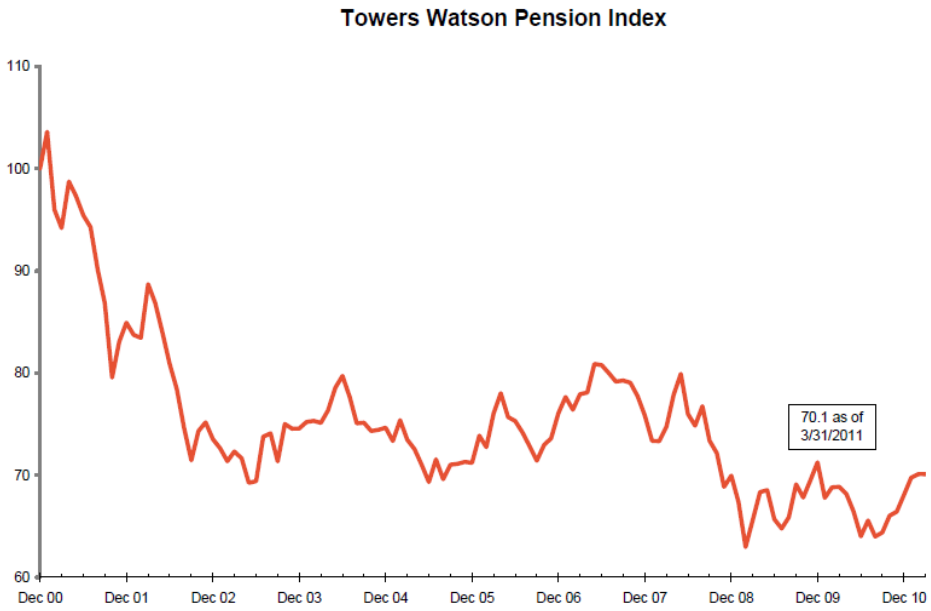

Figure 5.4 (b): The global pension fund index trend for the past decade.

Source: Towers Watson

5.1.3 Pension funds asset allocation

In some of the G7 countries, for instance the US, when a company sponsors a defined-benefit[6] pension plan, the plan's assets and liabilities are assets and liabilities of the company. There has been a controversy on how pension liabilities (especially defined-benefit liabilities) should be valued: actuaries and economists differ in their approaches. There are also differences in the approaches between accountants and economists over how pension assets and liabilities should be treated in company accounts. Another important issue is the appropriate asset allocation (i.e. the weights of the key asset classes in) for the pension fund. We consider the concept of optimal asset allocation of a pension fund and show that it depends on whether the pension fund is over or underfunded, whether or not pension liabilities are linked to

[6]Defined benefits pension plan is where the annual contributions are determined by the benefits "defined" in the plan paid at retirement. If value of pension assets exceeds (over funded - Occurred during stock and bond boom of the 1990's) current and future benefits owed, employer may: Reduce future contributions, or Distribute surplus to shareholders

earnings growth and whether the pension fund is insured or not. Finally, the pension fund is influenced by the sponsoring company's share price.

Usually the company and its pension plan are considered as consolidated entities, having three groups with a claim on the firm's total assets. The groups are: 1) The employees who include both the retired and active. 2) The investors which include the shareholders and creditors. 3) The government, involved through corporate taxes and corporate pension benefit guarantees. The employees' claim on retirement benefits — the pension liability — is a debt-like liability of the firm, secured by the pension assets as specific collateral.

In this study, using the Dutch market data, we examine the empirical question whether pension funds are affected by the equity risk as measured by beta. There can be a number of reasons to suspect this. The main one is the unclear set of accounting rules used to report pension assets, liabilities, and expenses. Pension plan assets and liabilities are off-balance sheet and are often viewed as segregated from the rest of the firm, with its own trustees. Hence the pension accounting rules are seen to be complicated. We also have the real relationship between pension plan risk and firm equity risk which has not been clearly covered in most literature. The empirical findings in this study are consistent with the hypothesis that the presence of equity risk reflects the risk of the firm's pension plan; hence an indicator that the market slump would have a big negative impact on pensions. Furthermore, we consider the pension asset allocation during the past decade, 2002 to 2011, and note that despite the great volatility in the stock market, the equities asset class are the leading investment class for pension funds in the Netherlands. This is how the fall in the markets has influenced the retirement income.

5.1.4 Research on pensions and the stock market

There has been great interest in research on pension market issues from the 1980's till 2007. The following subsections consider the past work, starting with those that covered the relationship between the pensions and stock market, pension risk and share prices, in addition to pension asset allocation.

Coile et al, (2006) investigate the relationship between stock market performance and

retirement benefits, paying particular attention to the boom and bust periods of the late 1990s and early 2000s. First, retirement rates did not rise during the market boom of the late 1990s, even after adjusting for the effect of the strong economy. Second, as the sustained market decline only began in September 2000, the retirement response in late 2000 would have had to be very large to drive a two-point reduction for the year as a whole. The authors compare the effect of the stock market on the retirement behaviour of individuals likely to have been differentially affected by changes in the market.

Franzoni and Martin (2006), argue that the market significantly overvalues firms with severely underfunded pension plans. These companies earn lower stock returns than firms with healthier pension plans for at least 5 years after the first emergence of the underfunding. The low returns are not explained by risk, price momentum, earnings momentum, or accruals. Further, the evidence suggests that investors do not anticipate the impact of the pension liability on future earnings, and they are surprised when the negative implications of underfunding ultimately materialize. Finally, underfunded firms have poor operating performance, and they earn low returns although they are value companies. Their results and findings note that investors have failed to realize that an underfunded pension will eventually hurt earnings. So when earnings finally do take a hit the stock gets punished.

Jin et. al (2006) examined the empirical question of whether equity risk of U.S. firms as measured by beta, from the Capital Asset Pricing Model reflects the risk of their pension plans. They note that pension plan assets and liabilities are off-balance sheet, and are often viewed as segregated from the rest of the firm, with its own trustees. Their empirical findings are consistent with the hypothesis that equity risk does reflect the risk of the firm's pension plan.

One recent study on pension information is by Cardinale, M.(2007) who empirically tested pensions and corporate bond spreads. Cardinale considered corporate bond data of U.S. companies for the 2001-2004 period where unfunded pension liabilities are incorporated in credit spreads. This study is limited to US pensions and not many studies have been extended to other markets pension plans in the world. Klumpes and McMeeking (2007) had a study to examine the impact of pension reforms. They considered how the new U.K. pension accounting regulations significantly increase the exposure of the balance sheets of

U.K. firms to volatilities in pension fund valuations. Their results suggest that unexpected changes in interest rates have a differential effect on a firm's sources of pension, financial, and core earnings. Klumpes and McMeeking fall short of covering the impact of the stock market on the pensioners' investment.

5.1.5 Firms' pension risk and share prices of the pension sponsoring firms

There is earlier work by Feldstein and Seligman (1981), where they find results consistent with the conclusion that share prices fully reflect the value of unfunded pension obligations, so the market correctly takes into account pension liabilities when valuing a company—a one dollar change of pension funding status will change the share price by one dollar (both relative to the firm's market value). Feldstein and Seligman (1981) was one of the earliest studies to investigate the effect of a firm's pension deficit on the firm's share price. They found, using a sample of US manufacturing firms, that the emergence of a deficit is incorporated rapidly into the share price, in the sense that the share price is reduced (relative to tangible assets) by the per share size of unfunded pension liabilities. Feldstein and Mørck (1983) then showed that company share prices reflect pension plan surpluses as well as deficits, and that the financial markets 'see through' the manipulation of pension liabilities considered above and instead value the pension liabilities of all firms at a common standard discount rate, very close to the average used across all firms.

Bodie and Papke (1992) is the one paper that provides considerable empirical evidence that the equity market valuation of firms takes into account the difference between the value of pension plan assets and its liabilities, i.e., the pension surplus or deficit (if that difference is negative).

Carroll and Niehaus (1998) had their results later confirmed by Ibbotson and Kaplan (2000) in a parallel test of debt market recognition of the value of the pension surplus or deficit, by empirically examining the positive relationship between funding of defined-benefit pension funds and debt ratings. Furthermore, in both equity and debt markets, there seems to be an asymmetric information in the impact of changes in pension assets and liabilities on the market value of the firm and on debt ratings. This is due to each dollar increase in

liabilities lowers the market value of the firm by about a dollar. This is consistent with the view that, while an under-funded pension liability should be fully reflected as a corporate liability, over-funded pension assets are not entirely a corporate asset, due to the difficulty of converting an overfunded pension plan's assets into unburdened corporate assets. Moreover, Ibbotson and Kaplan (2000) note that in line with the efficient-market theory, evidence shows that pension funds are unsuccessful in exploiting market timing to generate excess returns.

Vrinda Gupta (2006), analyses whether employees with a defined-benefit pension scheme perceive risk to their expected income in retirement while forming their opinions about the long-term business success of their employer. They use a dataset of pension risk indicators for FTSE 100 companies and data from employees' opinion in the UK to show that employees do seem to care about the level of funding of their benefits. Earlier, Alier and Vittas (2000) investigated the impact of the volatility of investment returns on replacement rates in the context of personal pension plans. The authors' findings suggest that overconcern about the impact on replacement rates of short-term volatility in stock markets may not be warranted.

5.1.6 Recent research on pension asset allocation

A few studies have also shown that strategic asset allocation dominates portfolio performance. In particular, strategic asset allocation is shown to explain more than 90 percent of the variability in pension fund returns over time, while the additional variation explained by market timing is less than 5 percent. This is considered by Blake et al (1999). They note that stock market timing is shown to cause an average loss of 20–66 basis points per year. In their study they found a negative correlation between asset class returns and net cash flows to the corresponding asset class, which points to rebalancing. In addition, they noted that the asset allocation for UK pension funds drifts toward asset classes that performed relatively well, in line with a free-float strategy. Apparently, UK pension funds only partly rebalance their investments in response to different returns across asset categories. Hence, the degree of rebalancing versus free float in pension fund asset allocation remains an open question. Despite this initial study Blake has now turned his attention on Longevity and its

impact on pensions[7].

We can note that in the literature there has been almost no analysis, either theoretical or empirical, about how the risk level of a pension plan is affected by the stock market volatility. Jin et al. (2006), a paper mentioned above, is the closest to our research goal. The authors are concerned about the firms' equity risk and whether it reflects the risk in a pension scheme. We extend the model used in their research to examine how stock market movement affects pensions.

5.1.7 Pensions in Netherlands

The Netherlands' retirement income system comprises a flat-rate public pension and a quasi-mandatory earnings-related occupational pension linked to industrial agreements[8]. Most employees belong to these occupational schemes which are industry-wide defined-benefit plans with the earnings measure based on lifetime average earnings. The pension scheme involves a regulation where about 600 pension funds, (theoretically) fully funded, provide pensions to probably over 90% of non-self-employed workers. Most are defined-benefit, although, the share of defined contribution is rising. The investment strategy of Dutch pension funds, which is the best managed fund in Europe, is of key importance to society, as it involves more than €700 billion in assets. The way in which these assets are invested has a significant influence on the level of required premiums or final benefits. There has been one percent lower annual return reported over the life cycle of a typical worker in the Netherlands which translates into 27 percent lower accumulated pension assets. Consequently, one of the most important responsibilities of pension funds' trustees is to maximize the expected return on assets at an acceptable level of risk, e.g., measured in terms of the probability of underfunding.

[7] http://www.pensions-institute.org/

[8] Melbourne mercer global pension index; http://www.mercer.com/articles/global-pension-index-netherlands

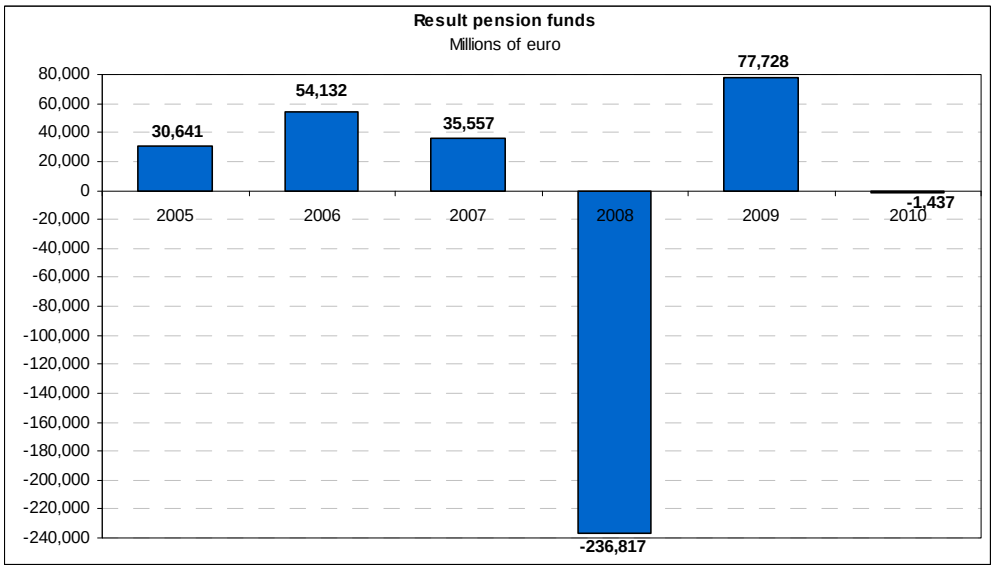

Figure 5.5 (a) Dutch pension funds in last five years. Source: De Nederlandsche Bank

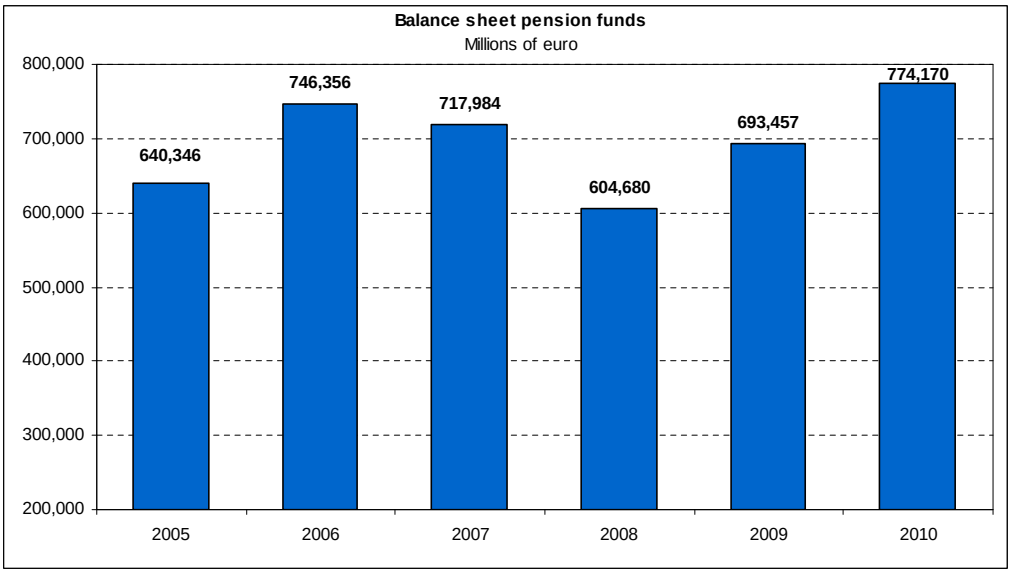

Figure 5.5 (b) Balance sheet of Dutch pension funds in last five years. Source: De Nederlandsche Bank

Figures 5.5 (a) and 5.5 (b) show the results and the balance sheet of Dutch pension funds in the years, 2005 - 2010. It is can be noted that the values drop due to the financial market crisis in 2008. This is seen in Figure 5.5 (a) where the Dutch funds lost €236,817 millions. Figure 5.5(b) indicates an interesting trend of the balance sheet of pension funds. We note a maximum of €774,170 millions worth of assets in 2010 while the lowest of €604,680 millions in 2008.

5.1.8 Pension asset allocation

The assets allocation of pension funds are allocated over the following four broad classes: equities, bonds, cash, and real estate (other assets), are illustrated in Figure 5.6(a). The percentages in the Figure 5.6(b) below shows that the pension fund investment policy includes the strategic asset allocation decision in the UK and US had higher proportion for the equity above all the other classes. The equities asset class have the highest expected return but also the highest volatility. For most pension funds in the world, equities are the largest asset category. Consequently, equity allocation is one of the key policy variables determining the risk-return profile of a given pension fund.

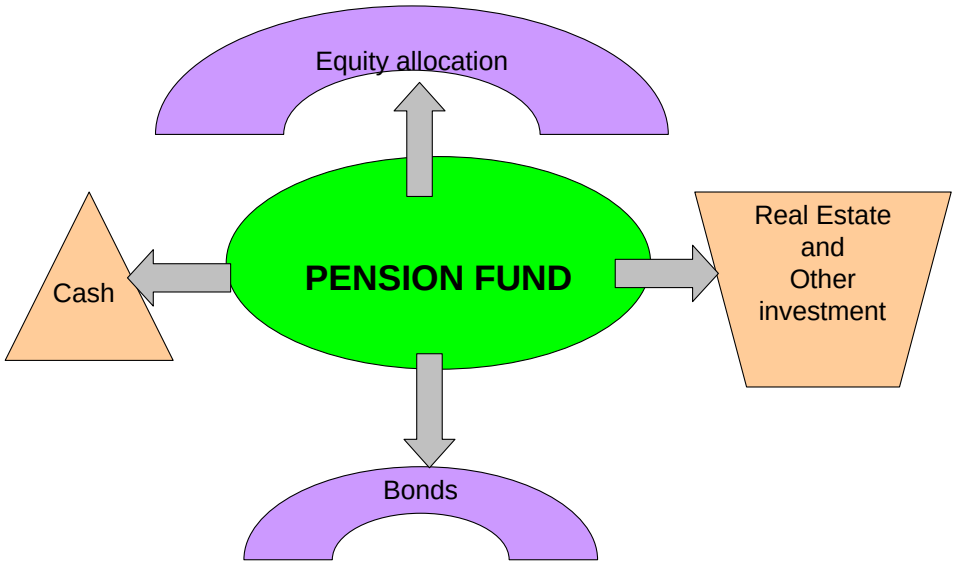

Figure 5.6 (a): The pension asset allocation classes. Source; Author's illustration

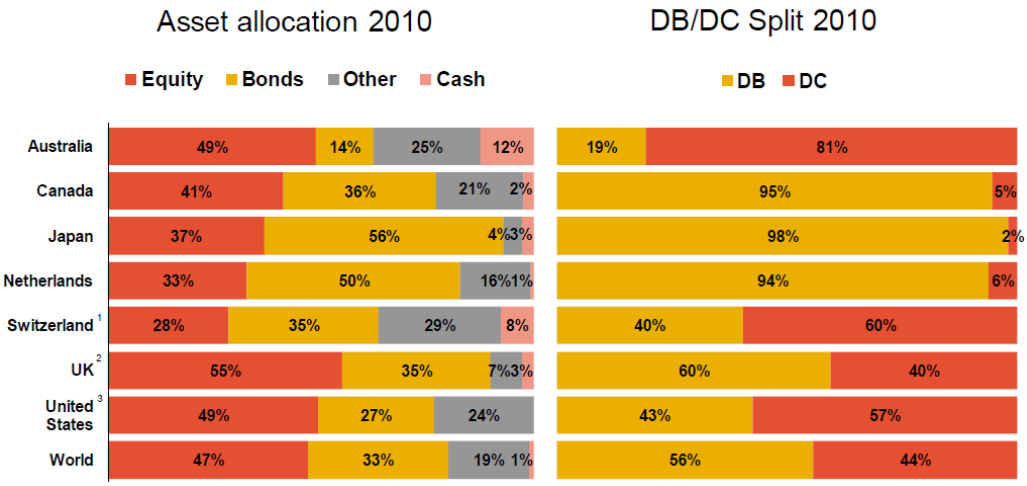

Figure 5.6(b): Global pension asset allocation for 2010. Source: Towers Watson 2011 analysis; Switzerland, UK and US, do not include the personal and stakeholders assets

Figure 5.6(b) shows that a number of countries have been cautious in investment policy strategy during this financial crisis period which directly affects the pension plans. As can be seen in Figure 5.6(b), Canada, Japan,and Netherlands have the largest percentage (95%, 98% and 94% respectively) of the defined-benefits (DB) pension plan which corresponds to lower percentage of asset allocation to the equities While Australia with 81% has the largest proportion defined contributions[9] (DC) pension plan, which corresponds to lowest percentage allocated bonds.

5.1.9 Dutch stock market index performance

The Amsterdam Exchange index (AEX) is the stock market index which began in 1983. It is composed of a maximum of 25 of the most actively traded Dutch securities on the exchange. It is one of the main national indices of the pan-European stock exchange group Euronext alongside Brussels' BEL20, Paris's CAC 40 and Lisbon's PSI-20. It was formed

[9]Defined-contribution plan provides benefits determined by the accumulated contributions and the fund's investment performance. "Contributions" are designated in plan, not amounts available at retirement. The Firm knows with certainty the amount of the contribution and it provides uncertain benefits to participants.

on 3 January 1983 and it consisted of 13 stocks. On 3 January 1985 the index started using a weighting factor: "As of this date the value of the Amsterdam Exchanges-index (AEX) is calculated by multiplying the price of each stock by its weighting factor. These amounts are then cumulated and divided by one hundred". Since that time the composition and weighting of the AEX index has changed many times.

5.2 METHODOLOGY

There are two opposing views on optimal asset allocation by pension funds may be distinguished: the long-term strategy and the all-bonds strategy. Starting with the first one, we consider that a pension fund has to meet benefit promises to both current and future retirees. For a typical pension plan in the Netherlands, the duration of accrued benefits is between 15 and 20 years. Campbell and Viceira (2002) argue that the risks of the various asset categories are different for varying time horizons. So, portfolio choices by long-term investors will differ from those of short-term investors. Both short-term and long-term investors benefit from risk diversification across asset classes. As risk is horizon-dependent, long-term investors also benefit from any time diversification within asset classes. Some empirical research finds that stocks are less risky in the long run due to their mean reversion: the annualized standard deviation halves over a 25 year horizon (Campbell and Viceira, 2002; Hoevenaars, 2008). Besides, long-term investors may invest in less liquid assets such as real estate. Money market instruments are relatively safe for short-term investors, but not for long-term investors because of reinvestment risk, that is, uncertain future short-term interest rates.

Most theories suggest that the relationship of the pension fund members and equity allocation is linear, (Malkiel, 2007), while others postulate a non-linear or hump-shaped relationship (Benzoni et al., 2007).

$$w = \frac{H + F}{F} \frac{\mu - R^f}{\gamma \sigma^2} \tag{5.1}$$

Lucas and Zeldes (2009) investigate a relationship between the relative share of active participants and the equity allocation, also assuming a non-linear age pattern: a (constant)

effect during the active years compared to the retirement years. Gerber and Weber (2007) regarded two definitions of average age: age of all participants and age of active participants, where the latter implies a non-linear functional form of age, due to the truncation at the retirement age. Taking the various specifications in the literature into account, we investigate both a linear and a nonlinear version of our model. Our linear age-dependent model for the strategic equity allocation of pension funds reads as:

$$E_{strategic\ allocation} = \alpha + \beta \text{ age} + \gamma \log(\text{size}) + \theta \text{ Define benefit} + \delta \text{ funding ratio} + \mu_i \quad (5.2)$$

The argument from this model was that the pension fund size would go hand in hand with degree of investment expertise and willingness to exploit return-risk optimization. They also defined the pension fund's size as the total number of participants, where the logarithms of size is taken to reduce possible heteroscedasticity. The funding ratio was considered as a determinant of equity allocation, where by a higher funding ratio may stimulate higher risk taking as it provided a larger buffer against equity risk. A higher risk margin for equity is required under the Dutch supervisory regime (Bikker and Vlaar, 2007).

We therefore note that these studies managed to capture that – unlike the actual equity allocation, the strategic equity allocation is not affected directly by price shocks, although gradually, over time, the strategic equity allocation may be influenced somewhat by trends in the stock market (Bikker, Broeders en De Dreu, 2009). We therefore consider another alterantive model, although linear it considers the liabilities, the pension surplus, leverage ratio and even the market value of equity.

5.2.1 Pension and stock market volatility

Jin et al (2006) confirmed that a company's equity returns do reflect the risk of its pension plan. This is despite that the accounting rules for pensions are known by few analysts, Jin et al (2006). Using the improved balance sheet for a company:

$$Assets = OA + PA = E + D + PL = Liabilities \quad (5.3)$$

where

OA = value of operating assets of the company; E = market value of equity in the firm; D = market value of debt in the firm; PA = value of pension assets; PL = value of pension liabilities

We can also define the pension surplus and leverage ratio as;

$S = PA - PL$ = pension surplus; $L = D/E$ = leverage ratio.

The share price of the company in an efficient market[10] will reflect the true operating risk. This is measured by the beta or systematic risk of the operating assets, (β_{OA})

$$\beta_{OA} = \frac{E}{OA}\beta_E + \frac{D}{OA}\beta_D - \left[\frac{PA}{OA}\beta_{PA} - \frac{PL}{OA}\beta_{PL}\right] \tag{5.4}$$

$$= \frac{E}{OA}(\beta_E + \beta_D) + \frac{D-E}{OA}\beta_D - \frac{PA}{OA}(\beta_{PA} - \beta_{PL}) - \frac{S}{OA}\beta_{PL} \tag{5.5}$$

If the pension fund and its risk are ignored, then the beta of the operating assets becomes:

$$\beta^{'}_{OA} = \frac{E}{E+D}\beta_E + \frac{D}{E+D}\beta_D \tag{5.6}$$

Now this gives us:

$$\beta^{'}_{OA} - \beta_{OA} = \frac{PA}{OA+S}\left(\beta_{PA} - \beta_{PL}\right) - \frac{S}{OA+S}\left(\beta_{OA} - \beta_{PL}\right) \tag{5.7}$$

This will be positive if $\beta_{PA} \geqslant \beta_{PL}, \beta_{OA} \geqslant \beta_{PL}$ and $S \leqslant 0$. These conditions will often hold in many firms sponsoring pension funds. Therefore the company's financial capital (defined as equity plus debt) is now found by rearranging

$$E + D = OA + PA - PL = OA + S \tag{5.8}$$

and will be equal to the value of the operating assets plus the pension fund surplus. Hence the capital structure risk, the systematic risk borne by the company's equity and debt-holders, is:

$$\beta_{E+D} = \frac{E}{E+D}\beta_E + \frac{D}{E+D}\beta_D \tag{5.9}$$

[10]since in an efficient market, share prices fully reflect all relevant information

which we can write as

$$\beta_{E+D} = \frac{PA}{E+D}\beta_{PA} - \frac{PL}{E+D}\beta_{PL} + \frac{OA}{E+D}\beta_{OA} \tag{5.10}$$

and simplified to

$$\beta_{E+D} = \beta_{PF} + \frac{OA}{E+D}\beta_{OA} \tag{5.11}$$

This shows that there is a one-to-one relationship between a company's capital structure risk and its pension fund risk. Where the pension fund risk is defined as:

$$\beta_{PF} = \frac{PA}{E+D}\beta_{PA} - \frac{PL}{E+D}\beta_{PL} \tag{5.12}$$

5.3 DESCRIPTION OF THE DATA AND VARIABLES

In the previous section we looked at the risk relations between the pension plan's assets and liabilities when they are fully recognized by investors and measured at market prices. We now explore the question: Do those relations hold in practice? We consider, as an empirical matter, the extent to which a company's pension funding status and asset mix are incorporated in the risk of its equity. We estimate the size of the pension risk-firm risk relation then use this result to test the hypothesis that a higher overall firm market risk translates into a higher pension plan risk.

From the asset allocation information reported in Bloomberg, we compute the total amount of pension assets. We also measure the average systematic risk exposure from the pension plan assets by making certain assumptions about the beta risk of various categories of assets.

We obtained the data used in our study from three sources: 1) Bloomberg provides asset allocation information for each plan sponsored by a company and company level data about pension liabilities and other balance sheet and income statement variables, 2) AMADEUS and 3) statistics provided by the central bank of Netherlands, De Nederlandsche Bank (DNB). We match data from these three sources to create a merged company level panel

data set. Bloomberg data in addition to the merged data set is used to calculate equity betas for the firms in our sample. We will then carry out panel data regression for the individual firms. We consider a linear model to check the relationship between the market risk and pensions. We define all the variables used in the following subsection.

5.3.1 Definition of variables:

Overfunded (underfunded) pension: This is the funded status of the post-retirement benefit plan. it represents the difference between the fair value of plan assets less the projected benefit obligation. The plan is overfunded if the plan assets exceed the projected benefit and the plan is underfunded if the plan assets exceed the projected benefit obligation.

Pension Market capitalization: This compares the present value of the company's total employee invested and non-invested pension benefit to the market capitalization of the firm. It displays the company's burden compared to its total value. It is calculated as: Projected Benefit Obligation/Historical market cap.

Pension plan asset (Fair value): This is the fair market value of the pension plan assets at the end of the period.

Pension Benefit paid: This is the actuarial present value of the total cost of all employees invested and non-invested pension benefits that have been attributed by the pension benefit formula to services performed by employees at the end of the period.

Pension liabilities: Future payouts that a pension is obliged to make.

Service cost: This is the actuarial present value of pension benefits attributed by the pension benefit formula to employee service during a specific period. It is the amount of pension benefits earned by employees during the period.

Expected rate of return on Pension Asset (PA): This is the estimated expected long term rate of return on pension plan assets expressed as a percentage. The higher the expected rate of return, the lower the pension expense.

Pension income: This is the pension income reported by the company which represents the net amount of pension income that is recognized in the income statement. The compo-

nents of pension income are the service cost, interest cost or the projected benefit obligation, expected return on plan assets and amortization of unrecognized prior service cost

Pension and post retirement reserve: This is the pension and post retirement figure as reported by the company

5.4 THE MODEL

We consider linear models based on one-to-one relationship between the market risk and pensions fund risk as shown in equation (5.10) above.

5.4.1 Market risk, capital structure and pensions

First, we look at the relationship between a firm's equity beta and the pension fund risk; then, a firm's capital structure and pension fund risk. The relationship are outrightly linear as shown earlier in equations (5.7) and (5.8). The data input into the model is what we have obtained from a firm's balance sheets information submitted to Bloomberg. The firms considered are all the twenty-five firms listed on AEX index. We take equity betas[11] from Bloomberg as the dependent variable to capture the effect of the market risk relative to individual firms. Then, independent variable is the pension fund beta risk as calculated from equation (5.8) above. Therefore, we have the following linear model in equation (5.9).

$$\beta_{itE+D} = a + Coefficient_i * \sum_{i=1}^{N} \beta_{it-1,PFi}, \quad \text{where } i = 1,\ 2,\ ...25 \ \text{ and } t = 1,\ 2, ..., 10 \quad (5.13)$$

Where β_{itE+D} is the equity beta for firm i, while $\beta_{it,PF}$ is the pension fund beta for each individual firm i for the year t

Similarly, we fit a linear model in equation (5.11) with the dependent variable being the measure of cost of capital[12]. The measure used in this case is the Weighted Average Cost of

[11] This is calculated in Bloomberg from the following formula:
$\beta_{itE+D} = \frac{Cov(r_i, r_{AEX})}{Var(r_{AEX})}$
where r_i are returns of individual firms and r_{AEX} is the return of the market.

[12] This is our indirect measure of capital structure for the firm

Capital (WACC). The values used for WACC are obtained in Bloomberg for all the listed firms on the AEX index. The WACC is a calculation of a firm's cost of capital in which each category of capital is proportionately weighted. It is obtained by the following formula

$$WACC = \frac{E}{V} * Ce + \frac{D}{V} * Cd * (1 - Tc) \tag{5.14}$$

where, $V = E + D; Cd$=cost of debt; Ce=cost of equity; Tc=corporate tax rate; $\frac{E}{V}$ = percentage of financing that is equity; $\frac{D}{V}$= percentage of financing that is debt

Furthermore, we fit a linear model to the pension fund variables with beta equity as the dependent variable. The model is defined by

$$\beta_{itE+D} = a + Coefficient_i * \sum_{k=1}^{K} P_{t-1,} + \varepsilon_i, \text{ where } k = 1,\ 2,\ ...9 \text{ and } t = 1,\ 2, ..., 10 \tag{5.15}$$

$$\sigma_{AEX} = \mu_i + \psi * \sum_{i=1}^{4} \phi_{t-1}, \text{ where } t = 1,\ 2,\ ...10\ years \tag{5.16}$$

5.4.2 Volatility and pension fund asset allocation

We also consider the linear relationship between the stock volatility and the natural logarithm of the amount invested in various asset classes. Equation (5.13) is used to examine this linear relationship. We use σ_{AEX} as a measure for the volatility of AEX stock market index. We obtain the quarterly data of 30-day historical volatility[13] (HV) data of AEX index for the 2000 - 2010 period from Bloomberg database. The $\phi_t's$ are the five pension fund asset classes[14], equities, bonds, cash, and real estate (other assets).

[13]This is the realized volatility of a index over a given time period, in our case, last 10 years. It is calculated by determining the average deviation from the average price of the index in the given time period. the formula used in this case is:
$HV = \sqrt{\frac{\sum (R_t)^2}{n}}$

[14]The equities include all the investment made to the emerging markets, mature amd private equities. Then, the real estate included both the direct and indirect investment into the real estate. The fixed yield securities asset class include the investment into Government bonds (for instance the non-index-linked bonds), the index-linked bonds, mortgage loans and credits.

5.4.3 Equity in pension fund investments

We consider that a pension fund has to meet benefit promises to both current and future retirees. For a typical pension plan in the Netherlands, the duration of accrued benefits is between 15 and 20 years. Campbell and Viceira (2002) argued that the risks of the various asset categories are different for varying time horizons. So, portfolio choices by long-term investors will differ from those of short-term investors. Both short-term and long-term investors benefit from risk diversification across asset classes. As risk is horizon-dependent, long-term investors also benefit from any time diversification within asset classes. Some empirical research finds that stocks are less risky in the long run due to their mean reversion: the annualized standard deviation halves over a 25 year horizon (Campbell and Viceira, 2002; Hoevenaars, 2008). Money market instruments are relatively safe for short-term investors, but not for long-term investors because of reinvestment risk, that is, uncertain future short-term interest rates. Apart from the favourable return-risk trade off in the long run, equities may partly hedge increasing wage- or inflation-indexed liabilities, due to the positive long-run correlation between stock returns, on the one hand, and wages and inflation on the other

Pension funds have participants in a wide range of ages, from just over 20 to over 100. In models of optimal life-cycle saving and investing, the age of the investor plays a key role. Therefore, the question is whether the average age of participants acts as a determinant of the asset allocation in the greater entity of pension funds, and to what extent (Bovenberg et al., 2007). The rationale is that young workers possess more human capital than older workers, where younger workers can diversify investment risk, assuming that human capital is a relatively safe, so bond-like, asset. The age-dependency of human capital results in a negative age-dependency of equity exposure.

The original literature on optimal lifecycle investments (Bodie et al. 1992, Campbell and Viceira 2002)) has pointed out that the optimal investments in risky assets over the lifecycle should be structured as follows:

$$\alpha_x = \frac{\mu - r}{\gamma \sigma^2} \frac{HC_x + FC_x}{FC_x} \tag{5.17}$$

where:

α_x = fraction financial capital in stocks at age x;

μ = expected rate of return stocks;

r = risk free rate;

γ = risk aversion;

σ^2 = riskiness stocks (variance);

HC_x = human capital at age x;

FC_x = financial capital at age$x$;

The basic version of the life-cycle model with risk-free human capital can be summarized by the following equation for the optimal fraction of stock investment, denoted w

$$w = \frac{\mu - R^f}{\gamma\sigma^2}\frac{H+F}{F} \tag{5.18}$$

Here H is the human capital (the total of current and discounted future wages) of an individual, and F is the person's current financial capital. The risk-premium of the stock market is given by $\mu - R^f$, while γ and σ^2 denote, respectively, the individual's constant relative risk aversion and the variance of stock market returns. As can be seen, more human capital leads to higher optimal investment in stocks.

Not only do young workers have more human capital, they also have more flexibility to vary their labour supply – that is, to adjust the number of working hours or their retirement date – in the face of adverse financial shocks. Flexible labour supply acts as a form of self-insurance for low investment returns. Bodie et al. (1992) show that this reinforces the optimality result, i.e. that young workers should have more equity exposure.

The negative relationship between age and equity exposure in the portfolio is usually derived under the assumption that human capital is close to risk-free, or at least is not correlated with capital return. Benzoni et al. (2007) put forward that in the short run, this correlation is indeed low while in the longer run, labour income and capital income are highly cointegrated, since the shares of wages and profits in national income are almost constant. This finding implies that the risk profile of young workers' labour income is equity-like and that they should therefore hold their financial wealth in the form of safe bonds to offset the high risk exposure in their human capital. Therefore, Benzoni et al.(2007) suggest that the optimal equity share in financial assets is hump-shaped over the lifecycle: cointegration

between human capital and stock returns dominates in the first part of working life, whereas the decline in human capital accounts for the negative age-dependency of optimal equity holdings later in life.

The negative age-dependency of asset holdings corresponds to the rule of thumb that an individual should invest (100 – age) % in stocks (see Malkiel, 2007). All in all, the economic theory suggests a negative relationship between participants' age and pension fund's equity exposure, although a single theory indicates that this relationship might be reversed.

5.5 RESULTS ANALYSIS

5.5.1 Descriptive statistics

Pension asset, pension liability and market capitalization information in Table 5.1 below is based on the balance sheet information of the individual firms as obtained in Bloomberg. The Beta of equity values in the table are estimated using the Single index model. In our case it is for the ten year-quarterly stock return as reported in Bloomberg. It is can be noted that the average pension liabilities are quite high (€865.51 million) for all the firms listed on the AEX index. This explains the reason for the average pension surplus being negative (-€23.87 million)despite the average equity beta being close to 1(i.e. 1.08). The beta equity beta is positive which indicates the direct dependence between the pension funds return and the AEX market returns.

Table 5.1: Summary statistics of the Dutch pensions, 21 listed firms

Firm Name	ROPA(%)	IW	Last Px	PL (€ mil)	PS (€ mil)	EB	Mkt CAP(€ mil)	PI (€ mil)
TNT express	6.50	1.41	9.94	45.00	-146.00	0.97	4567.74	-37.00
PostNL NV	5.70	0.69	4.88	218.00	1181.00	1.25	1721.44	1555.00
ING Groep NV-CVA	6.09	9.69	6.77	0.00	904.00	1.72	35302.52	217.00
Air France-KLM	7.65	0.00	4.69	1040.00	-421.00	1.21	1923.14	231.00
Aegon NV	0.00	2.57	4.00	0.00	-3436.00	1.43	10296.13	590.00
Arcelormittal	10.47	5.29	16.49	0.00	-25.00	1.46	34836.74	4.00
Aperam	3.20	0.28	15.89	181.00	-5.13	1.43	1701.57	30.73
SBM offshore NV	0.00	0.85	13.39	0.00	-24.30	1.18	3077.35	94.20
RANDSTAD holding	5.70	1.14	27.46	24.40	-1049.00	1.28	6324.03	316.00
AKZO nobel	5.70	3.89	44.97	0.00	-86.00	1.04	13810.90	15.00
Koninklijke phil	0.00	5.99	16.25	0.00	-997.00	1.15	21956.68	0.00
Heineken NV	0.00	3.87	39.91	1174.00	-15.57	0.75	30559.54	27.40
Boskalis WES	0.00	0.69	28.01	0.00	-103.00	1.14	3898.44	21.00
DSM (Konin)	0.00	2.71	42.02	270.00	-2.00	0.97	10208.66	-0.80
Corio NV	5.95	1.19	35.20	1.20	-64.52	1.08	4449.92	29.30
Fugro NV-CVA	5.20	1.36	53.37	71.60	-716.00	1.18	5850.48	128.00
KPN (Konin) NV	0.00	4.62	8.08	441.00	0.00	0.68	15339.67	0.00
Reed Elsevier	0.00	2.53	9.34	0.00	0.00	0.82	9009.71	40.59
ASML Holding NV	6.30	5.71	35.39	0.00	-2070.00	0.96	20472.14	276.00
Unilever NV-CVA	0.00	15.57	25.55	4206.00	0.00	0.64	101553.49	8.31
Tomtom	4.25	0.16	4.31	0.00	-10.40	1.22	1276.98	3.80
Unibail-Rodamco	5.90	2.09	144.45	10.90	-22.00	0.91	17891.13	46.00
Wolters Kluwer	0.00	1.56	13.99	142.00	81.00	0.93	5674.75	65.00
Ahold NV	6.60	4.89	10.97	92.00	-2586.00	0.72	16075.81	1364.00
Royal Dutch SH-A	0.00	17.90	27.38	5931.00	0.00	0.84	231133.66	0.00
Average	3.41	4.03	25.71	865.51	-23.57	1.08	24356.51	
Std.Dev.	3.31	4.4	28.05	1653.13	1.33	0.26	46766.98	

Table 5.1 above shows that out of the five top firms listed on the AEX index (based on market capitalization), that is, the Royal Dutch Shell, Unilever, ING Groep, Arcelormittal and Heineken, only one, the ING Groep NV, is overfunded. Two, Royal Dutch and Unilever break-even on average while Arcelormittal and Heineken are among the 15 listed firms that have a negative pension surplus. The equity beta for most of the firms is less than one. For example Royal Dutch Shell and Unilever have betas of 0.8385 and 0.6442. The firms with higher equity beta have negative pension surplus which may show how the market risk affects the pensions.

5.5.2 Empirical results

The equity beta of the firms listed on the AEX index have direct linear impact on their pension fund betas. Table 5.2 below shows that eight of the listed firms,have statistically significant positive coefficient. Arcelormittal which is one of the underfunded firms has a significant negative coefficient indicating that the equity beta has an impact on the pension fund beta, which is reflected in the pension surplus. ING Groep has a positive coefficient which also coincides with its positive pension surplus. Royal Dutch Shell which broke even on its pension funding also a significant positive coefficient.

The data is now fitted to the model in equation (5.11) with WACC as the dependent variable. The results are as shown in Table 5.3 below. The capital structure of the firms is directly related to the pension fund risk. We also get similar relationship as from the beta equity vs pension fund risk relationship where for instance Arcelormittal has a significant negative coefficient and Royal Dutch Shell has a significant positive coefficient.

Table 5.2: OLS, Equity beta as the dependent variable

*, **, and *** are coefficient significance at 1%, 5% and 10%.

Firm Name	coefficient	Probability
TNT express	0.08	0.05**
PostNL NV	0.37	0.04**
ING Groep NV-CVA	0.99	0.03**
Air France-KLM	0.23	0.01*
Aegon NV	0.22	0.01*
Arcelormittal	0.29	0.01*
Aperam	0.04	0.00*
SBM offshore NV	0.11	0.47
RANDSTAD holding	1.16	0.03**
AKZO nobel	-0.84	0.02
Koninklijke phil	-0.09	0.21
Heineken NV	0.89	0.07***
Boskalis WES	0.14	0.08***
DSM (Konin)	0.34	0.00*
Corio NV	0.22	0.08
Fugro NV-CVA	-0.26	0.03**
KPN (Konin) NV	0.34	0.06***
Reed Elsevier	0.89	0.94
ASML Holding NV	-0.83	0.07***
Unilever NV-CVA	0.31	0.08***
Tomtom	0.71	0.04**
Unibail-Rodamco	-1.29	0.03**
Wolters Kluwer	0.06	0.02**
Ahold NV	0.02	0.20
Royal Dutch SH-A	0.14	0.02**

Table 5.3: Fixed effects, Cost of capital as the dependent variable

*, **, and *** are coefficient significance at 1%, 5% and 10%.

Firm Name	coefficient	Probability
TNT express	0.14	0.10***
PostNL NV	0.22	0.02**
ING Groep NV-CVA	0.59	0.04**
Air France-KLM	0.11	0.00*
Aegon NV	0.07	0.00*
Arcelormittal	0.33	0.55
Aperam	0.46	0.01*
SBM offshore NV	0.15	0.20
RANDSTAD holding	1.08	0.04**
AKZO nobel	-0.34	0.08***
Koninklijke phil	1.19	0.09***
Heineken NV	-1.03	0.31
Boskalis WES	-0.25	0.42
DSM (Konin)	0.50	0.01*
Corio NV	0.37	0.08***
Fugro NV-CVA	0.68	0.04**
KPN (Konin) NV	0.82	0.02**
Reed Elsevier	0.74	0.01*
ASML Holding NV	-0.91	0.19
Unilever NV-CVA	0.43	0.04**
Tomtom	0.27	0.09***
Unibail-Rodamco	0.30	0.80***
Wolters Kluwer	0.55	0.00*
Ahold NV	-1.06	0.40**
Royal Dutch SH-A	0.08	0.00*

We now consider the relationship between equity beta and the various pension fund variables (defined in section 5.3 above). We fit the data to equation (5.13) above. The results are

shown in Table 5.4 below. All but two pension variables are significant. Overfunding (underfunding) pension, pension assets, pension benefit paid and pension expenses are among pension variables that are significant. Only coefficients of pension market capitalization and service cost are not significant. These results are as expected since the pension assets and pension benefit have a positive coefficient, showing a positive direct proportion relationship with the equity beta. This shows that the higher the risk the higher the value of pension assets, which means that pension funds will often be investing in diversified projects to boost their value. This could also lead to an increase in the total pension benefits paid, hence the pension expenses have a significant negative coefficient. We note that the overfunding/underfunding pension variable (measure of pension surplus) is negative, which indicates that the increase of market risk will lead to drop in the pension surplus. Similarly, the expected rate of return on pension assets has a negative coefficient. Hence the service cost, pension expenses, pension and post retirement reserve are all negative showing that increase in market risk will always lead to a drop in the expenses. This means that high stock volatility affects the pensions of the individual firms.

Table 5.4: Equity beta and pension variables,

*, **, and *** are coefficient significance at 1%, 5% and 10%.

Variable	Coefficient	P-value
Intercept	–1.06	0.330
Overfunding (Underfunding) pension	-0.06	0.091***
Pension assets (Fair value)	0.04	0.049**
Pension Benefit paid	0.01	0.101*
Pension liabilities	0.08	0.004*
Service cost	-0.04	0.730
Expected rate of return on Pension assets	-0.10	0.0.064***
Pension expenses	-0.02	0.100
Pension and post retirement reserve	-0.02	0.041
Pension market capitalization	0.10	0.024
Multiple R	0.94	
Adjusted R^2	0.70	

5.6 PENSION ASSET ALLOCATION

After looking at market risk — pension risk relationship, we look at the impact of the market volatility on pension asset allocation. The question we consider is what happens to the pension fund investments? Is there any impact on proportion invested into the equity, real estate, fixed yield securities and other investments? Table 5.5 below shows the summary statistics of quarterly data for the period, 2000 — 2010, for the aggregate pension asset allocation for the Dutch pension funds. The allocation to equities is the second largest with a mean of €239,300.11 million. The allocation to the other investments that include hedge funds, commodities and liquid assets is the least, at an average value of €33,174.94 million. This shows how the stock volatility has had an impact on asset allocation.

Table 5.5: Netherlands' pension fund asset allocation, 2000 - 2010

Descriptive statistics for the amount of asset allocation				
	Mean	Std. Dev.	Skewness	Kurtosis
Total equities	239,300.11	36,377.38	-1.1336	3.3534
Total fixed yield securities	314,425.44	22,493.96	0.2946	1.5974
Total investments at fund's risk	657,748.83	60,940.71	-0.8906	3.0954
Total other investments	33,174.94	11,888.91	-0.3473	2.0987
Total Real estate invest	70,848.50	5,571.70	-0.4707	2.2428

Table 5.6: Fixed effects results, Equity beta and asset classes.

*, **, and *** are coefficient significance at 1%, 5% and 10%

$R^2 = 0.75$ and Adjusted-$R^2 = 0.63$

Variable	Coefficient	Probability
Total equities	-1.42	0.0109*
Total fixed yield securities	–0.55	0.0048*
Total investments at fund's risk	0.30	0.0020*
Total other investments	-0.31	0.0903***
Total Real estate invest	-0.72	0.0501**

5.7 POLICY IMPLICATION

Given the size of pension assets, it is not surprising that pension funds are the dominant institutional investors in capital markets: a significant percentage of equities and fixed income securities are held by pension funds. These observations suggest that the valuation and the financial policies (funding and asset allocation) of pension funds should be of great interest to policy makers and researchers.

Over the past 10 years, retirement planning strategies used by the top asset managers in the world experienced an increase in equity allocations and had significantly increased exposure to non-traditional asset classes till the financial crisis. The rational conclusions are that asset managers then, viewed equity investments as better value than fixed income investments. Asset managers had found additional diversification value in non-traditional asset classes. The 2008/2009 global financial crisis was a turning point for pension funds after their equity-heavy portfolios suffered heavy losses and spurred them to seek alternative investments. That triggered a step-change in the way that our clients and pension fund managers think about building out alternative portfolios. That was the start of introducing things like real assets and commodities.

Dutch pension funds are in need of "far-reaching measures" to strengthen the financial

buffers that protect their retirement savings, as low interest rates and investment returns continue to exacerbate funding shortfalls. The average funding ratio of Dutch pension funds has fallen[15] to 99%. De Nederlandsche Bank, the Dutch financial regulator, requires that pension funds have a funding ratio of at least 105%. Falling below this threshold means they must submit a recovery plan to the regulator, detailing how they propose to get back to the required level. The capital position of the life insurance industry has been under pressure from high guarantees provided and disappointing investment performance in combination with low interest rates. However, 103 of the Netherlands' 454 pension funds are facing cuts to benefits in order to hit their funding target, according to data submitted to the regulator. The 103 funds represent about 7.5 million active members, pensioners and deferred members, and a total pension liability of €390 billion. Benefits are expected to be slashed by an average of 2.3%. However, 34 of these funds intend to cut benefits by over 7%. According to DNB, 298 of the 454 pension funds in the Netherlands have now had to put their recovery plans in place. These plans usually run for three years, but the regulator extended this to five years due to the current 2008 - 2012 economic crisis.

Pension funds must then hold enough buffers, in the form of equity, to be able to cope with any financial setbacks. While the size of these buffers could vary depending on several factors, such as the age of pensioners, the average pension fund will require a coverage ratio – including buffers – of about 125%. Buffers had been sufficient to support pension funds in the past, but the financial crisis saw fund portfolios fall sharply. The buffers work for short-term shocks, but in reality there is a risk that the Dutch economy will remain in a prolonged period of low economic growth, meaning that further measures are necessary. There is a possible suggestion of long-term solution being increasing the retirement age. Although, this will not provide a solution for the current funding deficits. In February 2012, the Dutch regulator suggested that, as one potential solution, a number of Dutch pension funds could be forced to cut their payments to members by the end of next year

European Pensions Briefing reports that the pension deficits of the world's largest 100 companies had risen to €290 billion at the end of September 2011. The funding situation deteriorated further throughout the following six months, following falls in equity values and

[15]Dutch financial regulator De Nederlandsche Bank, (DNB)

bond yields. The deficit had increased to €300 billion by end-March 2012 (according to LCP update[16]). The latest Purple Book[17], jointly produced by the UK's Pension Protection Fund and The Pensions Regulator and focusing on the risks faced by occupational defined benefit pension schemes, reports that there were 5,450 schemes in deficit (85% of the total) in December 2011, and their aggregate funding deficit on a Pension Protection Fund liabilities (section 179) valuation at 31 March 2011 was £78.3 billion, or £470.7 billion on a full buy-out basis.

Our results have arrived at similar conclusions to Yermo and Severinson (2010) compared the regulatory frameworks for pension funds across OECD countries and examined how different pension systems had responded to the financial crisis. The Netherlands may consider how the UK Pensions Act 2004 empowered the pensions regulator to intervene when pension schemes were in deficit and required sponsoring companies to fully fund their pension liabilities. Although, UK had low economic growth and fiscal austerity at that time, it is interesting to see the effectiveness of these regulations and how companies responded to such obligations. Potentially, companies deferred funding their liabilities, or alternatively they reduced wages and other costs, dividends, and investments.

The results imply that if the pension funds aim to meet their pension obligations in the future, more focus should be placed on the developing a comprehensive pension asset and liability management. This could lead to modification of the Dutch regulations that will support an appropriate asset and liability management system. This is an important issue particularly now when pension reforms in the Netherlands and other Western European countries are aiming at tackling the longevity risk due to the rapidly aging population.

We find there is a strong negative relationship between a firm's dividend payments and its mandatory pension contributions, even after controlling for the endogeneity of pension funding status on dividends and investments. The effect of pension contributions on investments

[16] http://www.lcp.uk.com/

[17] Pension Protection Fund/Pension Regulator (2012) Table 4.2 page 39, and Chart 5.6 page 51. The Purple Book is based on a comprehensive dataset of 6,432 schemes in the UK, and reports the extent of scheme underfunding, and the risks of the sponsoring employer becoming insolvent. Pension Protection Fund-liabilities are the value of pension liabilities if the Pension Protection Fund (equivalent to the US's Pension Benefit Guaranty Corporation) took over responsibility for the pension, and includes caps on pension payments; full buy-out liabilities are calculated without any of the Pension Protection Fund caps. The PPF 7800 index of funding deficits was £206 billion at 31 March 2012

is weaker than the evidence for study involving US companies, Rauh (2006). This suggests that pension regulations in the Netherlands allow firms sufficient discretion to maintain investment spending, and that in the Netherlands the response of balance sheet adjustments to financial pressures takes place through dividends rather than real investments.

Under the Minimum Funding Requirement, pension contributions for underfunded firms were smoothed over a number of years, but after 2005, the MFR was replaced with firm-specific funding requirements – allowing firms to focus on developing optimal funding plans appropriate to the circumstances of the scheme – and the Pensions Regulator, with the powers to require companies to fund their pension liabilities. Dividend and investment sensitivities to pension contributions are more pronounced in and after 2005, indicating that the regulations in the Pensions Act 2004 have had a significant effect on corporate expenditures. These results show that the channel through which companies with large pension deficits make up their funding shortfalls is paying lower dividends to shareholders, rather than cutting back on investments. The implication is that shareholders in a company with a pension deficit should anticipate that future dividends are likely to be reduced and this may have implications for share prices. The chart in Figure 5.8 below shows at a glance how as volatility increases so does the long term potential for growing pension savings respective to different asset class. Volatility can be seen to be a factor that be worthwhile being included among variables affecting strategic asset allocation of pension funds.

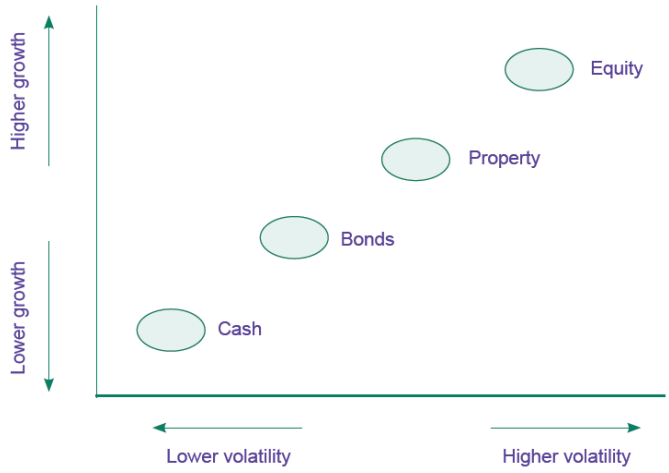

Figure 5.8: Pension asset classes vs volatility

Our findings are in line with Mercer's annual European Asset Allocation Survey[18]. They found that pension fund allocations to alternatives increase as European investors continue to turn their back on the equity markets as they are rattled by the volatility created by the Eurozone crisis. The survey of more than 1,200 European pension funds with assets of over €650 billion found that an increasingly broad range of alternative asset classes are being considered by pension plans, with 50% of schemes now holding an allocation to alternatives, up from 40% last year. Mercer's research reveals that schemes in traditionally equity-heavy markets such as the UK and Ireland still have the largest equity weightings although they have witnessed the largest falls in equity allocations, mainly driven by a move away from domestic equities. In the UK, average allocations to domestic and non domestic equities fell by 4% (from 47% to 43%) over the last 12 months. In Ireland the current average allocation to equities is 44%, down 6% from last year and down over 20% since 2008.

5.7.1 Robustness.

First using Quantile regression, we check above results by using different models. We consider the median-quantile regression for the equity beta, WACC relationship with the pension fund beta. The results in Tables 5.7(a) to (c) below confirm the previous results obtained by OLS

[18]http://uk.mercer.com/home

in Table 5.2. This confirms the one-to-one linear relationship between equity beta, capital structure and pension fund beta.

Table 5.7(a): Quantile regression, equity Beta,

*, **, and *** are coefficient significance at 1%, 5% and 10%.

Firm Name	coefficient	Probability
Air France	0.23	0.0001*
AEGON NV	1.11	0.0000*
AHOLD NV	0.02	0.2036
AKZO Nobel	-0.84	0.0000*
Arcelormittal	-0.30	0.0000*
Aperam	0.23	0.0000*
SBM offshore NV	0.11	0.4694
RANDSTAD holding	1.16	0.0000*
ING Groep nv-cva	0.99	0.0001*
Koninklijke phil	-0.09	0.2165
Heineken NV	0.89	0.0001*
Boskalis WES	1.36	0.0011*
DSM (Konin)	0.35	0.0003*
Corio NV	1.89	0.0001*
Fugro NV-CVA	0.26	0.0046*
KPN (Konin) NV	2.34	0.0002*
Reed Elsevier	-0.01	0.9420
ASML Holding NV	0.82	0.0000*
Unilever NV-CVA	0.32	0.0010*
Tomtom	0.72	0.0005*
Unibail-Rodamco	-1.29	0.0021*
Wolters Kluwer	2.06	0.0011*
Royal Dutch SH-A	0.47	0.0021*
Postnl nv	-0.54	0.0001*
TNT express	0.08	0.0002*

Table 5.7(b): Quantile regression, WACC,

*, **, and *** are coefficient significance at 1%, 5% and 10%.

Firm Name	coefficient	Probability
TNT express	0.05	0.5292
PostNL NV	-2.55	0.0003*
ING Groep NV-CVA	-2.12	0.0372*
Air France-KLM	-0.49	0.0551*
Aegon NV	1.71	0.1106
Arcelormittal	0.76	0.0005*
Aperam	-0.19	0.4365
SBM offshore NV	4.37	0.0001*
RANDSTAD holding	1.50	0.0149*
AKZO nobel	3.13	0.0080*
Koninklijke phil	0.17	0.4148
Heineken NV	-7.69	0.0001*
Boskalis WES	1.40	0.1914
DSM (Konin)	1.10	0.1227
Corio NV	-2.24	0.0186*
Fugro NV-CVA	-2.39	0.0004*
KPN (Konin) NV	-0.05	0.9707
Reed Elsevier	0.95	0.0799*
ASML Holding NV	-0.62	0.2198
Unilever NV-CVA	0.19	0.6757
Tomtom	0.65	0.1831
Unibail-Rodamco	-1.51	0.0426*
Wolters Kluwer	3.51	0.0078*
Ahold NV	0.05	0.6503
Royal Dutch SH-A	-1.58	0.0288**
R^2	0.6258	

Table 5.7(c): Equity beta, pension variable, Quantile regression, ,

*, **, and *** are coefficient significance at 1%, 5% and 10%.

Variable	Coefficient	P-value
Overfunding (Underfunding) pension	-0.68	0.5205
Pension assets (Fair value)	-0.45	0.0664***
Pension Benefit paid	0.72	0.0097*
Pension liabilities	0.38	0.0719***
Service cost	0.18	0.0862***
Expected rate of return on Pension assets	-0.43	0.6774
Pension expenses	-0.20	0.0847***
Pension and post retirement reserve	-0.58	0.0058*
Pension market capitalization	-0.62	0.5550
Adjusted R^2	0.55	

5.7.2 Modeling with EGARCH

We use the Exponential Generalized Autoregressive conditional Heteroscedasticity (EGARCH) model to consider stock market swing and asset allocation. We also include the sub classes of the assets classes. The EGARCH model we use is shown in equation (5.15). The results shown in table (5.8) are consistent with the results shown earlier in Table 5.6 The EGARCH(1,1) model is given by:

$$\log(h_t) = \omega + \alpha * \frac{\mid \varepsilon_{t-1} \mid}{\sqrt{(h_{t-1})}} + \gamma * \frac{\varepsilon_{t-1}}{\sqrt{(h_{t-1})}} + \beta * \log(h_{t-1}); h_t = \omega + \alpha\varepsilon_{t-1}^2 + \beta h_{t-1} \quad (5.19)$$

where the historical volatility is the dependent and is represented by h_t, which can be defined as in equation 5.16, and the term $\frac{|\varepsilon_{t-1}|}{\sqrt{(h_{t-1})}}$ is the standardized residual and the positivity constraints on the model parameters in the variance equation are $\omega > 0$; α, $\beta \geqslant 0$

Table 5.8: EGARCH model, with logAEX returns as dependent variable vs investment classes.

*, **, *** are significance at 1%, 5% and 10% levels

Variable	Coefficient	Prob
Real estate investments		
Total rate of return	-22.019	0.00*
Direct investment in real estate	22.017	0.00*
Indirect investments in real estate	22.035	0.00*
Equities		
Mature Markets	0.001	0.66
Private Equity	-0.015	0.03**
Equity investment fund	0.019	0.03**
Emerging markets	0.016	0.02**
Fixed yieLd securities		
Government bonds	0.000	0.91
Index linked bonds	-0.003	0.46
Mortgage loans	0.001	0.58
Short term claims on banks	0.002	0.87
Other investments		
Hedge funds	0.008	0.92
Commodities	0.011	0.00*
Other investment funds	0.004	0.79
Liquid assets	0.008	0.04
Total investments at funds risk	-0.002	0.00
Variance equation		
C(20)	7.503	0.02**
C(21)	-0.739	0.51
C(22)	0.994	0.05**
C(23)	0.835	0.29
C(24)	0.056	0.88

It is notable that the EGARCH above capture the impact of the AEX index behaviour on

Equity investment. At least one independent variable is significantly positive. This shows that a rise or a fall of the stock market will be followed by a similar trend (fall or rise) in equity investment. The real asset variables are also significant for the EGARCH model which shows that the volatility of the stock market strongly affects the pension investment to real estate. Therefore, the fixed yield investment is the possible option for the pension fund investment when the stock market is very volatile.

5.8 CONCLUSION

The results indicate that there is a relationship between the capital structure, equity beta and pension fund beta, and hence a concrete relationship between market volatility and asset allocation. The study indicates the wide dispersion in pension asset allocation. A portion of the different asset allocation is explained by the market volatility. Our findings indicate that the equity beta, capital structure of the pension sponsoring firms and market volatility affect the pension fund risk and asset allocation. The move away from equities is particularly marked among larger schemes – those with over £1bn of assets – where 37% expect to increase their allocation to bonds in the next 12 months. Nearly half of these larger schemes also plan to grow their alternative asset holdings. As the battle for deficit reduction intensifies, what we have seen is a growing focus on developing more sophisticated asset management strategies that aim to provide equity-like growth potential with bond-like volatility.

The Netherlands pension funds had the largest asset allocation to bonds, (50%), second to Japan's 56%. This leaves only 33% going to the equity assets and mere 1% to be held in cash There has been an interesting up and down trend in assets allocated to equity increased from 33% in 2006 to 35% in 2007, but dropping to 32% in 2008 before the latest percentage of 33% in 2010. This indicates how the pension fund management has been concerned on the impact of the stock market volatility during this period, 2006 - 2011. In the UK, the pension market has also been decreasing the allocated proportion to the equity. The reported drop from 68% in 2003 to 58% in 2008 and finally 55% in 2010 shows the same trend of moving away from the stock market risk.

The results provide evidence that most firms who allocated a large percentage of their asset into the equity were negatively affected by the stock market crush. Most pension funds have a highly dispersed asset allocation. This applies to investments in a sponsor, real estate investment, and money market investments, which will all fluctuate dramatically between funds.

We can conclude that the long-term effects of the 2008 stock market crash on retirement incomes will depend on the stock market's future performance, as well as investors' market exposure at the time of the crash, the amount and composition of their future contributions, the proportion of their retirement income coming from assets, and how many years they have to rebuild their assets. Pensions deficits for AEX companies could grow as falling bond yields and volatile stock markets are mitigated by a reduction in interest rate projections. Therefore market volatility has been of great influence on pension assets. This could also have implication to foreign markets where the continued fall in gilt yields for example means that UK pension funds need to find a way to diversify further away from traditional methods of reducing risk by investing in corporate and government bonds.

'As a matter of urgency the government must develop mechanisms that provide low-risk opportunities with an attractive yield – bond-like structures, such as asset-backed securities or special "infrastructure bonds" which would benefit pension schemes at the same time as providing funding for much-needed private finance initiative projects

During the past decade, we can generalize that all global pension assets decreased relative to financial market performance. This implies that pension funds have become a major capital market participant. Pension funds in the Netherlands will mature in the coming years. This may lead to a shift in policy focus towards the interests of the elderly. The asset mix may become more conservative to safeguard the payout of benefits to retirees as promised. A conservative mix is not in the interest of the young participants. The lifecycle investing approach recommends that individuals accept high risk exposure early in life and the risk exposure has to decline gradually over the lifecyle.

6.0 SUMMARY OF MAIN FINDINGS

This study has analysed banks and pension funds. We summarise our findings as follows.

6.1 BANK SECURITIZATION

We have analysed the reasons why UK banks securitize or did securitize during the period before the 2007 financial crisis. We have shown that the search for liquidity (i.e. the need to fund their balance sheets) has been the principal motive for UK banks to securitize. We have also shown that regulatory capital arbitrage and credit risk transfer have played a role, albeit a smaller one, in the decision of banks to securitize. We have shown that banks which issued more asset-backed securities (ABSs) before the financial crisis suffered more defaults after the financial crisis. We attribute this to the fact that the market for ABSs was frozen abruptly in the summer of 2007 and hence they were unable to sell off their loans and suffered the consequences as the credit-crunch and the global financial crisis took their toll on the quality of the banks' loan books.

Finally, we showed that large banks were the ones for which securitization was more important to explain profits while commercial and savings banks were the ones whose balance sheets were the most exposed (and highly sensitive) to changes in the conditions of the securitization market.

The new regulation and market concerns with regard to high information disclosure may lead ABS to be losing the attractiveness as a funding tool when compared to alternative asset based instruments such as covered bonds. Thus the market may resume with the level of activity previous to the crisis. Therefore, information is crucial for all markets but it is

particularly important for ABS markets. However, enhancing information, both in content and in disclosure aspects, may not be the key factor to restore the markets.

The goal of regulation should be to preserve those benefits while achieving important public policy objectives, including financial stability, investor protection, and market integrity. Devising an appropriate regulatory response to financial innovation is challenging. We should strive to implement a regulatory regime that is principles-based, risk-focused, and consistently applied. Enhancing market discipline can complement and strengthen such an approach.

6.2 BANK CAPITAL STRUCTURE

From our empirical analysis we can clearly argue that due to the financial crisis the cost of funding has increased for commercial banks and funding is not as easily accessible before the crisis. Additionally, we further argue that due to the financial crisis commercial banks now have stronger incentives to attain debt relative to new equity as the probability of undervaluation has increased. It is due to the fact that the recent financial crisis will make the investors risk appetite to invest in banking is decreased. Funding structure will be more towards stable and long term sources such as capital and deposits. As a consequence, the median costs of capital and bond will increase accordingly.

The financial crisis has further diminished liquidity and created insolvency for commercial banks. The response by regulators has been to increase capital requirements in Basel III and further restrict the liquidity ratio and the Leverage Ratio. The increase in capital requirements can be considered as a radical change in this current financial crisis that is increasing cost of funding for commercial banks. This is because debt financing is considered as cheaper financing relative to new external equity financing. As a result, the increase in capital requirements could potentially increase the overall cost of funding.

It is also important to bear in mind that upon the implementation of the Basel III, debt will remain the major funding source for commercial banks. It leaves the commercial banks a highly leverage sector. Consequently the government should start to think how to deal with "too big to fail" financial institutions so that they are not become "too big to regulate"

institutions. The main purpose of the capital requirement is to limit the risk exposure of the government and taxpayers that stand behind it.

In this study, we have offered a new advantage to the use of debt such that in situations where only insiders know the quality of the firm, the use of debt acts as a barrier to entry of inferior firms and banks. This implies that those banks issuing debt have improved the average quality of the banks in the financial market, thus benefiting both the investors and shareholders even when perfect discrimination is impossible. We have also provided the normative result that bank managers and directors will use debt financing (even if it is risky) if they perceive that the bank is undervalued and use equity financing if they perceive it is overvalued. The way managers decide about the type of debt financing is not universal. Furthermore, factors such as liquidation and renegotiation, moral hazard and adverse selection, floatation costs are found to be significantly relevant while deciding the mix of debt to be issued by the bank.

A bank will not issue equity unless it has already exhausted its "debt capacity"—that is, unless the bank has issued so much debt already that it would face substantial additional costs in issuing more debt than planned level. Therefore, we can conclude that the large banks will finance their investment opportunities with debt and small banks with equity. New equity issues are associated with small, loss-making banks such that after an IPO, equity issues are more important for small banks than for large banks. When larger banks do issue equity, the number of issues can be expected to be large. As noted earlier, the liquidity of banks' assets can be taken as evidence to show the extent to which these assets of companies can be manipulated by shareholders at the expense of debt holders.

6.3 PENSION FUND ASSET ALLOCATION

The pension problem illustrates how the recession and the meltdown in the financial markets can become self-reinforcing. Ballooning pension deficits will leave some companies with diminished profits, weaker credit ratings and higher borrowing costs, which can translate into lower stock prices. The results provide evidence that most firms who allocated a large percentage of their assets to equity were negatively affected by the stock market crush.

Most pension funds have a highly dispersed asset allocation. This applies to investments in a sponsor, real estate investment, and money market investments, which will all fluctuate dramatically between funds.

The results indicate that when the pension plans are underfunded, companies are required to plough enough additional money into the funds each year to correct the imbalance. This will always lead to a better performance by the stock market as it did in January 2011 and helped put pension funds on a sounder footing. The Standard & Poor's 500 index gained nearly 11 percent in the fourth quarter of 2011. Similarly reported was an increase in the funding ratios of pension plans, on average, by 11 percent in the same fourth quarter. This helped push up the average pension fund to gain roughly 7 percent for the quarter. This is due to the rising bond yields which resulted in pension discount rates rising 30 basis points from 5.3 to 5.6 percent.

We can conclude that the long-term effects of the 2008 stock market crash on retirement incomes will depend on the stock market's future performance, as well as investors' market exposure at the time of the crash, the amount and composition of their future contributions, the proportion of their retirement income coming from assets, and how many years they have to rebuild their assets. Pensions deficits for AEX companies could grow as falling bond yields and volatile stock markets are mitigated by a reduction in interest rate projections. Therefore market volatility has been of great influence on pension assets. Therefore we have shown that;

- Pension fund allocations to equities has fall – majority of reduction through domestic equities.
- Allocations to alternative assets has increased as pension schemes seek to diversify portfolios.
- Faced with low bond yields pension funds adopt a 'wait and see' approach to increasing bond allocations.
- Demand for inflation-linked assets is expected to remain strong due to inflation concerns.
- Property (real estate) allocation falls out of favour across continental Europe

The asset allocation of defined benefit pension plans is a setting where both risk-shifting

and risk-management incentives are likely be present. Empirically, firms with poorly funded pension plans and weak credit ratings allocate a greater share of pension fund assets to safer securities such as government debt and cash, whereas firms with well-funded pension plans and strong credit ratings invest more heavily in equity. These relations hold both in pooled regressions and within firms and plans over time. The incentive to limit costly financial distress plays a considerably larger role than risk shifting in explaining variation in pension fund investment policy among firms in the Netherlands. During the past decade, we can generalize that all global pension assets decreased relative to financial market performance. This implies that pension funds have become a major capital market participant.

These findings suggest that the investment policies of pension funds are partially driven by the cyclical performance of the stock market. Pension funds respond asymmetrically to stock market shocks: rebalancing is much stronger after negative equity returns. On average, this strategy led to negative excess returns over the period under consideration. Investment policies of large funds deviate from that of small funds: they hold more equity and their equity allocation is much more strongly affected by actual equity returns, reflecting less rebalancing. The largest funds react highly asymmetrically to positive excess equity returns, adjusting their portfolios by significantly more than 100%, reflecting 'overshooting' of free floating, or positive feedback trading. Apparently, managers of large funds demonstrate great risk tolerance, particularly in bull markets.

7.0 FUTURE RESEARCH AND EXTENSIONS

The next couple of years will be crucial in establishing a new framework for the OTC market. The ABS security market will be in the line of fire. Different proposals are being advanced. In the previous sections we focused on a few of them. Particularly we focused on the two which we believe are likely to have a severe impact on the ABS market, namely fixed floor for the proportion of the security retained and full disclosure of the pool. We concluded that, each of these two proposals, will lead to a severe decline in the profitability for this market. It follows that, given the importance of this market itself for the wide economy, such decisions should be based on empirical studies assessing their impact on the market.

Therefore the introduction of a fixed floor will have unknown implications and also, it is not yet obvious if the retained proportion of the security should be chosen using a vertical or a horizontal approach. We believe that a better approach might consist of disclosing data on the quantity of the security issued that has been put on sale and the proportion of the same retained. Investors may use this information to infer about the quality of the security. Should the sponsor retain the security for a period of time before re-selling it? Once again, we believe that the best approach is full disclosure of the proportion of the (retained) security put on sale. What about investors? Should investors retain the security for a certain period? Why should they be asked to do so? Investors (and not only speculators) generally buy a security at a lower price and sell it at a higher price. Why should it not be the same in this case?[1]

The SEC has proposed the adoption of new rules for the disclosure requirements for ABS

[1]It has been suggested that under this proposal one would better ensure that the resale is not a distribution. We do not see much wrong with the old model based on the distribution approach. Afterall, it is not a model which causes a crisis but it is the way the model is interpreted and applied.Regulators should probably focus on these issues.

securities: specific data on each loan or asset in the pool, obligor characteristics, description of the methodology used to calculate the pool performance and computer program to run the cash flow provisions of the transaction. Thus, the issuer (sponsor) is obliged to filing a computer program of the contractual cash flow provisions of the securities and all the information cited earlier. This information should be made available to investors in full. We have discussed the possible impact on the ABS market of the "full disclosure approach" above. We believe that full disclosure may have a substantial impact on the market (see the example above). To mitigate this effect we propose that investors should only have access to aggregate information rather than specific informations as mentioned above. On the other hand, one may think of a regulatory body to whom sponsors (originators) should be obliged to report full information on the security (including the methodology used to obtain the price). We believe that all the information cited above should be disclosed in aggregate form, considering similar deals conducted by the same issuer[2].

7.1 PROPOSALS FOR THE FUTURE

The next couple of years will be crucial in establishing a new framework for the Over the Counter Market (OTC). The ABS security market will be in "the line" of fire. Different proposals are being advanced. In the previous sections we have focused on two. We have focused on two, which we believe are likely to have a severe impact on the ABS market and concluded that, they may lead to a severe decline in the liquidity of this market. Given the importance of the ABS market for the whole economy, we need empirical evidence assessing the impact of these proposals on the economy. In this section we shall make some recommendations. Two main conclusions can be reached from the discussion above: Firstly, given the high cost for the issuer to retain a larger proportion of the security, and given the market asymmetry, investors rationally anticipate the demand curve and they interpret the proportion of the security put on sale by the issuer as a credible signal[3]. Secondly, as

[2]This can follow the same approach as for the aggregate CDS position data released by DTCC (see also discussion in Duffie et al, 2010).

[3]It is not a coincidence that sponsors in the ABS market already used to retain a proportion of the security, and it is typical practice for credit card ABS market. The model above clarifies the reason why that

Figure A8 shows, if the market asymmetry is largely removed by regulations, the profit for the issuer may fall significantly which, in the last instance, may imply that most of the ABS products will disappear. As discussed earlier, the effect of the introduction of a fixed floor is largely unknown and also it is not yet obvious how this policy should be implemented (see Fender et al, 2009)[4].

The information made available to investors should include factors such as illiquidity for that category of assets, credit risk and also model risk. On the other hand, one may think of a regulatory body to whom sponsors (originators) should be obliged to report full information on the security (including the methodology used to obtain the price). In this way the new body will have a clear picture of the overall systemic risk and banks' total risk exposure. Information can be disclosed in aggregate form, considering similar deals conducted in the market The new regulatory framework for the ABS market may lead it to loose the attractiveness as a funding tool. This study has reviewed recent developments in this market and focused on two recent regulatory proposals (SEC, 2010), namely fixed retention floor of the security and new disclosure principles. The study concluded that, if implemented, these policies are likely to have a major impact on the liquidity of the ABS market. The recent crisis in the ABS market has more to do with reputational concerns than retention policy. This study suggests using alternative approaches which should alleviate the pressure on originators (issuers). It is important that regulators find the right balance between maintaining a such client interest in the securitization market and at the same time avoid the errors made in the past.

To do this, we need theoretical as well as empirical studies to analyze the impact of the new regulatory framework on the securitization market and the economy as a whole. The availability of information to market participants is crucial for the correct functioning of the securitization market. However, full disclosure of information may not be the key to restart the market. Indeed, it may even reduce the market liquidity. The goal of regulation should be to preserve the benefits deriving from the ABS market while achieving important pub-

happened. Thus, the retention of a proportion of the security may have very little to do with the "inability or lack of incentive to sell those securities" as suggested by the SEC (2010) document.

[4]However, under technical regularity conditions, Innes (1990) shows that the optimal security to retain is pure equity, which is, in effect, what has generally happened in the past.

lic policy objectives, including financial stability, investor protection, and market integrity. Devising an appropriate regulatory response to financial innovation is challenging. The introduction of the regulations may well lead to either the shut-down of the securitization market (or at least a significant reduction of the market), or to the rise of riskier instruments[5].

At this level of our study, we will rest the impact of the Basel III Accord of higher capital requirement (common equity) on the commercial banks' capital structure and risk taking to other researchers to elaborate upon its implementation in the near future.

It remains somewhat unclear why UK pension funds invest so much more in equities than their US counterparts, hence could be an area of further research. It will also be necessary to understand what appear to be nontrivial effects of lagged investment returns on pension fund asset allocation, and whether this is efficient or not. Finally, given that a large part of firm-level variation in asset allocation remains unexplained, further studies could aim to identify other factors that affect variations in pension fund investment strategies. Is the equity allocation of Dutch pension funds age dependent?

7.2 APPENDIX:

In this section we consider some concepts that we could not cover in details in the main text of the chapter. We address the possible factors that may have impact on the results. First, we start by looking at the detection of outliers and then multicollinearity analysis. Afterwards, we also look at the additional study on securitization, in particular Asset Backed Securities (ABS) market.

7.2.1 Detection of Outliers

An outlier is an observation that appears to deviate markedly from other observations in the sample. Outliers can be caused by experimental or measurement errors, or by a long-tailed population. It is therefore desirable to identify the outliers and remove them from

[5]For example for the case of Collateralised Loan Obligation (CLO), Duffie (2007), based on Innes (1990), shows that if the cost of effort (for the issuer) of controlling for the quality of the loan in the pool is very high, the issuer will simply sell the entire loan portfolio, making minimal effort.

data before performing a statistical analysis. According to Rousseeuw and Leroy (1987), this is because the outliers can throw off the results since they do not accurately represent the sample population. The simplest way we use to identify outliers is the quartile method. This involves using the interquartile range[6], obtained together with descriptive statistics.

Multiplying the interquartile range by 1.5, (150%) then adding this to the upper quartile and subtracting it from the lower quartile we get data points; any data point which is outside these values is a mild outlier. While when we multiply the interquartile range by 3, (300%) and add this to the upper quartile and subtract it from the lower quartile, any data point outside these values is an extreme outlier.

In this way we detect and determine the impact of the extreme outliers in our data. We find that the data points representing the extreme outliers represent large securitizing banks. This accounts for the lower impact that can be observed by inclusion of outliers in the original sample. Table A1 below shows the descriptive statistics after excluding the outliers, and the mean and the standard deviation are similar to those in Table 4(a) considered earlier.

[6]We find the upper quartile, Q2; this is the data point at which 25 percent of the data are larger; then the lower quartile, Q1; which is the data point at which 25 percent of the data are smaller. Thus, we subtract the lower quartile from the higher quartile to get the interquartile range, IQ.

Table A1: Descriptive statistics, banks using securitization, without outliers

We calculate the descriptive statistics of the banks that securitize without the outliers

We have the descriptive statistics of the explanatory variables for number of securitizing banks, N=527.

	Mean	Std.Error	Skewnesss	Kurtosis	Std.Dev
Funding					
Interbank ratio	68.61	7.58	3.51	13.52	157.90
Liquid assets/Customer deposits & ST funding	63.13	6.31	4.07	18.87	131.47
Liquid assets/Total deposits & borrowing	40.10	4.67	4.96	28.40	97.30
Net loans/Deposits & ST funding	31.25	1.61	0.59	-1.15	33.59
Net loans /Total assets	48.38	4.56	5.53	40.23	95.01
Net loans/Total deposits & Borrowing	25.32	1.85	1.61	2.65	38.46
Capital regulation					
Cap.Funds/Deposits & ST funding	5.87	0.71	4.22	19.82	14.89
Cap.Funds/Net loans	15.37	2.91	5.95	37.68	60.57
Cap. Funds / Total assets	14.99	2.49	5.84	40.46	51.93
Equity/Liabilities	29.34	1.79	-0.81	12.97	37.37
Equity/Total assets	71.48	7.63	3.04	9.39	159.00
Tier 1 Ratio	3.10	0.46	6.42	60.37	9.61
Total capital ratio	3.64	0.56	8.07	100.43	11.74
Risk transfer					
Impaired loans/Equity	1.51	0.29	11.36	172.21	6.00
Impaired loans/ Gross loans	9.57	1.44	4.92	29.48	30.07
Loan loss prov. / Net int.Rev	11.91	2.89	0.99	70.07	60.27
Loan loss Res. / Gross loans	1.68	0.27	7.31	66.63	5.60
Unreserved impaired loans /Equity	4.91	0.88	5.68	37.05	18.35
Net charge-off/Average Gross loans	0.39	0.14	9.03	131.31	2.92
Size					
Log total assets	43.14	9.32	6.32	43.14	194.16

7.2.2 The Originate-To-Distribute model and securitizing banks

The Originate-To-Distribute (OTD) model is where banks originate loans without intentions of holding them in portfolio. The main aim of the banks is to sell the loans and transfer risk. Section 3.3.5 showed that growth of securitization made it easier for banks to sell loans that they originated. The OTD model is made easier by securitization, but banks that sell loans need not be 'securitizers' as shown in Table A2(a) and A2(b) below. In these tables, we consider the model in equation (4) but exclude the $preotd_t$, a time invariant variable measuring the extent of the bank's participation in the Originate-to-distribute (OTD) market, $after_t$ a dummy variable taking the value one in the period after the financial crisis began and zero otherwise and hence the interaction term $after_t * preotd_i$ measuring the change in net charge-offs around the crisis period across banks with varying intensities of participation in the OTD market prior to the crisis.

The results show the same significant results as in Tables 3.9(a) and 3.9(b) considered earlier. We can remark that the dummy was effective at splitting the banks into securitizing and non securitizing banks. We can also note from the results in Table A2(a) and A2(b), that banks that used the OTD model were the ones to suffer the most (in terms of default).

Table A2(a): Default rate for Securitizing banks, 2004 -2010;

*, **, and *** are coefficient significance at 1%, 5% and 10%.

Variable	Coefficient	Prob
Funding		
Interbank ratio	0.26	0.01*
Net loans/Total assets	0.42	0.82
Capital regulation		
Capital funds/Total assets	0.40	0.19
Tier 1 ratio	2.17	0.01*
Risk Transfer		
Impaired loans/Equity	0.02	0.05**
Impaired loans/Gross loans	0.02	0.84
Size of the banks		
Natural log of total assets	0.02	0.04**

Table A2(b): Default rate for Non securitizing banks, 2004 -2010;

*, **, and *** are coefficient significance at 1%, 5% and 10%.

Variable	Coefficient	Prob
Funding		
Interbank ratio	0.26	0.03*
Net loans/Total assets	0.02	0.87
Capital regulation		
Capital funds/Total assets	0.40	0.02*
Tier 1 ratio	2.17	0.01*
Risk Transfer		
Impaired loans/Equity	-0.02	0.08***
Impaired loans/Gross loans	-0.08	0.01**
Size of the banks		
Natural log of total assets	0.01	0.06**

7.3 APPENDIX B:

Basel capital accords are produced by the Bank for International Settlements Basel Committee on Banking Supervision, (Walter, E., B., 1984). These agreements provide a framework for determining the minimum capital financial institutions must hold as a cushion against losses and insolvency. The less capital a bank holds the more capital it has to lend, which generally increases the bank's profitability, but makes it more vulnerable to losses and failure, which could lead to the need for government financial assistance. Without financial institutions holding this minimum amount of capital, banking regulators would not permit banking organizations to conduct normal banking business.

7.3.1 Bank capital structure and Basel accords

The first Basel accord was adopted in 1988 and is credited with providing stability to the international banking system, both through defining consistent safety and soundness standards and by promoting better coordination among regulators and financial supervisors in participating countries. However, Basel I had flaws. Banking regulators in the United States and other countries developed Basel II in 2004 because it had become clear to regulators that the methods use to calculate the requirements in Basel I were not sufficiently sensitive in measuring risk exposures. It was also clear that the regulatory capital needed in the increasingly complex and dynamic banking system could not be determined accurately and consistently under the Basel I framework.

The Basel II capital accord upon which Basel III was built is a three-pillared framework. The first pillar draws the most attention. It provides the methodology for calculating the minimum capital requirements for various categories of banks and banking instruments, such as mortgages, payment cards, and private and government securities. In the Basel II framework the capital requirement for each bank asset was subject to measurement. Consequently, it was found to account for more of the risk exposures in the assets in a bank's balance sheet than Basel I. Basel I determined the risk exposures for large categories of assets, making it less sensitive to individual asset risk exposure. The second pillar specifies the supervisory

review process. For example, pillar two requires banks to maintain management mechanisms to conduct ongoing internal self evaluation of risk exposures and compliance with the minimum regulatory capital requirement for each level of risk exposure. It also requires regulators to validate these mechanisms. The third pillar facilitates market discipline in the banking system to create the proper incentives to adopt the best safety and soundness practices. A bank's financial disclosure, for example, could determine the willingness of depositors and investors to do business with that bank.

7.3.2 Basel III and capital structure

The purpose of Basel III is to remedy the regulatory capital and liquidity failures that resulted in the 2007-2009 global financial crisis. Basel III would make significant changes in bank regulatory capital requirements. It would increase the amount of common tangible equity held as minimum regulatory capital because common equity improves loss absorbency. Tangible common equity consists of bank shares and retained earnings. This increase is a significant change in regulatory capital requirements because many assets that are being used as regulatory capital would have to be converted to common tangible equity. By 2015, more than half of the total regulatory capital would be composed of common tangible equity capital. Common tangible equity will also be used in a new conservation capital buffer. This capital conservation buffer is to ensure that banks build up capital outside periods of financial stress that can be drawn down when losses are incurred. The minimum total capital plus conservation buffer would be 10.5% of risk-weighted asset in January 1, 2019, which is 2.5% higher than the current minimum requirement. If another element, the countercyclical capital buffer, is fully added, the minimum total capital requirement would be 13% of risk-weighted assets. This would be a remarkable increase in capital requirement from current levels. Very few U.S. banks were able to maintain 13% of risk-weighted assets at the highest level of U.S. bank profitability. At that time, the average total equity capital ratio was 10.52%.

Basel III will eventually tighten capital requirements. The minimum requirement for common equity, the highest form of loss absorbing capital, will be raised from the current

2% to 4.5% after the application of stricter adjustments. This will be phased in by 1 January 2015. The total Tier 1 capital requirement, which includes common equity and other qualifying financial instruments based on stricter criteria, will increase from 4% to 6% over the same period. There will also be a "buffer requirement" of 2.5% that can be drawn down to the 4.5% minimum requirement during times of stress. This effectively will raise common equity requirements to 7%.

If a bank draws below the 7% common equity requirement, including the buffer, distribution of earnings must be curtailed until the 7% level is recovered. These restrictions would apply to dividends and executive compensation, including bonuses.

It appears that actual implementation won't start until 2012 and the accords will not be fully implemented until 2018. Here, Table B1, is the implementation schedule:

Table B1: Phase in Arrangements as January of each year from 2011 to 2019

Source: Bank for international settlement

Variable	2011	2012	2013	2014	2015	2016	2017
Leverage ratio	Supervisory monitoring		Parallel run 1 Jan. 2013 - 1 Jan. 2017				Migr
Minimum common equity capital ratio			3.5%	4.0	4.5	4.5	4.5
Capital conservation buffer						0.625	1.25
Minimum common equity plus capital conservation buffer			3.5	4.0	4.5	5.125	5.75
Phase -in of deductions from CET1				20	40	60	80
Minimum Tier 1 capital			4.5	5.5	8.0	6.0	6.0
Minimum Total capital			8.0	8.0	8.0	8.0	8.0
Minimum Total capital plus conservation buffer			8.0	8.0	8.0	8.625	9.125
Capital instruments that no longer qualify as Tier 1 or Tier 2							

According to an article by Brooke Masters in The Financial Times, the UK and the U.S. had pushed for earlier implementation (2016). Many countries (including the UK and U.S.) wanted higher Tier 1 capital ratios, up to 10%, but others, most notably Germany, argued for lower ratios, some as low as 4% including buffer. Germany was also on the opposite side of the implementation schedule argument, at one time wanting a 15 year schedule.

It had long been agreed that Tier 3 capital, that bastion of dark capital instruments such

as CDS (credit default swaps) and SIV (special investment vehicles), would be eliminated from the capital structure of banks by the Basel 3 accords. Tier 2 capital will remain in the equation (up to 2% of total capital) but just what can be held in tier 2 is uncertain. As shown in the bottom line of the graphic, by 2013 definitions of prohibited instruments will be defined.

7.3.3 The Basel III capital adequacy

The Basel III capital adequacy accord is the most recent international effort to establish a new capital standard for banks. Specifically, Basel III is an agreement on capital requirements among countries' central banks and bank supervisory authorities.

Basel III redefines regulatory capital. To raise the quality, consistency and transparency of regulatory capital, the committee determined that Tier 1 capital must consist predominantly of common equity and retained earnings. Under current standards, there are two types of capital counted in meeting the capital adequacy rules under Basel I—core capital and supplementary capital. Tier 1 is core capital and is made up of mainly common shareholders' equity (issued and fully paid), disclosed reserves, most retained earnings, and perpetual non-cumulative preferred stocks. Supplementary or Tier 2 capital consists of subordinated debt, limited-life preferred stocks and loan loss reserves, and goodwill. Banks can hold as little as 2% of common equity to risk-weighted assets. Consequently, banks can display strong Tier 1 capital containing a limited amount of tangible common equity. The financial crisis demonstrated that the resources to cushion against credit losses and write-downs came out of retained earning, which is a part of a bank's tangible equity base. Under the Basel III framework Tier 1 capital is adjusted to narrow it as close as possible to bank tangible common shares. Goodwill and preferred stocks, as well as other assets, would not be included in the new Tier 1 capital.

7.3.4 Conclusion

Capital regulation based on the Basel Accord advises that banks hold capital in proportion to the amount of the risk they take. Based on the CAR calculation of the US Commercial

Banks from 1992 to 2011 we concluded that the economic capital, which is high for small-sized banks and around the same level as the BIS■ Minimum Regulatory Capital for large-sized banks, is more important for the bank to hold than the regulatory capital in running their businesses. Consequently the impact of the capital buffer theory, that predicts banks hold safety cushions above the regulatory capital requirement, can be proved for the US Commercial Banks small-sized banks capital buffer and lightly observable among the US Commercial Banks large-sized banks.

Commercial banks high level of leverage implies that a significant level of debt funding composes the optimal capital structure. However, the increase in capital requirements in Basel III embrace that regulators deem that commercial banks■ high level of leverage is not privately and/or socially optimal. An increase in capital requirements will decrease the undervaluation of new equity financing.

7.4 APPENDIX C:

Pension plans in the private and public sectors have become a key institution in the functioning of financial markets. These plans provide a mechanism for consumers to save, and can influence the retirement incentives.

7.4.1 Dutch pensions

Dutch pension funds effectively are collective savings arrangements, covering almost the entire population of employees. Pension funds often take the characteristics of their participants on board in their decision-making on strategic investment allocation. The Netherlands as all the European countries face an ageing population which will have a major impact on the design of the pension schemes. Countries with a pure pay-as-you-go system foresee problems with this system because a diminishing working population has to support an ever increasing population of retired people. This calls for far-reaching reforms. However, even countries such as the Netherlands with a second pillar that is funded foresee difficulties. New accounting rules and new rules for technical provisions in order to keep a proper solvency

margin of the schemes as well as an ageing society and increasing costs of pension systems may result in the reduction of pension benefits.

In Europe, pension systems differ largely from country to country. At one end of the spectrum we have countries with only a pay-as-you-go system, where pension benefits are fully paid for by the working population. At the other end we have countries where people save for their pension individually, in which case the level of pension benefit t is largely determined by the amount of return on investments. However many combinations of these two basic systems are possible, and the Netherlands in fact do have such a combination. From a European point of view it is important that the advantages and disadvantages of the various systems are being considered. We have therefore summarised the key aspects of the Dutch pension system.

7.4.2 Characteristics of Dutch pension funds

As in most developed countries, the institutional structure of the pension system in the Netherlands is organized as a three-pillar system. The first pillar comprises the public pension scheme financed on a pay-as-you-go base. It offers a basic flat-rate pension to all retirees. The benefit level is linked to the legal minimum wage. The second pillar provides retired workers with additional income from the supplementary scheme. The third pillar comprises tax-deferred personal savings, which individuals undertake on their own initiative. The Dutch pension system is unique as it combines a state run pay-as-you-go scheme in the first pillar with funded occupational plans in the second pillar. The first pillar implies that a young individual cedes part of its human capital to elder generations, in exchange for a claim on part of the human capital of future generations. Given the life-cycle hypothesis, this type of intergenerational risk sharing enforces the preference of younger people to invest in equity. For that reason, we might expect a stronger age effect on equity exposure for Dutch pension funds.

Pension funds typically adjust contributions and indexation of accrued benefits as instruments to restore the funding ratio. Higher contributions weigh on active participants whereas lower indexation hurts older participants most. The less flexible these instruments

are, the longer it takes to adjust the funding level, and the more strongly will shocks be shared with future (active) participants. Effectively, intergenerational risk sharing extends the risk bearing basis in terms of human capital. The literature on optimal intergenerational risk sharing rules in pension funding concludes that intergenerational risk sharing within pension funds generally should lead to more risk taking by pension funds compared to individual pension plans (e.g. Cui et al., 2009). Thus Dutch pension funds, with their high call on intergenerational risk sharing, may be expected to invest relatively heavily in risky assets.

There are three types of pension funds in the Netherlands. The first is the industry-wide pension fund, organized for a specific sector of industry (e.g. construction, health care, transport). Participation in an industry-wide pension fund is mandatory for all firms operating in the sector. A corporate can opt out only if it establishes a corporate pension fund that offers a better pension plan to its employees than the industry-wide fund. Where a supplementary scheme exists, either as a corporate pension fund or as an industry-wide pension fund, participation by the workers is mandatory and governed by collective labour agreements. The third type of pension fund is the professional group pension fund, organized for a specific group of professionals such as physicians or notaries. Occupational pension plans are financed primarily through company and industry-wide pension funds.

The Dutch pension fund system is massive, covering 94% of the active labour force. But whereas all employees are covered, the self-employed need to arrange their own retirement plans. As reported in Table C1(a) to (c), the numbers of pension fund members has been on the decrease since the end of 2007. More than 85% of all pension funds are of the corporate pension fund type. Of the remaining 15%, most are industry-wide funds, besides a small number of professional group funds. The circa 95 industry-wide pension funds are the dominant players, in terms of their relative share in total active participants ($> 85\%$) and in assets under management ($> 70\%$). Almost 600 corporate pension funds encompass over a quarter of the remaining assets, serving 12% of plan participants. Professional group pension funds are mostly very small funds.

Table C1: Dutch pension funds data, 2007 - 2011. Source: De Nederlandsche Bank

	Number of pension funds	Number of pension schemes	Number of members (000s)
		Professional group pension funds	
2007	508	837	856
2008	483	839	821
2009	450	835	790
2010	394	752	760
2011	348	696	715
		Corporate pension funds	
2007	13	16	46
2008	12	15	43
2009	12	15	51
2010	12	15	53
2011	12	15	54
		Industry-wide pension funds	
2007	94	138	5,061
2008	93	138	5,119
2009	86	142	4,983
2010	85	135	5,007
2011	82	140	5,082
		Totals	
2007	615	991	5,964
2008	588	992	5,984
2009	548	992	5,823
2010	491	902	5,820
2011	442	851	5,851

Table C2: Source: OECD Global Pension Statistics.

Netherlands Demographics and macroeconomics	
Nominal GDP (EUR bn)	559.5
GDP per capita (USD)	46,761.9
Population (000s)	16,346.0
Labour force (000s)	8,741.4
Employment rate	96.8
Population over 65 (%)	14.4
Dependency ratio	27.4

Table C3: Dutch pension funds data, 2003 - 2007. Source: OECD Global Pension Statistics.

	2002	2003	2004	2005	2006
Total investments (EUR bn)	482.6	531.1	619.6	671.9	739.8
Total investments as % of GDP	101.2	108.1	121.7	125.7	132.2
Total contributions as % of GDP	4.4	4.6	5.0	4.4	4.2
Total benefits as a % of GDP	3.2	3.4	3.5	3.6	3.6
Total number of funds	876	843	800	768	713

Participation in a sectoral pension plan becomes mandatory if the sector's employers request the Ministry of Social Affairs and Employment to declare membership obligatory, and if the employer organisations making the request represent at least 60% of employees in the sector. With over 90% of the working population covered, the system can be described as quasi-mandatory. Employers may opt out of a sectoral plan if they offer a provision that promises equal or better benefits.

7.4.3 Typical Dutch pension plan design

Occupational pension plans can be defined benefit or defined contribution. The vast majority of employees (over 90%) are covered by defined benefit plans, although collective defined

contribution plans and hybrid schemes are gaining popularity. Defined benefit plans can be final salary plans or lifetime-average earnings, while a small number of plans combine the two or provide fixed amounts. Most plans were switched to career-average defined benefit schemes after 2000. Benefits generally vest after one year of membership. Most final salary plans give 1.75% of earnings for each year of service, yielding a replacement rate of 70% for a 40-year career. In most average-earnings plans, the accrual rate varies between 1.75% and 2% per year of service. The indexation of pension benefits is typically conditional, being at the discretion of the funds themselves and depending, in practice, on funding levels.

Pension funds are obliged to inform their members of their indexation expectations. Half of all pensions in payment are adjusted for wage growth in the relevant sector or industry, 27% are price-indexed, and just under one-quarter use other means of benefit adjustment. Occupational plans are fully funded. Contribution levels for employers and employees are determined by collective bargaining, though the employers' share generally represents three-quarters of total contributions. There is no ceiling on pensionable earnings. The official retirement age for men and women is 65, which is the average age at which people actually do retire. Benefits can be paid out as a lump sum or as annuities, which enjoy tax relief. Members do not pay fees to pension funds, whose estimated administrative costs are about 0.18% of total assets per year.

Employer contributions to an occupational plan are tax-deductible and employee contributions are not considered taxable income. Assets and investment returns are tax-exempt, while benefits paid out as annuities are subject to ordinary taxation. Plans must comply with the fiscal limitations on them. Taxation levels depend on benefit levels: final pay plans may have an accrual rate of no more than 2% per year, leading to a 70% replacement rate after 35 years. Career-average plans may apply a maximum accrual rate of 2.25% per year. If, on a member's retirement, his or her benefits exceed 100% of final pay (including public pension benefits), the surplus is taxed at a progressive rate.

Personal voluntary plans are also offered in the Netherlands in order to meet the growing demand for greater flexibility in terms of participation requirements, contributions, etc. Anyone may enter into a contract for any type of personal pension savings plan. Members may pay their contributions as a lump sum when they sign a contract, or at regular or flexible

intervals thereafter. Benefits can be paid out as a fixed or unit-linked annuity and, in some circumstances, in a fixed number of withdrawals. If an insured person dies before taking his or her benefits, they generally revert to one or more beneficiaries. Contributions to annuity policies are tax-deductible up to a ceiling of EUR 1 036. Contributions made to bridge a gap in the accrual of occupational plan assets may also benefit from tax relief. Investment income is tax-exempt, while benefits are subject to income tax at a rate of 30%.

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