ESSAYS IN BANK DIVIDEND SIGNALING, SMOOTHING AND RISK SHIFTING UNDER INFORMATION ASYMMETRY AND AGENCY CONFLICT

SUDIP PATRA

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ABSTRACT

The current thesis is a collection of essays on costly signaling, smoothing (partial adjustment), and risk shifting through various pay outs by bank holding firms. The thesis is based on three chapters, or sections, which are through econometric investigations on the above mentioned topics. The major findings of the investigations are, one, a detailed firm level information content analysis of costly signaling by banks via different pay out methods, two, that partial adjustment or smoothing via pay outs can also be perceived as costly signals which is based on the information content of allied measures like bank specific speed of adjustments, and half-life periods, three, that rather than dividend pay outs share repurchases play relatively significant role in risk shifting exhibited by banking firms.

Chapter 1 is devoted to the analysis of different types of dividend and other pay out signaling under information asymmetry (between the outsider shareholders of banks and the insider managers), and impact of various bank specific variables on the levels of pay outs/ signaling, thus revealing the information content of such signaling. Both panel data analysis and vector auto regression analysis have been conducted to achieve these findings. Another finding in this section is a comparative analysis between share repurchases and dividend pay outs by bank holding firms.

Chapter2 is devoted to the investigation of bank specific partial adjustments of dividends, a modified partial adjustment model is used which is capable of investigating bank specific speeds of adjustments and half-life periods which may vary over periods. Such a model is an improvement over basic smoothing models in the standard literature which have mainly investigated the industry average speed of adjustment, and hence less efficient in investigating the bank specific information content of such measures.

Chapter 3 provides analysis based on a system of equations model on, one, whether risk shifting has been exhibited by the bank holding firms for a comprehensive period between 1990-2015, and two, which are the specific pay out channels through which such risk shifting or wealth transfers have taken place.

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I am extremely grateful to my Supervisors (Dr Frank Liu and Prof Mario Cerrato) and the University of Glasgow for providing me thorough support for completion of the thesis. Specifically Dr Frank Hong Liu, my first supervisor, has been a wise friend, philosopher and guide to me. I have been always fortunate to have his technical as well as general guidance as to which direction I should be leading my research, specifically, when the area of my thesis has been less researched earlier (there have been numerous studies for dynamic pay out strategies for firms in general, but very few in case of bank holding companies, and the area is still nascent and evolving fast). I have been deeply inspired by Dr Frank's knowledge and expertise on banking (partial adjustment models, agency theory models, complexity models and alike) and related econometric theory.

Dr Frank has always been the first to guide me in allied issues, for example in career choice and job interviews too. I cannot thank him more, a true Guru as we say in Indian tradition.

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CHAPTER1

1.1.1 Introduction: dividend *signaling, smoothing and risk shifting by banking firms*

There is a long-standing debate in corporate finance literature regarding the value-adding role of dividend payouts by firms. The basic question is whether dividends add to shareholder value, in the light of modern corporate finance theory which suggests that the principal objective of any firm is to maximize shareholder value.

The seminal dividend irrelevance proposition theory proposed by Miller and Modigliani (1958) holds that under a perfect capital market assumption, dividends are irrelevant to rational utility maximizing shareholders; rather, when dividend taxation is included, such pay-outs should become more costly for the shareholders.

However, the dividend irrelevance proposition breaks down when market frictions are introduced in the model. One such very important friction is information asymmetry, or opacity between insider managers, who are agents but also the controllers of resources and decision-makers regarding investments and retained earnings, and outsider shareholders, who are the active and dominant principal group.

In the perfect capital market scenario, the outsider principal group can access any hidden information of insider agents free of cost, and also can effectively monitor the insiders. Since the principals can access insider information freely, there is no so-called adverse selection problem, which indicates that the principals can cost effectively choose between high risk and low-risk firms, and price them accordingly in the debt or equity markets[1].

Again, since agents can also be monitored effectively, there is no feasibility of misbehavior by managers (i.e. investing in excessive risky projects and hence destroying shareholders' wealth)and, hence, no so-called moral hazard problem.[2]

However, in incomplete capital markets, there are severe adverse selection or moral hazard problems (Stiglitz & Wiess, 1981, Stiglitz 1990), which have unintended consequences[3]. For example, in equity markets with adverse selection, there can be average pricing which may deter the good or safer firms from remaining in the market since the effective cost of capital for safer firms in such a scenario is too high and, ultimately, such markets can be occupied only with high risk or bad firms, which may even lead to complete market failure (Akerlof, 1970). In the presence of moral hazard problems, firms may face underinvestment problems.[4]

Committing to paying higher dividends can also be very costly during periods of falling[5] earnings) for the firms, which helps in establishing signaling solutions where the good firms with potential investment opportunities and higher earnings perspectives can continue to remain committed to stable dividend payouts, but the bad firms, which lack potential earnings growth, cannot remain committed so eventually withdraw from the markets. This is the classical (Bhattacharya, 1979, 2001) signaling solution to the adverse selection problem in the capital markets. Hence, under information asymmetry

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[1] This issue is often termed as the lemons premium or information premium in financial markets.

[2] Hence in the presence of information asymmetry, between outsiders and insiders, and also between outsider investors themselves, there can be different types of adverse selection and moral hazard problems. Specifically in case of baking industry such problems are severe since there are many stake holders involved, and also the severe negative externality of bank failure has to be accounted for.

[3] In various markets like credit markets, to used car markets if the adverse selection problem persists market can even collapse, such scenarios are common in subprime mortgage markets with a very high level of opacity or information asymmetry about the quality of products.

[4] Underinvestment problem means that firms facing adverse selection cost may forgo profitable projects, since it may be too costly for such firms to raise capital from the external market in the first place.

[5] Under such imperfect capital market conditions, dividends can assume central importance for solving or mitigating such adverse selection and moral hazard problems. Against this background, costly dividend signaling literature has been well studied, where dividends prove to be costly signals (costly since, firstly, from the perspective of shareholders, dividends are taxed higher than capital gains and, secondly, from the perspective of insider managers, the cost of paying dividends may comprise raising costly external financing due to a lack of retained earnings while investing in positive NPV projects.

friction, dividends assume signaling and value-adding roles.

Along with adverse selection solutions, costly dividends can also be used to mitigate agency cost problems. Specifically, the Jensen's free cash flow hypothesis (1984) states that for large and matured firms with fewer investment opportunities and large retained earnings, the agency cost of monitoring is high. In such a scenario, it is optimal for the insider managers to pay out the retained earnings as dividends to convince shareholders of not destroying value or investing in excessive risky projects.

There is an indirect impact of dividend payouts in disciplining managers since they require moving to external financial markets to raise capital more frequently, and thus will subject themselves to greater effective monitoring of markets.

Dividend signaling, as is explored in detail later, has been explained from various perspectives or theories, mainly, signaling theory (Miler & Rocks, 1985), pecking order theory (Myers & Mazluf, 1984, Myers, 1984) and dividend life cycle theory (Deangelo et, al, 2006, 2008)[6]. These theories often predict nearly opposite hypotheses. This contrasts with how the predictions play a critical role in the current thesis when it comes to analysing dividend signaling.

Later theoretical models (Leary and Roberts, 2011) have shown that dividends are not paid randomly; rather, there is generally a partial adjustment of dividends towards a target level, which is determined by firm-specific factors (so to say, endogenised); hence, relative to the stochastic earnings, the dividends are rigid, with varying speeds of adjustments.

Such a phenomenon is well established in the empirical literature (Leary & Roberts,2011) and theoretical models also predict such so- called dividend smoothing. The matter under investigation is whether such smoothing can be considered as signaling too? And what do such adjustment processes signal?

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[6] In the 2006 paper De Angelo et al demonstrated the irrelevance of the irrelevance of the dividend pay out proposal as in the original Miller and Modglianni versions.

As of yet, the common tendency in the empirical literature has been to test the predictions of the underlying theoretical models (as mentioned above) for non-banking or non-financial firms using various panel data or time series estimations. However, it is surprising that there has been scarce theoretical or empirical study of dividend signaling by banking firms.

There are strong grounds on which banking firms should be studied. First, as will be explored later, a strong strand of empirical literature has observed that banking firms are relatively more opaque[7] than non-financial firms, which should mean that there could be signaling roles for outs like dividends. Second, the same strand shows that banks are even more opaque during crisis periods. So, what do the dividend pay-outs during crisis periods by banks convey? For banks, the nature of agency conflict is much more complex, since there are many stakeholders involved, viz, depositors, other creditors, shareholders, managers and regulators, and, of course, society at large (due to the negative externalities of bank failures or crises). Hence, there should be value-adding roles of costly dividend signaling in mitigating such agency costs. There are rather more severe problems of risk shifting via dividend payouts in banking which have not been studied empirically as of yet[8] .

Hence studying the signaling and the information content of dividend signals for banking firms will most likely reveal intriguing insights into the theory of banking too.[9]

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[7] Opacity here refers to the information asymmetry between the insider managers and the share holders or the general creditors. Opacity is significantly large in case of banking firms since the asset portfolios, or the loan portfolios held by the banks are opaque, or banks are very reluctant to divulge information on the quality of such assets, or credit history, or default probabilities. Such opacity has also lead to the problem of surmounting non performing assets in the banking industry of developed as well as developing nations.

[8] These insights are fundamentally different from that of standard corporate finance of agency conflicts. Then, of course, dividend smoothing by the banking firms follows.

[9] Recently Acharya, et al (2011) have developed theoretical models of bank dividend payouts based on information asymmetry and risk shifting. In the current thesis risk shifting in banking has also been briefly studied in the 4th chapter.

1.1.2 Research questions and objectives

Based on the main research aim to investigate the dividend signaling and smoothing by banking firms, the primary aim is to investigate what the nature and significance of the impact of information asymmetry level on dividend pay-outs and speed of adjustments in case of dividend smoothing are. (In this thesis, the opacity level is estimated based on the information asymmetry between outsider principal groups, mainly shareholders, depositors, and the insider agents, namely, managers, who are also the controller of resources, mainly, free cash flows.)

Hence, the following research questions are framed, which are supplemented by more bank-specific issues later.

1. Is there any causality flowing from opacity level measures to dividend payout levels for bank holding companies?

What are the underlying theories explaining such causality, for example, signaling theory or pecking order theory, or dividend life cycle theory?

2. More generally, is there any causality flowing from opacity levels to payout policies in general, for example, cash dividends, stock dividends and share buybacks?

4. What is the information content of dividend pay-outs? [10]

5. Based on recent empirical studies, are dividend payouts also a signal for risk shifting? Have such phenomena increased over the crisis period of 2008-?

[10] Information content has the standard meaning here of what may be the external factors impacting the levels of dividend pay outs, in the current thesis different types of dividend pay outs have been studied including shar repurchases.

6. Based on the theoretical models of dividend or payout smoothing in general, what is the nature of the impact of bank specific opacity levels on bank-specific speeds of adjustments?

7. More generally, what is the nature of the impact of bank-level opacity on adjustments of pay-out policies in general?

8. If smoothing is also a form of signaling, then what is the information content?

9. What are the underlying theories explaining signaling via dividend smoothing?

10. Can risk shifting happen through the smoothing of dividends? And has this phenomenon increased over the crisis period of 2007-09 [11]

The above research questions are general, and are motivated by the general costly signaling theory of dividend pay-outs. However, such questions are important too for building upon more bank-specific research questions. The main difference between the banking and non- banking firms related to costly signaling is based on the specific information content of the dividends signaling, also in the form of dynamic payouts.[12] The following section provides a detailed sketch of specific banking variables that are required to perform such a systematic study, which also distinguishes the current study

[11] Risk shifting here again is to mean the standard process of shifting of wealth (hence risk in the opposite direction) from the depositor, or general creditor group to the share holders, hence violating the first principle of corporate finance which maintains that shareholders are the residual claimants of wealth generated by firms.
[12] Dynamic pay outs here means partial adjustment of pay outs.

from the general empirical literature on dividend signaling.

1.1.3 Theoretical and empirical studies on dividend signaling

In studies on developed economies, mainly US-based studies, it has been demonstrated on multiple occasions that dividends contain information or can be used as costly signals. An example is the study by Aharony and Swaray (1980). Although most of these studies have been done for non-banking firms, of late there is a budding literature on bank dividend signaling, which is discussed later in the thesis in relevant sections. In this section, a general overview of signaling and the need for the same is discussed.

Signaling is required in the context of incomplete information where there are adverse selection or moral hazard problems. Such problems might arise due to several factors. For example, adverse selection in the equity market is well known. This also deters the good firms with earnings potential and investment opportunities since they fail to secure fair pricing and have to pay extra premiums in such incomplete markets.

Moral hazard issues might arise due to agency conflict problems. An example is the well-known free cash flow problem, which holds that for mature firms, there is a higher agency cost, which would mean that the outsider shareholders are not effective monitors of insider managers; hence, in such a scenario, managers might invest in value -destroying projects using the free cash flows. Hence, dividends are warranted in such scenarios to prevent such inefficient investments[13]. Similarly, there are studies on market response to dividends also, such as the one summarised by Al-Yahayee et al. (2009), where generally there are positive responses to the dividend increases and

[13] The main argument put forward for such arguments is the signaling hypothesis, which holds that under conditions of opacity, dividends contain information.

negative responses for dividend omission and cutbacks.[14]

A seminal example in this literature is the study by Bhattacharaya (1979), where a theoretical model was built where dividends might be costly signals to remove information asymmetry regarding true firms' values. There are two main signaling costs in this regard. One is the differential tax treatments between dividends and capital gains. A second is the external financing costs which firms need to bear to remain committed to their dividend policies. It is argued in most of the theoretical literature that such costs are not worth bearing by bad firms which lack future earnings potential, and, hence, only good firms are able to absorb such costs. Thus, via this mechanism, dividends become signals which create separating equilibrium between good firms and lemons. Again in the same seminal paper, Bhattacharaya (1979) argued that the strength of dividend signal might be a positive function of the level of personal tax on dividends. This is also related to the managers' task of maximising shareholder value after taxes on wealth.

Hence, a higher taxation rate provides a greater incentive to the managers to signal the true earnings potential, which the poor performers fail to imitate. Multiple theoretical models, for example, the one by John and Williams (1985), have been established on a similar line of thinking, where the taxation cost is the main source of costly signaling.

Here, however, one should note that in the case of banking firms, there might be different costs and information content of dividends, and such studies are explored in later sections. An important point can be mentioned here, that is, the information content of signaling for bank dividends is more related to underlying liquidity and

[14] Certainly all such market responses can not be fully explained by dividend signaling theory, for example the behavioral finance studies have found larger negative responses from the shareholders in case of cuts and omissions as compared to positive responses for similar increase in pay outs, loss aversion rather than risk aversion can help analyze such responses.

solvency measures.

Again, there is a difficult problem of risk shifting via dividend payouts from shareholders to the depositors in banking firms. Such risk shifting phenomena are observed in general, but for banking, they are more intensive (Acharya, 2012, 2013) since there are implicit bailout guarantees or deposit insurance guarantees.

1.1.4 Signaling and agency cost literature

The separation between ownership and control is the main source of agency conflict, where the agents or managers might not work to optimise principals' or shareholders' wealth. This problem then forces the shareholders to assume extra agency costs to monitor the shareholders effectively. Easterbrook (1984) was the first researcher to propose that dividends might reduce such agency costs by preventing insider managers from investing free cash flows in bad projects. Again, if the managers are forced to commit to stable dividend payouts, then there will be external financing needs also, which would also discipline the managers, a so-called hard capital rationing or hard budget constraint.

Jensen (1986) further proposed that managers might be driven by compensation and human capital incentives, which might cause over-investment of cash flows in the absence of good investment opportunities. Here too, costly dividends are a tool to mitigate such moral hazard problems. Hence, the positive market response to dividend payouts is consistent with the reduction in agency cost[15]. In traditional studies like that by Ashqith and Mullins (1983), some versions of a dividend

[15] There have been numerous empirical studies conducted on the impact of dividend announcements on stock prices, and most of the studies report that changes in the stock prices follow the same direction as the changes in the dividends. However, the current thesis is more focused on the causation of the dividend payouts rather than the information content of such signals (an important area, which is discussed in later sections).

prediction model were used. Here, we can also relate such studies to the dividend smoothing studies, where the firms have exhibited remarkable rigidity in paying out dividends. [16]

Authors such as Jagannath et al. (2001), DeAngelo et al. (2000) and Guay and Harford (2000) have observed that dividends can work as signals, as explained earlier, only when firms remain

Committed to a consistent payout policy. Their suggestion is consistent with the paper on dividend smoothing by Lintener (1956), where the author observed that managers avoid reducing or omitting dividends. Later in the thesis, whether dividend smoothing might emerge as a costly signal from the typical dividend signaling models is discussed[17]. There are a few studies which have considered partial adjustments of dividends vis-à-vis stochastic underlying earnings being costly signals in a continuous time framework.

1.1.5 Opacity in the banking industry: the literature

Since the current thesis is based on the questions of whether banking firms use payout policies to signal under information asymmetry to the outside shareholders and whether particularly partial adjustments of payouts are used as signals, an obvious matter of importance is to investigate whether banking firms are relatively more opaque than non-banking firms. In this area, however, the studies are not in agreement with each other. Some authors suggest that it is better to accept the above as a hypothesis than a fact.

Authors provide empirical evidence that banking firms are more opaque than non-banking firms. Hence, from this perspective, these firms should face greater urgency

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[16] Mainly in the case of banking firms, there have been fewer dividend cuts or omissions even during crisis periods, measures which were recommended for capital requirement purposes.

[17] Its worth noting that Lintner (1956) in the original thesis did not theorize dividend smoothing as a costly signaling process, rather costly signaling literature emerged later. The original thesis was empirical in nature which reflected the pay out rigidity practiced by most of the corporate.

in signaling to the market participants about future earnings or solvency for mitigating adverse selection or moral hazard problems[18].

There are alternative perspectives too. For example, Flannery et al. (2013)[19] have shown that banks are relatively more opaque only in times of crisis. The same authors have investigated the share trading characteristics of banks before and during the last financial crisis, and have found strong evidence that prior to crises there was no significant difference in opacity between banks and non-banks; however, during the crisis, there was a sharp increase in opacity for both small and large banks. Nevertheless, they have also observed that it is difficult to relate a specific asset class to an opacity measure for banks.

One critical departure from the current thesis for such studies on bank opacity is that the current work is rather focussed on the response of the banking firms to the opacity or on the question of whether the more opaque banks try to mitigate the bad consequences of greater opacity by signaling and smoothing. Such questions are not addressed by the above strand of literature.

1.1.6 Dividend signaling theory for banking firms

There are a few studies which investigate the signaling role of dividend payouts in banks. Kauko (2012) is one such study that has challenged the classical Miller and Modigliani irrelevance paradigm, which holds that under perfect capital market and complete information conditions, there is no value-adding role for dividends. Kauko

[18] Recent studies have provided strong empirical evidence for the signaling behaviour of banks via dividend payouts or payouts in general, although here too, effectively, no study has been carried out to investigate the dynamic behaviour of dividends or related payouts and whether information asymmetry impacts such adjustments or smoothing.

[19] In the current thesis the crisis period of 2007-09 has been included to verify whether there has been a significant change in the pay out levels, or the adjustment speed of pay outs by banking firms.

argues that with imperfect information, that is, when bank managers have better information about liquidity and solvency than the outsider shareholders[20], dividends can be used as costly signals[21].

Such a proposition is also made in the paper by Myers and Mazluf (1984), which suggested a pecking order for the capital structure under incomplete information (the same theory also has strong implications for dividend payouts, which is discussed later).

Khan and Kiang (2002) observed that there might be a positive association between dividend payouts and the information asymmetry level at the firm level, and the same authors also proposed that institutional monitoring theory is not capable of explaining the dividend policy of firms, but rather that the free cash flow hypothesis is a better candidate in the same scenario.

Another interesting argument by Kauko is that since banks do not like to cut back dividends once committed to them, there might be more liquidation of assets if equity is used more. Hence, there are implications for maintaining stable dividend payout policies. Such a policy is related to dividend smoothing or partial adjustments of dividends, though the model is a discrete time multi-period model without smoothing.

There has been comparatively less empirical, and theoretical work on bank dividend policies in general. Baker et al. (2008) have investigated how the managers in financial and non-financial firms perceive standard dividend payout theories, for example, signaling theories, agency conflict based theories, clientele theories and life cycle

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[20] Hence in the current thesis some measures of solvency has been used to investigate the impact on pay out levels and adjustment speeds of specific banks.

[21] This proposition is also based on the fact that most bank managers find equity capital costlier than debt capital, the reason being that in equity markets, due to the presence of adverse selection problems, banks have to pay a greater premium, which is also known as the lemons premium.

theories, and found that the managers of financial firms act significantly differently from the managers of non-financial firms. One main difference pointed out in the study is that bank managers perceive dividends as a stronger signaling device than non-financial firm managers.

There are a few empirical studies which support signaling and agency conflict theory predictions for the dividend payouts by banks. One such early study is the one by Boldin and Legget (1995), who provided empirical evidence based on 207 US-based banks that dividend signaling by such banks improved credit ratings[22]. Bessler and Nohel (1996), in a comprehensive event study analysis, found that there were significant negative abnormal returns around the dividend omissions or cutbacks made by banks.

In a more recent study by Abrue and Gollamhosen (2013), clear evidence was presented that bank holding companies use dividends as signals for future growth prospects. Such a finding is in accordance with signaling theory in general. Forti and Schiozer (2015) provided a comprehensive information content study of dividend signaling by banks in the Brazilian banking system, and the results show that these banks have used dividends as a signal to information sensitive depositors for asset quality and liquidity.

Again, the same study showed that such signaling is significantly stronger during financial crises, when there are rising problems of information asymmetry, the opaqueness of asset quality and the concerns of common depositors. There can be interesting differences between the dividend policies of banks for different economies and regulatory environments. For example, Basse et al. (2014) provided evidence that for the European commercial banks, there was neither consistent dividend signaling

[22] Changes in credit ratings over periods are also used as proxy measures of opacity (), though it is a very indirect measure since it is based on the perception of credit raters and investors which themselves can be biased, we can relate such biasness to the banking crises of 2007-09 where very low quality bonds were also given high ratings.

nor smoothing during the 1998-2008 period.

As explained elsewhere in the current thesis, the agency-based models of dividend payouts hold that dividends can be used as mechanisms for solving agency problems between managers and shareholders (although, it is argued later in the thesis that the agency problem in banking is much more complex since there are many other creditors to banks, and there can be agency conflicts among different combinations of principals and agents which may generate risk-shifting problems[23]. John et al. (2010) observed that the agency problem in banking was far more severe when there was extremely high leverage. Collins et al. (1996) investigated the change in the dividend payout ratios with the insider holdings, and they are of the view that the dividend policy of banks can be compared with that of unregulated firms or sectors. Asraf and Zheng (2015) found that bank managers may not use dividends to solve the conflict between inside and outside debt holders.

Recently, the debate on bank dividend policies has shifted towards an investigation on risk shifting by banks, mainly during the financial crisis of 2007-09. Acharya et al. (2011) started the related debate by investigating the pre-crisis dividend policies of 25 large US financial institutions. The authors found that these institutions paid large dividends in the pre-crisis period and also maintained a smooth dividend payout policy even in mid-2008. In a later theoretical analysis, Acharya et al. (2014) suggested that a combination of risk-shifting incentives and the low charter or franchise value of banks may generate such dividend patterns. In the same study, the authors also suggested that risk shifting based on coordinated dividend policies between banks may be severe during crises periods. Empirically, Kanas (2013) has provided strong evidence of risk shifting from 1992 to 2008, with high-risk banks being more likely to pay higher dividends. Onali (2014) has provided evidence that dividends and default risk are

[23] In theoretical modeling such a scenario may be called as multiparty signaling, where the same type of signal may convey different meanings to different parties.

positively associated[24].

Generally, the bank dividend literature finds size, growth opportunities and profitability measures (Fama and Fench, 2001) are important determinants of dividend payouts. Empirical studies often suggest that the stocks of large banks are widely held by investors, and, hence, such banks have greater and cheaper access to external financial markets and, therefore, have less dependence on internal financial markets. There are differences between standalone banks and the BHCs too since the latter types of institutions pay more dividends[25]. More recently, Abreu and Gulamhussen (2013) have shown that for US banks, size and profitability are important determinants of dividend payouts. Ashraf et al. (2015) have found similar results for the Italian banks. On the other hand, banks with higher growth opportunities pay fewer dividends[26].

A dividend policy implies the payout of free cash flows or internally retained earnings by firms to the shareholders. Such payouts can be justified based on various market fractions, such as information asymmetry or agency costs; however, such dividends are not value adding at all in cases of perfect market conditions. In the case of information asymmetry, the good firms wish to pay dividends in order to distinguish themselves from the bad firms, or in other words, those

firms which do not have earnings potential find dividend payouts very costly and, thus, are not in a position to maintain them and fall out of the market. This is called signaling equilibrium, where dividends can act as costly signals (Miller & Rock, 1985). For mature firms, when there are fewer investment opportunities in place, the shareholders

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[24] However positive association may not exactly show risk shifting, we need to investigate the channels of such risk shifting, enabling factors and the types (whether from depositors to share holders or other types), which have been briefly studied in the 4th chapter.

[25] Which again shows the complicated agency conflict faced by the BHCs.

[26] No doubt all such results are not in unison to each other, pecking order theory, dividend life cycle theory and alike may provide conflicting predictions about the causes of dividend pay outs, the issue is briefly discussed later.

demands greater dividend payouts since the insider managers might invest in value destroying projects (DeAngelo et al., 2006). Hence, from either a signaling or agency conflict view, dividends are quite critical.

Even after few decades, economists argue that dividends have remained a puzzle where there is no consensus among the various schools (Bratton, 2004; Amidu and Abor, 2006; Rashid and Rahman, 2008; Gill et al. 2010). There are initial perfect capital market models where the theorists believe that dividends do not matter (dividend irrelevance theory), since the shareholders are indifferent about capital gains and dividends, and might generate homemade dividends to nullify any payout policies by firms (Miller & Modigliani, 1958, 1961)[27].

Of late there have been studies on so-called partial adjustments of dividend policies, which means that firms do not payout random dividends but actually have targets to set according to various firm-specific parameters and then slowly adjust towards the target (Baker, et al. 2001; Naceur et al. 2006; Andres et al. 2009). There are differences in targets and speeds of adjustments for various firms according to firm-level determining factors like life cycle factors and opacity level factors[28]. Hence, the study of such factors for financial firms is rare.[29]

Information content of bank dividends

There is a strong strand of literature on the information content of dividends and payouts in general (e.g. share repurchases) by the non-banking firms, but the

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[27] However, there are then taxation considerations. For example, dividends are taxed more than capital gains; hence, why should shareholders prefer payouts? Tax clientele theory states that investors' clienteles different income or consumption needs; hence, firms might pay according to that (Allen et al., 2000). In empirical analyses, there has been less evidence presented for perfect capital markets.

[28] Again in the standard dividend smoothing literature, the speed of adjustment means an average speed for the sector, or a group of firms in that sector, firm specific speeds of adjustment is not generally computed. However the firm specific characteristics like life cycle features are not captured in such standard models. The current thesis attempts to modify such models by computing the firm specific adjustment speeds.

[29] There can be some justification found for this exclusion of banking firms, for example, banks are significantly highly leveraged, or banks are significantly opaque as compared to non banking firms.

comparatively very thin literature on the information content of dividend signaling by banks. The empirical literature on the information content of bank dividend payouts (Forti & Schiozer, 2015) again has not been extended to the dynamic behaviour of dividends or dividend smoothing per se.

Generally, the gap in the empirical literature is surprising since, as Dickens et al. (2002) have shown, the banking sector is the largest payer of dividends in developed economies, namely, the US. Even then, banks are generally excluded from any typical sample for investigating payouts by firms.

There are a few studies which investigate the impact of dividend payouts by banks on price reactions (Bessler & Nohel, 2000, for example) and find positive significant responses. However, these studies have not investigated the information which is conveyed by the dividend payouts to shareholders or debt holders in general.

Kauko's theoretical study (2012) suggests that banks may use dividend payouts to signal liquidity and profitability to the depositors. Recently, Forti and Schiozer (2015) conducted a comprehensive investigation of the information content of bank dividend payouts to information sensitive depositors. A brief discussion of the specific variables which are found to have probabilistic impacts on dividend payouts in the above-mentioned study is provided below.

1. Size: Size, which is measured by the natural logarithm of the total assets of banks, has been found to have a very consistent positive impact on the probability of paying higher dividends.
2. Profitability: A general measure of profitability is ROA, or return on assets,

which is obtained by dividing income by total assets is used, and a consistently positive impact is found for all TOBIT regression-based results on the probability of paying higher dividends. Such an observation is again consistent with Kauko’s (2012) theoretical model, as discussed earlier.

3. Leverage: Leverage capital is obtained by dividing liabilities by equity capital, a standard measure of capital structure. This variable is found to have a consistent negative impact on the probability of paying higher dividends.

4. Capital: Capital adequacy ratio is calculated by taking the ratio of the equity capital and the risk-weighted assets. Capital has been found to have a consistent negative impact on the probability of paying dividends.

5. Loan risk/credit risk: This is a measure of risk of the bank loan portfolio, which is obtained by the ratio of non-performing assets to total loans. The very study has found a consistently negative probabilistic impact on the dividend payouts.

6. Credit growth: This is a measure of the growth rate of the loan portfolio, which is obtained by subtracting the last period’s loan portfolio value from the current loan portfolio value and dividing it by the previous year’s portfolio value. This variable is also found to have a consistently negative impact on the probability of paying higher dividends.

7. Crisis dummy: In the current thesis, crisis dummy is used, which captures the banking crisis period, i.e. the dummy has the value 1 if for the quarters between 2007 third quarter and 2009 first quarter, and 0 otherwise.

The above impacts can be explained from the perspective of different theoretical strands, which are given detailed attention later in the thesis. Forti and Schiozer (2015) observed that dividend payouts have worked as costly signals for depositors in general and institutional investors (the category whom they identified as the information sensitive depositors) specifically, and that the significant impact of the above bank-specific variable increased over the period of crisis. The last observation lends support to the earlier observations made by the authors, who found banks assets turn more opaque during crisis periods; hence, the need for signaling intensifies.

Acharya et al. (2013) reported that in US-based surveys, dividends might have been used as a risk shifting or expropriation tool during the crisis, which means that having given implicit bailout guarantees, banks paid out excessive dividends during the crisis to shift wealth from the depositors to the shareholders.

However, the study by Forti and Schiozer (2015) found a consistently negative impact of crisis dummy variables and the risk measures on the payout probabilities, which clarifies that such risk shifting or wealth expropriation is not generally observed.

Based on the extant literature as referred to in the above section, the current thesis aims to investigate and extend some of the critical gaps which are mainly related to the empirical literature, the most critical one being the systematic analysis of partial adjustment or dynamic dividend behaviours by bank-holding companies in relation to, first, the impact of the level of opacity on speed of adjustment (the gap which has been mentioned earlier while framing the main research questions), and, second, what the information content of such dynamic behaviour is; the latter area has not been investigated in the literature as of yet. Along with dividend payouts and dividend smoothing or partial adjustment by banks, the thesis also attempts to investigate signaling by other payout types, for example, net share repurchases[30] by banks, total dividend payouts, which also includes stock dividend payouts, and total payout, which is the combination of cash dividends, stock dividends and share repurchases. Later, a growing strand of literature is discussed (for example, even theoretical models, viz, Lambrecht & Myres, 2013) which, for firms in general, takes the view that partial adjustment behaviours are relevant for various types of payouts.

However, there is no such systematic study for banking firms, where the signaling nature and content of different payouts by banks have been studied, and certainly not in the form of dynamic dividends and other forms of payouts, or smoothing. Hence, based on the information content of signaling and other forms of payouts, several additional research questions are posed, as follows.

The difference between this set of further questions and the earlier set is that the latter is specifically focussed on the information content of signaling via dividends and other payouts, both in the form of absolute payout levels and partial adjustments[31]. The research questions are as follows:

1. Does profitability have any significant probabilistic impact on levels of dividend payouts?

[30] In standard literature there is an ongoing debate on whether share repurchases can be good substitute of dividends as pay out strategies by firms, the so called substitution hypothesis.

[31] More specifically, the extant literature on bank dividend pay outs is focused on the standard empirical tests of predictions from agency cost theory of firms (for example the free cash flow hypothesis), however given the nature and level of bank opacity more specific questions need to be analyzed based on pay out levels and speed of adjustment of pay outs. The purpose of such research questions should be to investigate the relationship between several bank specific variables and pay outs/ speed of adjustment. Over all these questions also bring out the signaling content of bank dividend pay outs.

2. Does profitability have any significant probabilistic impact on other payout levels by banking firms, viz, net share repurchase levels? Etc.

3. Does profitability have any significant probabilistic impact on the speed of adjustment of dividends by banking firms?

4. Does profitability have any significant probabilistic impact on the speed of adjustments of other payouts, viz, total payout, including share repurchases?

5. Does capital adequacy ratio have any significant probabilistic impact on bank-specific dividend payouts? Does the same variable have any significant impact on share repurchases by individual banks?

6. Does a bank-specific capital adequacy ratio impact bank-specific adjustment speeds where speeds are related to dividend smoothing as well as other payout adjustments?

7. What is the nature and significance of the impact of credit growth on dividend payouts and other payouts viz share repurchases at the bank level?

8. What is the nature and significance of the impact of credit growth on the speeds of adjustments for dividends and other payouts at the bank level?

9. Does loan risk/credit risk have any significant impact on such payout levels?

10. Does loan risk have a significant impact on speeds of adjustments of such payouts at the bank level?

Along with these specific questions, various life cycle variables are also employed in the research, namely, investment opportunity measures, free cash flow measure, namely, retained earnings to total assets/total equity, which is a standard measure of maturity as per the dividend life cycle theory (DeAngelo et al.op cit), among others. Hence, the impact of such lifecycle control variables on payouts, the speed of adjustments and allied measures reveal further information about bank payout signaling in general.[32]

1.1.7 Research objectives

Based on the research questions, the following research objectives are pursued in the current thesis.

1. To perform a systematic investigation of the impact of bank level opacity on various bank-level payouts. Such an investigation will be conducted by employing standard methods based on the relevant literature, which is explained in detail in the following sections.

2. To perform a systematic investigation of the information content of bank-specific

[32] Hence lifecycle variables act as control variables in the models developed in the current thesis.

payouts and also to provide a comparative study of the differences between the signaling content of different payouts, for example, differences between dividend signaling content and share repurchase signaling content. Such comparisons are again based on underlying relevant theories, an area explored in detail in the relevant sections. [33]

3. To perform a systematic investigation of the dynamic payout behaviours at the bank level, comprising dividend smoothing along with other payouts. Here again, the primary objective is to estimate the bank-specific speeds of adjustments (related to different types of payouts) under the impact of bank-specific opacity levels, along with standard life cycle variables.

4. To employ a modified form of the partial adjustment model (referring to the longstanding empirical literature developed since Lintner (1956)) which is capable of estimating firm-specific adjustment speeds over periods. This would be a fundamental improvement on earlier adjustment models, which are used only to estimate average adjustment speeds at sectoral or industry level.

5. To perform a systematic analysis of information content of such adjustments, specifically the signaling content of speeds of adjustments and allied measures, for example, half life (Oliver et al., 2015).

6. To perform detailed subsample analyses, which are expected to reveal more information regarding the change in bank payout behaviours over the last financial crisis period.

[33] This will help us to study the conflicting hypotheses developed by different underlying theories: signaling, pecking order, and dividend lifecycle theories.

Overall, the thesis is divided into three sections, as follows.

1. The first section provides a comprehensive investigation on bank specific dividend and other payout signaling, and the information content of such signals.

2. The second section provides a comprehensive estimation of bank-specific adjustment speeds and the information content of such dynamic signals.

3. The third section provides a brief account of a specific phenomenon, risk shifting via dividend payouts during the crisis period, which has been claimed to be observed (Acharya et al., 2013), although this is not agreed upon widely (Forti & Schiozer, 2015). This section will extend such analyses to investigate whether risk shifting is observed via the smoothing of payouts. More recently, Duran and Vivas (2015) have demonstrated that large European and US-based BHCs have exhibited multiple types of risk shifting, for example in their terms ‘double sided’, ‘deposit based’ and ‘non deposit debt based’ risk shifting (such terms will be explained in detail in the third section); however, they found that such phenomena have prevailed during the crisis period and have withered away since 2009. Again, the authors have also not examined such risk shifting through payouts and payout smoothing. The current thesis will be the first such work to build upon the literature.

Further motivation for the current thesis is drawn from a more systemic and policy-based literature. Molenuex (2015) has observed that since the banking crisis of 2008, both in the US and the EU, there have been sustained efforts by central banks and governments to, firstly, provide guarantees for bank liabilities, secondly, provide recapitalizations of banks, thirdly, provide asset supports (relieving banks of troubled assets), and fourthly, provide banks with various liquidity buffers. Molenuex (2015) notes that the large banks have started being or are being perceived by states as public utility firms, which means their failures now amount to very large negative externalities for the rest of the economy. Given this backdrop, one pertinent question is how it is possible for the banks to gain the confidence of the depositors in specific cases and shareholders and other creditors in general. Regulatory requirements alone may not be sufficient; banks also have to signal solvency, liquidity and future stable earnings, etc. to the market in an effective way. Hence, from such a systemic perspective, a thorough investigation on bank payout strategies amidst the lack of confidence created by the crisis is warranted, which the current thesis attempts to achieve.

1.1.8 Plan for methodology

The methodology in the current thesis draws upon several standard and modified econometric models. Before specifying the broad domains of the econometric models, the purpose can be summarized again. The main broader objectives, which encompass the research questions and objectives specified earlier are, one, to investigate the signaling content of different payout levels based on bank-specific information and, two, to investigate the signaling content of the speed of adjustments or the partial adjustments of different payouts based on similar bank-specific information.

Hence, the thesis is divided into two broad sections, one, in which the causality between opacity variables and different payouts is investigated first, which reveals the signaling nature of such payouts. This step is estimated by using a multivariate vector autoregressive model.

The second step of the first section is to investigate the signaling content of such absolute payout levels, for which, based on the standard literature (Forti & Schiozer, 2015), TOBIT models have been constructed.

The second section of the thesis is devoted to estimating the bank-specific adjustment speeds for different payouts, and allied measures like half-life estimations (Oliver et al., 2014). For this step, a modified three-step partial adjustment model has been constructed.

The second step in the section is to again investigate the bank-specific signaling content in such speeds of adjustments, which reflects the process of adjustment. Hence, TOBIT models are again used.

Along with these main methods, several univariate subsample tests have been done. These are required for investigating changes in bank-specific payout characteristics before and during the crisis period. Standard significance tests of difference in median levels of various characteristics variables have been done, as these can reveal such information.

Chapter 2

Impact of opacity on dividend signaling by banks and information content of signaling

The current study provides a comprehensive analysis of information content of banking firms pay outs. The current study deviates from the standard literature on determinants of dividend pay outs, since it uses various bank specific explanatory variables which make bank holding firms special. Based on a data set of bank holding firms from the merged data bases of CRSP and COMPUSTAT and for the period between 1990-2015 the current study is an early investigation on the information content of different types of dividend pay outs by banks as well as share repurchases which is of significant importance to the information sensitive depositors and creditors alike.

Key words : opacity, agency conflict, dividend signaling, share repurchases , BHC (bank holding companies)

2.1. Introduction

Theoretical studies (Bhattacharya, 1979, Boldin et al, 1995) construct dividend signaling and dividend smoothing models under information asymmetry between the insider managers and outsider investors of a firm in general, later empirical studies (Lierry et al, 2011) examine various firm specific factors which impact the dividend pay out levels, as well as the dynamic adjustment of dividends. Among the standard factors analyzed there are agency conflict measures, life cycle measures, and information asymmetry measures[34].

However, there is a critical gap in the same area for banking firms, both theoretically and empirically as has been explored in the introductory section of the thesis. Hence based on the gap in this paper the author examine the impact of information asymmetry, among other factors, on the level and probability of dividend pay outs (signaling), and the information content of signaling(Forti and Schiozer, 2015).

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[34] However in the very paper authors have found less significant impact of information asymmetry or opacity level on the speed of adjustment. Again here the speed of adjustment is an average measure rather than firm specific.

Standard literature has employed probabilistic models to investigate the information content of dividend signals. The current section builds upon the standard bank specific studies, but also extends on the same by comparing and contrasting between information content of different types of pay outs, namely, dividends and share repurchases[35].

General theoretical models have held that there can be a separating equilibrium created via costly dividend signaling. Kirmani and Rao (2000) have provided a simple way of conceptualizing the equilibrium. If one considers a market with adverse selection problem, then the market can be thought of comprising good and bad quality firms, however the type of firms are a private information to the managers.

In that scenario if a good firm signals dividend then the pay-off is say A, where as if it does not signal then the payoff is say B, where as if a bad firm signals dividend then the payoff is C and if it does not signal then the pay off is D. then in this scenario there will be a separating equilibrium if and only A>B and C>D. this is what gives the signaling its cost.

In the empirical literature there are only a few papers (For example, Fort and Schiozer, 2015) which have included some firm specific variables which reflect the cost of signaling, in the current section such variables are included to bring out the nature of costly signaling by the bank holding companies.

Here one important distinction needs to be made between the banking and non banking firms when it comes to the concept of quality which is signaled through dividends, for example. As Connelly et al (2011) argued that quality is the unobservable ability of the signaler for meeting

[35] For example the substitution hypothesis between the dividend pay outs and share repurchases, whether they are both impacted by opacity levels in similar ways.

the needs or demands of the outsiders observing the signal. For general firms this value/ quality is captured by the insider information about the future earnings/ future investment opportunities. However for banks there are other quality issues for example future solvency[36]. Hence in the current section and in the thesis several bank specific variables are used which are beyond the standard measures of profitability or investment opportunities.

There are two fold contributions of this section to the banking literature, one, it provides a comprehensive evidence for dividend signaling under opacity which is robust across various heterogeneous characteristics of banks and over regimes (pre-crisis and post-crisis), two, the section employs bank specific variables (for example credit risk, default risk, capital adequacy, credit growth etc) to investigate the specific signaling content of different pay outs of bank holding companies, which distinguishes banks from non banking firms. This investigation is a further development on standard scarce literature on determinants of bank dividend pay outs (for example Dickens et al, 2000, or Forti and Schiozer, 2015), which have either treated banks similarly as non-banks and investigated standard hypotheses based on traditional theories, viz, signaling, pecking order, life-cycle theory etc, or have only restricted to one type of pay out namely dividend.

There is another additional observation regarding the risk shifting behavior by banks via dividend pay outs. Recently there has been multiple critical surveys which have shown that in developed economies, specifically in USA there has been dramatic persistence of dividend payments by banking firms even during financial crisis, when actually banks should have omitted or cut dividends to remain solvent. Authors(Achraya et al, 2013) have marked this behavior as risk shifting by banks, where the banks would like to shift the wealth from depositors to shareholders, and hence the risk in opposite direction. Again such behaviors have been more exhibited by financially distressed banks or where the default probabilities are very

[36] Hence one critical point of difference between banks and non banks is the measure of quality of assets, solvency and liquidity becomes more important for banking firms, in typical theoretical models of signaling generally these factors are not considered.

high. Later authors (Forti and Schiozer, 2015) have termed such wealth transferring or risk shifting behavior as cashing out by the shareholders[37].

In the current section an additional investigation is done on the evidence of such cashing out behavior, however in the current analysis other pay outs are also included. Hence the section provides an intriguing investigation on the impact of high default risk on share repurchases too which has not been studied comprehensively.

2.1.1. *Difference between the current study and more traditional studies*

The main difference lies in the fact that though earlier studies (Dickens, 2000 etc as mentioned earlier) have found that financial markets do influence pay out decisions, or as in the words of Forti and Schiozer (2015) shape dividends, they are mainly limited to the equity market responses, for example price reactions to dividend pay outs, however the current study is based on a more new trend in banking literature (Oliveira, 2015, Forti and Schiozer, 2015) which investigates the signaling role of pay outs from the perspective of depositors, or creditors in general.

Hence in the following investigation there are two phases, one, a general causality analysis flowing from opacity level to pay outs which indicates signaling nature of pay outs, and two, more specifically the signaling content of pay outs from the perspective of depositors in particular, for which the study has used bank specific variables based on the recent papers.

First, the study is related to the information content of dividends (Sant and Cowan, 1994; Michaely etal, 1995; Nissim and Ziv, 2001; Koch and Amy,2004 and others) but also extends to other pay out types. Second, the study is also related to the role of financial markets in influencing dividend policy (Brav et al, 2005; Leary and Michaely, 2011; Michaely and Roberts, 2012) but extends that to the depositor side more. Third, the study is also related to the traditional bank dividend literature, as argued earlier which mainly was an extension of non financial, or general dividend signaling theories (Boldin and Legget, 1995; Bessler and Nohel,

[37] Cashing out is equivalent to risk shifting, however, for an elaborate study of risk shifting we need to investigate the channels, types and enabling factors which is not apparent just by observing any cashing out phenomenon.

1996; Casey and Dickens, 2000; Dickens etal, 2002).

2.2. Literature review

Since there are fewer studies on banking firms in related areas, it's required to benchmark the paper with related studies for non-financial firms, and then it can be analyzed further whether similar results hold for banking firms too. Hence in this section a synthesis of main stream studies, both theoretical and empirical is provided.

2.2.1 *Failure of efficiency market theory and emergence of dividend signaling*

In the corporate finance literature there has been a long-standing debate on the purpose of dividend pay-outs. Under complete information, with no market frictions and full rationality of the agents, there seems to be no value adding role for dividend pay-outs (Miller & Modigliani, 1958). In the presence of information asymmetry between insiders (managers) and outsiders (shareholders), dividend pay-outs can be used as signaling healthy financial performance of the firm, i.e. Signaling the stability of underlying and future expected earnings (Bhattacharya, 1979, Boldin et al, 1995). This literature is primarily motivated by the broader signaling literature based on the works of Akerlof (1972) and Spence (1977), where costly signals generate full separating equilibriums.

There have been very thorough review articles on the relevance of dividend signaling, or dividend pay out policies in general across industries (for example in Bhattacharya, 2007), however as Basse et al (2014) note that surprisingly there is a dearth of good econometric studies when it comes to banking firms. One of the justifications is that banking firms are still viewed from the perspective of Miller and Modigliani models, and if so this automatically leads to the conclusion that dividend pay outs are irrelevant events practiced by naïve firms.

Rozef (1982) performed a comprehensive econometric study across industries however avoided banking industry, and that also without much justification.

Related to banks there have been some earlier studies (Gupta and Walker , 1975) which are of survey paper types, and these authors have mainly pointed out some bank level variables (for example in the referred paper, corporate profit, total asset growth, and liquidity measures) which have significant positive impact on pay out levels, however there is nearly no attempt to explain these observations from the fundamental theoretical perspectives, as explored earlier.

In this context a seminal empirical work is by Bessler and Nohel (1996) who documented that there is a significant negative impact on bank abnormal returns in their sample, if there have been dividend cuts, or omissions. Hence their work lends indirect support to the information asymmetry theories, which suggests dividends as costly signaling which can resolve adverse selection problems.

More recently Dickens et al (2003) have provided comprehensive evidence on USA banking firms regarding the bank level factors impacting the pay out levels, and the factors are, risk, agency conflict level, investment opportunities, size and dividend history. Interestingly though the authors have not explored theoretical underpinnings, there are indications regarding signaling as well as smoothing in their analysis (for smoothing / partial adjustment dividend history is critically relevant).

Other authors like Theis and Dutta (2009) have supported the very findings. In case of European banking firms the studies are even fewer, for example, Eriotis et al (2007) have observed that Greece banks have statistically significantly different dividend policies as compared to the industrial firms in the same economy. Such empirical studies do point out that banks should be treated differently from the other firms as regard to dividend / pay out policies in general. One of the justifications might be that for banks the agency conflict structure is far more complex, since there are many principals (share holders, creditors, depositors) and stake holders (society at large, regulators) involved, and also that there is a trade off between maintaining capital base of banks and paying out dividends (more later).[38] Earlier studies like by Allen and Michaely, 1995; Collins et al., 1996 and others have also pointed that though there might be some similarities between the dividend pay out policies by the industrial firms and banking firms, further empirical evidence should be provided to draw clear inferences. As regards to the information asymmetry theory again, Brav and Heaton, 1998, have observed that measure of tangibility (net equipment and plants) is expected to have a negative impact on adjustment speed (in terms of smoothing). Frank and Goyal (2003) and Lemmon and Zender (2010) have observed and explained that firms with greater size and more age smooth less, and by this we should understand that for larger firms since the information led problems are relatively less as compared to more opaque and smaller firms, the speed of adjustment for the larger and matured firms is significantly higher than the smaller firms. O'Hara, 2003, have considered other measures for information asymmetry such as earnings and stock return volatility.

2.2.2 ***Three contending information asymmetry models for explaining dividends***

Even recent studies..have agreed that till now it's not clarified why firms in general sets dividend pay out policies, and more specifically exactly how factors like agency costs impact dividend pay outs. Along with the earlier mentioned adverse selection models, or the proposal of information asymmetry hypothesis there is another contending theory which is also based on the information asymmetry between outsider investors and insiders of firms, namely, the pecking order theory Deshmukh 2005, argues that empirical literature has done surprisingly little study on the implications of pecking order theory for dividend pay outs. Seminal work by Myers and mazluf, 1984, argued that in the presence of incomplete information firms might suffer from underinvestment problems.

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[38] Rather this trade off between buffer capital and pay outs may vary significantly over the periods, mainly in the crisis period it is interesting to investigate how this trade-off or ratio differs from that in the non crisis period. Stiglitz and Helman (2000) have put forward the skin in the game model for banks which requires more of own capital to stake.

This problem arises when the firms face limited capital to invest in the good projects and would not bear the lemons premium in the capital market, mainly due to adverse selection problem in the equity market. In such a scenario the standard solution is to use the retained earning for investments rather than than paying dividends. Hence this theory suggest that higher the information asymmetry level lower is the dividend pay outs for mitigating underinvestment problems.

This prediction is contradictory to that of the signaling model, for example Miller and rocks(1985), in their seminal signaling model proposed that dividend signaling level is an increasing function of the level of information asymmetry.

This is a standard explanation since as the current thesis observes in the earlier theoretical section that faced with adverse selection problem costly dividends can create separating equilibrium to distinguish good firms from lemons. Hence these two predictions are opposite to each other, and hence can be distinguished.

Pecking order theory holds that the likelihood of underinvestment can destroy firms value ex ante, and this is caused by the adverse selection problem in the equity market which forces firms to pay extra premium which is often called the lemons premium. Hence here the solution posed is to increase slack through detention of earnings, which further implies cut back or omission of dividends. Hence here the use of dividend policy is to control the problem of underinvestment. The theory thus suggests that optimal dividend pay out policy should be to pay less or no dividends at all under greater information asymmetry.

On the other hand a substantial component of theoretical as well as empirical studies is based on costly signaling role of dividends. Miller and Rocks(1985). Provided a seminal model where the dividends might signal greater underlying earnings, hence might act as an optimal policy for the insider managers. In the very model if dividends reveal greater level of current earnings then further earnings might be inferred from the signaling too, since earnings are assumed to be correlated over time.

Earlier empirical studies, for example, Easterbrook(1984), reveal that underlying agency costs might be the main explanatory factor for dividend pay outs under the assumption of imperfect capital markets. Later a seminal study by Dickens et al (2002) extended similar models to bank holding companies.

In fact the same authors observed five explanatory variables which in their sample exhibited significant impact on the bank dividend levels, those factors were namely, size, risk, investment opportunity, insider holdings level, and dividend history.

Though in the seminal study the same authors provided agency theoretic explanation of the impact of explanatory variables, mainly the insider holdings level, an important dimension is not captured in such studies which is whether opacity degree within BHC s directly cause banks to signal more dividends. As has been pointed earlier too that most of the agency conflicts between the insider managers and outsider shareholders and creditors at large fundamentally is based on incomplete information between principals and agents.

Later in the thesis however another growing literature is explored which investigates the information content of dividends payed by banks, hence confirming the basic costly signaling purpose of dividends.

Interestingly there are a few empirical study, for example, Li and Zhao(2008), which have found rather a negative linear relationship between the information asymmetry level for non financial firms and the dividend pay out levels, which is contradictory to the standard signaling theory.

However one must note that validity of such studies have to be made on the construction on variables too, at times use of market driven variables like dispersion of investors opinion around future earnings are taken as opacity measures which might be misleading, since these measures might also convey optimism by the investors rather the degree of adverse selection in the capital market, hence might provide contradicting results, as observed by some seminal studies like in Chaterjee et al, 2013 and others.[39]

Referring back to the two contending models, namely pecking order and signaling, there is no comprehensive empirical study as of yet for banking firms. Hence this thesis provides first of its kind empirical results on this front based on panel data estimations using vector auto regressive models and Tobit or censured regression models[40].

2.2.3 *Dividend life cycle hypothesis*

In their seminal study Fama and French (2001) provided comprehensive evidence that the USA based firms had reached a peak in paying out dividends in 1978 and then onwards there had been a decline, so called the problem of disappearing dividends. They also noted that the main factor responsible for less propensity of the firms to pay dividends is the increase in the proportion of small firms with greater investment opportunities or in other words lower retained earnings.

Hence a lifecycle theoretic perspective can be used to explain such phenomenon, or trend, I.e relatively younger firms with relatively larger investment opportunity sets would prefer to pay less dividends and use retained earnings to invest in value adding projects more.

However there are two limitations here as far as the current thesis is concerned, one, these studies are mainly done for non financial or non banking firms, two, since it's also conjectured that smaller firms are more opaque in nature then why not they use dividends as costly signals?

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[39] There are measures like bid-ask spread of stock prices as proxy for information asymmetry which might also reflect the information asymmetry between the investors themselves: less informed and more informed traders.
[40] Hence one of the objectives of the thesis is also to investigate which underlying theoretical model can explain the pay outs by bank holding firms better.

Grullon et al (2002) in their robust empirical study have also suggested that there is a permanent dividend increase hypothesis, which means that dividend increasing firms would never cut back or omit dividends rather in the line of Lintners (1956) seminal study, would smooth dividends. Hence there seems to be a smoothing hypothesis based on the life cycle parameters, in other words matured and large firms with greater retained earnings would smooth dividends more.

DeAngelo et al (2006) is certainly the most cited study in the very field, and they have measured lifecycle based on the earnings contribution mix, which is the ratio of retained earnings to total assets or total equity. According to their study the firms with low ratio would mean they are in the capital infusion stage and would need to raise external capital more , and thus would cut back dividends, on the other hand firms with very high capital contribution mix are in the maturity stage with less investment opportunities and thus would be good candidates for paying out dividends since they might face free cash flow problems[41].

2.2.4 Empirical literature on bank dividend pay outs

Authors (Forti and schizer, 2015) have observed that even though banking firms are the largest payers of dividends (Dickens et al 2002 observed that about 92% of US banks paid dividends in 2000 compared to only 49% in the non banking sectors) a few studies have been done on the pay out strategies, or policies of banking firms. Systematically banks have been excluded from the empirical studies, based on the premise that banking firms are different from the non financial firms, such differences are based on heavy regulation and also high leverage for the banking firms.

However it is also true that authors have observed that BHC s are relatively more opaque than the non financial firms, and more the so in the crisis periods. Hence if pay outs are perceived

[41] We can observe here that dividend lifecycle theory is rather complex and contains elements from other theories too, for example signaling and agency cost theories.

as costly signals to mitigate the information related problems, or agency cost related problems like adverse selections and moral hazards then banks should be investigated more.

2.2.5 Empirical studies on other pay outs types by banks (share repurchases)

Following the last financial crisis there has been considerable increase in the bank share repurchases (Floyd et al 2015), and the bank holding companies are reported to buy back shares even at depressed prices. Hence share repurchases by bank holding companies should be included in the pay out policy in general, and there can be interesting differences between the information content of such signaling as compared to that of dividend pay outs.

A scarce but standard literature on share buy backs by banks (Hirtle, 2001, for example) holds that share buy backs do convey information to the equity markets, mainly in two dimensions, one, banks may prefer to distribute cash to shareholders if the future investment is shrinking, two, share buy backs can also reveal private information regarding increase in future profitability. However such signals are strong mainly for the publicly listed banks, for closely held banks information content may be weak or different.

Another striking feature about stock repurchases by banks is that the aggregate level of repurchases have increased immediately after recovery from any banking crisis, for example during the recovery from financial stress of early 1990s (Hirtle, 2001). There is a steady trend for bank holding companies in returning larger proportions of earnings to shareholders and share repurchase is playing increasingly growing role in the process.

However the earlier studies (as summarized in Hirtle, 2001) have mainly mirrored the general investigation on the determinants of share repurchases by non-financial firms (Jagganathan et al, 1999, Ikkenberry et al, 2000, Choi and Chen, 1997). In the standard literature one school holds that firms with more volatile cash flows tend to prefer more flexible stock buy backs than dividends (Jagganathan et al, 1999), which suggests that such firms prefer to distribute temporary profit to shareholders, and prefer dividends only when the insider expectation is that earnings have risen permanently.[42]

On the other hand the second school in the standard discourse holds that share repurchases (similar to dividend pay outs) may mitigate Jensens (1986) free cash flow problem in a principal agent frame work[43]. There are some evidence for such free cash flow (alternatively life cycle hypothesis) hypothesis in Grullon (2000), Lie (2000), Nohel and Tarhan (1998) among others.

However in above mentioned studies there is no systematic investigation on more bank specific information revelation(for example, the bank specific variables which have been mentioned earlier in the thesis, based on more recent studies, viz, Forti and Schiozer, 2015) via share buyback signaling, and whether such information content may differ from dividend pay outs, specifically when in after math of the last financial and banking crisis there is a growing trend of buy backs even more than dividend pay outs.

Overall the following limitations or incompleteness surface from the extant studies in this area

1. There are clear contradictions among the testable hypotheses based on signaling theory, pecking order theory, and lifecycle theory.

2. There are rare studies based on the above theories for banking firms

3. There are rare studies on the information content of dividend signaling, or, what bank specific information is revealed through such costly signals.

The following hypotheses building section thus draws upon both the general corporate finance based studies and bank specific literature.

[42] This view then may not be compatible with substitution hypothesis.
[43] Hence more akin to substitution hypothesis.

Brief account of share repurchases by the bank holding companies

Dividend resilience till the crisis period is well documented (Srivastav et al, 2013), however it is only a part of the story, since share repurchases have played a very critical role before the crisis period. From the perspective of standard theory share repurchases and dividends have similar impact on the balance sheet, since both entails reduction in capital and pay out to shareholders in form of cash (though certainly stock dividends also have been found to account for a significant portion of dividend pay outs, as is documented in the current thesis too).

Hirtle (2014) observes that in contrast to dividend pay outs repurchases suddenly dried up in the crisis period and reached the minimum point by 2008. There were many BHCs who reduced share repurchases to zero but continued paying dividends for several quarters. In some of the cases dividend were paid for more than a year after the share repurchases have stopped.

It has been argued in the standard empirical literature that dividends in general can play the role of signal for value for long run, however share repurchases may not act as costly signals since there is less commitment for continuing share repurchases. It has been argued that share repurchases are more volatile in nature and are used in periods where the income is high, and this trend is observed both for the financial as well as non financial firms (Jagannath et al, 2000; Hirtle, 2004).

In banking industry it's a common practise to pay out dividends on quarterly basis after been approved by the firm's board of directors. Where as at least in the past repurchases have been made more irregularly after public announcements of the same. Hirtle (2014) argues that bank holding companies were quick to reduce repurchases after the crisis deepened in 2008 and uncertainty increased about financial strength. One benefit to the bank holding companies could have been that they could continue paying dividends by cutting back repurchases.

However recently again this convention has been challenged (for example in Andirosopolous, 2013 and others) who have observed consistent repurchases by BHCs over a considerable period of time. This argument is however based on the underlying assumption that only dividend pay outs can work as costly signals, however in theoretical literature (discussed shortly afterwards) these two types of pay outs can be perfect substitutes, and there is some argument for repurchases also to play a signaling role.

One additional feature which the current thesis investigates is the information content of share repurchases of bank holding companies, and whether there can be a comparative study of the same with that of dividends information content.

2.2.6 Are dividends and share repurchases substitutes?

The most fundamental perfect market theory suggests (Miller and Modigliani, 1961) that the dividends and share repurchases are perfect substitutes. Which means that given the investment policy the residual cash can either be distributed in form of dividends or repurchase. The same is suggested by the agency conflict theory by Easterbrook (1984) and Jensen (1986), where the theory holds that shareholders can control managerial action by removing excess cash out of the firms. Hence the final out come will be in the favour of mitigating agency conflict irrespective of the pay out method.

Signaling theories in general always hold that share repurchases and dividends are perfect substitutes. All forms of transaction costs are either related to raising new capital, or reducing new investments and have nothing in relation to choice of payments(Bhattacharya, 1979; Miller and Rocks, 1985). The only exceptional model is by John and Williams (1985) which holds that signaling cost arise from the taxation on dividends and repurchases and dividends are not interchangeable. Another limitation of these general signaling models is that there has never been any systematic study of signaling characteristics of share repurchases.

Allen etal (2000) also have developed a model where the repurchases and dividend pay outs are not substitutes since dividend pay outs attracts the institutional investors, since the institutional investors are more interested to discover whether the firms are undervalued or overvalued since they also have the means and expertise to gather costly information. Hence the undervalued firms use this situation and signal via dividends. Interestingly signaling equilibrium is not reached in this model by repurchases.

To estimate the degree of substitutability between the dividends and repurchases De Angelo et al (2000) examined the disappearance of special dividends and emergence of repurchase events across boards for the non financial firms. However the authors have not found any significant evidence for repurchases. Hence question can be raised if repurchases are independent signals. Jagannath et al (2000) have again argued that dividends are payed from the permanent earning streams whereas repurchases are used to pay extraordinary transitory earnings.

There is a lack of systematic study in comparing the implications of dividends and repurchases from the signaling perspective. More the so in banking sector there are only some good survey based studies which observes the trends in the pay outs by bank holding companies. The following analysis in the current section is aimed at resolving the questions related to the signaling characteristics of the pay outs.

2.2.8 Hypotheses building

Based on the main objective of analysing dividend signaling by banking firms under information asymmetry, again the type of signaling here refers to the value signaling as in the theoretical neo-classical literature(Miller and Rocks, 1985) (of the type between the bank managers and the out side investors/ share holders), the following hypotheses are proposed for the first section:

H1a: *size has a significant positive impact on the level of dividend pay outs by the bank holding companies*

A corollary to the first hypothesis is

H1b: *probability of dividend pay outs significantly rises with the increase in size*
Size of bank holding companies has been a matter of argument since the early studies as is observed in the current literature review section too. Impact of size on the pay outs, specifically the dividend pay out level can be considered from various perspectives.

One theory relates to standard information asymmetry, which holds that smaller banks may hold larger proportion of opaque assets, or there is higher level of opacity levels which may icentivise the managers to pay greater dividend levels to signal value in the market.

However there is the perspective of the agency cost theory, which is based on the free cash flow hypothesis. The very theory holds that for larger firms due to agency cost of retained earnings moral hazard problem is imminent hence greater pay outs is warranted to resolve the problem.

Hence it is an empirical question which can be examined by the above hypothesis. Here again the contradictory views of pecking order and signaling theory can be considered, where the pecking order theory would predict less dividends in case of greater information asymmetry
problem, since the adverse selection cost of equity may be high in the market, where as the signaling theory would predict opposite of the same.

Another perspective for the banking firms is the diversification theory, where the standard view is that larger is the bank greater is the diversification across the assets hence less opaque it is which might impact the dividend pay outs negatively. Larger banks may also have greater reputation capital which might reduce the need for signaling via dividend pay outs.

Its under these background the size hypothesis is analysed in the current thesis. Hence size factor can either reflect the underlying opacity degree or reflect the agency cost. However agency cost or the moral hazard problem between managers and outside share holders is also generated from the inefficient monitoring of the managers which is again based on the information asymmetry level (Myers and Lambrecht, 2015).

Along with the dividend pay outs the hypothesis will also be tested on different types of dividend pay outs, and on the share repurchases as another important means of pay outs by banks, mainly in the after math of the financial crisis.

H2a: *tangibility of assets has a significant negative impact on the level of dividend pay outs by the bank holding companies*

Corollary to this hypothesis is:

H2b: *probability of dividend pay outs decreases significantly with the increase of tangibility level*

Banking firms are criticised for greater opacity as compared to the non financial or industrial firms. The main reason for the greater level of opacity is the non transparent assets. Which is also the major reason for liquidity risk for BHCs. Hence opacity level is directly reflected in the proportion of transparent assets of the total assets as on bank balance sheets.

Hence if value signaling is practised via pay outs then BHCs might need to pay more dividends, or the probability of pay might rise with the rise of opaque assets. Tangibility being the measure of transparency for banking firms should be negatively related then to the signaling of dividend pay outs which can be tested by the second hypothesis.

There is a well known literature of collateral signaling (starting from Leyland and Pyle, 1977) which propose tangible assets as signal of quality or financial strength of firms. Hence firms with higher proportion of tangible assets might not need greater dividend pay outs as costly signaling[44].

However from the perspective of the pecking order theory less transparency of assets may give rise to more opacity and hence more requirement of retained earnings, and thus less dividend pay outs. In effect signaling theory and pecking order theory predictions are contrary to each other in this case too[45].

For the above hypothesis also different types of dividend pay outs and the share repurchase will be analysed[46].

H3a: *spread of stock prices for the bank holding companies have a positive significant impact on the dividend pay out level in general*

Corollary for the above hypothesis is:

H3b: *probability of dividend pay outs rises with the increase of spread measures for BHCs*

Again based on the Neoclassical value signaling literature it can be argued that bank holding companies also do control pay outs in face of credit growth, loan risk, capital adequacy, as has been shown in the recent literature too (Forti and Schizer, 2015). Hence here the suggestion is that reducing dividends to manage such risk is also a signal for shareholder value creation. Hence following extra hypotheses are proposed for the current section.

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[44] However intangible assets may play the opposite role, i.e. proportion of intangible or opaque assets may be positively related to the pay out levels of firms, hence in the following analysis both measures are kept for a robustness check of the predictions of signaling model.

[45] Here again there are very few studies on baking firms related to such contradicting predictions.

[46] In the standard literature though different types of pay outs has not been theorized as different tools of signaling, however, as we have seen in the earlier discussion there are studies comparing cash dividends and share repurchases.

Role played by other bank specific and lifecycle control variables

1. Capital adequacy has remained a major criterion for the bank holding firms to demonstrate solvency across time periods, and more importantly since the financial crisis of 2007 onwards. Standard route of capital adequacy is reducing dividends or increasing the retained earnings. However there are contradicting studies regarding the role of banks during the financial crisis regarding maintaining the capital adequacy ratio. On one hand the recent studies (Floyd etal, 2016, Forti and Schiozer, 2015) on dividend pay out dynamics of banks do observe negative impact of capital adequacy on pay outs, then on the other hand some theoretical studies argue violation of the same by excessive dividend pay outs.

2. As explained in the variable definition section here credit growth is explained as the growth in the loan portfolio. Though there has been some observations in the recent years since the financial crisis on the pattern of bank dividends along with the expansion of banking credit, there is less study on the impact of credit growth on the probability of bank dividend pay outs.Here the expected nature of impact would be negative, since aligned with the value signaling theory again banks would like to increase buffer capital if the portfolio of risky loans have expanded over the last period.
3. Acharya et al (2013) have observed that many US bank holding companies have cashed out in the financial crisis, which also means increasing the dividend pay outs irrespective of the rise of default risk. However such observations have been challenged by other studies. Here one related measure for default risk is the loan risk is defined in the variables section. Such measure is widely used in the relevant studies.

2.3 Methodology

This section discusses relevant methods which have been used for analyzing the impact of opacity levels as well as other bank specific control variables (a detailed discussion on variables will follow) on dividend signaling, as well as dividend persistence/ partial adjustment of dividends. Multiple methods are deployed here for robustness study, namely, multivariate panel data VAR model, panel data TOBIT model, and a modified partial adjustment model. The following section provides some justification for choosing the very models.

2.3.1 Multivariate VAR

A VAR is a simple extension of univariate auto regressive model to multivariate time series. The model has been regularly used to analyse the dynamic behaviour of multivariate financial time series as well as to forecast. The current work uses this technique to one, analyse the dynamic relationship between opacity level and the dividend pay-out levels, two, to analyse the predictability of opacity level for dividend level. VAR model has been made a popular adoption in the financial and economics literature by scholars like Sims(1980), Luktepohl (1991, 1992), Watson (1994), Mills (1999), Pena et al(2001) among others.[47]

Hence VAR method can be adopted as to be a more suitable method for both time series and panel data (where variables are treated as endogenous only. For the current purpose this is suitable since the main purpose of the paper is to analyse both unidirectional and granger causality (as explained later) among opacity and dividend signaling level. VAR methodology has been used in the macro econometric studies since 1980s (Granger, 1969, Cambelll and Shiller, 1987), and recently this method has also been used in corporate finance based

[47] Statisticians (Sims, 1980) observe that structural equations often are inefficient in the sense that endogenous and exogenous variables are predetermined, and unnecessary restrictions are imposed for identification.

studies[48].

One typical problem with VAR modelling (Doornik and Hendry, 2008) is that if there are too many lags in the model structure then its difficult to interpret the results, specifically if the coefficient signs are alternating, again too many lags also uses up too many degrees of freedom (Kanas, 2013).

The central assumption of all the VAR models developed is that the dependent and the independent variables are non- stationary I (1) at the level however when they are transformed to their first difference form they become stationary. In the current case VAR model is deployed for serving two specific purposes, one, to test the individual null hypothesis that the appropriate lags of the opacity variable is not significantly correlated with the signaling variable, and two, whether there is Granger causality between opacity and DPS level.

Granger Causality test can be extended beyond bivariate models (Hamilton, 1994) for example in the current case it can be tested using Wald-Granger test that whether lagged opacity variables as well as the control variables together G causes DPS for the next period.

Recent studies which have deployed VAR modelling

There have been some important studies (Basse etal, 2013, Reddemann et al, 2010, Goddard et al, 2006) on the analysis of various firm specific factors' impact on dividend policies followed by banking firms, and non financial firms in general. Doornik et al (2009) have proposed a detailed VAR based method in which forecasting can be achieved based on financial statements for firms in general. The authors have used Granger-causality tests along with VECM estimations. Goddard et al (2006) have used VAR methodology for analyzing both signaling and smoothing behaviors of dividend pay outs in UK. The authors have investigated two specific hypotheses, one the signaling hypotheses, and the other one the smoothing

[48] Hamilton (1991) demonstrated that VAR method is basically a modification of overlapped simultaneous equation model.

hypotheses. According to the standard signaling hypothesis the dividend pay outs have information content and they can predict future earnings.

Whereas according to the standard smoothing hypothesis the dividend pay outs are rather influenced by the past pay out levels and earnings levels. Certainly in the current section, as well as in the thesis elsewhere it will be demonstrated that there are more modified versions of dividend smoothing models with more specific hypotheses. However it seems that even from the argument of the above authors, VAR is a better model for investigating the predictive power of dividend pay outs, or in other words the predictive power of those firm specific variables which impact dividends[49].

For the current paper four preliminary unrestricted VAR models are used, where the first model analyses correlation between DPS and Size, the second model analyses correlation between DPS and tangibility, the third does the same for DPS and turnover, and the fourth does the same for DPS and spread, and for every model the same firm specific control variables are used.

Overall some costs and benefits of using VAR methodology over other alike methods are summarized briefly below.

1. since VAR method unlike other structural equation methods does not rely on any underlying theory for model specification there might be a data mining bias since the researchers might tend to achieve results which are congruent to their expectations.

2. If there are k equations, and each with m variables and with n lags for each m variables, then there will be (k + nm2) parameters to be estimated. There will be loss of degree of freedom as

[49] One critical difference between the papers mentioned and the current analysis is that here more the objective is not to examine the information content of bank dividends for future earnings, but to analyze the predictive power of the information asymmetry levels on the future pay out of dividends itself. Hence from this perspective the following analyses builds upon the earlier explored dividend signaling models, however we are interested in examining factors which cause dividend signaling.

too many lags specified, especially on small size samplings. It would also result in large standard errors and wide confidence intervals for the specified coefficients. Hence keeping this in mind here the rule of parsimony is followed with only one lag (Kanas,2013)

3. VAR method can only analyse short term bivariate causality among the endogenous variables, but for analysing any long term causality more advanced models like VECM (vector error correction) might be more appropriate.

Lastly a brief pros and cons of using Granger causality measure can be examined as below:

1. There are multiple properties of Granger causality which makes it a good candidate for measuring causal effects. For example it follows symmetry properties (Barret and Barnett, 2009, Barret Et al, 2010) which helps preserve the causality relation when there is a scale transformation of variables (Geweke, 1982; Hosoya, 1991; Barrettet al., 2010), the main advantage is that this measure helps to infer the predictive power which one or more X variables have for Y.

2. Barnett et al (2009) have further shown that for the Gaussian distribution following variables the Granger causality measure is equivalent to Shannon Entropy flow concept, which is another related strand in mathematical finance which is also deployed for investigating causal relationship.

3. Generally GC measure can also be used to compare the causal interaction between different sets of time series.

4. However there are certain limitations of GC measure too, Hu et al (2011) make the claim that GC measure does not capture how strongly one time series influence the other, though this claim has been contained by other authors like Barret and Barnett (2013).

5. Certainly GC(Granger Causality) is not a good measure for all types of stochastic time series, for example if the model is not a true autoregressive model with white noise residuals then there can be biasness in the measures of GC or inference from it can be erroneous.

Hence in conclusion its safe to observe that GC measures causal relation quite strongly if the model is stationary multivariate autoregressive.

Note on Bivariate Granger Causality test

The general question for investigation in Granger Cusality test, or Vector Auto regression model, is whether a scalar y can help forecast another scalar x. if the answer is no then we can say that y does not Granger cause (or G cause) x. More generally, y fails to G cause x, if for all s>0, man squared error (MSE) of a forecast of x_{t+s} based on (x_t, x_{t-1},….) is the same as the MSE of a forecast of x_{t+s} that uses both (x_t, x_{t-1},…) and (y_t, y_{t-1},…). Hence if only the linear functions are used then y fails to G cause x if:

MSE(E(x_{t+s} given x_t, x_{t-1},….))= MSE(E(x_{t+s} given x_t, x_{t-1},…..y_t, y_{t-1}…….)).

Hence if the above equality holds then we can say that x is exogenous in the time series with respect to y. there is another expression of the same meaning, i.e. y is not linearly informative about the future x.

In the standard framework Granger (1969) meant that if any even x is caused by another event y, then it should precede the even t x. However as Hamilton notes (1994) that there can be serious limitations to the practical implementation of the original idea for aggregate time series data.

Econometric test for G causality

For econometric test of G causality we mean whether series y Granger causes series x. To implement this test we assume a particular autoregressive lag length p and estimate

$X_t=c_t+\sum\alpha_t x_{t-i}+\sum\beta_t y_{t-i}+u_t$

We estimate the equation by OLS. We then conduct the F test of the null hypothesis:

H_0: all β’s are =0, where the alternative hypothesis being at least one β is significantly different from 0. One way to implement this test is to measure the RSS or the sum squared of residuals from the above equation: $RSS_1 =\sum$ESTIMATED u_t^2, and then compare the measure with the RSS from the univariate auto regression for X_t (with only lags of X), call it RSS_0 (this equation is also estimated by OLS).

If $S_1 =\{ (RSS_0-RSS_1)/p\}/RSS_1/(t-2p-1) >$ 5% critical value for F(p, t-2p-1) distribution, then the null hypothesis is rejected, which means that Y does G cause X series. In the current thesis this is the test which has been utilized for inferring whether the lagged opacity variables do G cause the pay out variables, mainly the dividend pay outs by banking firms.

Hamilton (1994) further provides an asymptotic equivalent test which is measuring

$S_2 = t(RSS_0 - RSS_1)/RSS_1$ here we would reject the null hypothesis if S_2 is greater than the critical values of $\chi^2(p)$ variable[50].

Certainly as Hamilton () points out that the result for any G causality test is sensitive to the choice of lag length p, and also to the methods used to deal with the potential nonstationarity of the series. In the current thesis lag length is chosen based on the standard literature (Kanas, 2013).

Lastly a brief pros and cons of using Granger causality measure can be examined as below:

1. There are multiple properties of Granger causality (GC) which makes it a good candidate for measuring causal effects. For example it follows symmetry properties (Barret and Barnett, 2013) which helps preserve the causality relation when there is a scale transformation of variables (Geweke, 1982; Hosoya, 1991; Barrettet al., 2010), the main advantage is that this measure helps to infer the predictive power which one or more X variables have for Y.

2. Barnett et al (2009) have further shown that for the Gaussian distribution following variables the Granger causality measure is equivalent to Shannon Entropy flow concept, which is another related strand in mathematical finance which is also deployed for investigating causal relationship. Generally GC measure can also be used to compare the causal interaction between different sets of time series.

4. However there are certain limitations of GC measure too, Hu et al (2011) make the claim that GC measure does not capture how strongly one time series influence the other, though this claim has been contained by other authors like Barret and Barnett (2013).

5. Certainly GC is not a good measure for all types of stochastic time series, for example if the model is not a true autoregressive model with white noise residuals then there can be biasness in the measures of GC or inference from it can be erroneous. Hence in conclusion its safe to observe that GC measures causal relation quite strongly if the model is stationary multivariate autoregressive.

VAR equations

It has been discussed in the thesis that the opacity and pay out variables are the main explanatory and independent variables. Opacity variables used for the multivariate VAR equations are: tangibility, intangibility, spread, turnover and size. The payout variables used are : dividend per share (DPS), cash dividend value in log, value of total dividend payment in log including stock dividend value (later in other estimations net share repurchases value has also been used). Along with these main variables all VAR equations also includes exogenous or bank level control variables, which are based on the dividend life cycle literature as explained in the variable section. Below is a summary of the equations.

[50] Over years there have been a variety of G causality tests proposed, for reference, please see, Gweke, Meese and Dent (1983).

$$DPS_t = \beta_{10} + \beta_{11}DPS_{t-1} + \beta_{12}X_{t-1} + \sum\nolimits_n \beta Y_{t-1} + \varepsilon_t$$

$$X_t = \beta_{20} + \beta_{21}X_{t-1} + \beta_{22}DPS_{t-1} + \sum\nolimits_n \beta Y_{t-1} + \varepsilon_t$$

The above is the set of equations for DPS and the opacity variables, X, where Y is the vector of control variables. As the standard VAR model is estimated here DPS and the X variables are taken as a pair every time (i.e. DPS& tangibility, or DPS& spread, or DPS& turnover, or DPS& intangibility) along with the fixed set of controls. Here the lag is of order 1, so the system is VAR (1).

All the other sets of equations are formulated similarly.

$$CASH\ DIVIDEND_t = \beta_{10} + \beta_{11}CASH\ DIVIDEND_{t-1} + \beta_{12}X_{t-1} + \sum\nolimits_n \beta Y_{t-1} + \varepsilon_t$$

$$X_t = \beta_{20} + \beta_{21}X_{t-1} + \beta_{22}CASH\ DIVIDEND_{t-1} + \sum\nolimits_n \beta Y_{t-1} + \varepsilon_t$$

$$TOTAL\ DIVIDEND_t = \beta_{10} + \beta_{11}TOTAL\ DIVIDEND_{t-1} + \beta_{12}X_{t-1} + \sum\nolimits_n \beta Y_{t-1} + \varepsilon_t$$

$$X_t = \beta_{20} + \beta_{21}X_{t-1} + \beta_{22}TOTAL\ DIVIDEND_{t-1} + \sum\nolimits_n \beta Y_{t-1} + \varepsilon_t$$

Results and discussion

1. Results from full sample analysis: the full sample comprises of 1000 data points on dividend omission (as discussed in the data section of the chapter) to avoid any sample selection bias. Later a restricted sample with only positive values of dividend pay outs is also analyzed to find any significant difference between the nature of impact of opacity and other bank level variables on pay outs.

   Based on the VAR equations as written above here each opacity variables: tangibility, intangibility, spread, turnover and size is regressed upon pay out variables: dividend per share, cash dividends and total dividend pay outs. For each regression bank level controls are used as discussed in the data section earlier.
   The following section is composed of tables showing the directions of causality from opacity variables to the payout variables. P values and z scores are reported which shows whether the causality measures are significant at all or not. Underlying possible theories have been discussed earlier.

2.3.2 Panel Data TOBIT model

For further robustness check for the results obtained from the panel VAR a panel data TOBIT model is deployed. TOBIT model can be interpreted in the similar way as a PROBIT model / LOGIT model with the special feature that it is a censored regression model. In the very model the dependent variable can be censored either from above or below, here the depended variable for the TOBIT model is dividend par share, and hence it is censored from below since its value is always greater than the threshold value of 0.

However censoring may not change the sample, but a more severe form of censoring is truncation which limits the sample, as in this case when TOBIT is run. There are three specific models with opacity variables as the explanatory variables along with firm level controls which are also the life cycle variables. Recently (Malkawai, 2008) authors have used panel data TOBIT models for investigating the impact of multiple firms specific factors on pay out levels, and through this investigation the authors have also verified several underlying theoretical models, for example agency cost models, pecking order theory, signaling theory etc.

In most of the cases to investigate dividend pay out policies linear models are used, namely, dynamic models, where the estimation techniques vary widely (as will be explored briefly below)[51].

There can be some various forms of such truncations, for example if in the current sample all such banking firms are included which do not pay dividends in the given time period, then the

[51] However, as suggested by Long (1997) that in real life scenarios there can be truncated samples, which means that the information regarding explanatory variables are fully available but for the response variable the information is limited.

information about dividend pay outs on average will be limited even if the firm characteristics (for example in this case the information asymmetry levels) will be still measured. Hence in such cases TOBIT modelling might be suitable.

Now as observed by econometricians (Long, 1997; Gujarati, 2003; Woolbridge,2003; Chuang et, al,2002) an OLS estimate of the above model will be biased since it will systematically underestimate the intercept and overestimate the slope or vice versa. Hence such studies have always recommended TOBIT estimation technique.

Hence technically in case of studies where the dependent variable is dividend payout, the value of such variables can be 0 or greater, and OLS estimation technique might produce biased results for such cases. Studies like by Singhania and Gupta (2015) have also recommended TOBIT models for the analysis of dividend pay outs.

TOBIT model can be considered as the censored normal regression model (Wooldrdge, 2002). There is however a clear difference between censoring and truncation (Long (1997, 188) provides a nice picture of truncation and censoring). Truncation occurs when the data on both the dependent variable and the regressors is lost, whereas censoring occurs when the data on dependent variable is lost but the data on regressors is intact. Hence truncation leads to a greater loss of data.Both are the forms of defect in sampling, since if there were absence of data loss the sample could have been the true representative sample of the underlying population.

Truncated normal distribution:

Here again the latent dependent variable theory is applicable, for example unlike the normal regression the value of the dependent variable y is an incomplete description of the underlying latent variable y*. since the sample here is a subset of the larger population, the observed value of the y variable can be truncated from below or above. For example if the value is truncated from below, then we can only observe that value of y=y* which is greater than the truncation point, say, π, in effect we lose the observations of y* which are equal to or less than π.

In such case the assumption is then that the variable y, such that, y>π, follows a truncated normal distribution. Geometrically, then, since the distribution is truncated now, we no longer have the area under the curve equal to unity, hence we need to rescale the data (Greene 2003, 757) to make the area under the left over distribution equal to unity. Hence if we consider that the continuous random variable, y, has a probability density function pdf f(y), and π is constant, then we get:

$$f(y; y > \pi) = \frac{f(y)}{P(y > \pi)}$$

Again the probability function in the denominator can be expressed as, $P(y > \pi) = 1 - \phi(\alpha)$

Where $\Phi(\alpha)$ is the standard cumulative density function of the normal distribution, where $\alpha = (\pi - \mu)/\sigma$, with μ, and σ as the mean and standard deviation of the normal distribution as usual. Hence the likelihood function for the truncated normal distribution function is

$$L = \prod f(y)/1 - \phi(\alpha)$$

Taking natural logarithm on both sides we have $Ln\, L = \sum \quad Ln\big(f(y)\big) - Ln(1 - \phi(\alpha))$

Some results from truncated distributions are as below:

1. If the truncation is from below, then the mean of the truncated variable is greater than the mean of theoriginal one. If the truncation is from above, then the mean of the truncated variable is smaller thanthe mean of the original one.
2. Truncation reduces the variance compared with the variance in the un-truncated distribution.

<u>Moment conditions for truncated normal distributions</u>

If y follows a normal distribution $N(\mu,\sigma)$, and the truncation point is π, then the following moment conditions hold:

$E(y; y > \pi) = \mu + \sigma f(\alpha)$, and Variance$V(y; y > \pi) = \sigma^\wedge 2(1 - g(\alpha))$, where

$g(\alpha) = f(\alpha)\{f(\alpha) - \alpha\}$ And f $(\alpha) = \Phi(\alpha)/1-\Phi(\alpha)$. Again $f(\alpha)$ is known as the inverse Mill's ratio, which is a measure of the degree of truncation, higher is the inverse Mill's ratio greater is the truncation. Hence based on the moment conditions and the measure of truncation we can first model the truncated regression as below.

<u>Truncated regression model</u>

Our main assumption here is y follows $N(\mu,\sigma^2)$, and we are interested in the distribution of y given that $y>\pi$, the truncation point. Hence we have$E(y; y > \pi) = \mu + \sigma f(\alpha)$, where we can substitute the $\Phi(\alpha)$ expression from the above section. Hence we find that the conditional mean is a nonlinear function of the parameters, μ, π and σ. Again it is now apparent that why OLS is not an efficient estimator in this case, since OLS ignores the $\sigma f(\alpha)$ part, and hence there is both omitted variable bias and heteroscedasticity in the error term. It is in this context that TOBIT estimation can be used.

<u>Censored normal distribution</u>

Here the vales of y are censored from the left, observations which are equal to or below π are set equal to π_y:

$y = y * if\ y *> \pi, and\ y =$$\pi_y$ if $y^* <$ or $= \pi$, again if the continuous variable y has the pdf f(y) and π is a constant, then, $f(y) = [f(y)]^{d_i}[F(\pi)]^{1-d_i}$, here d is the indicator variable which is = 1 if

$y>\pi$, i.e. the observation is uncensored, and is =0 if $y=\pi$, i.e. the observation is censored. Hence the density of y is same as that of y* for $y>\pi$.

Again P(censored)=P($y^*<\pi$)=$\Phi((\pi-\mu)/\sigma)$= 1- $\Phi(((\mu-\pi)/\sigma)$, where as P(uncensonsored)= $\Phi(((\mu-\pi)/\sigma)$, hence the expected value of a censored variable is E(y)=(P(censored)*E(y given $y=\pi_y$)+P(un-censored)*E(y given $y>\pi$)), which is again expressed as:

E(y) = $\{\Phi((\pi-\mu)/\sigma)*\pi_y\}+\{\Phi((\mu-\pi)/\sigma))*(\mu+\sigma f(\sigma)\}$. We can consider a special case here, for $\pi=0$(which is relevant for the use of TOBIT models for investigating dividend pay outs, as discussed later).

Censored regression models can be grouped into two categories, the first one is censored regression applications model where true censoring happens as discussed above. In this modeling if the value y* is observed then we can have simple OLS regression, however there is a data problem from the fact that y* is either censored from below or above, i.e. it is not observed for some part of the population.

The second type of censored regression is corner solution models, which have the characteristics that y takes the value 0 with positive probability but is a strictly continuous random variable over strictly positive values. Hence such a model is equivalent to solving a maximization problem, for example for some of the agents the optimal solution here would be y=0, the typical corner solution. In this model the problem is not with the data observability as in the truly censored models, but the interest lies in finding E(y) and P(y=0). Again in such settings OLS cannot be used as a consistent estimator (Wooldridge, 2002).

Structure of the TOBIT model

The structure of the TOBIT model is as below:

$$y *= X\beta + \varepsilon$$

Where the error term is assumed to have a normal distribution, and y* is the latent variable which is observed for values>π, or is 0 otherwise. The observed values of y are described by the following measurement equation:

$y = y *, if\ y *> \pi, and\ y = \pi_y$ if $y^*<\pi$.

In the typical form of this model we assume that $\pi=0$, or the data is censored at 0.

Expected values for the TOBIT model

We can now derive the expected values easily by substituting $\pi=0$ in the general moment conditions as stated earlier.

1. Expected value for the latent variable, $E(y^*)=X_i\beta$
2. Expected value of y, given y>0: E(y, s.t.y>0)=$X_i\beta+\sigma f(\alpha)$, where as earlier $f(\alpha)$ is the inverse Mill's ratio.
3. Expected value of y = $\Phi\left(\frac{X\beta}{\sigma}\right)\{X\beta + \sigma f(\sigma)\}$, which is the product of the probability of the data being uncensored and the expected value of y given y is uncensored.

Marginal effects for TOBIT model

Just as there are three expected values there are three marginal effects for TOBIT model.

1. Marginal effect for the latent dependent variable y*: $d(E(y^*))/dx_k=\beta_k$, which means that the reported coefficients in the TOBIT regression shows how one unit change in the explanatory variable alters the latent dependent variable.
2. Marginal effect on the expected value of y for uncensored observations: $d(E(y,s.t.\ y>0))/dx_k = \beta_k\{1-f(\sigma)(X\beta/\sigma+f(\alpha)\}$, which shows how one unit change in the explanatory variable, x, alters the uncensored observations.
3. Marginal effect on the expected value of y(MacDonald and Moffits decomposition): $d(E(y))/dx_k=\beta_k\Phi(X\beta/\sigma)$, where the $\Phi(.)$ is the probability of un-censored data at these observations of X variable. Hence when this probability value tends to 1, or fewer censored observation the marginal effect on y will be dictated largely by β.

OLS as an inconsistent estimator of β

OLS provides inconsistent estimate of β for the whole sample or the un-censored sample. In case of the OLS regression for the uncensored sample we have$y = X\beta + \sigma f\left(\frac{X\beta}{\sigma}\right) + \varepsilon$, and $E(\varepsilon, s.t.\ X_i,\ y_i>0=0)$, which also implies that $E(\varepsilon,\ s.t,\ X_i, y_i>0,\ f\left(\frac{X\beta}{\sigma}\right))=0$. Hence we have mistakenly omitted $\sigma f\left(\frac{X\beta}{\sigma}\right)$ from the regression, which will thus appear in the disturbance term, which means that the X's will be correlated with the disturbance terms which will make the estimate inconsistent.

Now if we consider the OLS on the full sample we have$E(y) = \Phi\left(\frac{X\beta}{\sigma}\right)\{X\beta + \sigma f(\alpha)$, which is a non linear function of X, β and σ, hence will produce inconsistent estimate since OLS presumes linearity.

Use of TOBIT model in dividend payout investigations

Based on the above described literature the current thesis has used TOBIT as the estimation technique in the very section, the main purpose has been to investigate the probabilistic impact of the bank level variables on the bank level pay out measures, namely, different types of dividend pay outs. McDonald and Mottif(1980) first discussed the application of TOBIT model in empirical studies. Recently authors have used TOBIT model in analyzing factors determining the bank dividend pay outs, for example Al-Najjar (2009), and more recently, Forti and Schiozer (2015) have used such estimation technique for a sample of Brazillian banking firms. Authors hold that the main reason for using TOBIT model(for example random effect TOBIT model) is that firms can either pay positive dividends or omit paying dividends, and a negative value of dividend pay-out is not observed, hence for the standard random effect TOBIT model the following equations will hold for dividend pay outs: $D(i,t) = \alpha + \beta X(i,t) + \varepsilon(i,t)\ \ iff\ the\ risght\ hand\ \ side > 0, or\ else = 0$

Where D is the dividend pay out level of the i^{th} firm for the t^{th} time period, and X is the vector for firm level values.

2.3.3 A general observation on dynamic panel data models applied in corporate finance

Flannery and Hankins (2013) observe that dynamic panel data models are quite extensively used in corporate finance studies, specifically in the context of partial adjustment processes for example dividend adjustment, or capital adjustment. However use of fixed effect models with lagged depended variables may cause serious econometric biases in the estimations. There have been some methods which have been used (generally on small samples which have independent and normally distributed explanatory variables) to remove such biases.

However the main challenge in the realm of corporate finance (Flannery and Hankins, 2013) is that depended variables may be clustered or censored (for example if the depended variable is dividend per share or pay out ratios), and, or the independent variable data may be missing altogether. Independent variables may also be correlated with each other, or endogenous in nature[52].

Nerlove (1967), Nickell (1981), also Baltagi (2008) observe that there can be severe bias of estimators if OLS model is used in case of dynamic panel data, and the main reason is that the coefficient of the lagged dependent variable is biased due to correlation between fixed effects and the lagged dependent variable.

The severity of bias is inversely proportional to the length of the panel, however there are cases where even for time period greater than or equal to 30 there can remain severe bias. Again this biasness problem can be more related to some specific data bases, namely, COMPUSTAT, where median length of panel (time dimension) is 15. Generally the dynamic panel data models are being applied in case of corporate finance literature for corporate leverage, and other

[52] Such properties of data have significant impact on estimators. In this brief account we will explore the various types of impact which the data characteristics might have on the estimators' performances, which might also provide a clear guideline as to which estimation technique is appropriate given the scenarios.

measures of capital structure[53].

However there is less consensus among the authors regarding the adjustment behavior and of the factors affecting the leverage ratios in this case. Flannery and Hankins (2013) make the point that such lack of consensus is mainly caused by the econometric biases or uncertainties in the estimation techniques chosen in the studies.

There have been some techniques evolved to correct such biases, for example, GMM estimation, instrumental variables estimations, long differencing estimations etc. Flannery and Hankins (2013) have provided first of its kind comparison among seven estimation techniques for dynamic panel data models, namely, OLS, standard FE, Difference GMM (Arellano and Bond's, 1991), System GMM (Blundell and Bond, 1998), variations of Long differencing estimations (Hahn et al., 2007, Huang and Ritter, 2009), and also corrected least squares (Kiviet, 1995, Bruno, 2005).

In simple words, short panel bias can be detected by estimating the same dynamic model using OLS, FE and System GMM. In the main partial adjustment model (as will be discussed in details later) if the target ratio (which may be target leverage ratio, or target dividend pay outs etc) is a function of both observed firm specific variables and fixed effects, then there should be biases in the coefficient of the lagged dependent variable while running OLS or FE, since in case of OLS the fixed effect is completely ignored, and in case of FE the short panel bias is completely ignored. Relatively then System GMM is a better estimation.

2.4 Variables and data

Data

To analyze how the banking firms adjust dividend pay out levels data has been extracted from two sources, one, balance sheet data for all listed and active BHC from COMPUSTAT, and

[53] Important papers in this area being, Welch (2004), Fama and French (2002), Huang and Ritter (2009), Flannery and Rangan (2006), Oliver etal (2013), Xiang et al (2013) among others.

two, all listed BHC stock market data (stock price, and turnover) from CSRP. Sampling period is 1990-2015, hence covering the financial crisis period. We have used some selection criteria to ensure that we can capture the adjustment process, one, dropping the bank period observations which have missing data for the basic variables used, two, selecting those banks which have paid dividends for consecutive 4 periods to capture the adjustment process, three, winsorizing all variables used (standard 1% and 99% level) to remove any outlier effect.

Variables

Various variables which are used in the analysis are described in details below based on the standard literature, the paper adopts the widely used variables in the literature (Leary etal 2011, De Angelo etal, 2007, 2008, Healy & Palepu,2001, Forti and Schiozer, 2015) along with the firm specific control variables. A list of variables is discussed as below.

2.4.1 Pay out variables

First, to proxy the level of dividend signaling DPS/ dividend per share is used which is obtained as the ratio between the cash dividend declared in the respective quarter end and the common shares outstanding in the quarter end, as author (Onali,2010, Kanas, 2013) notes that this ratio is a better choice than various earnings ratio since they might have to negative values(Kanas,2013).

However as explained earlier the current thesis also investigates the signaling content of other pay out mechanisms by bank holding companies. Such pay outs are listed below.

Net share repurchases by banks: Hirtle (2004, 2014) further investigates the trend of bank holding companies’ share buybacks before and during the financial crisis. There is some evidence that the share repurchases by the bank holding companies dropped sharply during the early phase of the crisis, which increased later. There have been intriguing tradeoffs between dividend pay outs and repurchases by large and small bank holding companies[54].

One key finding by the same author is that for the smaller BHCs which had higher share repurchases level prior to the crisis the dividend pay out level reduced later, however the drop in such dividend pay outs were less than by those BHCs whose pre crisis share repurchases were less. There is thus a suggestion that repurchases may act as a cushion against dividend cuts. There is no doubt that this line of investigation perceives share repurchases as signals to markets along with dividend pay outs (as pointed out earlier), however such investigations are limited in the sense that they have not investigated bank specific information content in such buy backs.

In the current work a standard COMPUSTAT based share repurchase measure is used, which is (as used in Hirtle, 2014) equal to purchases of treasure stock, and net value of common stock retirements minus the conversions, if the later value is positive (which means that the value of retirements greater than conversions). In the current work all values are calculated based on quarterly pay outs by the BHCs.

Total cash dividends and stock dividends are also added together to form a category of total dividends payed out, which is then divided by total assets. Such a measure is used for further robustness check.

Finally all pay outs are added (money value term) and scaled by total assets to define the total pay out policy of the bank holding companies.

Different pay out variables are used as dependent variables in all the dynamic models used in this thesis. There are two major purposes for this, one, compare and contrast the signaling content of dividend pay outs and buy backs, two, robustness check.

[54] Udekem, 2014, has also observed the great reluctance of bank holding firms to cut back on dividends.

2.4.2 Opacity variables

Tangibility: Scholars (Haris &Raviv,1991) use this measure as a straightforward measure of degree of opacity, greater is the tangibility of assets less is the degree of opacity and in this case less might be the necessity of a firm to enhance dividend signaling level. The variable used in the current work is the tangibility level which is obtained by the ratio of tangible assets on the bank balance sheet to the total asset. Another related variable has also been used later, which is In-tangibility, which is the ratio of intangible assets to total assets, and measures the opacity of the bank balance sheet.

Turnover : this is a standard measure of degree of liquidity of a firm, scholars observe that generally greater liquidity might mean less degree of opacity hence less need for a firm to enhance signaling level. Here the standard measure of natural logarithm of total volume of shares traded in the quarter is used.

Spread: there is a strong literature (Flanery etal, 1998) which argues that the bid ask spread of the shares traded in the market might capture the degree of opacity, hence greater is the spread more is the level of opacity, hence more is the necessity of a firm to enhance signaling level. The standard measure adopted here is the difference between the average bids and ask price in the end of the quarter. More recently authors (Wu, 2004) have used the measure of spread as the proxy for information asymmetry between insider managers and outsider investors while investigating the capital structure implications for firms in general.

2.4.3 Bank specific variables for information content of signaling (control variables)

As explained earlier for distinguishing banking firms form non-banking firms, or to make the investigation more banking specific, the following variables are used which may reveal information content of signaling (either via absolute level of pay outs or speed of adjustment of pay outs). The following variables are used based on the previous relevant literature for bank holding companies, which were mainly focused on determinants of bank dividend pay outs, for example, Mayne 1980, Rozeff 1982, Barcley etal 1995, Nissim and Ziv 2001, Renneboog and Trojanowski 2011, Fatemi and Bildik 2012.

In this section there is an additional variable reflecting default risk level of a bank holding company. These earlier papers however didn't perform a systematic study of signaling content of different pay out types, and were limited only to absolute pay out levels, however in the current thesis these variables are used later for investigating signaling content of dynamic pay outs or partial adjustments also, which is for the first time in the relevant banking literature. The variables are as follows.

1. Leverage: by leverage its meant the bank leverage, which has been estimated by the ratio of liabilities to equity capital. The expected impact on dividend pay out is indeterminate here, as Forti and Schiozer(2015) observes the nature of impact can either be positive or negative. A more detailed analysis is provided in the results section.
2. Capital adequacy: This variable is the capital adequacy ratio, which is calculated as the ratio of equity capital to the risk weighted assets. Here again Forti and Schiozer (2015) observes that the nature of impact can be either positive or negative. Analysis section provides details on the nature of impact.
3. Credit risk: This variable is the measure of risk of loan portfolio, two measures have been used, one, non-performing loans divided by the total loans, and non-performing loans divided by total assets. Forti and Schiozer (2015) observes that the nature of impact is expected to be negative, however their study is limited only to dividend pay outs, not other pay out types.

   Credit growth: This variable is the estimation of growth of loan portfolio. Here the variable is calculated following Forti and Schiozer (2015), which is, by current loan portfolio minus the portfolio of the previous period divided by the portfolio of the previous period. The expected impact on dividend pay outs is negative here.

5. Default risk measure: Since there have been claims by studies (Acharya et al, 2013) that high default risk banks have shifted risk from shareholders to depositors via paying out dividends during the financial crisis, in the current section a proxy is used for such default risk level , which is a dummy variable, equal to one if the equity capital to total asset ratio is less than 2%, which indicates very high default risk bank, and 0 otherwise. In the third section of the thesis default risk measures are increased.
6. Crisis dummy: Two dummy variables have been used, one which is equal to 1 when the period is from 1st quarter 2008 to the last quarter 2008, and 0 other wise, two, where the dummy is 1 when the range of periods is from 1st quarter 2008 to last quarter 2010, and 0 other wise (Forti and Schiozer, 2015, have used the first dummy on a yearly basis, however here two dummies are used since there are disagreement on the duration of the distress period for the bank holding companies).
7. *On the measures of risk shifting (for this section)*

   Onali (2014) as well as Forti and Schiozer (2015) have used either a measure of default risk or a measure of credit risk for testing the hypothesis that during crisis share holders have ‘cashed out’ via dividend pay outs, however these studies have not investigated the interrelation between such risk measures and other pay out types by banks. In this thesis both types of measures are used for different pay out types.

   Measure for risk shifting. In relation to banking literature there is a long theoretical strand (for example in John et al, 1991, or more recently in Acharya, 2009) which investigates the role of default risk in relation to dividend pay outs. Recently in empirical literature (Onali, 2014) investigations have been undertaken and studies do confirm a significant positive impact of default risk on dividend pay out levels. However such studies have not explored partial adjustment of dividend pay outs by banks as argued above(for the next section).

2.4.4 Bank specific life cycle variables

Size(LnTA): Many studies have used size of firms, measured as natural log of total assets, as a proxy for information asymmetry level. Authors such as Atiase (1985), Balmer (1984), Diamond and Verrechia (1991) have found a negative association of size with information asymmetry, which might mean that smaller firms are more opaque hence should have the greater incentive to signal via costly dividends.

However there are contradicting findings from most of the current studies on dividend pay out studies, which investigates the firm level factors which impact the dividend pay outs. One of the reasons for such contradictions is that there are other theoretical factors underlying, for example the agency cost theory which would suggest that large matured firms would rather pay dividends regularly and relatively largely to mitigate free cash flow problem. There are then implications from the pecking order theory too. In case of banks size is certainly more difficult to explain since larger banks might also hold relatively more opaque assets.

size of a firm is poxied by the natural logarithm of the book value of total assets for the given quarter end, standard literature on non financial firms hold that with the increase in size there might be more reputation and transparency or less opacity, hence less necessity for a firm to enhance the level of dividend signaling. However, there are contradictions which might indicate with diversification and increase in size opacity level increases. Here the natural log of total assets is taken as the proxy for size, as a standard measure used by other scholars (Flannery etal,opcit).

Earnings per share: (eps) is used as an explanatory variable for all dynamic models (in this study the TOBIT models), and this is in accordance with the traditional theory of dividend smoothing as explained in the review section, many theoretical models as explored earlier maintain that smoothing can also be defined as the rigidity of change in dividend pay out levels with respect to stochastic changes in underlying earnings. Earnings per-share is used a standard profitability measure too, among the recent studies Forti and Schiozer also have used profitability measure as one of the information content of signaling.

Retained Earnings to total asset ratio: Since De Angelo & DeAngelo (2006), Fama & French (2001), and Grullon et al (2002) it has been a standard practice to investigate the impact of retained earnings to total assets or total equity mix on the dividend pay outs. Since the above mentioned seminal works on financial life cycle theory of dividend pay outs it has been established that retained earnings to total assets ratio or total equity ratio can be considered as the proxy for maturity of a firm, since such a ratio captures the earned/contributed capital mix.

Firms with low values of such ratios can be considered as to be younger firms which are in the capital infusion stage, and therefore it may not be possible for such firms to raise costly external equity or debt capital, and thus its rational for such firms to hold dividends and use retained earnings to invest in positive net present value projects. Whereas firms with higher retained earnings to total asset or total equity mix can be considered to be matured firms with greater cumulative earnings but relatively less investment opportunities.

Matured firms may face Jensen’s free cash flow problem, which is a moral hazard problem emerging out of incomplete monitoring of the insider managers by the outsider shareholders, where the latter group may want the insider manager who are in control of free cash flow to distribute to them in forms of pay outs since such pay outs may mitigate free cash flow problem. Hence matured firms are more likely to pay stable and relatively higher dividends.

Tangible common equity ratio: This ratio is commonly used as the determination of strength of a bank, in the sense that how much losses a bank can withstand before the shareholders equity is wiped out. Here this ratio is calculated by subtracting intangible assets, goodwill and preferred stock capital from the total equity value, and then dividing the net sum by the bank’s tangible assets.

Long term asset growth: This value is used as a proxy for investment opportunities, which is the growth of the long term or fixed tangible assets over the last period. There is a standard literature which has used growth in long term or fixed assets, or equity or sales as the investment opportunity for the firms (kalapur and Trombley, 1999).

However there are other commonly used investment opportunity measure too, for example market to book value ratio of assets and equity, separately, earnings to price ratio(Adam and Goyal,2000), however there can be some problems with such market based measures, one, there can be strong collinearity among the different market to book value ratio, and two, such measures, also known as Tobin's Q measures may capture investor sentiment and overvaluation more than real investment opportunities.

Leverage is also used as another life cycle variable, which following Forti and Schiozer (2015) has been estimated as the ratio of liabilities to equity.

Total loans to total asset ratio is used as another life cycle variable, since greater is the value of this ratio higher is the default risk.

Interest expense to total assets, or total earnings asset ratio, is used as another return measure which reflects banking efficiency to pay off interest expenses from assets.

Tables and results for the full sample

Results from full sample analysis: the full sample comprises of 1000 data points on dividend omission (as discussed in the data section of the chapter) to avoid any sample selection bias. Later a restricted sample with only positive values of dividend pay outs is also analyzed to find any significant difference between the nature of impact of opacity and other bank level variables on pay outs.

Based on the VAR equations as written above here each opacity variables: tangibility, intangibility, spread, turnover and size is regressed upon pay out variables: dividend per share, cash dividends and total dividend pay outs. For each regression bank level controls are used as discussed in the data section earlier.

The following section is composed of tables showing the directions of causality from opacity variables to the payout variables. P values and z scores are reported which shows whether the causality measures are significant at all or not. Underlying possible theories have been discussed earlier.

Table 1

L1 refers to 1 period Lag.

Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]	
TANGIBILITY						
tangibility						
L1.	.9470712	.0054029	175.29	0.000	.9364816	.9576607
DIVIDEND PER SHARE						
L1.	-.0002961	.000275	-1.08	0.282	-.0008352	.0002429
ceta	-.00269	.001654	-1.63	0.104	-.0059318	.0005518
dta	-.0000828	.0006182	-0.13	0.893	-.0012945	.0011288
reta	.0020662	.0012952	1.60	0.111	-.0004724	.0046048
ieta	.0346117	.0142488	2.43	0.015	.0066847	.0625388
earningspershare	-1.32e-06	2.24e-06	-0.59	0.556	-5.71e-06	3.07e-06
npata	.001476	.0022708	0.65	0.516	-.0029746	.0059267
_cons	.0008657	.0002115	4.09	0.000	.0004512	.0012803
DIVIDEND PER SHARE						
TANGIBILITY						
L1.	-1.135062	.3361101	-3.38	0.001	-1.793826	-.4762984
DIVIDEND PER SHARE						
L1.	.3422021	.0171098	20.00	0.000	.3086675	.3757367
ceta	.1293612	.102894	1.26	0.209	-.0723075	.3310298
dta	.048004	.038459	1.25	0.212	-.0273744	.1233823
reta	.6745603	.080575	8.37	0.000	.5166362	.8324843
ieta	3.996966	.8864003	4.51	0.000	2.259653	5.734279
earningspershare	-.0000531	.0001393	-0.38	0.703	-.0003262	.00022
npata	-.2061343	.1412621	-1.46	0.145	-.483003	.0707344
_cons	.0507737	.0131587	3.86	0.000	.0249832	.0765642

Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]	
tangibility						
tangibility						
L1.	.947546	.0053858	175.94	0.000	.93699	.9581019
logdividendtotal						
L1.	1.46e-06	.0000204	0.07	0.943	-.0000385	.0000414
ceta	-.002764	.0016537	-1.67	0.095	-.0060052	.0004771
dta	-.0000999	.0006181	-0.16	0.872	-.0013114	.0011117
reta	.0017811	.0012704	1.40	0.161	-.0007088	.004271
ieta	.0328136	.0141622	2.32	0.021	.0050562	.0605711
earningspershare	-1.30e-06	2.24e-06	-0.58	0.561	-5.69e-06	3.09e-06
npata	.0015749	.0022743	0.69	0.489	-.0028826	.0060324
_cons	.0008413	.0002141	3.93	0.000	.0004217	.001261
logdividendtotal						
tangibility						
L1.	-1.789122	1.400058	-1.28	0.201	-4.533184	.9549408
logdividendtotal						
L1.	.9524219	.0053007	179.68	0.000	.9420328	.962811
ceta	.3190052	.4298852	0.74	0.458	-.5235543	1.161565
dta	-.4861006	.1606864	-3.03	0.002	-.8010402	-.1711609
reta	-.0982439	.3302441	-0.30	0.766	-.7455106	.5490227
ieta	8.487569	3.681538	2.31	0.021	1.271888	15.70325
earningspershare	.0002345	.0005826	0.40	0.687	-.0009074	.0013763
npata	-.8240364	.5912101	-1.39	0.163	-1.982787	.3347141
_cons	.0986899	.0556584	1.77	0.076	-.0103987	.2077784

Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]	
tangibility						
tangibility						
L1.	.9477406	.0053892	175.86	0.000	.937178	.9583031
logcashdividend						
L1.	.0000206	.0000222	0.93	0.354	-.0000229	.0000641
ceta	-.0029158	.0016612	-1.76	0.079	-.0061717	.0003402
dta	-.0001086	.0006181	-0.18	0.861	-.0013201	.0011029
reta	.0017999	.0012669	1.42	0.155	-.0006831	.0042829
ieta	.0317964	.0141993	2.24	0.025	.0039662	.0596265
earningspershare	-1.32e-06	2.24e-06	-0.59	0.555	-5.71e-06	3.07e-06
npata	.0016831	.002273	0.74	0.459	-.0027718	.0061381
_cons	.0008277	.0002113	3.92	0.000	.0004136	.0012419
logcashdividend						
tangibility						
L1.	-3.373902	1.936094	-1.74	0.081	-7.168577	.4207729
logcashdividend						
L1.	.8873832	.0079795	111.21	0.000	.8717437	.9030227
ceta	.7462666	.5968094	1.25	0.211	-.4234584	1.915992
dta	.0412368	.2220603	0.19	0.853	-.3939934	.476467
reta	-.4343476	.45513	-0.95	0.340	-1.326386	.4576907
ieta	5.470411	5.101221	1.07	0.284	-4.527798	15.46862
earningspershare	.0008465	.0008047	1.05	0.293	-.0007308	.0024237
npata	-.6742362	.8165862	-0.83	0.409	-2.274716	.9262433
_cons	.169064	.0759157	2.23	0.026	.0202719	.3178561

Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]	
tangibility						
tangibility						
L1.	.9474518	.0053873	175.87	0.000	.936893	.9580107
cashdividend						
L1.	8.46e-08	1.26e-07	0.67	0.502	-1.62e-07	3.32e-07
ceta	-.0028489	.0016581	-1.72	0.086	-.0060988	.0004009
dta	-.0000738	.0006193	-0.12	0.905	-.0012876	.0011401
reta	.0018052	.0012675	1.42	0.154	-.000679	.0042895
ieta	.0317409	.0142502	2.23	0.026	.003811	.0596709
earningspershare	-1.30e-06	2.24e-06	-0.58	0.560	-5.69e-06	3.09e-06
npata	.0016322	.0022718	0.72	0.472	-.0028204	.0060848
_cons	.0008506	.0002108	4.03	0.000	.0004374	.0012637
cashdividend						
tangibility						
L1.	297.5414	491.835	0.60	0.545	-666.4374	1261.52
cashdividend						
L1.	.7653573	.0115052	66.52	0.000	.7428075	.7879072
ceta	244.8411	151.3789	1.62	0.106	-51.85615	541.5383
dta	-88.98772	56.54215	-1.57	0.116	-199.8083	21.83286
reta	-92.90958	115.7159	-0.80	0.422	-319.7086	133.8895
ieta	2664.256	1300.988	2.05	0.041	114.3665	5214.145
earningspershare	.0327543	.2045034	0.16	0.873	-.368065	.4335736
npata	-149.0544	207.4024	-0.72	0.472	-555.5557	257.4469
_cons	-14.23853	19.24593	-0.74	0.459	-51.95985	23.4828

Causality between tangibility and dividend payout measures

Lagged value of dividend per share has an insignificant negative relation with the tangibility level of the banking firms, or in other words the flow of causality from dividend per share to tangibility is not evident. This result is confirmed from the p value of .282 as in the above table which is >0.05, hence at 5% level of significance the causality can not be found.

However, as was expected from the discussion of signaling literature the reverse direction of causality is strong, or in other words the lagged tangibility measure has a very strong negative significant relation with the dividend per share level. The p value of 0.01 is a significant value at 5% level, and a coefficient of -1.13 shows the strong negative causality flowing from lagged tangibility to dividend pay out.

Causality between tangibility and total dividend pay out is analyzed in the next step, where we again find that the direction of causality is from lagged tangibility to pay out, and the p value is less significant this time. However in the third step the direction and significance of causality between lagged tangibility and cash dividend pay out is strong at 10% level.

Table 2

Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]	
intangibility						
intangibility						
L1.	.8238861	.0097681	84.34	0.000	.8047411	.8430312
dividendspersharepaydatequarter						
L1.	-.0002907	.0009226	-0.32	0.753	-.0020989	.0015175
ceta	-.0027918	.0054879	-0.51	0.611	-.0135478	.0079642
dta	-.0014356	.0020784	-0.69	0.490	-.0055091	.002638
reta	.0002265	.0043373	0.05	0.958	-.0082744	.0087273
ieta	-.0543358	.0475702	-1.14	0.253	-.1475717	.0389001
earningspershare	1.96e-06	7.53e-06	0.26	0.795	-.0000128	.0000167
npata	-.0081069	.0076275	-1.06	0.288	-.0230564	.0068427
_cons	.0025692	.0006288	4.09	0.000	.0013368	.0038015
dividendspersharepaydatequarter						
intangibility						
L1.	-.3072824	.1809906	-1.70	0.090	-.6620174	.0474526
dividendspersharepaydatequarter						
L1.	.3455226	.0170939	20.21	0.000	.3120192	.3790261
ceta	.1815338	.1016838	1.79	0.074	-.0177628	.3808304
dta	.0509592	.0385099	1.32	0.186	-.0245188	.1264372
reta	.6512768	.0803642	8.10	0.000	.4937659	.8087877
ieta	3.58154	.8814201	4.06	0.000	1.853988	5.309092
earningspershare	-.0000601	.0001395	-0.43	0.667	-.0003335	.0002134
npata	-.2271958	.1413279	-1.61	0.108	-.5041934	.0498019
_cons	.0326114	.01165	2.80	0.005	.0097778	.055445

Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]	
intangibility						
intangibility						
L1.	.8220995	.0098518	83.45	0.000	.8027904	.8414086
logdividendtotal						
L1.	.0000967	.0000692	1.40	0.162	-.0000389	.0002324
ceta	-.0031399	.0054819	-0.57	0.567	-.0138842	.0076044
dta	-.0014554	.002077	-0.70	0.483	-.0055263	.0026154
reta	.0004011	.0042575	0.09	0.925	-.0079435	.0087456
ieta	-.0582455	.0473258	-1.23	0.218	-.1510024	.0345113
earningspershare	1.66e-06	7.53e-06	0.22	0.825	-.0000131	.0000164
npata	-.007333	.0076347	-0.96	0.337	-.0222967	.0076308
_cons	.0023975	.000637	3.76	0.000	.0011489	.003646
logdividendtotal						
intangibility						
L1.	.6757091	.7622699	0.89	0.375	-.8183125	2.169731
logdividendtotal						
L1.	.9517455	.0053544	177.75	0.000	.941251	.96224
ceta	.4225727	.4241553	1.00	0.319	-.4087563	1.253902

dta	-.4688614	.1607073	-2.92	0.004	-.7838419	-.153881
reta	-.1305281	.3294188	-0.40	0.692	-.7761771	.515121
ieta	8.096668	3.661784	2.21	0.027	.919703	15.27363
earningspershare	.0002334	.0005827	0.40	0.689	-.0009086	.0013754
npata	-.8587262	.5907271	-1.45	0.146	-2.01653	.2990777
_cons	.0558413	.049289	1.13	0.257	-.0407632	.1524459

Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]	
intangibility						
intangibility						
L1.	.8242357	.0097748	84.32	0.000	.8050775	.8433939
cashdividend						
L1.	-1.43e-07	4.24e-07	-0.34	0.736	-9.75e-07	6.88e-07
ceta	-.002738	.005497	-0.50	0.618	-.0135119	.0080358
dta	-.0014971	.0020816	-0.72	0.472	-.0055769	.0025827
reta	-.0001015	.0042488	-0.02	0.981	-.008429	.0082261
ieta	-.0539506	.0476613	-1.13	0.258	-.147365	.0394639
earningspershare	1.99e-06	7.53e-06	0.26	0.791	-.0000128	.0000168
npata	-.0081217	.0076284	-1.06	0.287	-.0230732	.0068297
_cons	.0025445	.0006279	4.05	0.000	.0013138	.0037752
cashdividend						
intangibility						
L1.	346.612	265.4415	1.31	0.192	-173.6437	866.8677
cashdividend						
L1.	.7646239	.0115204	66.37	0.000	.7420443	.7872034
ceta	235.7535	149.2747	1.58	0.114	-56.81948	528.3265
dta	-87.22009	56.52652	-1.54	0.123	-198.01	23.56986
reta	-87.3013	115.3799	-0.76	0.449	-313.4417	138.8391
ieta	2828.95	1294.279	2.19	0.029	292.2097	5365.69
earningspershare	.0365929	.204461	0.18	0.858	-.3641432	.4373291
npata	-142.6678	207.1557	-0.69	0.491	-548.6855	263.35
_cons	-13.16021	17.05169	-0.77	0.440	-46.58091	20.26049

Causality between intangibility and dividend payout measures

The above table show the causal relation between the intangibility and the dividend pay out measures for the whole sample. Logically intangibility can be perceived as to be an opposite measure of tangibility, but certainly with qualifications, for example intangibility can also measure intangible asset values for example human capital, where a simple correlation with the opacity level may not be found. More specifically in the banking sector the meaning of the variable can be more complex (Mavridis,2004, Joshi et al, 2010 among many other authors observe that intangible assets in banking sector may also reflect intellectual capital and agency conflict level, hence there can be a relationship between opacity and intangible assets in banking since such assets are opaque and difficult to value, however a direct comparison with non baking firms is not logical).

The first table shows that the direction of causality (weak causality since the p value for the impact of lagged intangibility on the dividend per share is 0.09 which is significant only at 10% level)is from lagged intangibility to dividend per share measure. The opposite causality measurement is very weak or non existent.

The second table shows that the causality from lagged intangibility to total dividend pay out is positive but not significant. The reverse causality is also nonexistent.

The third table shows that the causality from lagged intangibility measure to cash dividend is positive but not significant, and the reverse causality is nonexistent.

Table3

Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]	
size						
size						
L1.	.9859407	.0027175	362.82	0.000	.9806146	.9912669
dividendspersharepaydatequarter						
L1.	.0460239	.0238063	1.93	0.053	-.0006357	.0926834
ceta	-.1252164	.1391923	-0.90	0.368	-.3980283	.1475955
dta	.129138	.053823	2.40	0.016	.0236468	.2346293
reta	.14721	.1102758	1.33	0.182	-.0689265	.3633466
ieta	-4.237859	1.217528	-3.48	0.001	-6.62417	-1.851547
earningspershare	.000081	.0001908	0.42	0.671	-.000293	.000455
npata	-.1264819	.1935051	-0.65	0.513	-.5057449	.2527811
_cons	.1327056	.0249759	5.31	0.000	.0837538	.1816574
dividendspersharepaydatequarter						
size						
L1.	.0158668	.0019688	8.06	0.000	.012008	.0197256
dividendspersharepaydatequarter						
L1.	.3199521	.0172477	18.55	0.000	.2861472	.3537571
ceta	.1478084	.1008452	1.47	0.143	-.0498445	.3454613
dta	-.012161	.0389949	-0.31	0.755	-.0885897	.0642676
reta	.7022159	.0798951	8.79	0.000	.5456244	.8588073
ieta	4.653278	.8821022	5.28	0.000	2.924389	6.382166
earningspershare	-.0000586	.0001382	-0.42	0.672	-.0003295	.0002124
npata	-.1738422	.1401949	-1.24	0.215	-.4486192	.1009347
_cons	-.0856489	.0180951	-4.73	0.000	-.1211145	-.0501832

Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]	
size						
size						
L1.	.9837558	.002819	348.97	0.000	.9782306	.989281
logdividendtotal						
L1.	.0063554	.0018368	3.46	0.001	.0027554	.0099553
ceta	-.1189578	.1389003	-0.86	0.392	-.3911973	.1532818
dta	.1428644	.0539283	2.65	0.008	.037167	.2485619
reta	.217847	.1078117	2.02	0.043	.0065399	.4291541
ieta	-4.234773	1.208774	-3.50	0.000	-6.603926	-1.86562
earningspershare	.0000575	.0001907	0.30	0.763	-.0003162	.0004312
npata	-.1048219	.1934173	-0.54	0.588	-.483913	.2742691
_cons	.1384118	.0249944	5.54	0.000	.0894236	.1874
logdividendtotal						
size						
L1.	.0252431	.0086046	2.93	0.003	.0083784	.0421078
logdividendtotal						
L1.	.9470094	.0056064	168.92	0.000	.9360212	.9579977
ceta	.3488641	.4239685	0.82	0.411	-.4820989	1.179827
dta	-.5853588	.1646065	-3.56	0.000	-.9079816	-.262736

reta	-.1134936	.3290762	-0.34	0.730	-.7584712	.5314839
ieta	9.45259	3.689567	2.56	0.010	2.221171	16.68401
earningspershare	.0002454	.000582	0.42	0.673	-.0008953	.001386
npata	-.7991331	.5903722	-1.35	0.176	-1.956241	.3579752
_cons	-.1092192	.0762911	-1.43	0.152	-.2587471	.0403086

Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]	
size						
size						
L1.	.9865218	.0026945	366.13	0.000	.9812408	.9918029
cashdividend						
L1.	.0000123	.0000108	1.14	0.255	-8.92e-06	.0000336
ceta	-.1243607	.1394389	-0.89	0.372	-.3976558	.1489345
dta	.1336798	.0540802	2.47	0.013	.0276847	.239675
reta	.1965857	.1077877	1.82	0.068	-.0146742	.4078457
ieta	-4.118018	1.218819	-3.38	0.001	-6.506859	-1.729177
earningspershare	.0000765	.0001909	0.40	0.689	-.0002977	.0004506
npata	-.1297482	.1936141	-0.67	0.503	-.5092248	.2497283
_cons	.1310832	.0250539	5.23	0.000	.0819784	.1801879
cashdividend						
size						
L1.	7.993753	2.883523	2.77	0.006	2.342152	13.64535
cashdividend						
L1.	.7609371	.0116082	65.55	0.000	.7381854	.7836889
ceta	210.4655	149.2225	1.41	0.158	-82.00524	502.9363
dta	-126.4063	57.87468	-2.18	0.029	-239.8386	-12.97401
reta	-76.39794	115.3506	-0.66	0.508	-302.4809	149.685
ieta	3251.73	1304.337	2.49	0.013	695.2771	5808.183
earningspershare	.0350769	.2042721	0.17	0.864	-.365289	.4354427
npata	-116.6078	207.1989	-0.56	0.574	-522.7102	289.4946
_cons	-66.68294	26.8118	-2.49	0.013	-119.2331	-14.13278

Causality results between size and payout measures

The relation between size and dividend pay out measures have been discussed widely in the literature. Here we test both directions of causality via the VAR equations. The above table shows that the causality flowing from the lagged size variable to dividend pay outs (dividend per share, cash dividend and total dividend pay out) is very significant, as reflected by the p values <0.05 in all cases.

Table 4

Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]	
turnover						
turnover						
L1.	.9478423	.0053721	176.44	0.000	.9373132	.9583714
dividendspersharepaydatequarter						
L1.	.0409835	.0686693	0.60	0.551	-.0936058	.1755728
ceta	1.187053	.4228942	2.81	0.005	.3581952	2.01591
dta	.5029995	.1590912	3.16	0.002	.1911865	.8148125
reta	-.4558017	.3303922	-1.38	0.168	-1.103359	.191755
ieta	-9.360384	3.63659	-2.57	0.010	-16.48797	-2.2328
earningspershare	-.000218	.0005601	-0.39	0.697	-.0013158	.0008798
npata	-.5339975	.5676676	-0.94	0.347	-1.646606	.5786105
_cons	.659921	.0816087	8.09	0.000	.4999709	.819871
dividendspersharepaydatequarter						
turnover						
L1.	.0019516	.0013382	1.46	0.145	-.0006713	.0045744
dividendspersharepaydatequarter						
L1.	.345448	.0171058	20.19	0.000	.3119212	.3789749
ceta	.1456086	.1053449	1.38	0.167	-.0608637	.3520808
dta	.040247	.0396304	1.02	0.310	-.0374271	.1179211
reta	.6764617	.0823023	8.22	0.000	.5151523	.8377712
ieta	3.940006	.9058916	4.35	0.000	2.164491	5.715521
earningspershare	-.0000595	.0001395	-0.43	0.670	-.0003329	.000214
npata	-.218966	.1414087	-1.55	0.122	-.4961219	.0581899
_cons	.0038238	.0203291	0.19	0.851	-.0360205	.0436681

Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]	
turnover						
turnover						
L1.	.9434698	.0055344	170.47	0.000	.9326225	.954317
logdividendtotal						
L1.	.0171535	.0052615	3.26	0.001	.0068411	.0274658
ceta	1.25118	.4223125	2.96	0.003	.423463	2.078897
dta	.5404523	.1592176	3.39	0.001	.2283917	.852513
reta	-.3901271	.3225257	-1.21	0.226	-1.022266	.2420116
ieta	-10.15577	3.620443	-2.81	0.005	-17.25171	-3.059831
earningspershare	-.0002711	.0005594	-0.48	0.628	-.0013676	.0008254
npata	-.4412769	.56733	-0.78	0.437	-1.553223	.6706694
_cons	.684218	.0818368	8.36	0.000	.5238208	.8446151
logdividendtotal						
turnover						
L1.	.0081932	.0057625	1.42	0.155	-.0031011	.0194875
logdividendtotal						
L1.	.950443	.0054784	173.49	0.000	.9397056	.9611804
ceta	.2440936	.4397173	0.56	0.579	-.6177364	1.105924
dta	-.5350511	.1657794	-3.23	0.001	-.8599727	-.2101294
reta	-.0356519	.335818	-0.11	0.915	-.693843	.6225393
ieta	9.251299	3.769652	2.45	0.014	1.862916	16.63968
earningspershare	.0002261	.0005825	0.39	0.698	-.0009156	.0013678
npata	-.8418251	.5907114	-1.43	0.154	-1.999598	.315948
_cons	-.0359099	.0852095	-0.42	0.673	-.2029175	.1310977

Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]	
turnover						
turnover						
L1.	.944555	.0056414	167.43	0.000	.9334981	.9556119
logcashdividend						
L1.	.0115352	.0058383	1.98	0.048	.0000922	.0229781
ceta	1.176336	.4225138	2.78	0.005	.3482246	2.004448
dta	.5239922	.1592992	3.29	0.001	.2117715	.8362129
reta	-.441368	.3230553	-1.37	0.172	-1.074545	.1918086
ieta	-10.19342	3.651376	-2.79	0.005	-17.34999	-3.036856
earningspershare	-.0002313	.0005598	-0.41	0.679	-.0013285	.0008659
npata	-.4906957	.5676773	-0.86	0.387	-1.603323	.6219313
_cons	.696072	.0836616	8.32	0.000	.5320984	.8600457
logcashdividend						
turnover						
L1.	.0436217	.0080781	5.40	0.000	.027789	.0594545
logcashdividend						
L1.	.8738404	.0083601	104.52	0.000	.8574549	.890226
ceta	.1167936	.6050113	0.19	0.847	-1.069007	1.302594
dta	-.2460329	.2281058	-1.08	0.281	-.693112	.2010462
reta	.0348056	.4625934	0.08	0.940	-.8718609	.9414721
ieta	11.80683	5.228526	2.26	0.024	1.559107	22.05455
earningspershare	.0008114	.0008016	1.01	0.311	-.0007598	.0023825
npata	-.6616901	.8128757	-0.81	0.416	-2.254897	.931517
_cons	-.4390559	.1197977	-3.66	0.000	-.6738552	-.2042567

Causality results between turnover and payout measures

The above table provides results for the causality results between payout measures and turnover of the full sample of BHCs. Overall there is insignificant causality flowing from lagged turnover and the pay out measures, except in the case of cash dividends, where the lagged turnover measure is rather positively associated with the cash dividend level, where the p value is 0.06, hence the significance is at the 10% level.

Hence overall a weak causality running from turnover to dividend payouts may not be explained by the information asymmetry or signaling hypothesis, but as we have already found there are other underlying theories which may be better candidates for such results, for example the lifecycle hypothesis. Higher turnover implies higher maturity stage of the firms since their stocks are more reputed and undergo relatively more transactions, hence these firms may be in a better position to pay out dividends. For matured firms free cash flow hypothesis also plays a driving role for more dividend pays.

Table 5

Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]	
spread						
spread						
L1.	.2977447	.016362	18.20	0.000	.2656757	.3298137
dividendspersharepaydatequarter						
L1.	1.821884	.2373675	7.68	0.000	1.356652	2.287115
ceta	-1.784692	1.386998	-1.29	0.198	-4.503159	.9337738
dta	.5506761	.524669	1.05	0.294	-.4776563	1.579008
reta	3.908342	1.098445	3.56	0.000	1.75543	6.061254
ieta	-5.557419	12.02194	-0.46	0.644	-29.11999	18.00515
earningspershare	.0005825	.0019036	0.31	0.760	-.0031485	.0043135
npata	-3.003823	1.929557	-1.56	0.120	-6.785686	.7780403
_cons	1.218086	.157978	7.71	0.000	.9084545	1.527717
dividendspersharepaydatequarter						
spread						
L1.	.0084709	.0011915	7.11	0.000	.0061356	.0108063
dividendspersharepaydatequarter						
L1.	.3230185	.0172855	18.69	0.000	.2891395	.3568975
ceta	.2102917	.1010036	2.08	0.037	.0123283	.4082552
dta	.047826	.0382073	1.25	0.211	-.027059	.1227109
reta	.6118652	.0799907	7.65	0.000	.4550864	.7686441
ieta	3.87631	.8754584	4.43	0.000	2.160443	5.592177
earningspershare	-.0000931	.0001386	-0.67	0.502	-.0003648	.0001786
npata	-.2748207	.1405137	-1.96	0.050	-.5502225	.0005811
_cons	.0131273	.0115042	1.14	0.254	-.0094206	.0356752

Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]	
spread						
spread						
L1.	.3208651	.0162014	19.80	0.000	.289111	.3526193
logdividendtotal						
L1.	.0287646	.0174806	1.65	0.100	-.0054968	.063026
ceta	-1.222697	1.396622	-0.88	0.381	-3.960026	1.514632
dta	.6577078	.5288495	1.24	0.214	-.3788181	1.694234
reta	5.623001	1.091744	5.15	0.000	3.483222	7.762779
ieta	4.170725	12.05047	0.35	0.729	-19.44776	27.78921
earningspershare	.000265	.0019198	0.14	0.890	-.0034977	.0040276
npata	-3.511133	1.947393	-1.80	0.071	-7.327953	.3056879
_cons	1.195109	.1623564	7.36	0.000	.8768964	1.513322
logdividendtotal						
spread						
L1.	.002545	.0049197	0.52	0.605	-.0070974	.0121874
logdividendtotal						
L1.	.9522777	.0053081	179.40	0.000	.941874	.9626814
ceta	.4158358	.4240946	0.98	0.327	-.4153743	1.247046
dta	-.4783384	.160589	-2.98	0.003	-.7930871	-.1635897
reta	-.1480538	.331516	-0.45	0.655	-.7978132	.5017055
ieta	7.990681	3.659214	2.18	0.029	.8187537	15.16261
earningspershare	.0002169	.0005829	0.37	0.710	-.0009256	.0013595
npata	-.8703663	.5913402	-1.47	0.141	-2.029372	.2886392
_cons	.0591045	.0493007	1.20	0.231	-.0375231	.1557321

Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]	
spread						
spread						
L1.	.3219875	.0161887	19.89	0.000	.2902582	.3537167
cashdividend						
L1.	.0000834	.0001079	0.77	0.440	-.0001282	.0002949
ceta	-1.235258	1.400502	-0.88	0.378	-3.980192	1.509675
dta	.6776002	.5301269	1.28	0.201	-.3614295	1.71663
reta	5.507893	1.089206	5.06	0.000	3.373087	7.642698
ieta	3.657557	12.13507	0.30	0.763	-20.12675	27.44186
earningspershare	.0003429	.0019197	0.18	0.858	-.0034196	.0041054
npata	-3.65565	1.945667	-1.88	0.060	-7.469088	.1577872
_cons	1.252155	.1594116	7.85	0.000	.9397141	1.564596
cashdividend						
spread						
L1.	.6034122	1.725495	0.35	0.727	-2.778497	3.985321
cashdividend						
L1.	.7654796	.011503	66.55	0.000	.7429342	.7880251
ceta	230.7046	149.2745	1.55	0.122	-61.86802	523.2772
dta	-91.2051	56.50432	-1.61	0.107	-201.9515	19.54134
reta	-92.17187	116.0946	-0.79	0.427	-319.7131	135.3693
ieta	2759.383	1293.434	2.13	0.033	224.2993	5294.466
earningspershare	.0316746	.2046127	0.15	0.877	-.3693589	.4327081
npata	-146.4624	207.3817	-0.71	0.480	-552.9229	259.9982
_cons	-9.573495	16.99111	-0.56	0.573	-42.87545	23.72846

Causality results between spread and payout measures

The above table provides results for causality between spread and payout variables. Interestingly there is a strong positive causality flowing from both lagged spread measure to dividend per share measures and the in the opposite way (p values 0.00 in both the cases, hence significant impact even at 1% level). The costly signaling hypothesis is validated through such results (as argued in the lit- review section too).
However the results are weak for the other forms of payout measures.

Tables and results for the restricted sample

Table 6

Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]	
dividendspersharepaydatequarter						
dividendspersharepaydatequarter						
L1.	.7503578	.0103383	72.58	0.000	.730095	.7706205
size						
L1.	.00465	.0009964	4.67	0.000	.002697	.006603
ceta	-.0004065	.0484303	-0.01	0.993	-.0953282	.0945151
dta	-.0005966	.0184324	-0.03	0.974	-.0367234	.0355301
reta	.1996382	.0454444	4.39	0.000	.1105688	.2887077
ieta	.4055088	.4161377	0.97	0.330	-.4101062	1.221124
earningspershare	-.0000167	.0000566	-0.29	0.768	-.0001277	.0000943
npata	-.0393696	.0779257	-0.51	0.613	-.1921012	.1133621
_cons	-.0045015	.0092585	-0.49	0.627	-.0226478	.0136448
size						
dividendspersharepaydatequarter						

L1.	-.0239917	.0178348	-1.35	0.179	-.0589472	.0109638
size						
L1.	.9955078	.001719	579.12	0.000	.9921387	.998877
ceta	.0299841	.0835477	0.36	0.720	-.1337664	.1937347
dta	.0205419	.0317979	0.65	0.518	-.0417808	.0828646
reta	-.0690515	.0783967	-0.88	0.378	-.2227063	.0846033
ieta	.6847486	.7178844	0.95	0.340	-.722279	2.091776
earningspershare	.0000452	.0000977	0.46	0.643	-.0001463	.0002367
npata	-.0739249	.1344306	-0.55	0.582	-.3374041	.1895544
_cons	.0575005	.015972	3.60	0.000	.026196	.088805

The above table for the restricted sample shows a very significant positive causality flowing from the lagged size measure to the dividend per share of the banking firms. The nature and significance of the causality is preserved as in the full sample results.

Table 7

Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]	
dividendspersharepaydatequarter						
dividendspersharepaydatequarter						
L1.	.7596933	.0101368	74.94	0.000	.7398256	.779561
tangibility						
L1.	-.3329096	.1682913	-1.98	0.048	-.6627546	-.0030646
ceta	.0077427	.0488426	0.16	0.874	-.087987	.1034724
dta	.0116079	.0182685	0.64	0.525	-.0241978	.0474136
reta	.1690804	.0451614	3.74	0.000	.0805657	.2575951
ieta	.2874302	.4178764	0.69	0.492	-.5315925	1.106453
earningspershare	-.0000124	.0000568	-0.22	0.828	-.0001238	.000099
npata	-.0665541	.0779285	-0.85	0.393	-.2192913	.086183
_cons	.0350961	.0067512	5.20	0.000	.021864	.0483283
tangibility						
dividendspersharepaydatequarter						
L1.	-.0002846	.0003636	-0.78	0.434	-.0009972	.000428
tangibility						
L1.	.9420907	.0060361	156.08	0.000	.9302601	.9539212
ceta	-.0019867	.0017518	-1.13	0.257	-.0054203	.0014468
dta	-.0000763	.0006552	-0.12	0.907	-.0013605	.001208
reta	.0040805	.0016198	2.52	0.012	.0009057	.0072552
ieta	.0305882	.014988	2.04	0.041	.0012122	.0599642
earningspershare	-1.08e-06	2.04e-06	-0.53	0.596	-5.08e-06	2.91e-06
npata	.0029665	.0027951	1.06	0.289	-.0025118	.0084447
_cons	.0007779	.0002421	3.21	0.001	.0003033	.0012525

The above table reports the causality results between the tangibility and dividend per share measures of the restricted sample. There is a significant (p value 0.048<0.05) relation between the lagged tangibility and dividend per share measure, which has a negative sign, which is again according to the costly signaling literature.
The nature and significance of the causality has been more significant in the restricted sample case this time.

Table 8

Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]	
dividendspersharepaydatequarter						
dividendspersharepaydatequarter						
L1.	.7621036	.0100614	75.75	0.000	.7423836	.7818236
intangibility						
L1.	– .0766211	.0915243	-0.84	0.402	-.2560055	.1027633
ceta	.0192938	.0484531	0.40	0.690	-.0756725	.1142602
dta	.0143058	.0182183	0.79	0.432	-.0214014	.050013
reta	.1536558	.0445971	3.45	0.001	.0662471	.2410646
ieta	.1752697	.4156978	0.42	0.673	-.639483	.9900224
earningspershare	-.000015	.0000569	-0.26	0.792	-.0001265	.0000965
npata	-.073957	.0779731	-0.95	0.343	-.2267815	.0788675
_cons	.029841	.0060851	4.90	0.000	.0179145	.0417675
intangibility						
dividendspersharepaydatequarter						
L1.	.0003649	.0012098	0.30	0.763	-.0020063	.0027361
intangibility						
L1.	.8122969	.0110052	73.81	0.000	.7907272	.8338667
ceta	– .0052122	.0058261	-0.89	0.371	-.0166312	.0062069
dta	– .0008065	.0021906	-0.37	0.713	-.0051	.003487
reta	– .0017042	.0053625	-0.32	0.751	-.0122145	.0088061
ieta	– .0204957	.0499847	-0.41	0.682	-.118464	.0774726
earningspershare	1.52e-06	6.84e-06	0.22	0.824	-.0000119	.0000149
npata	– .0184884	.0093757	-1.97	0.049	-.0368645	– .0001124
_cons	.0025829	.0007317	3.53	0.000	.0011488	.004017

The above table reports the causality results between the intangibility measure and the dividend per share values of the restricted sample. There is a strong positive causality flowing from lagged intangibility value (p value of 0.00) to the pay out value, which is again strongly supported by the costly signaling literature.

Table 9

Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]	
dividendspersharepaydatequarter						
dividendspersharepaydatequarter						
L1.	.7596881	.0104181	72.92	0.000	.739269	.7801072
spread						
L1.	.0005582	.0005884	0.95	0.343	-.0005952	.0017115
ceta	.0226576	.0484373	0.47	0.640	-.0722778	.1175931
dta	.0140424	.0182253	0.77	0.441	-.0216784	.0497633
reta	.1539862	.044587	3.45	0.001	.0665972	.2413751
ieta	.2078907	.4156465	0.50	0.617	-.6067614	1.022543
earningspershare	– .0000168	.0000569	-0.30	0.768	-.0001284	.0000947
npata	– .0746227	.0779843	-0.96	0.339	-.2274691	.0782238
_cons	.0278544	.0060116	4.63	0.000	.0160719	.039637

spread						
dividendspersharepaydatequarter						
L1.	3.613306	.3367066	10.73	0.000	2.953373	4.273239
spread						
L1.	.2609465	.0190179	13.72	0.000	.2236721	.2982209
ceta	– 2.177321	1.565463	-1.39	0.164	-5.245572	.8909298
dta	1.083368	.5890285	1.84	0.066	-.0711069	2.237843
reta	1.141773	1.441023	0.79	0.428	-1.68258	3.966126
ieta	– 19.15492	13.43342	-1.43	0.154	-45.48394	7.174103
earningspershare	.0009385	.0018397	0.51	0.610	-.0026673	.0045443
npata	– 2.543941	2.520402	-1.01	0.313	-7.483837	2.395956
_cons	1.153978	.1942909	5.94	0.000	.7731752	1.534781

The above table reports the causality results between spread and pay outs for the restricted sample. The nature and significance of the results have not changed significantly from the full sample case.

Table 10

Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]	
dividendspersharepaydatequarter						
dividendspersharepaydatequarter						
L1.	.7620466	.0100819	75.59	0.000	.7422865	.7818067
turnover						
L1.	.0002073	.0006341	0.33	0.744	-.0010354	.00145
ceta	.0161277	.0506825	0.32	0.750	-.0832082	.1154636
dta	.0133368	.0187284	0.71	0.476	-.0233702	.0500438
reta	.1585233	.0462424	3.43	0.001	.0678898	.2491567
ieta	.2202649	.4249157	0.52	0.604	-.6125545	1.053084
earningspershare	-.0000145	.0000569	-0.26	0.799	-.000126	.000097
npata	-.0697191	.0782062	-0.89	0.373	-.2230005	.0835622
_cons	.0261251	.0099502	2.63	0.009	.0066231	.0456272
turnover						
dividendspersharepaydatequarter						
L1.	.122127	.0832079	1.47	0.142	-.0409575	.2852115
turnover						
L1.	.9668988	.005233	184.77	0.000	.9566424	.9771552
ceta	1.312056	.418294	3.14	0.002	.4922146	2.131897
dta	.2244102	.1545698	1.45	0.147	-.078541	.5273613
reta	-.9314287	.3816489	-2.44	0.015	-1.679447	-.1834105
ieta	-.4820352	3.506924	-0.14	0.891	-7.355479	6.391409
earningspershare	-.0002434	.0004694	-0.52	0.604	-.0011634	.0006766
npata	-.7792489	.6454533	-1.21	0.227	-2.044314	.4858164
_cons	.3822106	.0821212	4.65	0.000	.221256	.5431652

The above table shows the causality results between the turnover and pay out variables for the restricted sample. Here again the nature and significance of the relation have not changed significantly from the full sample case.

Granger Causality results

Note on Bivariate Granger Causality test

The general question for investigation in Granger Cusality test, or Vector Auto regression model, is whether a scalar y can help forecast another scalar x. if the answer is no then we can say that y does not Granger cause (or G cause) x. More generally, y fails to G cause x, if for all s>0, man squared error (MSE) of a forecast of x_{t+s} based on (x_t, x_{t-1},….) is the same as the MSE of a forecast of x_{t+s} that uses both (x_t, x_{t-1},…) and (y_t, y_{t-1},…). Hence if only the linear functions are used then y fails to G cause x if:

MSE(E(x_{t+s} given x_t, x_{t-1},….))= MSE(E(x_{t+s} given x_t, x_{t-1},…..y_t, y_{t-1}…….)).

Hence if the above equality holds then we can say that x is exogenous in the time series with respect to y. there is another expression of the same meaning, i.e. y is not linearly informative about the future x.

In the standard framework Granger (1969) meant that if any even x is caused by another event y, then it should precede the even t x. However as Hamilton notes (1994) that there can be serious limitations to the practical implementation of the original idea for aggregate time series data.

Econometric test for G causality

For econometric test of G causality we mean whether series y Granger causes series x. To implement this test we assume a particular autoregressive lag length p and estimate

$X_t=c_t+\sum\alpha_t x_{t-i}+\sum\beta_t y_{t-i}+u_t$

We estimate the equation by OLS. We then conduct the F test of the null hypothesis:

H_0: all β’s are =0, where the alternative hypothesis being at least one β is significantly different from 0. One way to implement this test is to measure the RSS or the sum squared of residuals from the above equation: RSS_1 =∑ESTIMATED u_t^2, and then compare the measure with the RSS from the univariate auto regression for X_t (with only lags of X), call it RSS_0 (this equation is also estimated by OLS).

If S_1 ={ (RSS_0-RSS_1)/p}/RSS_1/(t-2p-1) > 5% critical value for F(p, t-2p-1) distribution, then the null hypothesis is rejected, which means that Y does G cause X series. In the current thesis this is the test which has been utilized for inferring whether the lagged opacity variables do G cause the pay out variables, mainly the dividend pay outs by banking firms.

Hamilton (1994) further provides an asymptotic equivalent test which is measuring

S_2= t(RSS_0-RSS_1)/RSS_1 here we would reject the null hypothesis if S_2 is greater than the critical values of χ^2(p) variable[55].

Certainly as Hamilton () points out that the result for any G causality test is sensitive to the choice of lag length p, and also to the methods used to deal with the potential nonstationarity of

[55] Over years there have been a variety of G causality tests proposed, for reference, please see, Gweke, Meese and Dent (1983).

the series. In the current thesis lag length is chosen based on the standard literature (Kanas, 2013).

Lastly a brief pros and cons of using Granger causality measure can be examined as below:

1. There are multiple properties of Granger causality (GC) which makes it a good candidate for measuring causal effects. For example it follows symmetry properties (Barret and Barnett, 2013) which helps preserve the causality relation when there is a scale transformation of variables (Geweke, 1982; Hosoya, 1991; Barrettet al., 2010), the main advantage is that this measure helps to infer the predictive power which one or more X variables have for Y.

Vector autoregression

Granger causality Wald tests				
Equation Excluded	chi2	df	Prob > chi2	
spread dividendspersha~r	75.211	1	0.000	
spread ALL	75.211	1	0.000	
dividendspersha~r spread	52.628	1	0.000	
dividendspersha~r ALL	52.628	1	0.000	

Granger causality Wald	tests				
Equation	Excluded	chi2	df	Prob > chi2	
tangibility	dividendspersha~r	.35817	1	0.550	
tangibility	ALL	.35817	1	0.550	
dividendspersha~r	tangibility	7.2982	1	0.007	
dividendspersha~r	ALL	7.2982	1	0.007	

Granger causality Wald tests				
Equation Excluded	chi2	df	Prob > chi2	
intangibility dividendspersha~r	.23458	1	0.628	
intangibility	.23458	1	0.628	

ALL				
dividendspersha~r intangibility	3.7188	1	0.054	
dividendspersha~r ALL	3.7188	1	0.054	

Granger causality Wald tests				
Equation Excluded	chi2	df	Prob > chi2	
turnover dividendspersha~r	.15774	1	0.691	
turnover ALL	.15774	1	0.691	
dividendspersha~r turnover	.03817	1	0.845	
dividendspersha~r ALL	.03817	1	0.845	

Granger causality Wald tests				
Equation Excluded	chi2	df	Prob > chi2	
size dividendspersha~r	3.1617	1	0.075	
size ALL	3.1617	1	0.075	
dividendspersha~r size	45.948	1	0.000	
dividendspersha~r ALL	45.948	1	0.000	

<u>Summary of observations based on both the full sample and restricted sample analysis</u>

Bank specific characteristics are based on life cycle theory of firms (De Angelo and De Angelo, 2006) and standard literature on factors determining bank dividend pay outs, for example, by Rozef (1982), Brclay et al (1995), Diickens et al (2002) and others.

In the above table the three bank specific opacity variables are tangibility, spread and turnover measures as have been defined in the variables section. The lagged value of dividend pay out is found to be positively and significantly associated with the current dividend pay out level, and this result is consistent all through the regression models. This observation is critical since later when the dividend smoothing estimations are done lagged pay outs play a critical role for determining the speed of smoothing. Size is found to be positively associated with the dividend pay out levels.

There can be several explanation of the positive association of size with dividend pay outs. From the perspective of the life cycle theory as well as the agency conflict theory (Jensen, 1986) size can be considered as to be a proxy for maturity of firms, also for banks, hence such firms are expected to retain greater cash flow as relative to the younger firms, this can also be due to less investment opportunity present for such firms.

Hence such firms do face free cash flow problem, which is another form of agency conflict, which can be mitigated if the insider managers decide to pay out greater dividends. However there can be alternative explanation for banking firms, as mentioned earlier opacity level can also be related to size, where there are contradicting views, for example standard theoretical view is that greater size reflects greater diversification, more reputation hence less opaque.

However size can also reflect larger volume of opaque assets, or illiquid loans, which may increase the information asymmetry problem, and make banks more complex, such happenings can also make managers of larger banks pay out more dividends to signal quality.

There is another different view point altogether from the perspective of recent studies by Acharya et al (2011, 2014) where the authors have observed that large banks during the crisis periods have kept on paying smooth and large dividends in spite of the regulatory pressure of building up capital, which may signal risk shifting. Later risk shifting via dividend pay outs have been observed by multiple studies (Kanas, 2013, Duran and Vivas, 2015), however there is no clear consensus regarding the same. Later in the current thesis there will be more detailed investigation on dividend smoothing and risk shifting.

Tangibility measure has a significant negative causal relationship with the dividend pay out level as in the table. Such negative association can be supported by the signaling hypothesis, rather than alternative theories like pecking order (as has been explored in the introductory section of the thesis, i.e. both theories have completely opposing predictions regarding the impact of opacity on the dividend pay outs.

The standard signaling theory, for example, as in Miller and Rocks (1985), suggests that at the separating equilibrium level greater opacity simply would mean greater dividend signaling to solve the adverse selection problem.

Hence from this view point there should be a negative association between tangibility and dividend pay out. However the pecking order theory suggests that greater is the opacity level, greater will be the cost of external capital hence greater will be the underinvestment problem, hence managers are better off holding back or cutting back dividends for investing in more positive NPV projects. Such contradictory views however are not empirically investigated commonly. In the present case the signaling theory finds strong support.).

The impact of SPREAD, as defined in the variable section is not unambiguous. The standard theory of signaling holds that greater is the bid ask spread more opaque is the stock traded which should also further mean greater need for dividend pay outs to mitigate the adverse selection of equity capital.

It is well known that equity capital suffers from adverse selection problem (since Myers and Muzluf, 1984) which increase the equity cost of capital, and one effective way to reduce such cost is via costly dividend signaling. The result in the very table do show that there is a significant positive causal relationship flowing from spread to dividend pay out level which supports the signaling version again.

However there is intense debate among academics as to which component of bid ask spread measure should be used in reflecting opacity. The above measure is a standard bid ask spread measure, which can further be dissociated. However one critical point here is that such decomposition is required to measure the adverse selection between the shareholders themselves, namely, between the less informed and the better informed traders, such that there can be some adverse selection premium demanded by the less informed traders. In the current context the opacity mainly reflects the adverse selection between the insider managers and all of the outsider shareholders. Hence a general measure of spread is used.

There is a strong branch of literature (Barclay and Dunbar (1991), Skinner (1992), Lee et al. (1993), Neal and Wheatley(1998) among others) which has associated turnover with the adverse selection problem.

Hence the association between turnover and the dividend pay out can also be explained from the signaling theory perspective, and the above results do show a significant positive association between the variables.

Among the other bank specific control variables, the association between retained earnings to total asset mix and the dividend pay outs is again explained based on the signaling and agency theory. Greater retained earnings do mean less investment opportunities, or greater free cash flow problem, and therefore more dividend is paid to mitigate the agency cost.

The causality of the common equity to total asset ratio and the dividend pay outs is negative and significant at 10% level, this is consistent with the regulatory implications, mainly during the crisis period, where there was strong suggestions of capital build up. There have been early theoretical studies (for example by Stiglitz and Hellman, 2000) on the skin in the game theory, where the models have been constructed for estimating the level of equity capital which banks themselves should hold.

The above results show that there is a negative causality between pay outs and holding capital, which can be directly influenced by the deterioration of franchise values of banks during crisis. Debt to total asset ratio do have a negative causality with the dividend pay out but not significant. Myers (1984) in an alternative pecking order theory has suggested that there can be complex relationship between debt and dividend pay outs, and also that dividend are rigid over time, which further indicates some smoothing behaviour.

Here the results show that the causality between dividends and debt may not be significant, however the negative nature is according to established theories like pecking order. The traditional studies of bank dividend pay outs determinants have ignored the cost of funding factor, which is reflected in variables like interest expense to total asset ratio, however recently there have been some studies including such variables, for example Forti and Sciozer (2015) have used interest expenses as one of the bank level control variable. However the association found in the very study has been negative significant, which is according to the cost of funding hypothesis formulated by Kuoku (2012) who argues that greater is the funding cost greeter is the cost of paying dividends, hence greater expense should be negatively associated with the pay outs.

However in the above results its striking that this variable is positively associated with the dividend pay out level. Later in further investigations this association is explained. However it can be possible that such positive association means that even if the cost of funding was greater for banks the high dividend pay outs was kept over the sample period, which is in line with the dividend rigidity theory.

Overall the measure of G causality has significant for all the opacity measures, which in other words mean that there is a clear evidence of short term causality running from the opacity variables to the DPS or dividend pay outs, but not in the opposite direction. In terms of G causality this also indicates that relative to the other control variables the opacity variables have significant predictive power for future dividend pay outs.

RESULTS FROM TOBIT MODEL

(table in the appendix 3)
Table above of this section provides results for the TOBIT model, where the dependent variables are dividend per share, total cash dividend pay out in log terms, and the money value of share repurchases (as described in the variables section). The reason for including different types of pay outs is that the general literature on dividend signaling or pay out signaling holds that impact of firm specific factors on the level of signaling may be different for different types of signaling.

The probabilistic impacts of the bank specific characteristics on the dividend per share level is in line with recent studies like Forti and Schiozer (2015). However in the above table the main signaling hypothesis is investigated, which following the seminal theoretical models like of Miller and Rocks (1985), hypotheses' that greater information asymmetry level will generate greater dividend pay outs for solving or mitigating the adverse selection of equity capital. Again as observed in the last table the results are in contradiction to the prediction of the pecking order theory, which predicts the opposite of the signaling theory.

Here the first four columns provide the results for the probabilistic impacts of the explanatory and control variables on the dividend per share levels. The first impact is of the size variable, which is one period lagged value relative to the dividend pay out, and the positive significant impact shows that greater is the size of the bank higher is the probability of paying out. Since the coefficients are of a probabilistic estimation they can not be interpreted in the same way as that for the linear model estimations, but the significant p values (which is indicated by the *) can reveal information about the greater or lower probability of pay outs.

The impact of size is according to the earlier table, which can be explained by either agency theory, or signaling theory. There can be either free cash flow problem faced by large banks (which is a critical issue in the financial crisis period, since that is argued to generate excessive risk taking), or the larger size can also show greater opacity in case of banks due to larger opaque assets, which is a different argument than the non banking firms, where the standard diversification or the reputation capital argument would predict that greater size represents less opacity instead.

The second main explanatory variable is the one period lagged tangibility value which is found to have significant negative probabilistic impact on the dividend per share level. This is again in accordance with the earlier causality model which supports the standard signaling hypothesis rather than the alternative hypothesis of pecking order theory.

Aivazian et al (2006) in a comprehensive econometric study have shown that firms which have better bond ratings are also those which have greater transparency in asset quality, and such firms also do smooth their pay outs. Hence this analysis will be critical in later section where investigation is based in the pay out smoothing of the banks in the sample. In this section the result is in harmony with the prediction of signaling theory.

The crisis dummy, which has been explained in the variable section, interestingly has a significant negative probabilistic impact on the dividend per share level. This finding is accordance with the results of Forti and Schiozer (2015), and hence similar to their finding the above results show that banks in the sample have at an average reduced dividend pay outs due to the impact of crisis, which can again be supported by the regulatory pressure of cutting back dividends and raising more capital.

Such negative impact of crisis is further investigated in details in the subsequent sections, where dividend smoothing, and later on possibility of risk shifting via dividend pay outs and smoothing is investigated, since there has been some recent claims by Achraya et al (2014) that crisis period may have produced risk shifting incentives to the larger banks in specific, who have maintained large dividend pay outs. The current analysis investigates whether such behaviour can be observed in general or not. As of now the above results do not support the view of risk shifting via dividend pay outs, rather supports the signaling view developed by Forti and Schiozer(2015), and Kuoku (2012). However one way the current analysis extends the above mentioned study is by investigating the impact of bank specific variables on other types of pay outs, specifically share repurchases which may throw some interesting insights.

In the above table the probabilistic impacts of the turnover lag and the spread lag remains positive and significant, which is consistent with the last VAR results which further provides support to the signaling story to mitigate adverse selection problem.

Among the bank specific control variables retained earnings, and one measure of default risk, namely non per performing assets to total asset ratio are found to have significant probabilistic impacts on the dividend per share levels.

The nature of impact of retained earnings is in line with the free cash flow theory (Jensen, 1986) and is also according to the general studies like by De Angelo et al (2006), where the banks with greater retained cash flow have found optimal to distribute larger dividends, which can also be considered as a signal for mitigating agency conflict.

The negative significant impact of the default risk measure on dividend pay outs is again in line with the recent study by Forti and Schiozer (2015), where banks with greater default risk level have found it optimal to cut back dividends, which may also be supported by the regulatory pressure of capital building or skin in the game approach.

Again this results are in line with recent studies and contradictory to the claim of Acharya et al (2014) that dividend s are used to expropriate the debt holders.

Overall the impacts on the dividend pay outs reveal the signaling behaviour of the banks to the debt holders in general. In the above table (TOBIT outputs) results the impact of the bank specific variables along with the opacity levels support the results for the dividend pay out per share level (which is the total dividend comprising stock, and cash dividend divided by the no of shares out standing). There is a strong evidence that both industrial firms and banks have increased dividend pay outs over years till the last financial crisis (Floyd et al, 2015). However the empirical studies argue that the reasons for increase in the pay out decisions are different in both cases. For the industrial firms the increase in dividend pay outs are also simultaneous with the increase in share repurchases, which is also evident in banks, as also in the current thesis.

However standard literature suggests that for the non banking industrial firms it is the free cash flow problem which stands out as the main reason for increasing dividend pays among the large firms (De Angelo et al, 2008). Again dividend increase in these firms are also consistent with the managerial reluctance to cut back dividends, which is again consistent with the dividend smoothing literature of Lintner (1956) to Brav et al (2005). However as Floyd et al (2015) observes the nature of signaling for banks dividend is fundamentally different from the industrial firms'.

The authors are in view that banks dividend signaling is more to convey future financial strength of the banks. This can be compared to the concept of value signaling as in the original signaling literature (for example in Miller and Rocks, 1985). The above results do support the original signaling theory as relative to the pecking order theory, or agency cost theory, though it is also clarified from the above results that the life cycle control variables also do have significant impacts on dividend pay outs.

The last four columns of the table above provides results for the impact of bank speciifc caharacterisctics on the share repurchases. Grullon et al (2002) have proposed the substitution hypothesis. According to this widely cited study there has been an increasing tendency to use funds otherwise used for dividends for share repurchases. This trend is increasing for the USA based firms in general.

Even more recent studies, for example, Andriosopolous et al (2013) have found that share repurchases have increased over the last 30 years along with the reluctance to cut back dividends. There are interesting theoretical as well as empirical observations on the substitutability between the dividend payments and the share repurchases.

Most of the early theoretical models, for example, by Bhatttacharya (1979) or Miller and Rocks (1985) have argued that these two pay out forms are perfect substitutes, since the source of transaction costs in these models are not associated with the choice between these pay outs. In Bhattacharya (1979) the source of cost associated with signaling is raising new capital, once a stable dividend pay out is committed by the manager.

However there is arguments on whether share repurchases can constitute signaling equilibrium, which separates good firms with future financial prospects from the bad firms with less financial prospects. Studies on substitution hypothesis have mentioned that since dividends attract institutional investors more than the share repurchases, undervalued firms signal via dividend pay outs rather than buy backs and that may create separating equilibrium.

Hence according to these studies there is no perfect substitutability between share repurchases and dividends. However its is also important to explain why then there is a simultaneous rise in buy backs along with dividend pay outs by industrial firms as well as banks. In the current thesis a comparative study of signaling content of these pay outs by banking firms is presented. Share repurchases by bank holding companies have increased drastically over the last few decade, and importantly over the last financial crisis (Floyd et al, 2015). Rather authors (Floyd et al, 2015) have been surprised by observing dividend rigidity among banks along with the rise in repurchases, since repurchases have greater flexibility, tax advantages and related benefits (Guay and Harford, 2008, Skinner, 2008).

There is some disagreement among the authors on whether share repurchases can be considered as costly signaling, since there is no ongoing commitment for share buy backs (Floyd et al, 2015) there is a view that they cannot be consistently used as signals.

However as shown in the current thesis, as well as recent studies, there is a persistency among the banks to maintain share repurchases along with dividend pay outs over considerable period of time. Hence it can be argued that share repurchases also do act as signals, and convey some important information to the information sensitive investors.

Baker and Wurgler (2012) have argued that changes in dividend per share is easy to observe, however it is difficult to gauge the magnitude of share repurchases[56].

In the current study the finding on bank share repurchases is compatible to the findings of Floyd et al (2015) which is that there has been a consistent and adjacent increase of share repurchases along with the rigidity of dividend pay outs by banks. However in the above mentioned study there is no investigation of information content of share repurchases along with that of the dividend pay outs by banks. The above table provides some of the information content of share repurchases which is supplemented by later results.

The lag value of size has the similar positive and significant impact on repurchases as on the dividend pay outs, which means that greater is the lag value of bank size higher is the probability of the banks to repurchase. Such result is consistent with the studies of Jgannath and Stephens (2002), and Andriosopoluous et al (2013) who have observed that the buyback programs are completed mostly by the larger firms. The last paper has also found that share buyback is positively associated with information disclosure for the firms in general.

In keeping with the finding that information disclosure and buy backs are positively associated the above results show that share buy backs are also impacted in the similar way by opacity levels (tangibility, spread and turnover measures) as the pay outs. These results suggest that buy

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[56] There can be other difficulties in share repurchases, for example as observed by Ikenberry and Vermaelen (1995) that per share amount of repurchases is not reported, amounts paid out are not tied to specific periods, and in some cases after the repurchases are announced the action is carried out over few years' time.

backs can also be used by banks to signal financial strength of banks (Floyd et al, 2015), or as according to the signaling theory, mitigate adverse selection problems.

Specifically the study by Floyd et al (2015) finds that any pay out strategy by banks, whether dividend pay outs or buy backs can be related to signaling of future financial strength. The above results supports the view. However more bank specific results are reported in later tables.

Among the other bank specific control variables retained earnings has a strong negative probabilistic impact on the buy backs, which is expected since one reason for buy backs is to build up own capital by banks. The impact of profitability, as reflected in the EPS measure is also as expected in theory, i.e. less profitable firms go for more share buy backs. This also relates to the standard literature that undervalued firms prefer to go for buy backs more than the overvalued firms which may impact their equity prices positively.

Another striking result is the impact of lag nonperforming asset ratio on buy backs which is significantly positive, as compared to significantly negative on dividend pay outs. However this is also supported by the argument that if the default risk level increases for banks then there is incentive for the managers to cut back dividends and increase own capital, which can be again accomplished through increasing buy backs.

Overall the last two tables do suggest that there is enough evidence at the firm level to suggest that both pay outs and share buy backs can be used as signals for financial strength, or mitigation of adverse selection. However there are important differences between the respective signals too.

The first two tables in the current section has demonstrated that dividend pay outs as well as share repurchases by banks can be considered as costly signaling, which is based on general value signaling concept of the signaling theory (Bhattacharya, 1977, Miller and Rocks, 1985 and others).

However it is extremely critical to recognize that banking firms are different than the non-banking firms, and such differences are based on the specific features of banking which is absent among the industrial firms. There is a strong and sound literature which posits banks differently than non-banks (Berger et al, 1995, Calomiris and Wilson, 2004,Diamond and Dygvig , 1983, Kashayap et al, 2002, Laven, 2013). The main differences emerge from the fact that banks create liquidity by taking more liquid deposits as relative to the opaque and illiquid assets created as loans, hence they are highly leveraged and rely heavily on depositors for short term financing.

For high opacity it is very hard for the outsider investors to assess the quality and value of assets. Hence as recent studies like Forti and Schiozer (2015) suggest that banks do have responsibilities towards information sensitive creditors for maintaining confidence, where the dividends can act as costly signals for solvency. Again if the confidence of the creditors break down then the funding model of banking will also collapse which may lead to runs and various other costs of distress.

Hence dividend signaling by banks also reveals inherent fragility of banks (Floyd et al, 2015, Acharya et al, 2011). It is also true that banks are a more homogenous group than industrial firms, hence are vulnerable to more common shocks, such features also make dividends worthy signals to market in general.

Keeping these distinctions of banking firms in mind it is critical that information content of bank pay outs is investigated in more specificity, which is attempted in the table 3 of this section. Specifically probabilistic impact of bank specific levels of leverage, credit growth, capital adequacy, loan risk, are studied on the dividend pay outs and share repurchases. This analysis is an extension of standard analysis as posed by Forti and Schiozer (2015).

The following table provides results for further information content of signals, namely, dividend per share, share repurchase, cash dividends, and total dividend pay outs including cash and stock (as described in the data and variables section). The bank specific explanatory, or information content, variables are (following Forti and Schiozer, 2015), leverage, credit growth, capital adequacy ratio, and loan or credit risk (as described in data and variables section). Size dummy is a control for large banks (Forti and Schiozer, 2015, Oliviera, et al 2014). The estimation technique is TOBIT regression as explained earlier. Significance levels of the variables are represented by ***, **, and*.

	(1) DPS	(2) Share repurchase	(3) Cash dividend	(4) Total dividend
No. of observations	**3943**	**3943**	**3943**	**3943**
SIZE DUMMY	**0.073*** **	**1.90*** **	**1.23*** **	**1.18*** **
LEVERAGE LAG	**-0.012** **	**-0.02** **	**-0.005* **	**-.0001**
CISIS	**-0.03*** **	**-.324** **	**-0.270** **	**-.247** **
CREDIT GRTH	**-0.014* **	**0.041** **	**-0.016* **	**0.007**
LOAN RISK	**-0.02** **	**0.130** **	**-.022* **	**-0.004**
CAPITAL ADQCY	**-0.008* **	**-7.02*** **	**-.170**	**-0.245**
EPS LAG	**0.001**	**-.309*** **	**0.0013**	**0.001**
Prob > chi2	**0.000**	**0.000**	**0.000**	**0.000**
Time dummy	**yes**	**yes**	**yes**	**yes**

Table above of the current section provides results for the significance and nature of probabilistic impact of further bank characteristics on pay outs and buy backs, these bank characteristics reflect the financial strength or the solvency of the banks. Capital adequacy ratio is found to have a negative significant impact on the payouts for all the measures of pay outs. This is in line with the results by Forti and Schiozer (2015), and recent theoretical models for example by Kouku (2012). Such impact shows that banks which are highly capitalized have less necessity to signal via dividends, as well as they have less need to buy back for building up further capital.

Which also means that capital constrained banks need to signal to the creditors about future ability to generate cash, which can be accomplished by paying out dividends, since according to signaling theory only those banks will be able to remain committed to dividends which have higher cash flows in future. In the later sections the impact of capital adequacy on smoothing or adjustment speed is also investigated such that the signaling theory over time is supported.

Loan risk has significant negative probabilistic impact on the dividend pay outs, which is again in line with the recent studies, and which means that greater is the risk of loan portfolio lower is the probability of paying dividends. This result is again in line with the regulatory need to build up capital if the probability of default is higher. The same result also mean that the lower risk of loan probability can be signaled by larger dividend pay outs. This result is compatible with the banking literature in general. However here it is also found that the loan risk level has a positive impact on the share repurchases, which means that banks have used share repurchases as an efficient tool to build up capital cushion.

The consistent negative impact of the crisis dummy on all pay out forms across all the above tables refutes the cash out hypothesis, which holds that for high distressed banks there is a clear risk shifting via dividend pay outs which transfers cash or wealth from the depositors to the shareholder groups, as developed by Acharya et al (2014). One possible explanation can be that in Acharya et al (2014) mainly large too big to fail banks which were severely distressed were considered, however as the current analysis shows that such cash out behavior may not be true for banks in general.

Dickens et al (2002), Forti and Schiozer (2015) among others have used credit growth for banks as the proxy for investment opportunities. Consistent with their findings the current results also show a negative significant impact of investment opportunities on pay outs. However there is certainly differences between the investment opportunities to a bank than to an industrial firm, for banks investments mainly refer to the loans made, however there can be investments in securities also, which can be accomplished by holding back dividends. Supporting the argument it is also found that the credit growth has a significant positive impact on the share repurchases.

The positive significant impact of size is consistent with the earlier tables, and this is also supported by the standard studies, as by Mayne (1980), Dickens et al (2002), Martins and Novaes (2012) among others who have also investigated on the US firms. Again this finding can be supported by signaling or agency theory as explained earlier. Size also do have positive and significant impact on the share repurchases, which indicates that it is the larger banks which go for the share repurchases more, and this result is also consistent with the banking literature. Some more TOBIT outputs with dummy variables has been reported in the appendix.

2.5.1 Pay outs during the crisis period: structural shifts results

The below tables provides some insightful results on the structural shifts of the dividend pay outs and share repurchases of the bank holding companies from a subsample of the whole data set.

VARIABLE	OBS	MEAN	STD.ERROR	STD.DEV
Dividends per share for total sample	3943	0.1356	.1727	.130
Dividends per share before crisis	3943	0.1355	.173	.130

H_0: MEAN (dividends full sample) - MEAN (dividends before crisis) = 0

H_a: difference of means < 0

Pr(T<t) = 0.5000 t = 0.000

VARIABLE	OBS	MEAN	STD.ERROR	STD.DEV
Dividends per share for full sample	3943	0.1356	.0027	.1727
Dividends per share during the crisis	3943	5.0376	0.0642	4.035

H_0: MEAN (dividends full sample) - MEAN (dividends during crisis) = 0

Ha: difference of means < 0

Pr(T<t) = 0.0000 t = -76.2090

VARIABLE	OBS	MEAN	STD.ERROR	STD.DEV
Dividends per share before crisis	3943	0.1356	.0027	.1727
Dividends per share during the crisis	3943	5.0376	0.0642	4.035

H_0: MEAN (dividends full sample) - MEAN (dividends during crisis) = 0

Ha: difference of means < 0

Pr(T<t) = 0.0000   t = -76.20

VARIABLE	OBS	MEAN	STD.ERROR	STD.DEV
Share repurchases for the total sample	3505	5.8027	.0640	3.792
Share repurchase during the crisis	438	5.7635	0.151	3.173

H_0: MEAN (share repurchase full sample) - MEAN (share repurchases during crisis) = 0

Ha: difference of means < 0

Pr(T<t) = 0.581 t = 0.2073

VARIABLE	OBS	MEAN	STD.ERROR	STD.DEV
SOA before crisis	2316	0.2777	0.0037	0.1814
SOA during crisis	821	0.3054	0.0070	0.2028

H_0: MEAN (SOA before) - MEAN (SOA during crisis) = 0

Ha: difference of means < 0

Pr(T<t) = 0.0001 t = -3.7027

Already there has been a good amount of attention in the banking literature on the changes in the patterns of pay outs by the baking firms during the crisis period, as mentioned earlier in the current thesis. The current thesis findings are captured in the above two tables, as regards to the dividend pay outs (in per share terms) and the volume of total share repurchases, during crisis, before crisis and or the whole sample period.

The first table shows that dividend pay outs have been very persistent for the whole period, since the same no of bank holding companies have maintained dividend pay outs before and during the crisis as also for the whole period of the sample. However there are significant differences between the mean dividend level before and during the crisis period, where the latter has been significantly higher.

The significant difference can be explained from the perspective of signaling via dividends, since the banks would like to maintain reputation via increasing dividends to signal future profitability during the crisis period.

Certainly there are alternative or opposing views, and one of them being the risk transferring or risk shifting via dividends. The very possibility is studied in later parts of the current thesis.

In case of share repurchases though the finding is quite striking. Since the second table above shows that there have been a significant increase in repurchases volume during the crisis as compared to before and over all sample period, but along with this its also true that no of bank holding companies doing share repurchases have significantly dropped during the crisis. Which also means that those banking firms which have done repurchase in the crisis period have drastically increased the volume of repurchases.

Till now there is less understanding in the current literature as to why share repurchase may be worth while for firms value, and how the trend of repurchases compare vis a vi that of dividend pay outs. There is a strand of literature as mentioned else where in the thesis, the so called substitution hypothesis which maintains that since share repurchases are not required to be committed to by the managers, unlike dividends, they are not costly signals, hence are not perfect substitutes of dividends.

However the above structural shift results do raise doubt on such theoretical propositions, which further calls for the detailed analysis of share repurchases by banks. As already shown in the current section that there are strong signaling content of this type of pay out further analysis is called for, which is carried out in subsequent sections/ chapters.

2.6 Conclusion

The following paragraphs summarise the main findings and contributions for the current section.

2.6.1*Problems with bank dividend signaling studies*

As the first section of this thesis has observed there are both theoretical as well as empirical studies on the dividend signaling theory for the industrial firms, but rare studies on the banking firms. The studies on the banking firms have either been motivated by the similar empirical studies on non financial firms, or there have been some more bank specific studies quite recently (Forti and Schiozer, 2015, Floyd etal, 2015, Onali 2013, Olivier etal, 2015, Hong etal, 2016 and others).

There are only a few theoretical models on dividend signaling by banks (Kuakwo, 2012) which too have been an extension or application of the standard Neoclassical models only. Hence there are gaps in the theoretical literature, for example in case of banks what do the dividends signal? Since there are many agents and principal groups involved in banking (for example shareholders, creditors, borrowers, regulators, society at large) signaling studies should be investigated from different bank specific variables.

Hence the current section has investigated the impact and causality between bank dividend pay outs and various bank specific explanatory factors, for example, opacity levels, default risk levels, capital adequacy levels, loan risk levels, along with standard life cycle control variables which capture the impact of agency cost on the signaling level.

The expectation from the results obtained is that further comprehensive signaling model can be based on the empirical results obtained here. Hence an inductive method of model building is used in the section rather than simple extension of earlier general econometric studies.

2.6.2 Competing underlying theories

The current section has also discussed the underlying theories based on which dividend signaling should be investigated, since unlike industrial firms there are more complex incentives for pay out decisions in general. The first such theory is obviously the adverse selection theory, which as per the standard Neoclassical literature, generates dividend signaling. However this does not mean, as seen in the analysis, that only information asymmetry measures have impact on signaling levels/ pay out levels. Causal relation between opacity variables and pay out levels do support value signaling theory, but there are many other bank specific variables which are critical in this respect.

For banking the phenomena of moral hazards, or risk shifting, or cash outs can occur. There is a strong case to investigate whether such factors do impact the pay out levels, since if they do then it may be in conflict with the standard value signaling theory. The current study has investigated on the very line and have not found any significant evidence of such issues[57].

As observed, other competing theories of pay outs are pecking order theory and agency cost theories. The current section has incorporated possible impacts from such theories also, and has found agency cost impacting the dividend pay out levels, but no evidence of pecking order theory is found[58].

2.6.3 *Different types of pay outs*

In most of the standard studies dividend per share, or different pay out ratios are used as the main dependent variables. However in the current study different dependent variables are used for robustness check, as well as to test whether signaling can be done through other pay outs also, namely, stock repurchases, stock dividends, cash dividends, total dividends, and total pay outs. Some recent studies have started using such comprehensive measures, mainly for

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[57] However in the last chapter some more detailed analysis is presented which may indicate some possible channels through which some specific type of risk shifting take place.

[58] Hence overall agency theory, signaling theory and life cycle theory holds in the current analysis.

banking firms. More specifically there is a substitution hypothesis in the banking literature which suggests that repurchases can also act as signals. However where the earlier studies have not found any substantial evidence for this, the current section demonstrates that share repurchases by banks do act as significant signals.

CHAPTER 3

Investigation of factors determining bank specific smoothing and the signaling content of smoothing

3.1 Abstract

Dynamic behavior of dividends, or dividend smoothing, has been investigated for non-financial firms on cross country basis. There is significant evidence for opacity levels, and life cycle factors as determinants of dividend target levels as well as impacting the speed of adjustments at from level. However there is relatively very rare investigation on banking firms. In the current paper authors provide first of its kind evidence for impact of bank specific opacity measures (along with bank specific lifecycle or control variables) on both the bank specific targets as well as specific speeds of adjustment.

In the earlier signaling or smoothing studies such firm level heterogeneity is missing in most of the cases. Another contribution of the paper is that it provides first evidence for partial adjustment of a more comprehensive pay out policy for banks, including cash dividends, stock dividends and share repurchases. The current paper uses a modified three step partial adjustment model and investigates all listed banking firms as in COMPUSTAT and CRSP data bases, for the period 1990-2015[59].

Main results from the partial adjustment model, and various subsample analysis lends support to underlying theories, namely, signaling based on information asymmetry hypothesis, and agency cost theory. Specifically banks with higher opacity, and, or greater agency costs sets higher pay out targets, and also adjust dividends relatively slowly[60].

[59] Modified here means a three step partial adjustment model rather than one step model where only average speed of adjustment can be measured.

[60] This slowness in the adjustment process can be related to dynamic signaling, for example as in studies by Leary et al (2011).

3.2 Dividend smoothing literature

3.2.1 Introduction

The current section builds upon the dividend, and other pay outs, namely, share repurchases and various forms of dividend payout signaling and information content of such signaling by banking firms as developed in the last section. The current section investigates the dynamic dividend and pay out behaviors of banking firms in general. Specifically what is the nature and significance of impact of bank specific opacity levels on the partial adjustment of such pay outs, and also what are the information content of such dynamic adjustments in the line of the last section.

Dynamic dividend behavior is no a new academic area, since Lintner (1956) to more recent investigations by Flaannery and Rangan (2006, 2008) there are umpteen numbers of empirical or econometric analysis on so called smoothing of dividends (or alternatively of closely related area of capital structure smoothing). [61]

The definition of smoothing is clarified by Leary et al (2011) which is that greater smoothing means slower adjustment of pay outs towards the target. Hence the main purpose of such empirical analyses has been to measure the speed of adjustments. However the traditional models of dividend smoothing, or smoothing in general have not been able to estimate heterogynous or firm specific adjustment speeds which may vary over time also. Most of the studies estimate average speeds of smoothing across industries, which has little information about the firm specific dynamic behaviors. Another obvious gap in the literature is that there is rare analysis of factors determining heterogynous bank behaviors in this regard. Again as explained in the last section there

[61] The basic idea as captured well in Leary et al (2011) is that every firm has some target pay out levels which managers try to adjust to every period based on certain constraints, such targets are again based on some idiosyncratic characteristics of firms, which cover most of the life cycle variables as explained earlier.

are many bank specific characteristics which are different from the non-financial characteristics, which also make dividend signaling by banks different than the non-banking firms[62].

Based on these gaps, the current section builds upon the very recent works of Oliver et al (), and Xiang et al (2015)[63], and constructs a modified partial adjustment model which for the first time is employed in investigating the bank specific adjustments of pay outs which varies over time. A comprehensive analysis of impact of different bank specific characteristics along with opacity levels on speed of adjustments is provided in the current section.

Though the analysis presented in the current section is econometric, there are obvious theoretical bases upon which the rationale of the analysis is established. Hence briefly a theoretical background of dividend smoothing in general is provided below.

3.2.2 General theoretical studies on dividend smoothing

Though the empirical patterns of dividends across firms is well documented there are challenges in theorizing dividend pay outs, mainly, dynamic dividend behaviors based on corporate decision making. The common approach has been to model dividends as residual after investment (Feldstien and Green 1983, John and Kalay 1985, Lambrecht and Myres 2015), however the empirical studies again have shown that dividends are smoothed relative to stochastic earnings, cash flows, and share prices, and dividends are also smoothed across time (Fama and Baibak, 1968, Allen and Michaely 2002, Leary and Michaely 2011). Empirical studies have also shown that: 1) dividends generate positive abnormal returns (Aharnoy and Swary (1980) 2) firms raise new capital while paying out dividends (Loderer and Mauer 1992) 3) recipients of dividends also reinvest a larger portion 4) and obviously dividend pay outs are influenced by the firm specific investment opportunity sets (Smith and

[62] Such variables appear in the analysis as control variables as earlier.
[63] Working paper on the capital adjustments by the Chinese BHCs.

Watts 1992). Hence as has been investigated in the first section too, if all these observations are combined it is clarified that dividends have information contents.[64] Recently it has been theorised that on a dynamic setting dividends can be used as signals which can solve adverse selection and or moral hazard problems. Such studies do establish that dividend smoothing can also be treated as signaling, which is critical for the current investigation since in the current thesis not only heterogynous speeds of adjustments will be estimated but also the information content of such adjustments will be analyzed[65].

Till now the incentives behind dividend smoothing is not fully understood by theoreticians, but decades of study has generated some probable incentives for managers to practice smoothing, 1) smoothing of dividends may improve credit rating (Aivazian et al, 2006), 2) dividend smoothing may attract large institutional investors (Aleen et al, 2000) 3) dividend smoothing may create firm specific investor clientele (Baker et al, 2007), 4) dividend smoothing may also mitigate signaling costs (Guttman et al, 2010), 5) dividend smoothing may also reduce the managerial consequences of bad performance (Fundenberg and Tirole , 1995), and 5) may also optimize managerial rent seeking (Lambrecht and Myers, 2015)[66]. Hence one common factor which runs through all such studies is the agency conflict problem between insider manager and the outsider shareholder, which is again based on adverse selection and or moral hazard. There is little doubt that such agency related problems is much more complex in case of banking, since there are many combination of principals and agents involved, however till now there is no specific theoretical model on bank dividend smoothing.

Empirical studies have also emphasized the same point, for example Lakin et al (2014) have found it difficult to establish that there is a positive association between firm value and smoothing. However Leary and Michaely (2011) have comprehensively shown that

[64] An early study, Bergheim and Wantz (1995) concluded that dividends are Spencian signal of firm value. More recent studies, for example, by Leary and Roberts (2014) have shown that determinants of dividends are far more complex than in the typical empirical studies.

[65] Here lies the importance of various bank specific variables along with the main opacity variables.

[66] Managerial rent seeking an also be viewed as risk shifting, since this also goes with the high risk taking in favor of the share holders-owner group at the expense of the other creditor groups.

determinants of smoothing are based on agency conflicts for example free cash flow problems as in Easterbrook (1984), Jensen (1986), and De Angelo and De Angelo (2007), later Knyazeva and Knyazeva (2014) have provided evidence that smoothing may also arise to mitigate governance problem. One interesting observation is that all these explanations are related to information asymmetry problems, for example monitoring problem in the last study mentioned.

There have been some earlier theoretical models which have incorporated information asymmetry problems more directly. Kang and Kumar (1990), Kumar and Spatt (1987), Kumar (1988) have shown that in a multi period setting dividend smoothing can be generated from the 'coarse' signaling properties of the models[67].

The concept of coarse signaling is related to the information problem that the higher quality firms cannot distinguish themselves until quality increases discretely. Hence qualities which are close to each other pay same level of dividends, which results in dividend smoothing relative to firm qualities. In the model of Kumar and Spatt (1987) dividend smoothing arises from the relationship between dividends and managers consumption needs[68]. One important point to note is that in Modigliani – Miller theorems based on perfect capital market there is no such link between dividend pay outs and managerial consumption, hence there is also no incentive to smooth from such perspective. Robe (1994) further developed a smoothing model as an extension on the seminal dividend signaling model by Miller and Rocks (1985). Hence these models do show that smoothing can be directly generated from a more static signaling model when intertemporal[69] allocations are considered.

There are many examples of such extensions, for example, John and Nachman (1987),

[67] Hence as an empirical extension to such theoretical multi-period model we have here a dynamic adjustment model based on changing quarterly data.
[68] Here one of the roles played by the bank specific variables like credit risk level or default risk level is also related to the quality of underlying assets, mainly the loan portfolios.
[69] Which in this case means that the insider managers would choose to adjust the reinvestment amount from the free cash flow over periods.

Juster (1994) and others have extended the static models of John and Williams and Myer and Mazluf (1984) respectively, and derived intertemporal signaling (which is the theoretical version of partial adjustment) equilibria which are based on costly dividend pay outs.

There are some more explicit models, for example, Dybvig and Zender (1991), where the dividend smoothing has been suggested as the solution of adverse selection problem, in these models the managerial incentives are endogenised.

There is a distinct strand of literature which suggests dividend smoothing as a solution to the agency conflict problems. Fluck (1998, 1999), Myers (2000), Lambrecht and Myers (2008) among others have laid down the foundation of theoretical agency models of dividend pay outs. For example Lambracht and Myres (2012) suggests that dividend smoothing may prevent shareholders from taking action against managerial rent seeking.

Here the main objective of the managers is to maximise manager's utility, as opposed to typical neoclassical theory of shareholders utility maximisation, which then generates risk aversion, and habit formations among managers. Again habit formations in particular motivates the managers to initiate dividend smoothing (such a suggestion has been provided by Fundenberg and Tirole (1995) who proposed that smoothing is based on maximising a concave managerial utility function). In recent models too smoothing is generated from endogenous objective functions.

Dividend smoothing can also be generated from maintaining of optimal managerial incentives. Chang (1993), Fundenberg and Tirole (1995) among others have established dividend smoothing models based on such considerations. For example in Chang (1993) managers can extract direct utility from over spending the retained earnings, hence to prevent managers from overspending smoothing of dividends can be linked to pay outs. Overall there is some overspending in the model, but dividends are smoothed with relative to the cash flows. Hence the last model shows that retained earnings, which is also a life cycle variable as explained in the first section of this thesis, can play a critical role in smoothing.

There can be dividend smoothing relative to share prices (Shiller, 1981), which actually reflects the residual cash flow. If value increases of share prices then the incentive for managerial perquisites decreases. Hence the increase in sensitivity of share price to value realization is simultaneous with the sensitivity of dividend decreases.

There can be incentive for dividend smoothing when investment and external capital requirements are introduced. In these studies (as suggested by Loderer and Mauer, 1992) there is a strict requirement for the firms to maintain contemporaneous dividend pay outs even when the firms are constrained to raise external capital for investments, and such behaviours do generate dividend smoothing[70].

Again firms whose stocks are known to be undervalued always have an incentive to signal their profitability through the increase of dividends. However to make the signal credible firms usually need to smooth dividends if and only they can maintain increased earnings (Guttman et al, 2010). Its standard to think that due to adverse selection cost of equity capital in the capital markets the over all cost of external capital increases, and therefore there is a strong incentive for the managers to hoard large free cash flow. In general this cash flow requirement makes the managers constrained from increasing dividends during the periods of good performances.

Based on such considerations Gugler (2003) shows that speed of dividend adjustment is associated with the information asymmetry and agency conflict.

To summarize the general studies the following strands can be specified, one, information asymmetry based models which suggests dividend smoothing as costly signals to solve adverse selection, and or moral hazard problems in a dynamic setting,

[70] In the current thesis the inclusion of share repurchase data is also based on the external capital market need.

two, pure agency based models which uses managerial incentives like rent seeking to generate dividend smoothing (here also an argument can be provided that such agency conflicts are also based on information asymmetry problem ultimately), and three, incentive based models where external financing needs along with maintaining dividend pay outs is present.

3.2.3 Empirical literature of dividend smoothing

In a frictionless capital market scenario firms would always maintain their target pay out ratios, however as author (Oliver et al, 2015) observe that in presence of various frictions (information asymmetry, or opacity level being one such) there is a trade off faced by the firms, i.e. if the adjustment costs are significant then whether to adjust towards the target pay out level or to keep operating at a sub optimal level (Flannery and Rangan, 2006). For banking firms such study has been done of late where the adjustment process studied is for leverage, however, no such study has been undertaken for dividend pay outs.

Empirical literature (Leary & Michaely, 2011) shows that dividends paid by firms are not stochastic but follow smoothing. Managers first decide whether to set a new target for dividend pay-out, which might be measured in terms of per share, and then partially adjust to the target level. Leary & Michaely (2011) argue that insider managers first decide whether its cost effective to shift from the existing dividend policy and then only set a new target. However, researchers do not agree on the factors impacting the decision of a firm to smooth dividends. Till date there have been many theoretical models formulated to rationalise dividend smoothing behaviour, they can be clubbed as information asymmetry theories(Kumar, 1988, Kumar &Lee, 2001,Brenman & Thakor,1990 Guttman etal, 2010), agency cost theories(Fndenberg &Tirole,1995, DeMarzo & Sannikov, 2008, DeMarzo et al,2006), and external capital constraints theories(Almedia etal, 2004, Bates etal, 2009). Another critical point to observe is though the possible explanations are drawn from diverse theories all of them have opacity as the central cause.

Impact of agency conflict- Specifically the agency cost associated with free cash flow problem is explored. Here in general greater is the free cash flow problem; greater is the propensity of the firms to signal dividends[71].

Impact of external financing constraints: This strand holds that for those firms who faces high cost of external capital, they sigh away from increasing dividends, rather they set low dividend targets and smooth out. Again related studies for banking firms are rare to cite. Firms which are at the growth phase and also face higher cost of external capital set low dividend targets, and then signal whereas Firms which are matured, and have greater agency conflict due to free cash flow problem set higher targets, and smooth out. However as already observed these problems can generate from the fundamental problem of high degree of information asymmetry[72].

The previous section explored the impact of opacity on dividend pay outs by banks, and investigated the same from the perspectives of signaling and smoothing hypotheses, however there is a diverse literature on various kinds of pay out smoothing by firms where dividend smoothing is also one sub group. Again there are many underlying theoretical perspectives on the cause of partial adjustment or smoothing.

The current section extends the earlier section mainly in two directions, one, here the emphasis is on bank specific factors including bank specific opacity levels on bank specific speeds of adjustments which certainly calls for various sub sample investigations which is duly reported, and two, along with dividend smoothing other pay out variables, namely, total dividend payout which includes both cash and stock dividends, and total payout

[71] Critical point to note is that the problem generates from the inability of the outside shareholders to monitor efficiently the insider managers which is a direct consequence of opacity level. However, for banks the degree of complexity is more, since many parties are involved, like insiders, depositors, investors, borrowers, regulators, and society at large (due to externality issues).

[72] Recently Onali (2009) has analysed the impact of life cycle factors on dividend pay outs by banking firms. In the studies mentioned in the table dividend signaling is used in the form of smoothing out dividends, hence these studies have analysed the impact of opacity, and other lifecycle factors on the intensity of smoothing by the firms.

variable, which includes share repurchase data, have also been investigated.

This section then is a more elaborate study of smoothing, where there are scopes of investigating multiple theoretical implications[73].

Specifically, the current section based on both univariate and dynamic panel data analysis of bank holding companies pay out policies (as obtained from COMPUSTAT and CRSP merged data base which has been explained earlier) have observed the following results:

1. When the sample is split across the median values of bank specific opacity levels, namely, across median values of size, tangibility, turn over, and spread, it is found that the bank specific adjustment speeds (related to dividend per share, total dividend pay outs, and total pay outs as defined earlier) differ significantly with the opacity levels(at 1% level), which lends support to the earlier section where average speed of smoothing was found to be impacted significantly by average opacity level across the sample.
2. Continuing with this univariate analysis, it is also found that specific target levels set by specific banks are also impacted significantly by the opacity levels, and the differences in the target levels for the banks above and below the median levels of opacity measures (tangibility, spread, size and turnover) is significant (at 1% level), specifically, banks with greater than median size has higher targets than the other half, and the difference is significant, banks with greater than median tangibility has lower targets , difference being significant, banks with higher than median spread has higher targets, and banks with higher than median turnover has lower targets, all differences are significant at 1% level. Hence such univariate subsample analysis also lends support to the signaling theory/ hypothesis, however other factors for example agency theory, life cycle theory, and managerial behavioral perspectives are also implied which are discussed in details later. The dynamic partial adjustment model has been improved in this section by introducing

[73] Again to the best of the knowledge of the author the current thesis is first of its kind in providing detailed investigations on the similar line for the banking firms. In the current section the standard convention is adapted based on Leary and Michely (2011) which holds that greater smoothing implies lower adjustment speeds. Hence the interpretations of results will be based on the very convention.

both bank specific and exogenous variables, and then a three step estimation has been carried out where the impact of bank specific opacity levels on the target pay out levels are being analyzed.

3.2.4 Implication of dividend smoothing: Various perspectives a brief review

Brav et al (2005) provided evidence based on their comprehensive sample that 90% of the CFOs practice smoothing of dividends on an annual basis and avoid omitting or cutting dividends[74].

Studies done till the early half of the 2000 (Ahorany and Swary, 1980, Loderer and Mauer, 1992, Nissim and Ziv, 2001) have all observed that at an average 80% of the sample firms have not changed annual dividends, and such persistence in the pay outs supports the signaling hypothesis that under information asymmetry the market participants places significant premium on the firms which practices smoothing. Guttmann et al (2010) have provided a comprehensive survey of all COMPUSTAT firms where the finding is that 25% of such firms have practiced smoothing spanning across all sectors.

One important lacuna in the earlier dividend signaling models (Bernheim, 1991, Bhattacharya, 1979, John and Williams, 1985) has been the inability to include and analyses other types of pay out policies as signals, for example the share repurchases along with dividend pay outs. Allen et al (2000), Allen et al (2002), have observed that significant number of firms have preferred dividend pay outs to share repurchases as signals, which can be explained by the clientele effect. For example when the institutional investors faces relatively less taxation on dividends than the retail investors, they get attracted more to firms paying dividends, again its also true that there has been a significant rise in the institutional holdings in all developed markets, and specifically in USA.

[74] This perspective has also been observed for banking firms during crisis period too. The main proposition for dividend smoothing has been the signaling hypothesis (Baker and Powell, 1999, Bernheim, 1991) which holds that under information asymmetry scenario market participants place a significant premium on those firms which practice stability or gradual growth rate in dividends.

The problem with such models is that they are static theoretical models which are incapable of capturing dynamic pay out behaviors. There are earlier theoretical models too which predicts dividend persistence even when there are small changes in underlying productivities in firms (Kumar, 1988). Garret and Priestley (2000) provides a cost benefit analysis of dividend smoothing, where they show that if there are increase on earnings on a permanent basis then there is less than one third of increase in the dividend pay outs.

In recent times agency cost theory has been considered as the driving force behind dividend smoothing (as in Lambrecht and Myers, 2012), and the authors argue that it's the total pay out which is smoothed over time, which includes dividends and net share repurchases. The theoretical implication is also that managers want to smooth their rents or consumptions, since they are financially constrained they prefer non-volatile and smooth overall consumption. Hence the insider manager would practice a smooth rent consumption which would further lead to smoothing of pay outs.

Amidst the financial crisis of 2007-, and specifically in banking sector surveys have been done to provide evidence of correlation of higher default risks with the stable dividend pay outs. Even earlier papers (Kumar and Lee, 2001) have observed that in general high default probabilities (measured by interest cover ratios, or cash to current liability ratio) are positively associated with stable dividend smoothing policies, and such observations are at odds with the

standard costly signaling theory, where dividend smoothing can be viewed as dynamic signaling to solve adverse selection and or moral hazard problems.

Javakhadze et al (2014) have provided a comprehensive analysis of dividend smoothing by firms across countries, and have found evidence for agency costs and information asymmetry as the prime determinants of dynamic dividend behaviors. One important suggestion by the study is that there is a simultaneous impact of agency cost and information asymmetry on smoothing behavior. Allen et al. (2000); Fudenberg and Tirole(1995) have earlier provided the theoretical base for rationalizing dividend smoothing as a tool for mitigating manager-shareholder agency conflict, which is also called as type1 agency conflict. Such a theoretical model would predict that dividends in the very scenario of type 1 agency conflict would be stable and predictable[75].

Hence firms which face greater agency conflict would smooth dividends more to mitigate the same. Since pay outs reduce free cash flow the practice of smoothing might also incentivize the firms to raise external capital more frequently which would expose them to market monitoring, hence again mitigating agency conflicts. Easterbrook (1984) and Jensen(1986) have predicted smoothing behaviors in their seminal studies on agency costs[76].

Dividend are more important for banks, and as observed by recent studies for example, Floyd et al (2015), banks do not show any propensity of declining dividends, except in crisis periods.

[75] In banking industry there can be other type of agency conflict too, which is among the different creditor groups, for example between the share holders and the depositor or non deposit creditor groups, hence the problem of risk shifting becomes critical. The current literature is not clear on whether the risk shifting is related to such different types of agency problems.

[76] Javakhadze et al (2014) have specifically found positive significant impact of tangibility at firm level on the speed of adjustments of dividend pay outs, again significant negative impact of stock turn over and size on the speed of adjustments (SOA). The authors claim that such impacts do lend support to both agency cost and information asymmetry theory as discussed above.

However based on the studies of dividend pay outs in the crisis period it is not clear that whether there was a significant change in the smoothing of pay outs during the crisis, specifically in the period 2007-09.

More specifically the current thesis investigates whether there has been a significant slowing down of speeds of adjustments of pay outs across banks and over time periods, which may have further implications from the perspective of signaling theory. To the best of the authors' knowledge partial adjustment behaviour of banking firms across the crisis period has not been studied from the perspective of value signaling, or signaling of financial strengths. In the remaining half of the review some recent observations on the dynamic dividend pay outs of banking firms is explored.

First its important to note that banking firms also do share repurchase, as has been investigated in the current thesis, but the general observations suggest that share repurchase volume is nearly one third of the dividend pay outs, and has never exceeded bank dividend pay outs. There can be signaling implications of the same, for example as observed by Floyd et al (2015), Skinner (2008) among others, dividend pay out generally implies commitment from the managerial perspective, there is an implied steady dividend pay put policy for the banks who pay regular dividends as relative to stochastic underlying earnings, such commitment may not be observed for share repurchases.

Floyd et al (2015) have observed that the majority of banks in developed countries have reduced dividends in crisis, however the speed of adjustments have been very slow. In terms of smoothing it can be said that banks have exhibited greater smoothing (following the definition of smoothing as in Leary and Michael (2011)).

Before the crisis period however, for example from 2001 onwards, there have been an upsurge in the dividend pay outs and the share repurchases also, both for the banking firms and the industrial firms. But as Floyd et al (2015) reports that unlike industrial firms even though the share repurchases have increased many fold dividend pay outs have always been greater in volume[77]. For example the same authors observe that the pay outs for banks have increased from $34 billion in 1998 for US banks to $71 billion in 2007.

That the dividends pay out by banks have always been considered as to be a commitment for the managers (Lintner 1956, Brav et al, 2005, De Angelo et al, 2008) provides two most important explanations for dividends from the perspective of banks, one, since bank dividends are ongoing commitments they may help reduce agency costs of free cash flow (Jensen, 1986), there can be other forms of expropriation which dividends can help mitigate for example tunnelling which is mostly observed in the closely held firms of emerging markets (La Porta et al, 1998, 1999), Dittmar et al(2003), however this form of expropriation is different from the free cash flow agency cost which is observed in the firms with dispersed share holders owners, second, bank dividends should signal managers confidence in the underlying profitability and financial strength (Miller and Rock, 1985; Baker et al, 2012).

The current thesis also draws upon the related literature which explains why banking firms are fundamentally different from the non-banking industrial firms, for example as observed by Berger et al (1995), Calomiris and Wilson (2004), Diamond and Dybvig (1983), Kashyap et al (2002), Laven (2013). These authors have pointed that since banks face liquidity risk problem due to mismatch of assets and liability maturity, and since banks are more opaque such that it is harder for the information sensitive investors to ascertain values to banks assets it is implied that banks have a natural tendency to signal via pay outs.

There is another striking feature as observed by Floyd et al (2015), i.e. the banks are a more homogenous group as compared to the industrial firms, which make them more vulnerable to an economic shock, and this feature reinforces the value of dividend as signals.

There are two contradicting theories on the reluctance of the banks to cut back dividends and repurchases during crisis period, one theory is of risk shifting (Acharya, Li and Shin,

[77] Hence one may observe that banks have used both types of pay out policies to the share holders, however it is intriguing to note whether opacity levels have impacted such different pay outs in similar or different ways.

2013; Hirtle 2014; Rosengren, 2010) which is met with mixed evidence and this theory is further investigated in the current thesis in the later sections, the second theory is as suggested in recent studies like Forti and Schozer (2015), or Acharya, Gujral, Kulkarni, and Shin (2011), that banks reluctance to cut dividends can be explained by their ongoing need to signal value or financial strength.

Recent studies suggest that industrial and banking firms both have increased various pay out types during the last decade, and this trend has remained strong till the beginning of the last financial crisis. However as Floyd et al (2015) have suggested that the evolution of pay out strategies for banks are different than non-banking industrial firms over the last 30 years. Specifically for the industrial firms dividends have been concentrated for those firms who also have done repurchases for the last decade.

The same authors suggest that persistence of dividend pay outs for the industrial firms may be explained better by the free cash flow cost theory of Jensen (1986), which also coincides with the life cycle explanations, less so from the perspective of Pecking order theory, and neoclassical signaling theory of firm value, for example such explanations is valid for the industries dominated by large and matured firms (De Angelo, De Angelo and Skinner, 2008).

For such large and matured firms it is observed that the dividend increase is rare, but the pay out policy is very persistent with managerial reluctance to cut back dividends. Certainly dividend smoothing or pay out smoothing in general is what exhibited by such large and matured public firms. Recent studies, for example, by Leary and Michealy (2011), or Michaely and Roberts (2012) have supported the dividend smoothing theory for the industrial firms. However in the same studies there have been less support from the signaling or information asymmetry (mainly adverse selection of equity capital) theory.

On the other hand a scarce literature on the persistence of bank dividend signaling has shown greater compatibility with the neoclassical signaling theory, i.e. as Floyd et al (2015) summaries that the most plausible explanation for the bank dividend pay outs is the use of dividends as costly signals for signaling the future financial strength. However there is a gap in the empirical literature to investigate the bank dividend smoothing phenomenon form the perspective of bank specific characteristics, for example, liquidity risk, solvency risk, capital adequacy, leverage etc[78]. Bliss et al (2015) is another related study.

The study by Floyd et al (2015) have suggested that over the last 30 years the banks have not cut dividends in general, and the banks have increased their dividend per share level (also the main pay out variable in the current thesis) in larger amount and more frequently as compared to the industrial firms. Whereas the share repurchases by banking firms are different than the industrial firms, since the mix of dividend pay outs and share repurchases for banks is always inclined towards the dividend pay outs, as opposed to the case of the industrial firms in the last 30 years[79]. However there is a gap in the standard literature in investigating the information content of smoothing via repurchases.
Another striking difference between the characteristics of firms paying out dividends is that if for the industrial firms mainly the large and matured firms pay out dividends, and also exhibit smoothing of dividends, for banks the signaling and smoothing of dividends is across board, over all sizes and all phases of maturity (more to be discussed in the descriptive statistics sections in the appendix).

Overall the study by Floyd et al (2015) shows that the persistence of bank dividends have been compatible with the persistence and rise of share repurchases. The main difference of explanations of dividend pay outs and pay outs in general between banks and industrial firms come from the signaling and agency cost theories. However these studies have not comprehensively investigated the impact of such theories on the adjustment processes of the

[78] As we have noted earlier theoretically banks are different since the signaling of liquidity and solvency is an important issue faced by BHCs.
[79] This point makes the substitution hypothesis between dividends and share repurchases intriguing for bank holding firms, since perfect substitution may not be possible. However the information content of pay outs is important to investigate.

pay outs specifically[80].

Main stream studies on dividend smoothing have ignored the implication of pay out smoothing in general, for example whether share repurchases also follow a smooth policy. This thesis investigates the information content of bank share repurchases also along with the dividend pay outs, hence partial adjustment of share repurchases by banks have also been studied here, the main focus has been to bring forth the similarities and differences between the information contents of these different types of banks pay out policies.

There is a strong literature on the implications of share repurchases for the capital markets as discussed in Andriosopoulos et al (2013). There is a consistent study of positive market reaction to the announcement of share repurchases, for example by Varmaelen (1981), Ikenberry et al (1995), Chen et al (2002). There is some degree of argument on whether share repurchases are different from dividend pay outs as signals to the market, since it is assumed that dividends are costly commitments for the firms whereas share repurchases don't entail such commitments, hence it can be rendered costless.

However later Bhattacharya and Dittmar (2001) have argued that there is a considerable degree of market scrutiny after the buy back announcements are made so that bad firms (with weak financial prospects) can not easily mimic the good firms, hence if the buy back announcements are credible, i.e. firms really honor their announcements over time, there can be consistent positive response by the capital markets.

Recently Andriosopolous et al (2013) have found information disclosure and CEO over confidence are the main determinants of the buy back programs. However the same study has not specified the information content of buy backs if they are really signaling tools.

[80] There is certainly another factor, investment opportunity, namely which can also explain the aggregate distributions of dividends. As the same authors observe, due to the increase in uncertainty in the investments it may have been optimal for many firms in general to increase pay outs to mitigate further agency problems.

3.2.4 Firm specific variables: impact on speed of adjustments across firms

Size: Frank and Goyal (2003, 2004, 2007,2008), Lemmon and Zender (2010) among others have observed that since the larger and matured firms are relatively more reputed they might face less information asymmetry, hence they might smooth dividends less (which again means they are not required to adjust dividends as slowly as compared to relatively highly opaque and smaller firms). However its also well known (since Jensen, 1986) that larger firms face greater agency cost problems, like free cash flow problem, which might again have a positive influence of dividend smoothing behavior by them. Fama and French (2002), Lang and Litzenberger (1989),[81] have used related measures either to proxy for agency cost or overinvestment problems. Hence as regard size the net impact is uncertain[82].

Tangibility: Harris and Raviv (1991) were the first among scholars to use the asset tangibility values as a proxy for opacity level, later in various smoothing studies (Leary and Micheil , 2011, Javakhadze et al (2014)) tangibility has been used regularly as one determinant for the dividend adjustments. Since tangibility is negatively correlated with opacity level, the common finding is there is a negative impact of tangibility on smoothing. Market to book value has also been used in the same context. However its also known that market value often captures investor sentiments (Chatterjee et al, 2012[83]) which is difficult to rationalize and hence might not be a good candidate for investigating the real purposes of dividend smoothing[84].

Volatility measures: Brennan and Subrahmanyam (1996), O'Hara (2003) among others

[81] In this paper the authors have brought out the inherent conflicts between the predictions of signaling theory visa vi other theories like pecking order and free cash flow theories.
[82] We can observe here that the relation between size and opacity is not very direct, since if we consider the standard adverse selection problem then it should be that smaller and less reputed firms face more adverse selection cost, however for large firms there may be a problem of suboptimal monitoring by the external shareholders, which is more of a moral hazard problem.
[83] One such measure is diversity of investor opinions, which is not one to one correlated with adverse selection problem.
[84] Intangibility is another alternative variable, which has been used in the last section.

have used the volatility measures like stock price volatility as both information asymmetry and risk measures. However here again the stock market volatility might not be always positively correlated with fundamental information asymmetry level, or agency cost problems. Investor sentiments might play important roles in inflating such measures too. One alternative measure has been bid-ask spread for stocks (JavaKhdze etal (2014)) which is argued to be positively correlated with the opacity levels.

Analysts forecast: Lang and Lundholm (1996) were among the first academics to use dispersion of analysts forecast measure as a proxy for information asymmetry. There is a long strand of theoretical (Miller, 1977) as well as empirical studies (as summarized succinctly in Chaterjee etal, 2012) which have investigated the impact of such diapersion measures on stock price returns. The studies are still undecided on the underlying explanation for the impact, there might be information asymmetry led problems, for example, adverse selection issues in financial markets which might be reflected in dispersion measures, or, as Chatterjee etal (2012) argue, these measures might also reflect investor optimism. Hence inclusion of such measures as determinants of dividend adjustments might not be rational, even though some authors have investigated in the same line (Leary and Micheil , 2011).

Alternative information asymmetry type's measure: Babenko, Tserlukevich, and Vedrashko (2009) among others have used the measure of no of analysts forecasting for an individual firm as an information asymmetry measure among the investors, for example between the retail and institutional investors. Such measures are based on the information asymmetry theories by scholars like Brennan and Thakor (1990)[85].

[85] However in the current investigation information asymmetry between insiders and outsiders is emphasized, since that seems to impact dividend policies or pay out policies at large more directly. Hence any further investigations on the impact of institutional holdings on smoothing and signaling has to be based on the fundamental information asymmetry between insiders and outsiders.

<u>Institutional holdings:</u> Hotchkiss and Lawrence (2007), Ferreira, Massa, and Matos (2009). Allen, Bernardo, and Welch (2000) among others have also used institutional holdings for specific firms as a proxy for information asymmetry between insiders and outsiders, the basic theoretical underpinning is that bigger institutions are better monitors of the insider managers hence in effect should be reducing agency/ information related problems. However one should also recall the literature on conflict between the various shareholder groups (Brennan and Thakor (1990)) mainly institutional investors versus retail investors[86].

3.2.5 Evidence on smoothing of total pay outs:

Fama and French (2001), Grullon and Michaely (2002) among others have noted that pay out policies of firms should be considered more broadly including the share repurchase data. These authors hold that at least theoretically dividend smoothing theory can also be extended to total payout smoothing, or, as Leary and Micheal (2011) finds agency problems and information asymmetry led problems (adverse selection/ moral hazard) might be mitigated by greater smoothing of total pay outs.

There has been a recent growing literature for non-financial firms' (Jagannathan, Stephens, and Weisbach (1999)) share repurchase behavior and its impact on dividend smoothing. Here again Leary and Michail (2011) based on COMPUSTAT data base have provided evidence for the phenomenon that firms which practice less share repurchase have higher speeds of adjustments, hence smooth less. Hence it can be expected that total pay out smoothing including share repurchases should have similar characteristics as dividend smoothing alone.

Boudoukh et al. (2007) among others have provided empirical evidence for total pay out smoothing relatively more than the dividend smoothing, the authors have conjectured that firms might be focused on time series properties of total pay outs rather than dividend s alone.

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[86] Hence its not completely clear that whether the presence of institutional holdings will naturally resolve agency problems between all shareholders groups and the managers.

However, Skinner (2008), and then Leary (2011) have shown that firms smooth dividends more than the total pay outs, which means that the median speed of adjustment and volatility of total pay out smoothing is significantly greater than that of dividend smoothing[87].

3.2.6 Impact of life cycle variables on dividend smoothing

Life cycle hypothesis (De ANgelo, et al 2006) proposes that firms which are in the early growth stage as reflected in relatively lower retained earnings to total asset mix (in some studies retained earnings to total equity mix) have to rely more on the external capital, where as firms with relatively greater values of the mix are in the maturity stage of life cycle, and hence are better candidates for paying dividends. However in this context it's worth recalling that matured firms also do face greater free cash flow problem or in other words greater agency costs. Hence to mitigate agency cost these firms might pay greater dividends, and also maintain steady dividend pay out policy.

Though there are rare studies on the impact of life cycle phase on dividend smoothing, it. can be conjectured that since matured firms face greater agency cost they might smooth more. Denis and Osobof (2008) also observed that the propensity to pay dividends is positively associated with size, growth opportunities and profitability. Hence as noted earlier size can also be a proxy for agency cost problem.

New studies (Abrue and Golamhussen 2013, Hsiao and Tseng, 2015) have investigated the dividend pay out behaviours by the bank holding companies of the US and other European countries during the 2007-2009 financial crsis. most of the studies have found support for the dividend signaling, and smoothing based on various underlying hypotheses, for example from the standard signaling hypotheses to lifecycle hypothesis. The later holds that for the more profitable, less growing, and larger matured banks the propensity to pay dividends are

[87] For banking firms though we do not have such detailed study as of yet.

more. However a direct impact of such factors on the dynamic dividend adjustment has not been tested as of yet.

Cziraki et al (2015) have provided fresh evidence that US banks have reduced share repurchases during 2007-09 but there is no such cut or omission in dividends until 2009. the same authors have not found any excessive dividend pay outs as compared to the bank fundamentals during the same period, as is claimed by some theoretical papers (Acharya 2012, 2013).

Again the relatively better performing banks have rather enhanced pay outs, which might again relate to the signaling implications for dividends. As the current thesis has also observed that adjustments should be perceived from a much broader perspective of various types of pay outs, for example stock dividends, cash dividends, as well as share repurchases, Floyd (2014) have observed that adjustments happened mainly via reducing share repurchases for the period 2007-09, during this period there were rare cuts and omissions in dividend pay outs, it is only after 2009 that there were some minor rise in the dividend cut backs by banks which was always warranted from the capital regulation requirements.

Cziraki et al (2015) have modelled the propensity to pay out dividends by banks according to Fama and Fench (2001), and De Angelo (2006) to investigate whether the dividend pay outs during the crisis period was excessive or not, to which they have found the answer is negative. However, one also should consider that the models on which the very paper is based have mainly life cycle factors as the determinants of dividends, but no opacity measures and regulatory measures are used as explanatory variables. This point is worth noting since again referring back to Flannery et al (2010) banks become relatively more opaque during the crisis periods, hence the impact of such increase in opacity on pay out adjustments is an intriguing area which has not been explored.

3.2.7Recent empirical studies

Recently authors (Al-Malkawai et al, 2014) have deployed Litner's model of dividend smoothing with some extensions, namely, censored regression models for example panel data TOBIT models to test the impact of several firms specific, as well as regulatory, or country specific factors on the speed of adjustment of dividend pay outs, as well as the signaling implications of dividend pay outs. For example the above mentioned study has found that the firms listed on Muscat stock market exchange follow a stable dividend pay out policy, or persistence of dividend pay outs, which is continued even in the global financial crisis period.

Again firm specific factors for example ownership structure and agency conflict have significant impact on the dividend smoothing behaviors of firms. However this study has not directly studied the impact of opacity levels on the signaling as well as smoothing behavior of pay outs, but only has observed that the average speed of adjustment of Muscat firms is significantly lower than that of the developed country's' listed firms.

However the study has not provided any justification for the very finding, the current author suspects there can be significant differences in agency conflict levels among firms listed at developed and less developed markets which is again driven by the differences in information asymmetry levels, hence there are differences in speed of adjustments too. In later sections more rigorous study will be done based on the firm specific adjustment speeds rather than average (and biased from the perspective of econometric modelling) speed of adjustment.

Jvakhadze et al (2014) have provided a cross country based (2000 firms spanning 24 nations) evidence of significant impact of agency conflict and opacity levels on the dividend persistence, which indicates clearly that higher levels of these firm specific characteristics have a slowing down impact on smoothing, or firms with higher agency conflicts (expressed in free cash flow problems in one such examples) practice slower adjustments of dividend pay outs.

The authors also argue (based on Funden burg and Tirole, 1995) that such slower adjustment of dividends act as efficient signals to the outsiders about the solvency, or, future financial prospects of the firms. However there some inconsistencies in the paper since the direct impact of opacity measures, such as asset tangibility level, or turnover levels have opposite impact on the speed of adjustment as predicted by the underlying theories. This finding seems to be explained less clearly by the authors since opacity levels and agency conflict levels ought to have deep positive correlations.

In similar papers ((Lang and Litzenberger, 1989, Fama and French, 2002, Michaely and Roberts 2012) free cash flow problem has been emphasized, where as a proxy for measure of free cash flow, market to book value, or logarithm of total assets, or free cash flow scaled by total assets have been used. Every measure has been found to have significant impact on the speed of adjustment.

Allen at al (2000) in addition argue that once the companies which have higher dividend levels are more attractive to institutional investors who further want managers to smooth dividends more. In general (as observed by Jvakhadze et al 2014) dividend smoothing theory suggests that the industries, or firms, which are more opaque, or have greater uncertainty

about their asset valuations will smooth dividend more. The same paper has observed a positive significant relationship between the mean return volatilities of industries and the measure of dividend smoothing for those industries. Banking industry is however not studied in the very work.

Implications of dividend signaling for banking industry has been studied occasionally (by this the author mean that not as frequently as for the non financial firms in general). There have been some seminal empirical studies for USA based banking firms, for example, in, Mayne (1980), Boldin and Leggett (1995), Bessler and Nohel (1996, 2000), Basse et al (2014) and authors have been divided on the issue that whether dividend signaling should be treated as a more effective means for gaining investor confidence that retain earnings more, or even cut back pay outs to strengthen the capital base.

However recent industry reports, for example, by Federal Reserve in USA during the period of 2012 onwards have witnessed dividend persistence by the banking firms[88]. Basse et al (2014) have argued (based on earlier theoretical studies, for example, Allen, 2001) that in banking industry dividend signaling and or smoothing may have different implications as compared to the suggestions by standard signaling literature. On one hand there is a dire need for solvency and strengthening capital base mainly during the crisis period, hence there are recommendations for cutting back or even omitting dividends, on the other hand, there are typical concerns by the investors that cutting back dividends or deviating from stable dividend pay out policy might indicate weak financial prospects in future. Hence banking firms have to decide which path to adopt based on a rigorous cost-benefit analysis[89].

Again reality seems to be quite different, for example if we turn to Acharya et al (2011) we find that even amidst the worse phases of financial crisis banks have been quite persistent with dividend policies, exhibiting signaling and smoothing (though the authors have mainly provided a comprehensive survey of dividend policies rather than explaining/ analyzing signaling or smoothing mechanisms).

[88] Recently Goddard et al (2006), Reddemann et al (2010), have proposed VAR (vector auto regression modelling) based modelling to investigate the factors impacting dividend signaling by banks.

[89] The same authors following econometric approach suggested by Reddmann et al (2010) have reached the conclusion that signaling and smoothing of dividends for banks are of secondary importance as compared to capital base strengthening. However, its entirely not clear that whether this conclusion is valid for all periods, or is it critical mainly in financial crisis periods.

There have been some alternative explanations for dividend persistence by banks during crisis period too, for example Acharya et al (2011) have argued that banks might shift risk from share holders to depositors via dividend pay outs, or in other words shift wealth in the opposite direction. Hence there can be further consequences of pay outs in such manners. This section will not focus on risk shifting specifically, however later in the thesis there will be opportunities to present some analysis on the same.

Imran et al (2013) provide a recent evidence of dividend smoothing by the listed banks on Karachi stock exchange in Pakistan. The authors have found the firm level variables for example, size, last periods dividend pay outs, earnings per share, capital ratio among others have strong positive significant impact on pay outs, cash flow as expected has negative significant impact.

The authors have found support for the Linters' original hypotheses, as well as transaction cost hypotheses. The authors have found that banks in their sample have followed a stable or persistent dividend pay out policy, rather than omitting or cutting back even in the periods of financial crisis. Justification for such persistence lies in the agency conflict theory, where dividend smoothing can be effectively deployed to mitigate intensity of conflicts among agents and principals[90].

3.2.8 A brief account of risk shifting behaviours by banking firms through dividend pay outs: Empirics

Amidst the financial crisis (2007-2009) there have been some critical surveys of dividend payout policies which throws insights into incentives of insider managers to practice risk shifting. In corporate finance the basic principle dictates that the shareholders are the

[90] Basse et al (2014) though have observed that signaling and smoothing are relatively less significant or 'important' economic phenomena for the banks there has been no strong justification for so, more over their findings are at odds with other industry reports and studies which observe dividend persistence even in crisis episodes.

residual claimants and creditors have the seniority in claims, however when under extreme circumstances the creditor group is deprived by shifting huge wealth towards the shareholders group risk shifting occurs. Acharya et al (2011) observes that there has been structural shift in the capital structure of banks (USA based) during 2007-09 from common equity to debt like hybrid claims, for example preferred equity and subordinate debts. Such corrosion of common equity base has been aggravated by persistence of dividend payments during crisis, and under financial distress conditions.

The authors further propose that dwindling common equity base might have been the main reason for the banking firms to be reluctant in lending further. Hence risk shifting in such manner has further policy implications. In a similar study Abrue and Gulamhussen (2013) find that the regulatory pressure has been ineffective for the undercapitalized banks to limit dividend pay outs amidst the crisis.

However commentators are not in agreement over whether such persistence of dividend pay outs can have only risk shifting implications, for example, Floyd et al (2014) have also documented comprehensively the persistence of dividend pay outs (as contrary to dividend cuts and omissions by non-financial firms) by US banking firms over 2007-09, however their perspective is that such dynamic behaviors might also convey costly signals to the market regarding future financial prospect (standard signaling theory), given that the market participants systematically respond negatively to the dividend omissions.

Bates, Kahle, and Stulz (2009) on the contrary have provided evidence for increase in cash holdings by industrial firms in the same economy. Hence it is unclear that why signaling implications would not hold for industrial firms. Dittmar and Mahrt-Smith, 2007;

Pinkowitz, Stulz, and Williamson, 2013[91], among others also observe similar behavior by industrial firms. Hence simple signaling theory is incapable of such dynamic behaviors, mainly during crisis period.

Floyd et al (2014) also provides critical survey for stable dividend payout patterns by both industrial and banking firms. Over a considerable period of time (1981-99) the fraction of banks which actually increased annual dividend per share increased by 74%, though that fraction decreased during 2007-09, but the overall fraction of banks which kept increasing dividend per share remained above 60%, which is significantly higher than the median value.

One limitation of such studies is that though dividend pay outs have been investigated partial adjustment or dividend smoothing has not been studied in this context. Hence an obvious question generates what is the impact of default risk on smoothing behaviors by banking firms? This question will also be addressed briefly in the current section (which is explored in details later in the thesis).

3.2.9 Agency conflict theoretic explanation of dividend smoothing

Though the main emphasis in the current thesis is on the implications of signaling theory on the pay out smoothing behaviour by bank holding companies, it is also important to focus on the agency theoretic explanations of pay out smoothing behaviours in general. As already mentioned in the thesis that Lambrecht and Myers (2012) have provided an agency theoretic view of dividend smoothing which is compatible with rent seeking by managers. The same authors based their investigation on various agency cost related studies, for example, Tirole and Fundenburg (1995), and come to conclusion that managers smooth their pay outs since they would also like to smooth their own compensation. However this theoretical strand of literature should be supported by the empirical findings, for example, whether the large and matured firms exhibit more smoothing? Since these are also those firms which face agency

[91] The main investigations have been on the change in the pay outs and cash holdings of US bank holding firms during and after the crisis period.

cost of monitoring the most[92].

John and Williams (1985) proposed that in a signaling equilibrium the optimal dividend strategy of firms should be to smooth dividend pays relative to stock prices which are stochastic. Models alike predict that if there is a higher agency cost of monitoring due to higher information asymmetry level then dividend will be smoothed more. There are alternative theoretical models also, as explained earlier, for example Kumar (1988) proposed a pooling equilibrium model. In Kumar's model there is a partial pooling equilibrium of different firm types based on different levels of private information regarding the quality of firm's cash flows. In the very study there is a unique dividend pay out related to a distinct range of firm values.

Whenever a firm announces dividend whose absolute value is different from a certain range as prescribed by the model the market perceives the firm as to be in the lowest range of values. Later Leary and Michaelly (2011) proposed that such a model in dynamic setting, i.e in multiple periods modelling may generate smoothing behaviours. Later Gutman et al (2010) have shown that a partial pooling equilibrium may exist where dividend is constant for
a given range of underlying earnings.
Here the risk levels of firms become an important determinants of speed of adjustment, since both Kumar (1988) and Gutman et al (2010) have predicted that riskier firms would tend to smooth more, or in other words the speed of adjustment for such firms are lower at an average. Again it is well known that agency conflict and risk levels of firms are compatible with each other.

Agency theory can explain dividend smoothing from the perspective of taxation too, for example, Rozycki (1997) have shown that personal income tax provision provides incentives

[92] Recently Hoang and Hoxha (2016) have provided a comprehensive investigation of corporate smoothing policies in a related context. The authors argue that corporate pay out decisions are based on the rationale that the variability in pay outs have to be minimized relative to the underlying incomes since that can minimize agency cost.

to managers to smooth dividend payments. Michaelly and Roberts (2012) have observed that firms with concentrated shareholders or large shareholders may smooth less, since such firms do not face severe agency problems and information asymmetry problems as the more dispersed shareholder owned firms do. Hence in the current thesis since publicly listed bank holding companies are studied in the sample, there is a greater propensity for these banks to smooth due to larger dispersed shareholder ownership. Leary and Michaelly (2011) also find support to the proposition that firms which face higher agency costs smooth their dividends more.

3.2.10Hypotheses building

H1a: *speed of adjustment increases if the BHC is of above median size in the sample*

In the first section the positive impact of size on the signaling level of pay outs is analyzed. However the current section investigates if the size factor has some significant impact on the speed of adjustment of the firms. Here the main aim is to investigate whether the impact of the bank specific variables have similar nature with regards to the smoothing of dividends, since then only it can be inferred that smoothing can also be accepted as signaling value.
The impact of size, as observed in the literature above, can be related to agency costs, opacity as well as factors like diversification. Leary and Michaely (2011) observe that generally firms with more individual investors and among larger and more financially stable smooth their dividends relatively more.

Since in this section a related measure of speed of adjustment is also used, namely, the half life of adjustment (Olivera et al, op cit), a corollary of the above hypothesis is as below:
H1b: *half life of dividend adjustments reduce if the BHC is above the median size of the sample*

This hypothesis is a further robustness check for the value signaling nature of dynamic dividend adjustments. Here the main objective is to test whether the large bank holding companies set greater half life for dividend adjustments. There are some seminal works in the theoretical literature on income and dividend smoothing of firms (Tirole and Fundenburg,op cit) which can be related to the hypothesis.

Income smoothing and dividend smoothing are closely related (Miller and Scholes, 1978). Here the main issue is that the investors can reduce the dividend taxation by utilizing some provisions of the personal income tax. Again the utilization of such provisions is a dynamic and long term process, which further suggests that such investors then would value dividend smoothing by corporates . another prediction of this theory is that dividend smoothing will be most valued by the public listed firms with retail investors (Leary and Michealy, 2011).

Since the sample of BHCs which have been used in the current study are public listed firms with dispersed ownership it can be assumed that dividend smoothing is perceived as a value signaling from the above perspective too.

Further Baker et al (2007) observe in the lie of the earlier theoretical models that as long as investors want to smooth consumption dividend smoothing is resulted.

Expected impact of bank level control variables on the speed of adjustment

1. *Speed of adjustment of pay outs may reduce with the increase in the capital adequacy level by bank holding firms.* This proposition is based on the theoretical assertion that banking firms with greater capital adequacy needs might smooth their pay outs more, since that would be aligned with the signaling theory as investigated in the first section. Hence the negative and significant impact of the capital adequacy on the speed of smoothing supports signaling by dividend smoothing.

   In other words as a corollary value of half-life increases with the capital adequacy level of the BHCs. Since the half life of adjustment is a managerial choice it can be used strategically by the banks to delay the achievement of the pay out target levels, and during the period increase the buffer capital as per the need of the capital regulation. Hence this adjustment can also be perceived as compatible with signaling via dividend smoothing.

2. *the level of default risk has a negative probabilistic impact on the speed of adjustment*

As observed and tested in the first section there are a number of surveys which have held that banks in developed economies have exhibited moral hazard by increasing dividend payouts, or maintaining steady pay outs during the crisis period when their default risk was very high. The above hypothesis is a direct test of such claims. However the above hypothesis extends on the standard literature by including dynamic pay out adjustments.

If the impact of default risk is negative on the speed of adjustments then default risk might cause greater smoothing for banking firms, which is again compatible with the overall signaling behavior.

The impact of default risk on the speed of adjustment is not directly investigated in the literature of banking firms, however Baker and Wurgler (2010) have suggested that as more loss averse shareholders value dividends with respect to a reference point of lagged dividend pay outs, firms smooth their dividends more. Hence this observation is also in line with the value signaling theory. Hence under greater default risk level investors might become more loss averse hence more smoothing is warranted.

In other words the *level of default risk has a positive probabilistic impact on the half-life periods for the BHCs.* This corollary also tests that whether high default banking firms have increased the half life period for meeting the target pay outs so that in the given period they can build up more buffer capital.

1. *retained earnings mix has a negative probabilistic impact on the speed of adjustments*

As in the first section retained earnings mix is used as the life cycle variable. The standard prediction for agency cost theory is that greater is the agency cost of free cash flow more is the dividend pay out level. However the standard literature has not investigated the impact of the very factor on the speed of adjustments, and hence whether agency cost makes managers to smooth pay outs more, and specifically for the BHCs.

In other words retained *earnings mix has a positive probabilistic impact on the half life periods of BHCs.* The above assertion is again the corollary of the last hypothesis.

Overall for all the hypotheses three types of pay outs are used as the dependent variables, namely, the dividend per share, total dividend pay outs including the stock and the cash dividends, and the total pay outs including the stock repurchases by the BHCs.

3.3 Methodology

Partial adjustment model

The following partial adjustment model has been developed, which is a modified partial adjustment model following Oliver etal (2015), Flannery and Rangan (2006) among others. In this form, a bank's current pay out ratio (or DPS) is a weighted average of its target pay out ratio and the previous period's pay out ratio, where the weight λ has the closed range (0,1), with a stochastic term, as below.

$DPS_{i,t} = \lambda\, DPS_{i,t}^{*} + (1-\lambda)DPS_{i,t-1} + e_{i,t}$….(1)

Hence ever period a bank can adjust towards the target level by λ proportion, which implies that smaller is the λ greater is the rigidity of the bank to change dividend pay outs towards the target. Hence, λ is considered as the speed of adjustment (SOA), and (1-λ) the portion of dividend pay out which is inertial. However since the target level is unobserved, and is a function of bank specific heterogeneities, it is further modelled as a function of bank level, and bank specific factors, as shown below:

$$DPS^{*} = \beta X + \nu i + \mu t \;\; \ldots .(2)$$

In the above equation x is the vector of firm specific characteristics, and the two error terms represents heterogeneity across space and time. At this stage for firm specific factors we have used standard life cycle variables following the very literature. Substituting 2 in 1 the following equation is generated.

$DPS_{i,t} = \lambda(\beta x_{i,t-1} + \nu_i + \mu_t) + (1-\lambda)DPS_{i,t-1} + e_{i,t}$ ….(3)

Again as the standard literature (Flannery and Rangan (2006), Lemmon et al. (2008),Huangand Ritter (2009), and Gropp and Heider (2010)) suggest that in the presence of lagged dependent variable with a short panel data, using fixed effect models can generate biasedestimates for λ. Hence following the recent estimations (Oliver et al, 2015, Flannery and Hankins (2013)) a system GMM estimation of the model (3) is adapted here by the author. Again we assume that each banking firm will have its own SOA factor, which is again a function of some bank specific variables, which can be captured in the following way:

$\lambda_{i,t} = \lambda_0+\alpha Z_{i,t-1}$, where Z is the vector of firm specific variables, here we use the opacity level as one of such firm specific variables to explicitly measure the impact of degree of information asymmetry on the adjustment process. hence substituting again this in 3 we get, $DPS^*-DPS = (\lambda+\alpha Z)(\beta x+ \nu+\mu-Y)+e$ …(4)

Again the last term in the bracket can be expressed as the difference between the target level and the lagged dependent variable, this can be termed as $GAP_{i,t-1}$, hence symbolically the partial adjustment model can now be written as

$Y_{i,t}-Y_{i,t-1} = (\lambda_0+\alpha Z_{i,t-1})GAP_{i,t-1}+e_{i,t}$ ...(5)

Overall following Jiang, Hong and Molleneaux (2015), who have used a similar partial adjustment model for investigating capital structure adjustment of bank holding firms, the estimation of the above steps have been done. Hence the first step which contains the lagged dependent variable has been estimated using system GMM method, whereas the remaining steps have been estimated using standard panel data fixed effect estimation method. There have been a huge literature on such estimation methods, specifically on the advantages on using GMM estimation techniques for panel data models. Following is the brief account of the three steps in which the partial adjustment model is run in the current paper.The paper follows studies by Flannery and Rangan (2006), De Jonghe and Oztekin (2015), and Xiang et al (2015) among others for a three step partial adjustment model, which allows for bank specific and time varying pay out targets and heterogeneous adjustment speeds. First a constant adjustment speed λ is assumed for all banking firms for measuring target pay outs for each quarter, this is the first step of the model. In the second step the gap between the actual pay out level and the estimated target pay out level for each bank is used to measure the varying speed of adjustment for each bank. Finally, in the third step, the varying target pay outs for each bank is re-estimated using the varying speed of adjustment measured from the second step.

In a partial adjustment model, a bank's current pay out level/ pay out ratio (k) is a weighted average of its target (k^*) and its previous period's (in the current study previous quarter) pay out level/ ratio, $K_{i,t}= \lambda K^*_{i,t}+(1-\lambda)K_{i,t-1}+\mu_{i,t}$ (2). Substituting the equation 1 into the equation 2 we get the following equation: $K_{i,t}=\lambda\beta X_{t-1}+(1-\lambda)K_{i,t-1}+\mu_{i,t}$ (3). However the assumption of the constant speed of adjustment can be relaxed, and we can have a firm specific adjustment speed which varies over time or bank quarters: $\lambda_{i,i}=\Lambda Z_{i,t-1}$, where Z is another firm specific characteristics vector. Hence we get the equation(4) as $K_{i,t}-K_{i,t-1}=\Lambda Z_{i,t-1}(\beta X_{i,t-1}-K_{i,t-1})+\mu_{i,t}$.

Then the model is estimated in a three step procedure. Assuming a constant adjustment speed λ a standard partial adjustment model is estimated in (3), for this step the estimation technique is system GMM (as explained earlier, and here the widely cited study of De Jonghe and Oztekin (2015) is followed, who have used system GMM mainly for the presence of the lagged dependent variable). The main purpose for the first step is to calculate an initial set of estimated β s , which are then used to measure the initial estimates of the target pay outs by the banks, $K^{*}_{i,t}=\beta X_{i,t-1}$, for each bank quarter. These estimates are likely to be biased since λ is assumed to be constant.

Hence in the second step, the gap between the estimated and the actual pay outs by banks in the previous quarter is estimated, say, $G_{i,t}$, which is then substituted in the equation (3), $G_{i,t}=\beta X_{i,t-1}-K_{i,t-1}$ (5), hence $K_{i,t}-K_{i,t-1} = \Lambda Z_{i,t-1} G+\mu_{i,t}$ (6), where G is the estimate of the gap as defined.

The equation (6) is used to calculate the estimates ofΛ, which is required for estimating the varying speeds of adjustments of the banking firms for each quarter. The varying speed of adjustment is given by the formula, $\lambda_{i,t}=(\Lambda)Z_{i,t-1}$.Hence the estimation of varying speed of adjustment comprises the second step of the model.

In the third step the pay out measures are re-estimated by using the varying speed of adjustment obtained in the second step into the equation (3), hence after re-arranging the equation we have the following equation, $K_{i,t}-K_{i,t-1}(1-\Lambda Z_{i,t-1})=\beta \Lambda Z_{\iota,\tau-1} X_{i,t-1}+\mu_{i,t}$(7), where the estimated values have been used forΛ, in this step bank specific adjustment speed is used for measuring the bank specific and time varying pay out targets, which can be perceived as the optimal pay outs[93].

3.3.1Estimation method: *a technical note*

In the next stage a GMM technique is deployed to measure the impact of product of GAP and opacity (among other variables) on the first difference of DPS, as interpreted by other

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[93] Again as the standard literature (Flannery and Rangan (2006), Lemmon et al. (2008), Huangand Ritter (2009), and Gropp and Heider (2010)) suggest that in the presence of lagged dependent variable with a short panel data, using fixed effect models can generate biased estimates of the speed of adjustment, hence the use of system GMM.

researchers (Leary etal, 2011) this might measure the impact of opacity level on dividend. smoothing, more specifically this might test the theoretical prediction (as cited in the review section) that opacity generates smoothing behavior. Here the inclusion of opacity variable (which impacts SOA) is as an endogenous variable[94].

3.3.2 A brief observation on system GMM estimation

In general, as observed by authors, since panel data always deal with observed heterogeneities, for example the individual effects and time fixed effects, there can be either one way fixed effect models/ random effect models (based on standard hypothesis tests, for eg hausman test, where the null hypothesis is that the random effect estimators are consistent), or using first difference forms of models if the second dimension of the panel data is a proper to series.

First differencing is done to remove the unobserved heterogeneities, or individual effects, and such estimation techniques mainly comprises of dynamic panel data models with lagged dependent variables. In such models there is an inbuilt partial adjustment process.

Nickel (1981) observed for the first time that if fixed effect model is run in the presence of the dynamic panel data, then there can be serious serial correlation problems, since the regressions can get correlated with the error terms. Such problem mainly arises when there is so called short panel bias, where the time dimension of the panel is much smaller compared to the cross sectional dimension. This serial correlation error creates bias in the estimation of the coefficient of the lagged dependent variable, which can't be removed by increasing the no of cross sectional units. Demeaning process in the fixed effect estimations create such regressors which are significantly correlated with the error terms, hence violating the classical assumption of

[94] There are other estimation techniques possible for example system GMM which might increase the efficiency of estimation (Baltagi, 2013) but since system GMM uses more no of instruments than difference GMM it might not be efficient to use in case of relatively less no of periods in the panel data, since this might weaken the Sargan test results for AR.

the explanatory variables being independently distributed of the error term. Nickel showed that the correlation coefficient in this case is of the order inverse of the time dimension, hence increases rapidly with the decrease in the no of time period observations. Hence of the measure of the correlation is significantly greater than zero, then there is a negative bias in the coefficient of the lagged dependent variable(more on this later).

There is one critical point to be noted here, I.e. The bias ness is not due to any autocorrelation error terms, since even if the error term is normal and iid such problems can arise, only that in case of a further auto correlation the estimates of the auto regressive model becomes severely inconsistent. Such serial correlation problems can also occur in case of random effect models, hence that too is not a solution.

There can be alternative solutions here, for example, one solution is to take first difference of the dynamic model as shown below

Hence its clear that first difference removes both the fixed effect as well as the constant term from the model. However in the resultant model too, there is a correlation between the difference of the lagged dependent variable and the differences error term, which is of a moving average of first order type.

Hence after removing the fixed effects completely, there is an opportunity to construct instrumental variable estimator. Instruments of the lagged dependent variable is generated from the higher order lags of the dependent variable. Such lags are highly correlated with the lagged dependent variable, however if the error is iid they are uncorrelated with the composite error term. This is the so called instrumental variable approach, and there are specific commands in packages like stata to operate, for example here, xtivreg.

The DPD approach however is a further modification of the above approach, the main argument here is that the instrumental variable approach is incapable of using all the information provided in the sample. Hence GMM method can accomplish the task, and thus can create better estimates of the dynamic panel data model.

AB argues that the AH method fails to exploit all the orthogonally conditions. Hence the GMM method they suggest also has one commonality with the AH method, I.e. the instruments are still the internal in the sense that they are still the lagged dependent variables, either in lagged form or differences form. However the estimators allow the external instruments also.

We can summarize the conditions in which the AB method can be used as below

1. Short panel bias, with longer cross sectional element than the time period element

2. Where the relationship between the explanatory variables and the dependent variable is linear

3. Dynamic panel data model

4. Some of the explanatory variables which is not exogenous, hence correlated with the past or current error terms

5. Presence of fixed effects

6. Presence of heteroskedasticity and autocorrelation with in the error terms.

AB method actually generates a GMM set up for the model, which means that the model is set up as system of equations, one equation for each time period where the instrumental variables for every equation may vary.

Stata commands:

There are some frequently used commands in stata for example, xtabond, or xtdpd, or built in command like xtabond2, the last command is developed by David Roodman.

Which provides various additional features which are not available in the normal Stata commands.

__The instrument variable matrix in system GMM__

In the standard 2SLS approach the twice lagged level is introduced in the matrix of instrumental variables, as below

The first row comprises of the time period 2, where the first observation is lost due to first differencing transformation. Which also mean that observation for each panel unit for the very order is missing from the matrix. Again if the thrice lagged level is used as another instrument, then there will be loss of observations per panel for the third order too as below

Loss of observations also do mean loss of degree of freedom, hence a method has been devised to arrest such loss in degrees of freedom. Holtz-Eakin, have popularised a method where there are instruments for each time period which are also different from each other, in this case the instrumental variable matrix takes the below form

Hence in this case the method is simply to replace missing variables with 0, a critique can be that this rule is arbitrary,which is true in this sense. However one benefit is that each column of instrumental variables thus found is orthogonal to the transformed error term, hence satisfying the moment condition that the instrumental variables and the transformed error terms are not correlated.

This approach helps to construct instrumental variable of all available lags of the untransformed variables. If the enogenous variables are used then lag 2 and higher are used, for those variables which are not strictly endogenous lag 1 is a valid option, and such lagged variables are only correlated with the errors of t-2 and earlier periods. The typical matrix has the following structure

In this set up there are different no of instruments for each time period, for example for time period 2 there is one instrument, for time period 3 there are two instruments or generally for time period n we have n-1 instruments. When higher time periods are considered more orthogonality conditions are available which in effect improves the AB estimators.

One disadvantage is however that the no of lagged instruments are quadratic in the length of time periods available, if the time period is short, less than 10 in general then it's manageable to run the model in stata, however for larger time series the past lags used has to be restricted. As shown by Flannery and Hankins (2013), the measure of the average adjustment speed across the firms will vary considerably among the estimation techniques. The authors have found a very low estimation for OLS to a very high estimation of speed of adjustment for FE estimation. Now the authors have shortened the panel length from 30 to 10, and repeated the same exercise, OLS estimation expectedly remained unchanged (which can be interpreted as that OLS estimation ignores firm level heterogeneities and introduces short panel bias in the results), for FE model the estimation rises further than before by a significant amount, where as for the System GMM estimation the rise in the estimation for speed is only minimal. When the panel length is curtailed to 5, the OLS estimation remained unchanged, FE estimation increased even further, but the GMM estimation did not rise further at all. From this perspective GMM estimation seems to be more robust over the change in the panel lengths. Summarily the following points can be collated from the relevant scholarship:

1. Bond (2002) observe that if OLS estimation is used in case of dynamic panel data analysis, there will be a strong upward bias in the coefficient of lagged dependent variable (since the adjustment speed is 1 – the lagged coefficient, there will be a downward bias in the speed of adjustment as found by Flannery and Hankins (op cit)) which is due to ignoring the firm fixed effects.

2. Nickell (1981), Baltagi (2008) among others observe that for FE estimation though the structure of the panel is incorporated, it ignores the correlation between the coefficient of the lagged dependent variable and the error term of the regression model.

Hence there have been suggestions by scholars about the better estimation methods to solve the bias for standard FE models. Following are some alternative estimation based on the relevant studies:

1. System GMM uses a two equation system in regression models, the first one in levels and the second one in first difference of the lag, in case of specific packages like STATA the default program is set for one lagged exogenous variable set, where the standard command is XTABOND2, again following Flannery and Hankins(op cit) lags can be restricted to two also. Such estimation can be used to produce unbiased estimate under the conditions of unobserved heterogeneity, dynamic panel data, unbalanced panel data, and in the presence of endogenous variables. However there can be some bias in the presence of second order serial correlation.
2. Difference GMM estimation creates the first difference of the linear regression model and then uses the lagged dependent variable levels as instruments for first difference of lags. Difference GMM estimation technique can also be used in all the scenarios as mentioned earlier for the system GMM case. However there are ceratin important differences between these two estimations, which have led the experts to use system GMM more commonly.
3. Heid et al (2011), presents eloquently the pros and cons of using these estimation techniques. For example Acemoglu (2008) has used difference GMM estimator in dynamic panel models, here the second and greater lags of the dependent variable can

be used as the instrument for the residuals in the initial model/ equation.

4.

5. However as the authors (Alonso-Borrego and Arellano, 1999) observe that such estimation will exhibit huge small sample bias when the no of time periods used in the panel data is small and the dependent variable shows a high degree of persistence.

6.

7. Which may well be the reason that such estimation should not be used in case of partial adjustment models, for dividend smoothing or leverage smoothing. One way to solve the small sample bias will be to take the average values of the variables, which might restrict the no of observations.

8. Hence better way is to deploy the system GMM estimation, which is based on some further moment conditions, unlike in the difference GMM simple lags of the dependent variables are not used in the orthogonality condition, rather first difference of lagged dependent variables are used. However as observed by Heid eta l (2011) that such so called asymptotic gain conditions in case of system GMM do not come with out cost, and one such cost is that the no of instruments increases exponentially with the no of time periods. Such increase in instruments have further consequences, for example very high pass rates for specification tests like Hansen J –TEST, which is a standard test to check the validity of the dynamic models.

A small note on power and size

Power of a statistical test

Statisticians observes that the significance level, or alpha, and the power of a test are complementary to each other, while the alpha factor quantifies the probability of rejecting the null hypothesis when it's actually true, I.e. a wrong decision, then power of a test quantifies the chance of rejecting the null hypothesis when it's actually false, I.e. a right decision.

Generally power of a test also demonstrates whether the size of the sample used is large enough for correct inference to be drawn from the tests. Generally power of a test can be easily calculated for from testing null hypotheses which are based on mean values, for example if we have a sample size of n with null hypothesis that the mean value is x, and alternative hypothesis of mean value y, then at 5 percentage level of significance the critical z score will be 1.645 which if is lower than the calculated z score, the null hypothesis will be rejected. Now we can equate this critical value of z with the formula for z score in the typical case and find out the mean value of the sample, this mean value will be that value for which the null can't be rejected. Then one can plug in this mean value and the value of alternative hypothesis in the z score formula, based on the assumption that alternative hypothesis is rather true.

Then we can see what is the probability that actual z score is greater than the obtained z score, this will be regarded as the power of the test, which gives the percentage chance of rejecting the null hypothesis when it is actually false. The thumb rule in this case is that any test with 80% power can be considered as to be powerful.

Reasons for using GMM estimation method in this specific analysis

In empirical finance literature there is a wide usage of linear factor models, for example, Fama&MacBeth (1973) methodology and the Shanken (1992) correction. However Fama&Macbeth model even after corrections are not free from some errors the most important is that the assumptions underlying the Shanken correction are not valid for heteroskedastic asset pricing models and so the modified standard errors are not consistent. Though in the current context the estimation is based on measurement of speed of adjustment of bank pay outs rather than asset pricing, consistency of standard errors is critical otherwise the speed of adjustment measure will be biased significantly.[95]

[95] Flannery and Henkeins (2013) have shown in details how estimation techniques like OLS, FE Fama&Macbeth generates biased values of the speed of adjustment measures in the partial adjustment model. The same authors also suggest that system GMM estimation to be better than first difference regressions.

The usual method of estimation while facing Heteroskedsticity of unknown form is GMM as introduced first by Hansen (1982). GMM estimation uses the orthogonality conditions to allow for efficient estimation of coefficients in the presence of heteroskedascticity of unknown form. Comparing with IV estimator, if heteroscedasticity is present then GMM is more efficient than IV estimator, however in the absence of heteroscedasticity it is not less efficient than IV.

More specifically for the partial adjustment model for dividend pay outs, there have been studies using cross sectional time series analysis, specifically when an average slope coefficient (in the present case it would mean an average speed of adjustment) is needed to be measured. However there in the current study such estimations could not have been appropriate since, one, the main objective of the study is to measure bank specific heterogeneous speed of adjustment rather than any industry average, and two, averaging data over such long periods wastes valuable information on the dynamics of the phenomenon under analysis. This is particularly the case with the analysis of Lintner's(1956) and Brittain'sbehavioural adjustment models, which are dynamic by definition.

Technically, such estimations also face the omitted variable bias problem due to the presence of heterogeneity, and then certainly there are some variables explaining dividend behavior which are endogenous in nature (for example the opacity variables in the current study) for which again GMM is a preferred estimator. [96]

<u>A brief account of comparison between the system GMM and other estimations</u>

In the current study since a partial adjustment model is used for measuring speed of adjustment of pay outs, there is a strong case for correcting the biases caused due to the presence of lagged dependent variable. Nerlove (1967), Nickell (1981), Blatagi (2008) among others have shown that for standard OLS estimation there can be severe bias in the coefficient

[96] Recently Oliver et al (2015/13), Xiang et al (2015) have used system GMM estimation for mitigating the endogeneity problem in the partial adjustment models.

of the lagged dependent variable in a dynamic panel data model due to correlation between the fixed effects and the lagged dependent variable.

Again such bias is inversely related to the panel data length, T (Flanery and Hankins, 2013), but significant bias can remain even with T =30. Such bias is thus known as to be the short panel bias. The current study is based on COMPUSTAT data base on a quarterly basis (1990-2015), and even though the panel data length is in the range of less than sever bias care was taken for choosing the appropriate estimation technique to make the bias minimum. Flannery and Hankins (2012) also argue that due to the persistence of short panel bias in standard studies there have been a significant amount of disagreement among the authors regarding the coefficient of lagged dependent variable, or the speed of adjustment thus measured. Such bias then generates different conclusions regarding the adjustment processes followed by firms in general. [97]

There have been quite a few econometric techniques evolved for the correction of such bias, for example, instrumental variables (IV), generalized method of moments (GMM) estimators, long differencing (LD), and bias correction formulae (Flannery and Hankins, 2012). Again Flannery and Hankins (2012)[98] argue that these estimation techniques have been used mainly for small data sets with less no of explanatory variables, however for large data sets with many explanatory variables there can still remain endogeneity and serial correlation problems which may not be minimized by these standard estimations. In the current study multiple bank level explanatory variables have been used, hence extra care was taken for minimizing endogeneity and serial correlation problems. Further advanced estimates have been explored in the study by Flanery and Hankins (2012), for example, difference GMM, Blundell and Bond (1998) system GMM, two variations of long differencing (Hahn et al., 2007, Huang and

[97] For example Welch (2004), Fama and French (2002), Lemmon et al (2008) have found completely different estimates for speeds of adjustments, and disagree significantly on how firms set target pay outs and smooth accordingly.

[98] Flannery and Hankins (2013) data set comprise panel data observations between 3000 and 15000, in the current study the range is between 3000 and 5000 data points.

Ritter, 2009), and corrected least-squares dependent variable, LSDVC (Kiviet, 1995, Bruno, 2005). Below a short summary of comparison of results obtained by alternative estimates is provided, which also supports why system GMM is selected as the appropriate technique for measuring an unbiased coefficient of the lagged dependent variable, which appears in the first step of the current partial adjustment model.

1. Estimation by OLS ignores firm specific heterogeneity altogether, hence varying the panel length might not change the coefficient estimate from OLS but the estimate itself is severely biased, for example in the study by Flannery and Hankins (2013), the OLS estimate for the coefficient of the lagged depended variable, and thus the speed of adjustment is abnormally low.
2. Estimation by standard FE model ignores the short panel bias, hence changing the panel length slightly would also change the estimate of the speed of adjustment significantly, as also found by Flannery and Hnakins (2013), and hence such an estimate cannot be relied upon as a consistent estimate.
3. LSDVC has the extra constraint of assuming exogenous regressors, which is not applicable in corporate financial research in general and partial adjustment models in particular due to the presence of endogeneity.
4. Relatively then system GMM is a better estimator, since, it incorporates endogenous regressors, it incorporates firm specific heterogeneity, it can be used for an unbalanced panel data, and also it mitigates short panel bias problem, such that when the panel length is changed significantly there is much less significant change of the coefficient estimate of the lagged dependent variable, and hence of speed of adjustment.

A brief note on the short panel bias and the use of system GMM to remove the same

Nickel (1981) observed for the first time that if fixed effect model is run in the presence of the dynamic panel data, then there can be serious serial correlation problems, since the regressions can get correlated with the error terms. Such problem mainly arises when there is so called short panel bias, where the time dimension of the panel is much smaller compared to the cross sectional dimension. This serial correlation error creates bias in the estimation of the coefficient of the lagged dependent variable, which can't be removed by increasing the no of cross sectional units.

Demeaning process in the fixed effect estimations create such regressors which are significantly correlated with the error terms, hence violating the classical assumption of the explanatory variables being independently distributed of the error term. Nickel showed that the correlation coefficient in this case is of the order inverse of the time dimension, hence increases rapidly with the decrease in the no of time period observations. Hence of the measure of the correlation is significantly greater than zero, then there is a negative bias in the coefficient of the lagged dependent variable(more on this later).

There is one critical point to be noted here, I.e. The bias ness is not due to any autocorrelation error terms, since even if the error term is normal and iid such problems can arise, only that in case of a further auto correlation the estimates of the auto regressive model becomes severely inconsistent. Such serial correlation problems can also occur in case of random effect models, hence that too is not a solution. There can be alternative solutions here, for example, one solution is to take first difference of the dynamic model as shown below Hence its clear that first difference removes both the fixed effect as well as the constant term from the model. However in the resultant model too, there is a correlation between the difference of the lagged dependent variable and the differences error term, which is of a moving average of first order type.

Hence after removing the fixed effects completely, there is an opportunity to construct instrumental variable estimator. Instruments of the lagged dependent variable is generated from the higher order lags of the dependent variable. Such lags are highly correlated with the lagged dependent variable, however if the error is iid they are uncorrelated with the composite error term. This is the so called instrumental variable approach, and there are specific commands in packages like stata to operate, for example here, xtivreg.

AB argues that the AH method fails to exploit all the orthogonally conditions. Hence the GMM method they suggest also has one commonality with the AH method, I.e. the instruments are still the internal in the sense that they are still the lagged dependent variables, either in lagged form or differences form. However the estimators allow the external instruments also.

We can summarize the conditions in which the AB method can be used as below

1. Short panel bias, with longer cross sectional element than the time period element
2. Where the relationship between the explanatory variables and the dependent variable is linear
3. Dynamic panel data model
4. Some of the explanatory variables which is not exogenous, hence correlated with the past or current error terms
5. Presence of fixed effects
6. Presence of heteroscedasticity and autocorrelation with in the error terms.

AB method actually generates a GMM set up for the model, which means that the model is set up as system of equations, one equation for each time period where the instrumental variables for every equation may vary.

To summarize, Flannery and Hankins (2013) observe that dynamic panel data models are quite extensively used in corporate finance studies, specifically in the context of partial adjustment processes for example dividend adjustment, or capital adjustment. However use of fixed effect models with lagged depended variables may cause serious econometric biases in the estimations. There have been some methods which have been used (generally on small samples which have independent and normally distributed explanatory variables) to remove such biases.

However the main challenge in the realm of corporate finance (Flannery and Hankins, 2013) is that depended variables may be clustered or censored (for example if the depended variable is dividend per share or pay out ratios), and, or the independent variable data may be missing altogether. Independent variables may also be correlated with each other, or endogenous in nature.

Such properties of data have significant impact on estimators. In this brief account we will explore the various types of impact which the data characteristics might have on the estimators' performances, which might also provide a clear guideline as to which estimation technique is appropriate given the scenarios.

Nerlove (1967), Nickell (1981), also Baltagi (2008) observe that there can be severe bias of estimators if OLS model is used in case of dynamic panel data, and the main reason is that the coefficient of the lagged dependent variable is biased due to correlation between fixed effects and the lagged dependent variable. However there is less consensus among the authors regarding the adjustment behavior and of the factors affecting the leverage ratios in this case. Flannery and Hankins (2013) make the point that such lack of consensus is mainly caused by the econometric biases or uncertainties in the estimation techniques chosen in the studies.There have been some techniques evolved to correct such biases, for example, GMM estimation, instrumental variables estimations, long differencing estimations etc. Flannery and Hankins (2013) have provided first of its kind comparison among seven estimation techniques for dynamic panel data models, namely, OLS, standard FE, Difference GMM (Arellano and Bond's, 1991), System GMM (Blundell and Bond, 1998), variations of Long differencing estimations (Hahn et al., 2007, Huang and Ritter, 2009), and also corrected least squares (Kiviet, 1995, Bruno, 2005).

In simple words, short panel bias can be detected by estimating the same dynamic model using OLS, FE and System GMM. In the main partial adjustment model (as will be discussed in details later) if the target ratio (which may be target leverage ratio, or target dividend pay outs etc) is a function of both observed firm specific variables and fixed effects, then there should be biases in the coefficient of the lagged dependent variable while running OLS or FE, since in case of OLS the fixed effect is completely ignored, and in case of FE the short panel bias is completely ignored. Relatively then System GMM is a better estimation.

Moment conditions for GMM estimation

General method of moments (GMM) is a general estimation method where the estimators are derived from the moment conditions. Moment condition is a statement about the data and parameters, as shown below:

$$g(\theta) = E[f(w, z, \theta)] = 0$$

Where θ is a K x 1 vector of parameters, f(.) is an R dimensional vector of non-linear functions, w contains the model variables, and z contains the instruments. Hence if the expectation values are known then it is possible to solve for θ. If there is a unique solution, or there is one θ which solves E[f(.)]=0, then the system is called identified. Again two issues regarding identification may arise, one, is the model constructed so that θ is unique, and two, are the data informative enough to determine the unique value of θ.

1. Instrumental variables estimation

In many applications the moment condition can be written as $f(w,z,\theta) = u(w,\theta) * z,$ here R instruments in z are multiplied by the disturbance term u, here u(.) is 1x1 and z is Rx1. here u can be thought of as an equivalent of an error term, hence then the moment condition becomes, $g(\theta) = E[u(.) * z] = 0$, which is the statement that the error terms are uncorrelated with the instruments of the model. These classes of estimators are called as the instrumental variables estimators. The function u(.) may be linear or non linear in θ.

2. Method of moment estimator (MM)

Here given the sample, w_t, and z_t (t=1,2,…,T), the sample moment conditions are measured:

$g(\theta) = 1/T\sum f(w,z,\theta)$, here we can derive an estimator θ'as solution of g(θ')=0.

The basic criteria for finding the estimator is that we need at least as many equations as we have parameters. The order condition for identification$R \geq K$:

1. R=K, is called as the exact identification, the estimator is denoted as the method of moment estimator.
2. R>K, is called as the over estimation, and the estimator is called as the generalized method of moment estimator (GMM).

MM estimator of the mean: Let us consider y_t as a random variable extracted from the population with the mean value μ_0, here we need only one moment condition, $g(\mu_0)=E(f(y_t,\mu_0))=E(y_t-\mu_0)=0$. Where $f(.)=y_t-\mu_0$.

Therefore for a sample of $y_1,y_2,\ldots,y_T$ we have the sample moment condition as

$g_T= 1/T*\sum(y_t-\mu)=0$. Here the MM estimator of the mean is the solution, which is $\mu_{average}=1/T\sum y_t$, which is the sample average.

However for the case of over estimation as defined in 2 there is no general solution for $g_T(\theta)=0$. Hence the optimal method is to minimize the distance between $g_T(\theta)$ and 0. This distance is measured in the quadratic form $Q_T(\theta)=g_T(\theta)'W_Tg_T(\theta)$, where W is RXR positive definite weight matrix. Here the GMM estimator is a function of the weight matrix:

Hence, estimate of θ_{GMM} =arg min { $g_T(\theta)'W_Tg_T(\theta)$}. There can be different choices of the weight matrix, for example it can be conceived as the Identity matrices where there are 2 moment conditions, say g_1, and g_2, therefore $g_T=\begin{pmatrix} g1 \\ g2 \end{pmatrix}$, the W matrix can be considered as to be I_2. Hence $Q_T(\theta)=g_T'I_2g_T=g_1^2+g_2^2$. This measure is nothing but the square of Euclidean distance from 0. Here then both the coordinates are equally important. However if the choice of the W matrix is $\begin{pmatrix} 2 & 0 \\ 0 & 1 \end{pmatrix}$ then the distance will be $2g_1^2+g_2^2$, where the first coordinate has more weight than the second coordinate.

The main reason that such a mechanism should work is that the law of large numbers should hold, i.e. $1/T\sum f(w,z.\theta)$ tends to $E(f(w,z.\theta))$ as T approaches infinity. Which also implies that if the moment conditions are correct than the GMM is consistent, which means that the estimate value approaches the true population value as T becomes very large.

Asymptotic distribution: it is assumed that there is a central limit theorem corresponding to $f(w,z,\theta)$, which means $\sqrt{T}.\ g_T(\theta)$ approaches N(0,S), where S is the asymptotic variance term. It follows then that for any positive definitive W matrix, the GMM estimator term has an asymptotic distribution which is given by $\sqrt{T}(\theta_{GMM}-\theta_0)$ approaches N(0,V), where V is the asymptotic variance. Where $V= (D'WD)^{-1}D'WSWD(D'WD)^{-1}$.

Hence the efficient GMM estimator has the smallest possible variance. A moment with small variance also means it is highly informative and hence should have large weight. It again follows that the optimal weight matrix W has the property, plim $W=S^{-1}$. Hence if this value is plugged into the expression of V, we get $V=(D'S^{-1}D)^{-1}$. The best moment conditions have small S and large D. small S implies that the sample variation or noise is small. Whereas large D means moment condition is violated if $\theta \neq \theta_0$, and the moment is very informative on true values of θ_0.

Testing the over identified moment conditions: K moment conditions are sufficient to estimate K parameters in θ. If R>K, the validity of R-K moment condition needs to be tested. MM conditions demand that the K moment conditions be set equal to 0, then if R moment conditions are valid R-K moments should also be closed to 0. Here J test or Hansen test is performed for testing over identifying restrictions, for linear models Sargan test is used.

3.4. Data and variable selection

Data extraction and variables used in this section is in continuity with the earlier sections, since the objective of the thesis is also to investigate whether the similar bank specific variables have significant impact on the adjustment process, i.e. the speed of smoothing. Another objective, as stated earlier, is to investigate whether the same sample of bank holding firms which pays dividends on a regular basis also practice smoothing of pay outs in general. The last objective is related to the theoretical underpinning of signaling via dynamic dividend pay outs, or pay outs in general (here signaling means value signaling as explained earlier).

Data collection

To analyze how the banking firms adjust dividend payout levels data has been extracted from two sources, one, balance sheet data for all listed and active BHC from COMPUSTAT, and two, all listed BHC stock market data (stock price, and turnover) from CRSP. Sampling period is 1990-2015, hence covering the financial crisis period. We have used some selection criteria to ensure that we can capture the adjustment process, one, dropping the bank period observations which have missing data for the basic variables
used, two, selecting those banks which have paid dividends for consecutive 4 periods to

capture the adjustment process, three, winsorizing all variables used (standard 1% and 99% level) to remove any outlier effect[99].

Variables used

The bank level variables used here are again based on the recent empirical literature on dynamic dividend adjustment. First, there are some standard opacity variables like size, bid ask spread over the periods, tangibility of assets, or intangibility of assets, average turnover or volume of trade on the firms share which will be used as the reflection of information asymmetry between the insider managers and the outsider shareholders.

There are alternative measures of opacity among the investors in general, for example, the adverse selection component of the bid-ask spread, in the current section since agency conflict between outsiders and insiders is more critical the earlier mentioned measures have been used.

There is a growing literature which investigates the impact of default risk measures on the level of dividend pay outs, since there is a theoretical suggestion that high default risk banks which have deposit insurance system can shift the risk to the depositors via paying out more dividends, and this phenomenon is more observed during the crisis periods. Such risk is captured by z score measures.

A similar risk measure will be loan risks which is measured by non-performing assets to total assets, or non-performing loans to total loans. Such measures have been used in the current section to investigate the impact on the speed of adjustments. Along with the opacity measures the firm specific control variables are adopted from the standard dividend life cycle theory literature (Densi etal, 2008) which holds that with the change of the life cycle phases reflected by these suitable variables dividend pay-out levels also do change significantly. These measures are retained earnings to total asset(RE/TA), common

[99] a more detailed description of data and variables is provided in the appendix section.

equity to total asset(CE/TA), long term debt to total asset(D/TA), and interest expenditure to total assets(IE/TA).

Retained earnings to Total asset (RE/TA) : following Denis etal (2008), DeAngelo etal (2006) among other studies on dividend life cycle theory we use RE/TA mix as the measure of life cycle phase of a firm. A relative low value of the ratio indicates relatively young firm with greater investment opportunities as compared to the relatively matured firms with higher value of the ratio. The standard theory of dividend lifecycle propose that with greater retained earnings ratio and shrinking investment opportunities the agency conflict rises, since under information asymmetry between insider managers and outsider investors the latter group finds it more costly to monitor whether the firm managers are managing shareholders wealth or destroying the same by investing in negative NPV projects. Hence in such a scenario its predicted by agency theory that dividends should be paid out more steadily to mitigate agency conflict. However, there is no extensive study done on the impact of retained earnings mix on dividend smoothing, specifically on the speed of adjustment.

Common equity to total asset (CE/TA): we follow Flannery etal (2010) and use CE/TA as another measure of lifecycle phase which is indirectly related with information asymmetry, or opacity level. The same author have observed that among banking firms a relatively lower vale of common equity reflects higher opacity level as comared to a relatively higher value, and this distinction has been shown very prominent during the last financial crisis 2007-09 as studied by the author.

Long term debt to total asset ratio (D/TA): we follow a strong body of literature (Flannery,1986, Liu etal 2012) and use long term debt to asset ratio as another frim specific variable which indirectly reflects the bank opacity level. Earlier studies mention that maturity structure of debt, or interest rate spread measures, or higher outstanding long term debt might reflect higher level of opacity for banking firms, and this is also related to the fact that generally long term debt held by banks are highly illiquid due to high opacity.

Interest expenditure to asset ratio (IE/TA): we follow a growing body of literature (Liao etal, 2012, Denis etal, 2005) which use measures of interest expenditure by both banking and non-banking firms as a firm specific variable which is used to reflect the information asymmetry level, even theoretical literature (Miller, 1977) holds that greater interest expense ratio reflects higher information asymmetry level. However the study of the impact of this measure on smoothing behaviour by banks has not been done hitherto.

Hence overall we find that both the direct measures of information asymmetry and indirect lifecycle or firm specific measures rationally seems to impact dividend smoothing, since smoothing, as predicted by the theoretical literature cited earlier, is generated by information asymmetry. However the nature of relationship is intriguing to study since it has not been investigated in details as of yet.

Overall the list of the variables remain similar as in the last section on dividend signaling. Here as the dependent variable for the adjustment model different types of dividend pay outs have been used, namely, DPS, cash dividend, stock dividend, total value of the dividend paid out. Share repurchase data has also been used.

3.5. Results and Discussion[100]

The table below provides results for information content of signaling through smoothing of pay outs, where the dependent variables are adjustment speed of dividend per share pay outs, adjustment speed of total dividend pay outs (including stock and cash dividend pays), and adjustment speed of total pay outs (including share repurchases). Among the bank specific explanatory variables a default risk dummy is also included, as described in the data and variables section. Significance of the impact of the explanatory variables are shown by *** as p< 0.01, ** as p value<0.05, and * as p< 0.10. Nature of impacts are discussed in the

result section for section 2. The estimation technique is standard TOBIT.

	(1) Adjustment Speed DPS	(2) Adjustment Speed Total dividend	(3) Adjustment Speed Total pay
No. of observations	3358	3360	3395
SIZE DUMMY	0.060***	0.001**	0.021***
LEVERAGE LAG	-0.005**	-0.01*	-.001
CISIS	0.004	0.004	0.012
CREDIT GRTH	-0.014*	-0.011	-0.001
LOAN RISK	-0.001	-0.001	-0.0001
CAPITAL ADQCY	-0.479***	-0.020***	-0.028**
Default Risk Dummy	-.223***	-.013*	-.010
RE/TA LAG	-0.481***	-.036**	-0.38***
EPS LAG	.001	-.309***	0.001
Prob > chi2	0.000	0.000	0.000
Time dummy	yes	yes	yes

TABLE 4 of the section investigates the specific information content of the speed of adjustments related to the dividend per share adjustment, total dividend pay-out adjustment which comprises both stock dividends and cash dividends, and total pay-out adjustments which comprises dividend levels as well as the share repurchase levels. In the descriptive analysis section further details of comparative statistics between these adjustment speeds are provided. In the above table the main focus is to investigate whether or not these adjustment speeds reflect smoothing as a signaling tool. Hence the main focus is whether the information content of these adjustment speeds or smoothing processes is consistent with the earlier sections on dividend or pay out signaling by banking firms in general. It is already mentioned

[100] Tables 1, 2, and 3 or the three step results of the partial adjustment model is presented in the appendix.

in the literature review of this section that there are multiple studies which have extended the seminal signaling models.

Miller and Rock (1985), or Bhattacharya (1977) and generated dynamic signaling models (for example Kumar and Lee, 1984) where smoothing or partial adjustment of dividends have resulted which can also convey insider information, or can be used as a costly signal to resolve agency conflict like free cash flow problem in a dynamic setting. Of late there have been some empirical studies which have investigated the firm specific or industry specific characteristics which determines the speed of smoothing, or whether firms should smooth more or less.

However the earlier studies have failed to investigate the firm specific adjustment speeds which may vary over time or periods, such heterogeneous adjustment speeds can reveal greater information or identify more firm specific characteristics which determines smoothing speed. Hence the current study has adopted a modified partial adjustment model which enable to estimate such heterogeneous adjustment speeds, and also such estimations are done for different types of adjustments comprising all three different adjustment speeds as mentioned above. The main contribution is however to extend the partial adjustment investigation to the bank holding companies and reveal the signaling nature of such adjustments.

Leary and Michaely (2011) have provided a comprehensive investigation on the dividend smoothing determinants for the industrial firms. The main finding is that smoothing is more prevalent among firms where the agency costs are higher, which is again reflected in the fact that larger firms, more matured firms with larger market to book values, or larger retained earnings do smooth more.

By smoothing more it is implied that the speed of smoothing for such firms are lower compared to the industry average. Such finding is in line with the dividend signaling investigation for the industrial firms (as explored in the last section), where agency cost theory holds more that the signaling theory. In the above mentioned study too value signaling, or signaling or future financial strength is found to be a weak determinant of smoothing.

Compared to the above finding it is worthwhile to recollect that for banks signaling of dividends or pay outs (as in the last section) in the current thesis is found to be the neoclassical value signaling, where solvency, financial strength, capital adequacy and related measures are found to be information content of pay out signaling. This difference in nature of signaling is the fundamental difference between the banks and non-banks, which is also found by Floyd et al (2015), or Forti and Schiozer (2015), but the current study extended the literature by investigating smoothing as signaling by banks.

The estimation used in the above table is a standard panel data TOBIT which is consistent with the earlier section as well as the recent bank specific studies as mentioned. The first significant impact is of size, which means that greater is the lagged value of size higher is the probability of increasing the adjustment speeds by the specific banks. Again higher adjustment speed according to the standard definition of smoothing means lower smoothing. This finding in conjunction with the earlier finding of positive impact of size on pay out levels do confirm that the impact of size on the smoothing or pay out levels support agency cost theory more than signaling theory. This finding is in line with the standard empirical literature that larger firms or more matured firms may use dividends or pay outs as tools for mitigating free cash flow agency costs. In the last section the impact of retained earnings has been shown to have positive impact on pay out levels already.

Agency cost signaling is also captured by the significant negative impact of the retained earnings level measure in the above table. It is clear that banks with greater retained earnings measure slows down the adjustment processes, or greater is the retained earnings measure lower is the probability of increasing the speed of adjustment. This result is compatible with the impact of the retained earning level on the pay out levels in the last section, which again reveals that free cash flow agency cost too has a significant role to play in the adjustment processes for the banks.

However the signaling theory lends support more to the other bank specific characteristics, which is again in the line with the section 1. For example, leverage level has a negative significant impact on the bank specific adjustment speed, which as explained in the last section is well supported by the signaling theory.

Credit growth, which is considered as the investment opportunity for banks (Forti and Schiozer, 2015), is found to have similar negative impact on the bank specific adjustment speed as in the last section. This impact can also be explained by the neo classical signaling theory as in the last section.

Loan risk which is found to have a significant negative impact on signaling level in the last section is found to have still negative impact on bank specific adjustment speed , but less significant. However taken together, i.e. both pay outs and adjustment speeds of pay outs the signaling theory lends support to the observed behaviours.

Capital adequacy level has exactly the similar significant and negative impact on the adjustment speeds as it has on the absolute pay out levels as found in the last section. This probabilistic impact is well supported by the signaling theory as explored in the last section, or in the literature review. This impact is also observed in recent studies of bank dividend signaling by Forti and Schiozer (2015).

Default risk dummy, as explained in the variable section, also is found to have a significant negative impact on the adjustment speeds, which is compatible with the recent dividend pay out literature for banks, i.e banks may reduce dividend during high default risk levels to build up capital. Here we can again recall two conflicting strands, as mentioned in details earlier, one strand holds that banks may cash out, or exhibit risk shifting or wealth transfers during high default risk periods, and thus pay larger dividends to shareholders, the other strand however holds exactly opposite of this and suggests that banks use dividends to signal financial strength or value hence should behave the opposite way. The finding in the current thesis supports the costly value signaling literature rather the risk shifting strand.

Table 5 CHAPTER 3, The table below provides results for information content of signaling through half life estimations (Oliviera, et al, 2014) of pay outs, where the dependent variables are adjustment speed of dividend per share pay outs, adjustment speed of total dividend pay outs (including stock and cash dividend pays), and adjustment speed of total pay outs (including share repurchases). Among the bank specific explanatory variables a default risk dummy is also included, as described in the data and variables section. Significance of the impact of the explanatory variables are shown by *** as p< 0.01, ** as p value<0.05, and * as p< 0.10. Nature of impacts are discussed in the result section for section 2. The estimation technique is standard TOBIT.

	(1) Half life DPS	(2) Half life Total Div	(3) Half life Totalpay
No. of observations	3358	3360	3395
SIZE DUMMY	-.776***	-1.05***	-0.3***
LEVERAGE LAG	-0.005	-0.01*	-.001
CISIS	-.207**	-0.083	-0.017
CREDIT GRTH	0.008	-0.015	0.004
LOAN RISK	0.001	0.001	0.0001
CAPITAL ADQCY	3.680***	4.28***	1.40***
Default Risk Dummy	0.538*	4.289***	0.248*
RE/TA LAG	6.450***	5.86	5.05***
EPS LAG	.001	0.002	0.001
Prob > chi2	0.000	0.000	0.000
Time dummy	yes	yes	yes

Table 5 of the section is based on the regression results where half life is the dependent variable and the bank specific characteristics are the explanatory variables. The main purpose of this table is to investigate the information content of the half life of pay out smoothing by bank holding companies. The estimation technique here also is TOBIT as a consistent method with the earlier tables. Half life is an important measure for the smoothing behaviours as has been calculated in recent studies (for example by Oliver et al (2014)). This estimate (details of the estimation formula is discussed in the literature review) captures the managerial expectation, since this estimate reveals the time taken for the managers to cover the half of the targeted pay out levels (which is further determined by other sets of bank specific variables as has been estimated in the current study, based on the standard literature, for example by Hong et al (2015) or Oliver et al (2014)). A simple expectation is that if rate of smoothing or adjustment speed is high then the half life is lower. Factors which have a negative impact on half life measure also speeds up the smoothing process.

According to the table size has a significant negative impact on half life which varies across the bank holding companies over quarters in the study. The impact is probabilistic which means that higher is the value of lagged size lower is the probability of increasing the half life value, or in other words larger banks do not have the incentives to smooth more by increasing the half life period. This impact is in line with the result for the impact of size on the adjustment speed. However if we keep in mind that in the last section where signaling content of absolute pay outs is investigated, positive impact of size on absolute level of pay out is always noted. Hence two results gets clarified, one, if agency theory based explanation is considered then larger banks paying larger absolute dividends gets supported by the free cash flow theory, however that does not imply that larger banks also smooths more, rather they smooth less, or in other words their adjustment speeds is greater than the smaller banks. The smoothing result for size is again more related to information asymmetry theory, which suggests that larger and more diversified and reputed banks may not smooth more since the level of opacity is lower as relative to the more young banks with lower size, hence less diversified. Hence for size the signaling theory prediction is more suitable.

Lagged value of the leverage variable has a negative significant impact of the total dividend payed out (at 10% level), which implies that for higher leverage levels of banks the half life is more, which again hints at the greater smoothing practised by the highly leveraged banks, though the impact is not very consistent since the negative impact is not significant for the adjustment speed, hence the half life of the total pay out policy, which comprises total dividend pay outs as well as the buy back levels. Earlier tables however have reported more significant impacts of leverage levels for signaling by dividends as well as pay outs by buy outs.

The impact of credit growth (which has been used in the current study as a proxy for investment opportunities, following Forti and Schiozer (2015) and others) is however not significant across the three different half life measures. Credit growth have some negative significant impact on the adjustment speed corresponding to the dividend per share level (as in the last table). However earlier in as per the signaling results in the first section of the study there is some significant impact of the investment opportunities on the absolute levels of pay outs. Here it can be observed that it is not always that the same variables affect the absolute value of bank specific signaling as well as bank specific speed of adjustments. Hence though there is a consistency between signaling and smoothing results, one cannot be considered as to be just an extension of the other.

Loan risk or the risk of the loan portfolio of banks have consistent positive impact on the three half-life measures, which is consistent with the impact of the same variable on the adjustment speeds. Hence it can be inferred that higher is the level of portfolio risk greater is the probability of increasing the half-life of bank pay outs, which means more smoothing. Such behaviors of banks is consistent with the regulatory requirement of capital building, hence following a more slow adjustment process of paying out via dividends. It should be kept in mind that studies on the information content of bank dividends loan risk is consistently found to have negative probabilistic impact on the absolute level of dividends, as in the current study also in the earlier section. Hence in this case we find a consistency between the signaling and smoothing behaviours of bank holding companies in regards with the information content. One very critical finding is that consistency between the regulatory capital need and the smoothing behaviours of bank holding companies in general (which again contradicts some studies on risk shifting by very large banks but lends support to the value signaling literature as explored earlier). The striking support for this observation comes from the result that capital adequacy level has consistent negative significant impact on all three types of half life estimations, where as in the last table capital adequacy has a consistent positive impact on all three estimated levels of bank specific adjustment speeds. This result indicates clearly that there is a compatibility between the building up of capital and more smoothing of pay outs. This study for the first time has shown some bank specific consistent results on the same, i.e. consistency between regulatory capital build up requirement, smoothing and signaling of pay outs.

Default risk dummy as explained in the variable section captures whether the specific banks are above or below median level of default risk in the panel data sample. The results from the table clearly shows that there is a consistent positive significant impact on the half life estimations of the dummy variable. This result implies that specific banks which have default risk levels greater than the median level prefers to slow down the adjustment process, hence more smoothing is exhibited by such banking firms.

According to this result also there is no indication of cash out hypothesis by Acharya et al (2011), and this result is consistent with Forti and Schiozer (2015) for absolute pay out levels.

Retained earnings ratio has a very consistent positive significant impact on the three estimates of half lives, which is compatible with the agency cost of free cash flow studies (Floyd et al, 2015; Lambrecht and Myers, 2013 among others).Throughout the earlier tables it is observed that free cash flow hypothesis is supported both by signaling in terms of absolute pay levels of dividends and smoothing of dividends, which implies that banks relatively richer in free cash flow signals greater dividends in absolute terms but along with it also slows down the adjustment process. Earlier there are only theoretical studies which have predicted such bank specific behaviour.

Subsample Result 1 The table below provides a mean difference test for the adjustment speed of dividend per share pay outs, when the sample is split around the median values of opacity levels, and size, the first two columns reports the mean values of adjustment speeds above and below the medians and the third column reports the significance level of the differences. Such differences are then discussed in the result section, based on underlying theoretical models, namely, signaling theory, pecking order theory and life cycle theory.

Table 6 Chapter 3

	(1) Above Median Speed	(2) Below Median Speed	(3) Significance Difference
No. of observations	3358	3358	3358
Around Size	0.3241	0.2985	0.004***
Around Tangibility	0.321	0.300	0.019**
Around Turnover	0.331	0.290	0.000***
Around Spread	0.311	0.300	0.990

Difference between average adjustment speeds across banks based on median opacity values

The partial adjustment model developed in the current thesis is different from the standard partial adjustment models where only average speed of adjustments can be estimated (for example in Flannery and Rnagan (2006)) since the modified partial adjustment model used in the thesis (based on Oliver et al (2014), and Hong et al (2015)) it is possible to estimate the bank specific and time varying adjustment speeds and half life values.

Such bank specific values is then used to perform some further sub sample analysis, where the adjustment speed values and half life values are split around the median values of opacity levels, and then standard mean difference analysis is performed to investigate if these values of adjustment speeds and half life are significantly different from each other. Such subsample results give further support to the underlying theories.

In the first subsample result, the results show that above the median size bank holding companies have greater adjustment speeds compared to the adjustment speeds of below the median size banks, and the difference is statistically significant at 5% level. This result support the earlier signaling and smoothing results in a more direct way. Signaling theory has held that the smaller and younger banks are relatively more opaque and therefore should face greater need to signal more to mitigate adverse selection of equity cost mainly.

Its clear from the earlier results that there are implications of signaling theory via the size impact, in the above table the result is more clear since only smaller and more opaque bank holding companies have the incentive to maintain a slower adjustment process, which means smoothing pay outs more (this result has to be compared with the impact of agency cost of free cash flow as suggested in the earlier tables).

Tangibility across all the tables have consistent negative significant impact on pay out level of dividends which is consistent with the signaling theory, which may not be consistent with the pecking order theory which as explained earlier predicts opposite.

In the subsample analysis table 1 it is clear that adjustment speed average for the bank holding companies have below the median level of tangible assets, hence more opaque, is less compared to the upper 50% of banks. Hence it can be inferred that to maintain a consistent pay out policy there is a compatibility between the absolute level pay out of dividends and smoothing of the same.

However when the adjustment speed averages are compared for subsample across the below and above median values of turnover it is found that the difference is significant but the former group of bank holding companies are smoothing more compared to the later. The results alsoprovides no significant difference across the spread measure.

Subsample Result 2 The table below provides a mean difference test for the target dividend per share levels , when the sample is split around the median values of opacity levels, and size, the first two columns reports the mean values of adjustment speeds above and below the medians and the third column reports the significance level of the differences. Such differences are then discussed in the result section, based on underlying theoretical models, namely, signaling theory, pecking order theory and life cycle theory.

Table 7 Chapter 3

	(1)	(2)	(3)

	Above Median Target	Below Median Target	Significance Difference
No. of observations	3358	3358	3358
Around Size	0.421	0.311	0.000***
Around Tangibility	0.337	0.395	0.000**
Around Turnover	0.414	0.318	0.000***
Around Spread	0.380	0.352	0.000***

Difference between target pay outs as estimated from the adjustment model based on difference in median opacity values

The partial adjustment analysis used in the thesis has also enabled the author to estimate the bank specific target pay outs (in terms of dividend per-share as well as other pay-out types which is discussed more in appendix). Again the same subsample analysis is done on these pay out target values. The results for the subsample analysis table 2 provides insights in to how the target values are changed according to the median opacity levels, which further reveals the importance of underlying theoretical explanation, primarily from the signaling and agency cost perspectives.

Bank holding companies which have greater than the median size also sets higher pay out targets as dividend per share basis, and the difference between the target values is statistically significant at 5% level significance. This finding is consistent with the findings of the actual pay out levels. Hence agency cost of free cash flow can be a compatible explanation for the same.

Bank holding companies with above median level of tangibility or proportionate tangible assets sets lower dividend per share targets compared to the below median tangibility group, and the difference is statistically significant at 5% level of significance.

This result is directly supported by the neoclassical value signaling theory, and is also supported by the actual pay out results in the earlier tables. Hence this result supports the Miller and Rocks (1985) type prediction that is at a separating equilibrium greater is the opacity level higher will be the pay out level or signaling level.

Bank holding companies with greater than the median turnover also sets greater targets as pay outs, and the difference between the two sub groups is also statistically significant. This result is also compatible with the impact of turnover on pay outs actual as in the earlier tables.

Bank holding companies with greater than the median level of bid ask spread for their equities also set greater pay out level targets, and the difference is significant at 5% level. This result is compatible with the adverse selection of equity theory which suggests that greater spread also reflects greater opacity between insider managers and outsider investors, hence higher adverse selection premium is demanded, higher dividend pay outs is a costly signal in this case to mitigate the cost.

In more market based studies adverse selection component of bid ask spread is measured as the opacity level, but such measure reflects the information asymmetry premium between the less informed and more informed investors.

Subsample Result 3 The table below provides a mean difference test for the target level pay outs for the total dividend pay outs including cash and stock dividends, when the sample is split around the median values of opacity levels, and size, the first two columns reports the mean values of adjustment speeds above and below the medians and the third column reports the significance level of the differences. Such differences are then discussed in the result section, based on underlying theoretical models, namely, signaling theory, pecking order theory and life cycle theory.

Table 8 Chapter 3

	(1) Above Median target	(2) Below Median target	(3) Significance Difference
No. of observations	3360	3360	3360
Around Size	2.53	1.63	0.000***
Around Tangibility	2.04	2.12	0.000**
Around Turnover	2.35	1.81	0.000***
Around Spread	2.12	2.03	0.000***

Subsample result 3 provides results for the target levels for the total dividend pay outs when the whole sample is split around the median values of the opacity levels.

In the standard dividend signaling literature pay outs are perfect substitute of each other (Bhattacharya, 1979; Miller and Rocks, 1985; Grullon et al, 2003 among others), such that the ultimate signaling nature is kept intact.

However later studies like Floyd etal (2015) have argued that types of pay outs by banks have changed fundamentally over last decade. In specific there has been a growing tendency of stock dividends and share repurchases.

The total dividend level in the current thesis is the sum of cash dividend and stock dividends. Here the speed of smoothing is for the total dividend pay outs, hence corresponding target levels is also the total dividend pay out targets.

The average target level of total dividend pay outs for the banks of above median size is greater than the banks with lower median size, and the difference is significant at 1% level. This result is consistent with the earlier tables and supports the agency cost of free cash flow theory. Bank holding companies are consistent between setting targets and actual pay outs as shown in the signaling results earlier.

The average total dividend pay out target for the below median level tangibility banks is significantly greater than the upper 50% of banks. Since lower tangibility implies greater opacity level or higher adverse selection cost the signaling theory implies such a result. The result is consistent with the earlier signaling results in the first section of the thesis.

When the sample is split between the median level of turnover the total dividend pay outs of the above median turnover banks is found to be significantly greater than that of the lower median turnover banks. This result also supports the theory that higher turnover is associated with greater adverse selection cost.When the sample is split across the spread level of the equity values, which represents higher adverse selection premium in general, it is found that the total target dividends for the above median spread level banks is significantly greater than that of the lower 50%. This result also supports the signaling theory under adverse selection.

Subsample Result 4 The table below provides a mean difference test for the target level pay outs for the total pays including cash dividends, stock dividends, and share repurchases, when the sample is split around the median values of opacity levels, and size, the first two columns reports the mean values of adjustment speeds above and below the medians and the third column reports the significance level of the differences. Such differences are then discussed in the result section, based on underlying theoretical models, namely, signaling theory, pecking order theory and life cycle theory.

Table 9 Chapter 3

	(1) Above Median Target	(2) Below Median Target	(3) Significance Difference
No. of observations	3395	3395	3395
Around Size	5.64	4.42	0.000***
Around Tangibility	4.90	5.96	0.000**
Around Turnover	5.55	4.51	0.000***
Around Spread	5.15	4.90	0.000***

Subsample result 4 provides the results for the total pay out target levels, which comprises dividends in cash and stock forms and share repurchases. Recently there is a good debate on the substitutability of these pay out types, specifically whether repurchases can substitute dividends. Earlier it has been shown in the current thesis that both dividends and repurchases can be thought of as signals, since their information contents relate to the agency cost theory and more specifically to the neoclassical value signal theory. However the information content is more bank specific rather than supporting general studies on firms.

The current table shows that the banks having greater than median size have also set greater total pay out targets, and the difference is significant at 1% level. This finding is consistent with other tables throughout. Grullon et al (2002) raised the question that why the larger and more matured firms pay more dividends rather than share repurchases? However for banking firms, as observed by Floyd et al (2015) there is nearly comparable rise in repurchases too. The current table supports the recent results which can again be explained by signaling, and or, agency theory of free cash flow.

Bank holding companies are also found to set greater targets for total pay outs when their turnover levels are greater than the median level, and the difference is significant at 1% level. This finding is consistent with the adverse selection problem as explained earlier. Subsample result for spread is supported by the earlier target levels too.

Hence for each model the result of interest is the impact of lagged opacity variables on the DPS level, hence if the corresponding p value is less than 5% then the null hypothesis that lagged opacity variable does not impact DPS is rejected. The outputs clearly show that the p values corresponding to all such pairs are all less than 5%, hence all the associated null hypotheses can be safely rejected. The p value corresponding to the impact of DPS lagged on DPS is always significant and positive for all the models, but this is not an output of main concern here. Hence from the results till here its clarified that the impact of opacity on dividend level is significant and robust in the implied sense. For the interpretation of the Granger tests the p values corresponding to the null hypothesis opacity does not G causes DPS is exhibited, and here too the rejection rule is same i.e. the p values should be less than 5%. In the table the first figure for the G tests against all the pairs is the chi-squared statistics, and the corresponding figure is the p value.

<u>Various adjustment speeds of pay outs</u>

In the current thesis different pay out types have been considered, namely, dividend per share (DPS), total dividend pay outs including cash dividends and stock dividends, and total payout including dividend pay outs and share repurchases. Hence the same partial adjustment model is utilized to measure the speed of adjustments of the last two pay out variables also. The below tables provides results for whether there has been significant differences in the mean value of speed of adjustment among these pay outs. Again in the relevant current literature such bank specific speed of adjustment comparisons are rare. Such comparisons may enhance our insight regarding the signaling / smoothing behaviors of banking firms.

Table Results 10 Chapter 3

VARIABLE	OBS	MEAN	STD.ERROR	STD.DEV
SOA DPS	3196	.3145	0.0049	0.2780
SOA total dividend pay	3196	0.0694	0.0009	0.0509

H_0: MEAN (SOA DPS) - MEAN (SOA total dividend pay) =

0 Ha: difference of means < 0

Pr(T<t) = 1.000 t = 49.018

The above table provides a mean difference result between the DPS and the total dividend pay out, the mean SOA for the DPS is significantly higher than that of the total dividend pay out, again the standard deviation measure of total dividend pay out is also smaller than that of the DPS, which indicates that bank holding firms smooth total dividends more than the DPS which further calls for investigating the strategic targeting of the cash dividend and stock dividend pay outs by the banks.

VARIABLE	OBS	MEAN	STD.ERROR	STD.DEV
SOA DPS	3196	.3145	0.0049	0.2780
SOA total pay	3196	0.2191	0.0028	0.1611

H_0: MEAN (SOA DPS) - MEAN (SOA total pay) = 0

Ha: difference of means < 0

Pr(T<t) = 1.00 t = 16.018

Above results show that the speed of adjustment of DPS is significantly higher than that of the total pay which also comprise the share repurchases data. As has already been shown in the result sections that share repurchases do have signaling content, it is also evident from the above table that share repurchases also play significant role in smoothing of pay outs.

Dividend smoothing before, during and since the crisis

As already discussed in the thesis that there has been a considerable amount of interest in the payout patterns by bank holding firms during and since the financial crisis (2007-2009) the current section provides some results for bank dividend smoothing. The main objective here is to investigate if there has been some significant structural shifts in the speed of adjustment of dividend payed out, between before, during and since the crisis period. There have been studies, as mentioned earlier, regarding pay outs, however less studies are done about structural shifts in speed of adjustment of bank pay outs.

VARIABLE	OBS	MEAN	STD.ERROR	STD.DEV
SOA before crisis	2316	0.2777	0.0037	0.1814
SOA during crisis	821	0.3054	0.0070	0.2028

H0: MEAN (SOA before) - MEAN (SOA during crisis) = 0

Ha: difference of means < 0

Pr(T<t) = 0.0001 t = -3.7027

In the above table the mean value of speed of adjustment of dividend per share (SOA) is observed for a subsample, before and during the crisis period (2007-2009 quarter 1), two sample t test clarifies that the null hypothesis of no mean difference is rejected at 1% level of significance, which shows that the mean value of SOA during the crisis was significantly higher than the mean value of SOA before the crisis period (which in this case is quite considerable since it starts from 1981 in the current sub sample till 2006 last quarter).

The significant impact of lagged opacity variables on next period DPS is intact after this splitting. Hence overall there are two robustness checks, one, with four separate measures of opacity levels, and two analyzing whether the significance of impacts remain intact for the relatively more opaque firms. However, as will be clarified later in case of the impact of lagged turnover on the DPS level there is a significant change in the sign of the coefficient for the more opaque banks. Significant results are obtained for three pairs, viz, size, DPS, turnover, DPS, and Spread, DPS.

Previous findings on the impact of opacity on dividend smoothing

There is a scarcity of empirical studies in the area for the banking firms, however, recently thorough studies have been done on the non-financial firms, and these papers don't lend support to the standard signaling theories. For example Leary etal (2011) find that smoothing is prevalent among those non-financial firms which are larger, matured, less financially constrained, have more tangible assets, and face less agency conflict emerging from opacity problems, as opposed to the firms which have opposite characteristics hence are supposed to be more opaque. Deangelo etal (2008) have also observed similar deviation in practice from theoretical predictions.

However, even theoretically as mentioned earlier its not absolutely clear that whether banking firms can be treated similarly as their non banking counterparts, and whether similar kinds of results should be expected for them. Given this back drop this paper finds significant difference in the results for the banks in the sample which might overall suggest that there is better match between theory and practice in this case. More specifically in the line of the theoretical dividend smoothing models, as explored in the literature review, there is a good indication that for banking firms opacity level has a general tendency to generate smoothing behaviour which is evident form the results from the partial adjustment model as explained earlier.

3.6. Conclusion

The following passages discuss the possible contributions by the current section in the literature of bank dividend signaling and smoothing.

3.6.1 Capital regulation and dividend smoothing by bank holding companies: thesis findings

Since the financial crisis of 2007-2009 there has been a sharp attention in the academic world on the relation between the dividend pay outs by the commercial banks and the regulation on capital requirements for the banks. Studies like Hsiao and Tseng (2016) and Acharya et al (2011) have shown that there are significant impact of the rising of capital requirements on the bank dividend pay out policies in the developed capital markets, for example in USA.

Hsiao and Tseng (2016) have provided a robust un-balanced panel data analysis for cross country banking firms where they have found significant negative impact of the capital regulation on the dividend pay out levels. The authors have reported similar results for developed as well as developing economies.

Brunnermeier et al(2009) has earlier suggested that bank capital requirement should be adhered to by the commercial banks other wise they should face sanctions, since the capital requirements are required for maintaining solvency and liquidity for the banking firms.

Onali (2010) has argued that bank dividend policy and capital requirement are two pillars for maintaining a prudent management policy overall. It has been well noted in the literature that it is very costly for the banks themselves to maintain capital requirements. Banks can achieve so either by raising costly external equity capital, and, or reducing the supply of credit in the system (Walsh and Wilcox, 1995; Akhter et al., 2010). However the last option is not favoured by the policymakers too for its negative externalities for the economic growth.

Along with the standard regulatory arguments like above, there have been a few studies on the bank dividend signaling during crisis (Abreu and Gulamhussen (2013)). Such studies have provided at best a very mixed results of whether signaling and smoothing by bank dividends can be related to capital requirements.

There are however some recent studies which have investigated the signaling content of the dividend pay outs (Forti and Schizer, 2015) which include the capital adequacy levels for banks. Such studies based on panel data TOBIT models have shown significant relationship between dividend pay outs and the regulatory ratios. Hence the current thesis section has built upon such studies to investigate the role of such variables on the dynamic signaling by the bank holding firms, or dividend smoothing.

Based on such studies there are several related hypotheses in this area, for example dividend smoothing hypothesis which relates the low growth and more profitable banks with more smoothing, there is then the regulation hypothesis which argues that bank holding companies may reduce dividends, and even omit them due to rise in regulatory pressure.

However there is a critical gap in the current empirical literature in this context, since the direct impact of the capital requirement / capital adequacy level on the bank specific smoothing behaviour is not analysed. Such papers only provide an industry wide or country wide surveys. In the current thesis based on the partial adjustment model developed in this section it has been possible to measure the impact of capital adequacy level on bank specific adjustment speeds, and also on the bank specific half life period measurements.

The results are quite consistent for all types of dividend pay outs, and the main finding is that there is a negative significant impact of the capital adequacy level on the adjustment speeds, and a positive significant impact on the bank specific half life periods.

The finding is new, and this finding demonstrate that if the capital adequacy level is higher then the bank holding companies would slow down the dividend adjustment process, and this is well compatible with the dynamic signaling theory, since slowing down of dividend adjustment signals solvency and liquidity management better.

Here the difference between the findings of the standard studies and the thesis is called for attention, while in the standard studies the main finding is about reduction or omission of dividend levels, which is not clearly related to the costly signaling nature of pay outs, in the current thesis the finding is specifically about the smoothing process which contains the nature of costly signaling as argued elsewhere.

A brief note on the dividend smoothing and signaling since the crisis: empirical evidence

Since one of the main objectives of the current thesis is to investigate whether dividend smoothing can be a form of dynamic signaling, it's important to summarize some very recent findings which are however more general, rather based on banking firms. Nguyen et al (2016) have provided good empirical evidence that firms in general in developed markets, specifically, in US have followed the dividend smoothing pattern since the crisis to keep paying large dividends, which the authors reason as the attempt to signal reputation to the potential investors. Hence for these firms dividend smoothing and dividend signaling complement each other's.

One the other hand the firms in the emerging economies, specifically, Philippines, Malaysia, and Indonesia have failed to pay out larger dividends in the post crisis period. However these firms have exhibited smoothing in a consistent manner. Again firms in Thailand and Singapore though have increased dividend pay outs since the crisis period, have failed to maintain any smoothing pattern.

Hence one outcome of these recent studies is that dividend signaling naturally may not imply dividend smoothing. Again the stage of development of the financial markets as a whole may also have played some significant role in the firm behaviors.

The rationale for investigating the impact of crisis on the dividend signaling and smoothing behaviors is that during financial crisis firms may undergo greater external financial constraints, or in other words cost of capital may be higher than the normal or boom periods, which may increase the cost of paying outs (external capital constraint theories have been discussed briefly earlier in the thesis). Hence it might be worth studying the applicability of signaling and smoothing models in such structural shift conditions.

However in the current study as the results section reveal that there has been a steady practice of dividend smoothing by the US bank holding firms. Results in this section thus also raises the question that whether bank holding firms should be treated at par with the non-banking firms, or in other words the bank holding firms may be more resilient in their behavior compared to the firms in general during crisis times. Overall the purpose the value signaling seems to be more important for the banking firms, which has the rationale in that the reputation capital is most critical in the banking business.

Panel data causality results

The granger causality results in the above table show that for long run the dividend policy or the pay out level is significantly correlated with the information asymmetry level for at least one lag. This can be interpreted as higher information asymmetry would lead to higher pay out policies. This result is consistent with those theoretical models which predict that at equilibrium dividend pay out level is an increasing function of opacity level, for example in, Bhattacharya (1979), Miller and Rocks (1985), William and John (1985), John and Lang (1991), Khan (2006)[101]. [102]

Further cautions on panel data causality tests

[101] However these results are contrary to the findings of Li and Zhao (2008), or, Valipor et al(2009).

[102] Granger causality result shows a significant value (F or the p value since) which confirms that the direction of causality is from lagged opacity variable to the current dividend pay out level and not the other way round, or there is no so called feed back effect.

Dumitrescu and Herlin (2011) observe that Granger causality test of panel data for auto regressive models entails testing linear restrictions on the coefficients of the model. Granger (2003) observes that if one variable x causes another variable y for every panel observation, then it can be used as a strong hypothesis. Technically it can be said that x causes y when any other information set which excludes x can not predict y better. Hence in case of panel data if the causality of x to y is observed for N individuals then the problem boils down to estimating the optimal information set required to predict y. The most general solution adapted is to test the causality of ith element of x on jth element of y, when i =j, and when i #j. The last solution is relatively more restrictive and can be derived from the time series analysis, which simply measures the causal relationship for a given individual.

3.6.2 Contribution to the extant empirical literature

The relevant literature review has demonstrated that though the dynamic dividend adjustment literature is well developed since Lintner (1956) to Flannery and Rangan (2006) there is a very thin literature for the bank holding firms. Only recently there has been some important contributions (Oliver et al, 2015, Hong etal, 2016[103]) on the capital structure adjustments of BHCs. Hence from that perspective the current study is among the earliest such systematic study on the bank dividend smoothing under the impact of several bank specific factors.

The main aim of the study has been to investigate the impact of different bank specific factors such as opacity levels, default risk levels, capital adequacy levels, credit growth levels, loan risk levels, along with bank life cycle variables eg, retained earnings to asset mix, on the bank specific speeds of adjustments and allied measures. Here is another contribution to the standard empirical methods used in the dividend smoothing literature, since the earlier studies have mainly estimated the industry average speed of adjustment measures, but not bank

[103] Working paper where the authors measured the impact of several bank specific and industry specific variables on the speed of adjustment of capital structure. Opacity variables were also included in the investigation.

specific measures.

Hence bank specific heterogeneity has been studied which has been ignored by the earlier general studies. From this perspective the current section builds upon the two afore mentioned studies on capital structure adjustments for BHCs and extend the same for the dividend smoothing behaviour.

3.6.3 Exploring the underlying theories

As observed in the literature review there have been many studies where theoretically it is predicted that agency cost and information asymmetry between managers and shareholders might generate dividend smoothing. However in the theoretical literature too there is no satisfactory model which can explain the dynamic dividend behaviour of banking firms.

Most of the empirical studies in this regard have been mainly for the industrial firms which have mainly investigated the theoretical predictions of earlier information asymmetry based models or agency cost based models. However there is no systematic investigation for the banking firms in this regard.

Again the last section it is observed that there are many bank specific factors which play significant roles in determining the dividend and other pay out levels, hence the current section builds upon the first section to investigate the impact of the same set of bank specific variables on the speed of smoothing and bank specific half life periods. Hence overall the attempt has been to investigate whether the dynamic adjustment of pay outs can play the role of signaling based on the similar theoretical models.

The analysis section demonstrates very strongly that the dividend smoothing in different forms have similar significant relations with the same set of bank specific factors as is in the case of signaling. Specifically, opacity levels, life cycle factors, risk factors and capital adequacy levels have similar significant impacts on the speed of adjustments as well as bank specific half life periods. Again as explained in the analysis section the underlying theoretical explanations relate to adverse selection, agency cost, moral hazard and income smoothing literature.

3.6.4 A technical note on the current analysis

As any study in corporate finance, the current study also has some limitations, it has been clarified that there are several underlying theories which are contending candidates for explaining the dividend policies by firms. However one common string running through all of such theories is information asymmetry among insider managers and outsiders (may be shareholders, creditors, other stake holders in case of banking), which generates multiple types of adverse selection, and or moral hazard problems, which are captured in a dispersed way in various such theoretical models. Hence as a solution to such problems signaling and smoothing of dividend pay outs have been suggested. The current thesis is devoted to the analysis in the same line for banking firms, however this also means that variables chosen in the current thesis is mainly firm level variables, be it life cycle or opacity levels, which immediately raises some limitations as below:

1. As many authors observe that business cycles and macro-economic shocks arises often which impact the pay out policies randomly, as Singhania and Gupta (2015) observe

   that such shocks can generate unexplained and at times opposite results which can't be easily explained based on neoclassical theories. For example in case of such shocks the dependent variable along with the explanatory variables will be impacted most likely in the same direction which might bias the estimations.
2. The partial adjustment model developed in this study is a modification on Lintner's original model, there are some alternative formulation of such models where along with partial adjustment rational adaptation is also included, for example, Waud 's

model (1966) which is a second order rational distributed lag order model (which has been recently modified by some authors like Kumar et al (2001), or, Fama and Baibak's ETM or earning's trend model (1968). However such models don't consider the impact of information asymmetry level on the adjustment behavior.

3. Here we provide a brief discussion on the dynamic panel data model as the suitable method to analyse the partial adjustment model instead of any other model like OLS or fixed effect. Generally if we consider any adjustment model of the following type, $Y_{i,t} = \alpha Y_{i,t-1}+(\mu_i+e_{i,t})$, we have two error terms, one the time invariant error which is again a function of firm specific characteristics, and the other the usual residual term which is a function of both firm specific characteristics and time, again since residuals of $Y_{i,t-1}$ can be correlated with the time invariant error part any estimation of the above model by OLS will lead to an upward bias(Baltagi, 2001, Bond, 2002) hence other estimation techniques have to be called for, again specific to the adjustment model we use here if fixed effect regression technique is adopted then there would be bias in the estimation of the speed of adjustment (Oliver etal), hence we have chosen a difference GMM technique, a system GMM might be a better technique in the sense that it might have increased the efficiency of estimation, but as observed by previous studies since system GMM uses more no of instruments than difference GMM it might not be efficient to use in case of relatively less no of periods in the panel data, since this might weaken the diagnostic test results for AR. Limitations of this technique however rests on the fact that if there is high serial correlation problem in the error term and the dependent variable is highly persistent then the estimates by GMM would not be consistent, and this problem will show up in the AR test diagnostics, in our case the Hansen test for all the estimations is robust every time.

Chapter 4 (Investigation of risk shifting via pay outs by bank holding companies)

4.1 Abstract

There is a strong theoretical strand of literature which supposes that bank holding firms exhibit risk shifting, i.e. transfer of wealth from creditors to shareholders in general, hence shifting risk from share-holders to creditors. However there is no comprehensive study on whether such risk shifting can occur via pay outs mainly dividend pay outs, and through dynamic adjustment or partial adjustment of dividend pay outs. The current study builds upon the extant empirical literature to investigate the very problems. Based on a data set on BHCs from merged data bases of CRSP and COMPUSTAT for the period 1990-2015 the study provides an early such investigation on risk shifting via dynamic pay out behaviours of bank holding firms.

Key words: risk shifting, dividend pay outs, agency conflict theory, and dividend smoothing

4.2 Introduction

4.2.1Theoretical basis of risk shifting via pay outs: introduction

The current section is a further extension on the first two sections of the thesis. In this section a very specific issue is investigated, namely, risk shifting via pay out policies of banks. Risk shifting is not a new problem to be investigated in corporate finance in general and banking in particular. There have been seminal theoretical models by Merton (1977), Keely (1990), among others who have observed that given the deposit insurance guarantees, or implicit bail out guarantees there can be a tendency among the bank managers to pay excessive dividends during bankruptcy such that wealth is transferred from the depositors end to the shareholders and hence risk is transferred in the opposite direction. However, there have been rare empirical studies to verify the risk shifting hypothesis. Risk shifting via pay outs in banking have again surfaced as a critical issue since the financial crisis of 2007-09.

Costly dividend signaling has been well studied for general firms (Bhattachraya, 1977,Miller and Rocks, 1985, Kumar and Lee, 1981), and the general consensus among the economists is that dividends can be used to signal future earnings growth, or solvency under specific scenarios. A huge body of empirical works have also provided support for the efficacy of dividend signaling for firms in general. For banking firms however there is a lack of well-founded dividend signaling theory. Some recent attempts theorise dividend signaling as a strategy adopted by the informed insider managers to convey solvency to the less informed outside shareholders, and depositors, which again may help restore confidence in them and prevent unnecessary panic driven bank runs (Diamond and Dygvig, 1983). However the recent developments in the banking sectors worldwide (referring to the banking debacle in the last financial crisis) reveals that dividend signaling by banks are far too complex as far as their implications go as compared to the earlier simplistic theoretical models[104].

A more specific problem which has been exhibited widely by the banks with high default risk is risk shifting via dividend pay outs (Achraya et al 2011), which has roots in the earlier theoretical models (Merton, 1977) which predicts that given implicit guarantee schemes banks with high default probability might shift wealth from depositors to shareholders via large dividend payments, and hence would shift risk in the opposite direction. Acharya etal(2012) builds upon this strand and propose a simple risk shifting model via dividend pay outs.Hence here lies the trade off, on one hand steady dividend pay outs under information asymmetry may work as costly signals for future solvency or earning growths, but on the other hand, large dividend pay outs may also exhibit risk shifting. The basic problem which the current model wants to investigate is whether Acharya etal ‘s model (and alike) can be modified to introduce dividend signaling yet prevent risk shifting.

However the problem of risk shifting is also very much an agency conflict problem, since

[104] Overall the root of complexity rises from the fact that there are many stake holders in the model, insider bankers, depositors, shareholders, regulator and the society at large which suffers from the negative externalities.

its clear that there are winners (shareholders) and losers (depositors) in the process. Therefore to reach at any equilibrium solution the inherent agency conflict has to be mitigated.

There have been many surveys (for example, Acharya et al, 2013, Adamati et al, 2013 a, b) of dividend pay out patterns by banks during the financial crisis period. Acharya et al (2013) in an influential theoretical study have observed that even though the losses were accumulating during the crisis banks kept on maintaining a smooth dividend pay out policy. Such observations were made in the US as well as UK banking systems. However it is not clear from such studies whether dividend smoothing played an important role in risk shifting, or whether more generally pay out smoothing played any critical role in the same.

In the imperfect capital markets with presence of frictions like agency conflicts matters for the firm valuations (Harris and Raviv, 1991, Myers, 2001). Here arises the opportunities where the shareholders can exploit the debt holders by substituting safer assets with riskier assets. The standard rationale behind such behavior is that if the risky assets pay off then the shareholders may keep the maximum portion of returns and the debt holders due to limited liability and seniority of claims will be able to capture only a fixed proportion. Hence shareholders have the incentive to invest in negative NPV projects with very low probability of success. The moral hazard perspective on the very problem is that after the debt contract is finalized in practice the shareholders have the incentive, and can make the managers (hidden action) to invest in riskier projects which would undermine the debt holders interest. Hence if such moral hazard activities are realized then the shareholders would not like to keep the amount of 'skin' in the game which would be compatible with the underlying risk, which in other words would mean risk being shifted towards debt holders.

In banking sector risk shifting can be particularly higher, since the leverage in this sector is systematically higher than in the other sectors (Berger et al, 1995). Again most of the liabilities in a commercial bank is in the form of deposits, where the owners of such deposits have less resources and incentives to monitor the managers effectively (Capiro and Summers, 1993). There have been creation of safety nets for the depositors through out the developed world, however as many authors (Bhattacharya and Thakor, 1998) have observed that creation of such safety nets have actually enhanced the moral hazard possibilities manifold. Risk shifting under deposit insurance however is no towards the depositors but towards non depositor based debt holders, as shown by Duran and Vivas (2014). Hence later capital requirements have been imposed on the bankers which may force the shareholders to keep greater skin in the game compatible with the underlying risk[105].

The empirical literature in banking have studied the impacts of deposit insurance, solvency regulation, the lender of last resort function of central banks, and market discipline over the incentives of moral hazards (for example, Berger et al, 1995, Stolz, 2002, Freixas and Rochet, 2008, Degryse et al, 2009). Recently Duran and Vivas (2015) have contributed to the empirical literature by investigating various types of risk shifting in banking, where the main finding is that through various channels banks do shift risk from shareholders to non deposit based debt holders.

Hence based on this evolving literature the current section builds upon some recent empirical studies of risk shifting (For example by Duran and Vivas (2015)) by banks, and extends the same to investigate whether risk shifting was practiced via pay outs, and more specifically by smoothing of pay outs. From this perspective too the current study is first of its kind. In the below section first of all a theoretical background of risk shifting is provided, which is followed by empirical literature review, methodology build up, results and analysis.

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[105] Kauko (2014) in a theoretical model has investigated the potential of the bailouts to create significant moral hazard problems rather than creating franchise values for banks.

4.3 Literature review:

4.3.1Theoretical studies

Acahraya et al (2013) has observed that during the financial crisis of 2007-09 it is not only that the large bank holding companies, for example, Bank of America, JP Morgan and others maintained smooth dividend pay outs, but also some securities firms such as Lehman Brothers and Merril Lynch actually increased their pay outs, even when their losses were accumulating which even triggered their bankruptcy. Such behaviours can not be rationalised by perfect capital market theories like Miller and Modigliani propositions (1958), but has to be understood from the perspective of a specific kind of risk shifting or asset substitution process which prefers equity holders over the creditors in general. Such risk shifting is in line with agency conflict theory proposed by Jensen and Meckling (1976).

There is a related and vast literature on moral hazard and managerial risk taking. Theoretically such risk taking behaviour generates from the convex pay off structure of the equity capital[106]. Saunders et al (1990) have provided early empirical evidence that banks whose managers have greater equity stakes, which also make them favour equity holders over the debt holders, are more prone to risk shifting since the managers are incentivised to invest in excessive risky assets. For less stake in equity the risk shifting tendency also falls. However these theoretical and early empirical studies have proposed risk shifting via the standard mechanism of excessive risky investment, but the recent financial crisis has shown that such can also be achieved via dividend pay outs[107].

Acharya et al (2013) provides first such theoretical model based on agency conflict. The very authors argue that when leverage is extremely high value transfers from debt holders to shareholders can be substantial, or in other words banks do have incentives to pay large

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[106] Earlier, Galai and Masulis (1976), have argued that since the debt holders cant do effective monitoring, and their control can be realized only on an ex-post basis, share holders can increase their equity value by increase of asset risk, which is equivalent to incentivizing managers to take on more risk.

[107] Rather pay outs can be considered as to be channels of risk shifting, as is investigated in the current thesis also.

dividends when the if their franchise value (which can be considered as to be the expected value of future cash flows) becomes too low[108].

Duran and Vivas (2014) have provided a comprehensive analysis of risk shifting among the US banks. The authors propose that type and paths through which transfer of risk takes place depends on the types of debt holders of banks to whim the risk is transferred. The authors have applied this methodology to a sample of US banks for the period 1998-2-11. The main purpose has been to study the relationship between types of risk shifting and financial crisis. For the subsample studies they have found that risk shifting is present for the pre-crisis and crisis periods, but such phenomena is absent after the crisis from 2008 onwards. The study has found that risk transfer has been from the shareholders to the non deposit based debt holders (since the deposits are normally covered by the implicit or explicit guarantees by the regulator). In the very study two types of bank specific variables are used, one, which directly demonstrate the process of risk shifting, two, variables which incentivise or dis-incentivise risk shifting. For example capital buffer is found to be one such dis-incentivising factor for banks. However this empirical study is different from the strand of literature which holds that pay outs by banks, mainly dividend pay outs can act as a channel of risk shifting. There is no indication in Duran and Vivas (2014) that pay outs have incentivised or dis-incentivised risk shifting. Hence the current study or the section of the current thesis builds upon the methodology of Duran and Vivas (2014) of system of equations and extends the same to investigate whether risk shifting has been incentivised by pay out mechanisms (dividends and share repurchases included)of bank holding companies in USA.

[108] There are critical differences between the dividend behaviours of the security companies and the bank holding companies, specifically for the large securities firms the franchise value have been worse hit during the crisis, since their franchise values are driven by flight prone customer relationship, compared to much more illiquid assets or loans in case of commercial banks.

4.3.2 Theory of risk shifting in banking

According to the standard literature at any given level of capital to asset ratio any risk taking or risk enhancement in the banks' portfolio of asset is considered as risk shifting. This risk change or increase can also be perceived as an investment strategy which increases the probability of default or losses which are to be absorbed by debt holders only. Whereas in this gamble the bulk of the return would go the shareholders[109].

Empirical investigation (as by Duran and Vivas (2014) for example) on risk shifting among banks have observed that if such risk shifting happens then there should be a negative relationship between the changes in risk and capital –to-assets ratio. Such relationship brings forth the underlying moral hazard problem in banking. Duran and Vivas (2014, 2015) further argues that on an average banks which increase risk also reduces their capital-to-assets ratio, which then becomes a strong signal for risk shifting.

The standard literature in bank risk shifting has mainly focussed on the moral hazard problem created by deposit insurance or any other bail out guarantee (Berger et al, 1995; Van Hoose, 2007; Frexias and Rochet, 2008; Degryse et al, 2009), however these studies have not investigated the methods of risk shifting or types of risk shifting in banks. Recent studies both theoretical as well as econometric have started addressing the issue.
Risk shifting has always remained at the core of regulation in the banking industry, specifically for the capital regulation (Frexias and Rochet, 2008). Opacity of banking industry also plays an important role in risk shifting, for example as Myers and Rajan (1998) argued that the relative ease with which banks can transfer risk is the result of opacity which does not allow the outsider creditors to observe such risk transfers. Then certainly there is a strong literature on the risk incentivising role of the bail out guarantees (Bhattacharya and Thakor, 1993).

[109] Again it also follows from the above argument that shareholders incentive to engage in the risk shifting will increase if their stake in the bank capital is reduced, this rationale also follows the standard skin in the game theory (Stiglitz and Hellman, 2000). Hence to prevent this pervert incentives there has been strong recommendations for capital buffer build up.

However this straight forward relationship between risk shifting and deposit insurance does not lack ambiguity, for example in contradiction to the deposit insurance subsidy hypothesis many banks do keep their capital ratio above the regulatory minimum (Ayuso et al, 2004; Lindquist, 2004; Jokipi and Milne, 2008; Stolz and Wedow, 2011). There are also some empirical evidence which suggest that deposit insurance are overpriced (Marcus and Shaked, 1984; Ronn and Verna, 1986, Pennachi, 1987). Again the relationship between deposit insurance and risk shifting is also not homogenous, for example some recent studies have argued that the exact sign of relationship depends on other bank specific variables (Hovakimian et al, 2003; Bushman and Williams, 2012).

Shrieves and Dahl (1992) have been the first of studies which have proposed a relationship between capital and risk changes in banks. However Duran and Vivas (2014) have expanded on the earlier approach to establish a more generalised investigation regarding the whole financial structure of the banks, hence they include capital, and debt as well as deposits in their systems of equations to identify types of risk shifting and also bank specific variables which incentivise risk shifting. Based on the specific method the authors propose four types of risk shifting, one, double sided risk shifting where the risk is shifted to both depositors and non-deposit debt holders, two, deposit based risk shifting where the risk is shifted to depositors only, other debt based risk shifting where the risk is shifted towards non deposit based debt holders, and unclassified risk shifting where though risk shifting is present it is unclear to whom the risk is shifted[110].

Risk shifting problem is also at the core of banking regulation, mainly the capital regulation (Freixas and Rochet,2008). Since the increase in the capital requirement actually force the shareholders to have more skin in the game, hence their motive of making banks increase the risk of their assets reduces. However here a counterargument is that uniform capital regulation

[110] In all of these cases however, risk is always shifted from the equity holders, and the main initiation is by increasing risk taking by the banks.

may not reduce the incentive of increasing risk sufficiently and hence there will remain significant insolvency (Koehnand Santomero, 1980; Kim and Santomero, 1988; Rochet, 1992). Hence a more bank level oriented study is required.

The literature of risk shifting in banking is generally a theoretical literature, and very less attention has been focused on the empirical study of risk shifting, let alone the relation between dividend pay outs and the risk shifting in banking.[111]

Theoretically as observed by Myers (1977) onwards, there can be a deposit insurance subsidy. According to this theory in the presence of full deposit insurance the banks would shift risk via relaxed capital requirements to the tax payers, since during default scenario such banks have to be bailed out. However deposit insurance guarantee does not explain the empirical observations, where banks do have capital above the minimum requirements (Ayusoet al., 2004; Lindquist, 2004; Jokipii and Milne, 2008; Stolz andWedow, 2011). There are various strands of literature which have observed that the relationship between risk shifting and deposit insurance is at best ambiguous[112].

4.3.3 Empirical studies on bank dividend pay outs during 2007-09 crisis

Bank dividend pay outs during the financial crisis has been studied by Acharya et al (2013) more comprehensively than others. The authors have concentrated on large BHCs in USA which were converted to bank holding companies in 2008. These large firms include Bank of Amercica, JP Morgan Chase, Wells Fargo, Wachovia, Washinton Mutual, Goldman Sachs, Morgan Stanley, Merrill Lynch, and Lehman Brothers. For all of these large firms dividends were paid continuously even in 2008, this is striking since at this time there was

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[111] There are a few studies on the correlation between bank dividend pay outs and default risk of banks (Onali, 2013) however, the current section draws upon the further agency theoretic definitions of risk shifting, and attempts to extend the literature via investigating the role of bank specific pay outs and dynamic adjustment of such pay outs.

[112] There can be positive relation ((Demirgüc¸ -Kunt and Detagriache, 2002; Grossman, 1992; Wheelock, 1992;Wheelock and Wilson, 1995), or negative relation ((Gropp andVesala, 2004), or complex relationship which is dependent on other bank specific variables (Hovakimian et al., 2003;Bushman and Williams, 2012).

recommendations from regulators to cutback dividends and build up capital. The authors have shown that these bank holding companies have maintained a smooth dividend pay out pattern, though whether technically these banks were smoothing dividends have not been studied in the very work. For some firms, for example, Merrill Lynch the pay outs were increased in the later half of 2008. One striking feature about all of the bank holding companies which either increased their dividends or smoothed their dividends during the peak of crisis was that they either failed completely or were taken over by the state. Hence if the standard definition of risk shifting is kept in mind then it becomes apparent that implicit or explicit bail out guarantees played an important role in the dividend pay outs during the crisis period. In the current thesis a more comprehensive study of risk shifting is attempted, where the sample comprises all listed bank holding companies as in the matched COMPUSTAT-CRSP data base.

Acharya et al (2013) have also observed that there has been significant and drastic changes in the dividend pay outs by most of these large bank holding companies since 2008. There are outliers both in the high side and low side. Firms like Lehman Brothers and Merrill Lynch were on the high side since they doubled their dividend pay outs during 2008 as compared to first quarter of 2007. Shortly after this Lehman failed completely, and Merrill Lycnh was taken over by the Bank of America. Hence such behaviours prior to the collapses further supports the risk shifting theory. However the question which is critical here is that whether such risk shifting behaviour has been exhibited by the bank holding companies in general.

A more recent study by Duran and Vivas (2015) has investigated whether risk shifting happened in the EU banking sector during the period 2002-09. In the very study various types of risk shifting has been investigated. There are two levels of study, one, in which the variables or the bank specific characters which are directly responsible for risk shifting are identified, two, another set of characteristics have been identified which either incentivize or disincentivize the risk shifting problem in banking. The main finding of the study has been that the banks in general have shifted risk to non-depository creditors. Again one of the findings of the study is that deposit insurance guarantees have incentivized risk shifting. The very study has divided the bank financial structure into equity, deposits, and non deposit funding. Banks do not have absolute control on the changes in the sources of such funding's, since one part of the funding source is always stochastic in nature. However the study has been able to find that changes in the discretionary part of funding is simultaneous with the changes in the underlying risk. The findings are compatible with that of the Duran and Vivas (2014) and Shrieves and Dahl (1992). The authors have provided subsample results before and during the crisis periods which show that similar kind of non depository based risk shifting is present throughout.

Duran and Vivas (2015) have observed that capital can be perceived as a call option on the value of a firm. Which can also be explained from the truncated pay off distributions to the residual claimants or shareholders, since in the events of loss creditors bear maximum losses. Hence shareholders always have the tendency to invest in negative NPV projects whose probability of success is very low but can generate high returns. Such incentives only create moral hazard problems in firms, and specifically in baking. The contribution of the study by Duran and Vivas (2015) is that they have investigated the financial structure of banks from three stand points, of equity holders, of depositors (with or with out deposit insurance), and of non deposit debt holders, so that it is clarified to whom the risk is being transferred from shareholders end. There are two striking observations, one, risk shifting s a reality and the direction is from the shareholders to the non deposit debt holders (for EU15 banking systems during the period 2002-09), two, risk shifting has significantly increased during the crisis of 2007-09. There are some regulatory implications of the study, and the authors are confident that if regulators perform their jobs prudently then banks may not have the incentives or opportunities to indulge in risk transfers. However the study seems to be incompatible with another growing strand of literature, namely, the studies on dividend pay out by banks during crisis (Acharaya et al, 2014) which have observed that risk shifting may have happened significantly via dividend pay outs. In Duran and Vivas (2014, 2015) pay outs have not been investigated as potential channels for risk transfers. Hence the current thesis is an attempt to bridge between these two evolving strands. Hence there can be regulatory implications including the pay out strategies of banks for mitigating the risk shifting problem.

There are further studies which have specified the salient features of risk shifting in bank holding companies, mainly such empirical papers have been focused on the US banking system.

First of all, for the risk increasing banks, there should be a negative significant correlation between the change in the risk and the change in the capital to asset ratio. The reason being that increasing the risk for banks is a critical factor for risk shifting itself (Duran and Vivas, 2014). Again this negative relationship also helps to capture the fact that the risk increasing banks are also those banks which reduces their capital ratios.

The standard empirical literature (Berger et al., 1995, Van Hoose, 2007, Freixas et, al (1997) and Degryse et al., 2009) has mainly investigated the role of safety nets like full or partial deposit insurance on the tendency of the banks to increase risk in their asset portfolios, which is the aforementioned moral hazard problem. However recently the attention has shifted to the types of risk shifting present in the banking sector, and which are the methods through which such risk shifting happens.

Hence in the current section too the main focus is on the different types of risk shifting, by which it is meant that how the bank shareholders can shift risk to the creditors in general, and specifically the non-deposit cerditors, since the non deposit creditors in the lack of full or partial safety net like deposit insurance would also be most affected by the risk shifting events.

Specifically the most recent literature emphasizes on four types of risk shifting based on the aforementioned definition based on the group of creditors to whom the risk is transferred, namely, one, double sided where the risk is shifted to creditors in general, two, deposit based (where the risk is shifted to depositors), three, other debt based (where the risk is shifted to the non deposit based creditors, and four, unclassified (where the risk shifting direction is unclear or the group to which the risk is shifted is unclear).

Here again Duran and Vivas (2014) have documented significant risk shifting by the US bank holding companies during the crisis period, and the main type of risk shifting has been the other debt based. The authors have also formulated as system of equations analyses which indicates the specific channels or bank specific variables which have been responsible for such non deposit based risk shifting.

The studies show that the risk shifting in such ways have weakened the resilience of the banking system as a whole and prolonged the crisis with increasing cost to the society as a whole. This finding do support the Basel committee recommendations (2011 onwards). However the studies as of now have not systematically investigated the role of pay outs and dynamic adjustment of pay outs by banks in the risk shifting process. However there are strong theoretical studies, as mentioned above, which propose that the dividend pay outs and dynamic dividend adjustments by banks can critically act as the risk shifting channels. However apart from some survey based studies there is no formal investigation on the same line.

The main contribution that the current thesis attempts is the extension of the Duran and Vivas (2014, 2015) set up to investigate that whether pay outs by commercial bank holding companies may act as a direct or indirect factor for risk shifting towards non depository debt holders. The methodology builds upon the earlier sections too where the speeds of adjustments of different pay out kinds have already been estimated. Hence the current section specifically extends the literature in two ways:

1. Investigating whether different pay outs, for example, dividends, share repurchases, different forms of dividend pay outs have direct or indirect roles in shifting risk. By direct role it means (following Duran and Vivas, 2014, 2015) whether these pay outs

cause risk shifting, and by indirect effect it means whether these pay outs incentivizes risk shifting or not.

2. Investigating whether smoothing of dividends and other pay outs have direct or indirect role in the risk shifting process.
3. Whether risk shifting can take place, or is indirectly affected by the dynamic adjustments of pay outs.

The following section builds the relevant hypotheses which are then investigated using a system of equations analysis based on the standard literature.

4.3.4 Hypothesis building

H1a: *bank holding companies exhibit risk shifting from shareholders to creditors in general through dividend pay outs*

The last two sections of the thesis have investigated the dividend pay outs and smoothing or dynamic behavior of dividend pay outs by the US bank holding companies, where financial crisis dummy variable has always been found to have a negative impact on the pay outs or the speed of adjustments. However this section focusses on whether the route of dividend pay outs or smoothing of dividends have been used to benefit shareholders by increasing the risk of default for the creditors in general, which can not be directly captured by the impact of financial crisis dummy on the level or speed of adjustments.

There is a growing body of literature, both theoretical and empirical, which either confirms risk shifting or contradicts the same. For example Acharya et al (2013) to Duran and Vivas (2014) do confirm that there are various types of risk shifting exhibited by the bank holding firms, however Forti and Schiozer (2015) finds no significant risk shifting via dividend pay outs. The last mentioned study has termed such risk shifting as the cash out hypothesis, which means that the shareholders of the banking firms may tend to cash out via pay outs while the creditors may suffer from increased default risk.

However none of the studies has investigated the direct or incentivizing role of dividend pay outs in the risk shifting process, the current hypothesis aims at bridging the gap by investigating the role of dividend pay outs in a widely used framework of systems of equations (Peltzman (1970), Marcus (1983), Wall andPeterson (1988), and Shrieves and Dahl (1992)).

H1b: *bank holding companies exhibit risk shifting from shareholders to creditors in general through other forms of pay outs like share repurchases*

Share repurchases by bank holding companies increased steeply during and after the financial crisis (Floyd et al, 2016), however there is no comprehensive study on the role of share repurchases on the types of risk shifting as aforementioned. Share repurchase has not been given the status of signaling in the standard literature as is mentioned in the earlier sections, specifically the substitution hypothesis as developed earlier in the literature has raised the question whether bank holding companies can signal to the shareholders or creditors via share repurchases as they can do via dividend pay outs. The main difference between the two types of pay outs being the larger commitment by the managers in maintaining dividend pay outs which may be absent in case of share repurchases.

However the earlier sections of the current thesis has demonstrated that share repurchases by the US bank holding companies have shown significant probabilistic relationship between the bank specific and other control variables, which in most cases are of opposite nature to that of the dividend pay outs. Though there is an absence of formal theorization of such relationships the current thesis investigates the above hypothesis and hence builds upon the extant literature.

H2a: *bank holding companies exhibit risk shifting from shareholders to general creditors via dividend smoothing (as an enabler or channel of risk shifting, as explained above)*

The relevant literature has not investigated the possibility of risk shifting via dividend smoothing or dynamic adjustment of dividends, however as has been observed multiple times in the earlier sections that there has been a rise in the dividend smoothing over the crisis periods and afterwards too. Hence the obvious extension of the extant literature can be to incorporate the dividend smoothing mechanism in the systems of equations framework. The last hypothesis can be conceived as the corollary to the earlier hypothesis, since as has been observed earlier that timing of adjustment or half life period of adjustments is a managerial decision and can certainly impact risk shifting.

4.4.Methodology

Since the main objective of the section is to model risk shifting via pay outs as mentioned earlier from the shareholders to the creditors in general, the main group of creditors considered here is the non depository debt holders. Another rationale for this choice is that deposit insurance guarantees have abated the risk shifting from shareholders to depositors up to a significant extent in developed economies, specifically in USA. Hence following Duran and Vivas (2014) two important bank specific ratios are considered, the equity to asset ratio, and total non depository debt to asset ratio. Adapting the standard notation such ratios is denoted as f's in the current section.

The main aim is to model the relationship between change in such ratios and the change in risk (specifically the default risk level). The relevant literature (Marcus (1983), Fama and Jensen(1983), and Shrieves and Dahl (1992) suggest that the both the change in risk and the ratios as defined are composed of a random part and a discretionary part, where the former component can be considered as to be a white noise, and the second component can be considered as to be a managerial decision making. Pay outs and smoothing of pay outs, or half life measures are decision variables here.

$\Delta \text{Ratios}_{i,t} = \Delta \text{managerial decision making}_{i,t} + \varepsilon \quad (1)$

Hence in the above equation the dependent variable is the total observable change in the above mentioned ratios or the risk levels, the first independent term is the change in such variables due to managerial decisions and the next component is the white noise. J denotes the Jth banking firm and T denotes the period observation.

The component Δ can then be expressed as the partial adjustment process, where the change in the ratios and the risk levels are the differences between the target values of the variables and their one period lagged values.

$\Delta \text{Ratios}_{i,t} = \alpha \text{Ratios}_{i,t}^{*} + \beta \text{ Ratios}_{i,t-1} + \varepsilon \quad (2)$

Where the first term in the parenthesis is the target level of any risk/ratio measure, and the next term is the one period lagged value of the same.

There are various risk scores or measures used in the relevant literature, however in the current section two relevant risk measures are used (Shreivas and Dahl (1992), Jokiipi and Milne (2011)) namely, risk weighted assets to total assets, and nonperforming assets to total assets. The above referred studies hold that risk weighted asset ratio reflects the managerial investment decisions.

It is well documented in the relevant literature that the target values of the risk levels or the ratios as mentioned above can not be observed directly, hence the partial adjustment models are used to proxy the target levels by some firm level or firm specific variables with a stochastic disturbance term. In the current section the choice of such bank specific variables have been based on the recent studies, where the bank specific variables chosen are theoretically correlated with the level of the risk and the financial structure of the banks. However in this section the major addition on the standard studies is that among those explanatory variables the pay outs, namely, dividend per share, share repurchase volume, as well as the speed of dividend adjustments and half life measures have been included, since as demonstrated in the earlier section that there are recent studies (Onali, 2011 for instance) which have empirically measured the association between pay out levels and the risk levels of banking firms (more discussions on the variables follows later).

In the current section partial adjustment models of risk measures and financial ratios are presented. Hence the target levels, differences and one period lag values of such variables are used (based on the related literature as cited in the section). Notations used in the equations are standard, for example Δ signifies change in the variable(specifically ΔDR means the change in the deposit ratio, and ΔCR means the change in the capital adequacy ratio), * denotes the target level of any variable, for example risk levels or any financial ratio, please see the equations below.

The equations used in the current section are as follows:

$\Delta Ratios_{i,t} = \Delta managerial\ decision\ making_{i,t-1} + \varepsilon$ (1)

Hence in the above equation the dependent variable is the total observable change in the above mentioned ratios or the risk levels, the first independent term is the change in such variables due to managerial decisions and the next component is the white noise. Here j denotes the j^{th} banking firm and t denotes the period observation.

The component Δ can then be expressed as the partial adjustment process, where the change in the ratios and the risk levels are the differences between the target values of the variables and their one period lagged values.

$\Delta Ratios_{i,t} = \alpha Ratios_{i,t}^{*} + \beta\ Ratios_{i,t-1} + \varepsilon$ (2)

Where the first term in the parenthesis is the target level of any risk/ratio measure, and the next term is the one period lagged value of the same.

There are various risk scores or measures used in the relevant literature, however in the current section two relevant risk measures are used (Shreivas and Dahl (1992), Jokiipi and Milne (2011)) namely, risk weighted assets to total assets, and nonperforming assets to total assets. The above referred studies hold that risk weighted asset ratio reflects the managerial investment decisions.

Based on the variables chosen (please see response to other questions too in this section) the following system of equations is used (also following Vivan and Duras, 2014, 2015):

$\Delta RISK_{i,t} = \alpha_{10} + \alpha_{11}\Delta CR_{j,t} + \alpha_{12}X_{j,t} + RISK_{j,t-1}$ (3)

$\Delta CR_{j,t} = \beta_{10} + \beta_{11}\Delta RISK_{j,t} + \beta_{12}X_{j,t} + CR_{j,t-1}$ (4)

The above system of equations is used to analyze the relation between the change in the risk measures and the capital ratios (namely the change in the capital adequacy ratio). X is the vector of bank specific variables, mainly the bank specific pay outs.

$\Delta RISK_{j,t}=\alpha_{20}+\alpha_{21}\Delta DR_{j,t}+\alpha_{22}X_{j,t}+\alpha_{23}RISK_{i,t-1}$ (5)

$\Delta DR_{j,t}= \beta_{20}+\beta_{21}\Delta RISK_{i,t}+\beta_{22}X_{j,t}+\beta_{23}DR_{i,t-1}$ (6)

The above system of equation is to analyze the relation between the change in risk measures and the deposit based debt ratio (DR), this system of equation is used to investigate whether risk shifting occurs towards the depositors. X is a vector of bank specific variables, which are bank specific controls for this set of equations. Here for our purpose X variables are bank specific pay out levels, for example dividend per share, share repurchases, speeds of adjustments (certainly these variables are used separately in equations). These variables, as also explained later in the section, might play the role for facilitating risk shifting.

It is well documented in the relevant literature that the target values of the risk levels or the ratios as mentioned above can not be observed directly, hence the partial adjustment models are used to proxy the target levels by some firm level or firm specific variables with a stochastic error term. In the current section the choice of such bank specific variables have been based on the recent studies, where the bank specific variables chosen are theoretically correlated with the level of the risk and the financial structure of the banks. However in this section the major addition on the standard studies is that among those explanatory variables the pay outs, namely, dividend per share, share repurchase volume, as well as the speed of dividend adjustments and half life measures have been included, since as demonstrated in the earlier section that there are recent studies (Onali, 2013 for instance) which have empirically measured the association between pay out levels and the risk levels of banking firms.

Hence based on the above mentioned explanatory and dependent variables the following system of equations is derived:

4.5 Variable selection

The set of explanatory and the dependent variables are based on the similar set of variables which have been already used in the last two sections of the thesis, with some risk measures. Here the main risk measures are, one, the ratio of the risk weighted assets to the total assets, two, the ratio of nonperforming loans to total assets. The main bank specific explanatory variables used are, buffer capital level, size, dividend per share vale, share repurchases value, speed of adjustment, half-life period, and the standard set of bank specific, industry specific and macroeconomic control variables which is used in the earlier sections too for consistency (for variable definitions please see the list of variables in the appendix).

Sample selection

Here the sample of the bank holding companies is not changed, same sample is used through out the thesis for consistency, however based on the suggestions of the standard empirical literature such bank holding companies are chosen whose change in risk level is greater than the median value of change in the risk. According to Duran and Vivas (2014, 2015) banks who are increasing the risk level are better candidates for analyzing whether risk shifting is exhibited by them too.

4.6 Analysis and results

The following two tables are interpreted to analyze, one, whether risk shifting is exhibited by the risk increasing banks, two, what is the direction of such risk shifting, i.e. towards depositors or non-depository based debt holders.

(Insert Table 1 section 3)

The above table is the first panel regression based on the following dependent and explanatory variables:

1. Δ RISK as the change in the risk weighted asset to total asset ratio over the one period
2. Δ CR as the change in the capital adequacy ratio, which reflects the change in the equity to asset ratio over the previous period

3. DPS or the dividend per share level as a bank specific pay out variable, which also plays the role of incentivizing or dis-incentivizing of risk shifting
4. Buffer capital: In the current section the buffer capital is defined, as in the standard literature (Duran and Vivas, 2014), as the difference between the risk weighted capital ratio of the specific bank holding firm in the given period and the minimum legal regulatory capital required for the specific period[113].
5. Crisis dummy, which is consistent with the measure as used in the other sections of this thesis, defined in the variable list in the appendix.
6. An interaction term between crisis dummy and DPS to capture any change in the nature of impact of DPS on the change in risk/ capital ratio.
7. Lag of the risk variable as defined.
8. Lag of the CR variable as defined earlier.
9. A set of industry specific and macroeconomic control variables.

Hence in the above table the first set of the system of equations is analyzed where the main analysis is the relationship between the change in the risk and the capital ratio level. Here the first set of hypotheses is referred to where the pay outs may or may not have significant impact on risk shifting phenomenon. One critical consideration is about the risk shifting definition itself for the above analysis, in recent theoretical papers (Boyde and Nicolo, 2005) risk shifting is equated to enhancing of bank portfolio risk and looting by the bank managers, however in the empirical literature the direction of risk shifting is captured and analyzed. Hence risk increasing banks may also exhibit risk shifting and thus increase in risk is related to risk shifting but not equivalent as theoretical models assume.

[113] Duran and Vivas (2014) have observed in their results that larger buffer capital (over and above the regulatory requirement) is negatively related to the risk shifting by bank holding firms, or in other words greater is the capital buffer less is the incentive for the bank managers to shift risk.

Results and Discussion

Below table provides results for the system of equations in the section 3, which is used for analysing whether there is risk shifting exhibited by the bank holding companies in general, and which are the enabling factors for risk shifting to happen. In the very section the variables are defined which again follows some recent studies as mentioned in the section. Here RISK measure is typically a default risk measure, here the non-performing asset to total asset ratio, DPS denotes the cash dividend per share, CR is capital ratio. As discussed in the results section the signs and significance of the impacts clearly shows risk shifting, however the impact of dividends as an enabling factor is negligible.

	(1) Change in RISK	(2) Change in CR
No. of observations	3943	3943
Δ CR	-2.43***	
DPS	0.198	0.05
CRISIS	0.04	0.003
BUFFER CAPITAL	0.37***	-.06***
DPS*CRISIS	-.19	0.016
LAGGED RISK	-0.04***	
Δ RISK		-0.04***
LAGGED CR		-0.02
Pr>F	0.000	0.000

The first important result from the set of equations in table 1 is that there is a very significant and negative relation between the change in the risk and the change in the capital adequacy ratio, where the significance of the impact is at 1% level. This result is well supported by the recent empirical studies, where the rationale is that for the risk shifting banks the change in risk and the change in leverage level should be positively related, which needs that the change in the risk and change in the capital ratio should be negatively related. Hence the basic condition that banks engage in risk shifting is that the corresponding coefficient be negative and significant (Duran and Vivas, 2014, 2015). The negative coefficient also mean that larger is the decrease in the capital ratio larger is the increase in risk. Hence the table 1 indicates strong risk shifting for the risk increasing banks.

The table below is the continuation of the same system of equation, where now as one of the depended variables change in the deposit ratio, or DR is introduced, other variables remaining the same. The result section provides detailed discussions of the impacts, however here too though there is evidence of risk shifting as a whole, there is no clear evidence that dividend pay outs have enabled such transfers.

Table 2 Chapter 4

	(1) Change in RISK	(2) Change in DR
No. of observations	3943	3943
Δ DR	-.58	
DPS	0.213	0.02
CRISIS	0.07	-0.04
BUFFER CAPITAL	0.83***	-.0.06***
DPS*CRISIS	-.26	0.04
LAGGED RISK	0.012	
Δ RISK		-.01
LAGGED DR		-.12***
Pr>F	0.000	0.000

Once the table results has shown that risk shifting is exhibited by the US bank holding companies in the sample, or in other words the banks have reduced their skin in the game, as opposed to the regulatory suggestions, the next task is to investigate the direction of this shift. Direction of the shift is captured in the above results.

In the above table the dependent variable in the first column is still the change in the risk, where as the among the explanatory variables the change in the depository debt ratio (ΔDR) is used as the main variable, along with the other controls. The result shows that the coefficient on the ΔDR is negative and significant, which is again according to the findings of Duran and Vivas (2014, 2015). Hence as per the explanations earlier these banks have shifted risk towards the non deposit based debts, rather than deposit based debts. This result is also backed by the standard assumption of deposit insurance for the retail depositors.

The above results have thus shown that risk shifting implies that the amount of risk taken by banks are not backed by enough capital, and the major cost of this process is borne by the non deposit based debt holders. Hovakimain and Kane (2000) have shown that the impact of risk shifting by banks is more severe on the economy if the risk- capital balance is disproportionate due to risk shifting.

In the both of the above tables a crisis dummy has been used, as defined in the variable table in the appendix, the impact of the crisis dummy on the change on risk s always positive but significant at 10% level, which indicates that risk shifting is rather a general phenomenon. Further subsample analysis is provided in the appendix, where similar results are analyzed before, during, and after crisis period. Recent empirical studies as mentioned earlier have also found that risk shifting was a common practice among the US banks before and during the crisis periods.

The impact of the other bank specific variables on the change of risk level and the change in the capital ratio level are as follows: the lagged value of risk always has a negative significant impact on the change in the risk level, which is according to the results of the earlier studies (Duran and Vivas, 2014, 2015), which actually indicates that the bank holding companies in the study are risk increasing over the period.

The remaining half of the analysis section provides results for the incentivizing / strengthening/ weakening factors of risk shifting. In other words whether pay outs and dividend smoothing it self have strengthening impacts on the risk shifting process. However to start with the analysis it can also be observed that the impact of Buffer capital (defined in the table of variables in appendix) is more ambiguous as compared to the results obtained in Duran and Vivas (op cit). since the variable has a strong positive significant impact on the change in the risk level, where

as the impact of the same on ΔCR and ΔDR are both negative and significant, which means that though increase in the buffer level is associated with increase in risk level it is unclear whether the buffer level incentivizes risk shifting in a specific direction.

Role of DPS variable: The above table now investigates if the risk has been shifted from the shareholders to the depositors. The following are the variables used for the table:

1. Change in the risk level, DPS, buffer capital, lagged Risk variables and the control variables are similar to the other tables.
2. ∆DR or the change in the deposit to asset ratio level is used in this case as the main explanatory variable, since here the main objective is to analyze the relationship between the change in the risk level and the deposit ratio level to infer the type of risk shifting.

   throughout the current thesis there has been no evidence of risk taking or increasing or cashing out through dividend pay outs, in the current section also its observed that the impact of DPS on ∆CR is positive, and on ∆DR is not-significant which again according to the earlier formulation means that DPS has no role to play in the risk shifting process overall.

The table below summarizes whether there is any risk shifting role played by the share repurchase by the individual banks in the crisis period, generally share repurchase variable is found to be insignificant, but the below table also uses an interaction variable of share repurchase with the crisis dummy. All the other variables are according to the earlier system of equations.

Table 3 Chapter 4

	Change in RISK	Change in DR
No. of observations	3943	3943
Δ DR	-.577	
Change in Risk		-0.002
Share repurchase crisis	0.0946*	-0.0005
CRISIS	-.140*	-1.52
BUFFER CAPITAL	0.833***	0.0005
LAGGED RISK	0.0121	
DR lag		-0.1259***
Pr>F	0.000	0.110

Role of share re-purchases: the impact of the share-repurchase variable on the change in capital ratio is negative and significant whereas on the change in the debt ratio is negative and not significant. Again the above table also shows clearly that the impact of share repurchase during the crisis period has been positive and nearly significant on the change in risk level for individual banks. These impacts again according the prior formulation do indicate that the share repurchase variable strengthens other debt based or non-depository debt based risk shifting, though the impact is weak. The last tables' demonstrated risk shifting in the US bank holding companies for the sample period 1990-2015, which is same throughout the thesis. However it is the share repurchases rather than the dividend pay outs which may have played some incentivizing role for risk shifting from shareholders to creditors in general. There is however a serious lack of theoretical modelling explaining the role of share repurchase in banking, whether signaling via it (referring to the substitution hypothesis as explained earlier) or its role in increasing or shifting risk.

The table below summarizes the potential relation between the change in loan risk for banks and the speeds of adjustments. Three speeds of adjustments have been used, namely SOA DPS which is the adjustment speed for the dividend per share in cash, SOA total DIV which is the speed of adjustment of the total dividend payed out including stock dividends, and SOA total PAY which also includes the share repurchases per bank. The estimation is similar to the other tables in this section, and is based on the earlier described system of equations.

Table 4 Chapter 4

	Change in RISK	Change in RISK	Change in RISK
No. of observations	3943	3943	3943
Δ CR	-19.45	-17.56	-18.82
SOA DPS	10.47		
SOA total DIV		16.52*	
SOA total PAY			10.96
CRISIS	-1.34	-1.52	-1.09
BUFFER CAPITAL	-0.271	9.23	-0.2803
LAGGED RISK	0.499***	-0.498***	0.498***
Pr>F	0.000	0.000	0.000

Role of speed of adjustment:

The impact of speed of adjustment on the change in capital ratio variable is however insignificant, the impact on the change in the debt ratio variable too is not statistically significant(which is not shown in the above table), which is a consistent finding with the nature of impact of dividend pay outs on the very variables. However there is a slight positive significant impact of the speed of adjustment of the total dividend payed out on the change in risk, as in the above table. This result is likely related to the earlier results that during crisis period there have been significant change in the speed of adjustments.

Hence the thesis through out maintains that the evidence of risk shifting via dividend pay outs or smoothing of dividends is not supported by the sample of BHCs.

4.7 Conclusion

The main contribution of this section of the thesis to the ongoing empirical literature is the explicit investigation of whether pay outs and dynamic pay out adjustments or behaviors play active role in strengthening or incentivizing the risk shifting types in bank holding companies.

Here one should also note that there is a serious lack of theoretical models on how pay outs may incentivize risk shifting in banks, except very recent game theory based models (for eg, dividend externalities paper by Acharya et al), where risk shifting is theorized as a type of moral hazard imminent in the agency theoretic context.

However the difference between the theoretical and the empirical studies, as done here, is that in theoretical studies as of now there is no indication of specific direction/ types of risk shifting, in theoretical models abrupt increase of risk is theorized as risk shifting (given regulatory incentives such as deposit insurance), where as in the empirical studies the main objective is to analyze the direction of risk shifting.

Given such backdrop the current study confers with the recent econometric studies (Duran and Vivas specifically) that non depository debt based risk shifting is exhibited by the US bank holding companies during and before the crisis. The current study then builds upon the extant literature to show that some pay outs, eg, share repurchases might have incentivized such risk shifting phenomena.

4.7.1 Risk shifting in banking via pay outs: comparing results from other recent studies

The theoretical literature on risk shifting in banking goes back to Jensen and Meckling (1976). The basic concept is that when the banks take excessive risk the equity holders get benefitted at the cost of the debt holders, and the main reason being that the equity holders have convex claims over the banks assets, which increases with the level of risk, whereas the debt holders (depositors mainly) have concave claims which decreases with the increase of risk level.

Hence the problem is aggravated when the risk taking banks further increases the dividend pay outs, which leave less liquid assets for the banks to honour the depositors claim. Hence authors like Acharya and others have proposed that dividend pay out can be a possible channel for risk shifting by banks.

Srivastav et al (2014) have further extended the literature by investigating whether other pay out strategies by bank holding companies also work as a risk shifting channels, specifically if the CEOs pay structures are more debt like than equity then banks may tend to favour debt holders over equity holders hence mitigating the risk shifting problem. In the same study the authors also note that such banks with CEO pay structure more debt like are likely to reduce both dividend pay outs and share repurchases. Hence there is an implicit assumption that share repurchases can also play roles for risk shifting, since buy backs can also be treated as an important source of channelling resources to equity holders at the cost of debt holders.

As noted earlier in the thesis there is a long standing debate on whether the share buy backs can be treated as substitutes of dividend pay outs, the so called substitution hypothesis. The thesis in the earlier sections have provided a positive answer for the hypothesis in terms of both absolute levels of pay outs and smoothing of pay outs. Hence risk shifting via share repurchases is a valid investigation.As argued in the result section of this section there is significant evidence of risk shifting via share repurchases in general for the US bank holding companies, however insignificant results for other medium of risk shifting like via smoothing.

CHAPTER 5.

Conclusion in general: contributions to the empirical literature

In the concluding chapter, the major findings or potential contributions to the extant literature is discussed. The thesis is an elaborate econometric analysis rather than a theoretical model building, where the fundamental theoretical models have played a critical role in framing the empirical approach and also in hypotheses building.

The main theoretical underpinnings arise from a costly dividend signaling model, dividend signaling in the presence of moral hazard, for example, the Jensen's free cash flow model, different theoretical models based on agency theories, which suggest dynamic dividend behavior by firms in general, risk shifting theories in banking and allied models. In the following paragraphs, the main findings of the thesis are explored point by point.

1. The main finding of the thesis is that dividend smoothing or, in general, payout smoothing can also play the role of costly signaling for information sensitive investors. Some very recent studies are cited in the literature review (Forti & Schiozer, 2015; Floyd et al., 2015). These include studies that have analyzed the information content of the dividend payouts by bank holding companies, or, in other words, how various bank specific variables relate to the payouts before and after the financial crisis period. Certainly, there is a strong general literature on the empirical study of the determinants of dividend payouts, which is again analyzed based on the underlying theories, for example, information asymmetry-based theories, agency theories and life cycle based theories.

However, there is no systematic study in general, as well as in the banking sector, about whether dynamic payout behaviors of firms also reveal similar kinds of information. In other words, can dynamic partial adjustment also be considered as signaling? The literature review section shows that theoretical modelling has been done in the same way.

This predicts smoothing or partial adjustment as a form of dynamic signaling to the investors or shareholders in particular. However, an empirical investigation for the same is absent.

There is a strong empirical literature which investigates the impact of information asymmetry or agency conflict on the dynamic dividend behaviors of firms in general (Leary & Roberts, op cit). However, firstly, these studies are based on Lintner type partial adjustment models, which are capable of measuring the average speed of adjustments, and secondly, these studies are not specific to bank holding firms.

Generally, such studies have not found a significant association between opacity measures and the average speed of adjustments, and the impact of agency costs us found to be more significant but varied.

Hence, in the empirical analysis in the thesis, the sections demonstrate that dividend smoothing by bank holding companies also exhibits a similar relationship to the sets of relevant variables as the dividend payouts do. Hence, the dynamic signaling quality of dividend smoothing is highlighted.

2. A modified partial adjustment model is one empirical contribution to the extant literature, specifically in relation to the dividend smoothing by banking firms. In the standard literature which dates back to Lintner (1956), the formulation and estimation of the partial adjustment model are based on an average speed of adjustment, whether it is the capital structure adjustment (Rangan et al., 2006) or dividend adjustment.

However, in the current thesis, the adjustment speed and the allied measures are firm specific, which varies over the time period. Again, to obtain such measures, the partial adjustment model has been run in some extra steps, which has been explained in section 2.
This helps in the analysis of firm-specific heterogeneity, which is not possible in the standard framework, except in some very recent works (Oliver et al., 2015). Again, the measures which have been thus obtained, namely, adjustment speeds and half-life values have been then used to do further analyses.

3. Various types of payouts have been included in the investigations, mainly the share repurchases since there are studies which are not conclusive on whether share repurchases and dividend payouts are substitutes or not. There is a skepticism that repurchases cannot be considered as costly signals since managers are not needed to remain committed to buying back shares on a regular basis.

4. Although there are theoretical models of dividend smoothing or income smoothing under agency conflict or information asymmetry, the standard models are not bank specific. As far as the bank specific theoretical models are concerned, there are a few of them where dividend payouts have been theorized as a mechanism or channel of shifting risk from shareholders to the creditors of banks. In the empirical literature, there is no comprehensive analysis to complement the theoretical literature on banks in this area.

5. In the thesis, a standard system of equations approach is adopted in the third section to investigate the type and direction of risk shifting by BHCs, and also to investigate the factors which strengthen such risk shifting taking place.

Bessler and Nohel (1996) suggest that dividends can be used to divert a bank's equity to its owners. The authors report that most banks continued to distribute dividends during the 1980s despite suffering large losses (Bessler & Nohel, 1996, p. 1490). As happens in many cases, history repeats itself and, as reported by Acharya et al. (2011), during the recent global financial crisis, even as the banking system suffered the depletion of common equity through losses on asset portfolios, banks continued to pay dividends (Acharya et al., 2011, p. 3). The investigation has extended the extant empirical models by introducing the payouts and dynamic variables, such as bank specific adjustment speeds and half-life periods, to investigate their roles in the process of risk shifting.

There is a good indication of non-depository debt based risk shifting, which is supported by some recent studies; however, the investigation also shows a significant positive impact of share repurchase on such risk shifting.

6. Throughout the thesis, the impact of various bank-specific and regulatory variables has been analyzed, and such bank-specific variables differentiate the results from the non-banking firm's study. One such variable is the regulatory capital requirement, or, as in this study, the capital adequacy measure.

Recently studies (Hsiao &Tseng, 2016) have found strong evidence of a significant negative impact of such ratios or measures on the dividend payout levels during and after the financial crisis. In this study, however, such an impact is found on the speed of the adjustment of banking payouts, which is still not comprehensively studied in the extant banking literature.

7. Recently, there has been an emergence of investigations on dividend smoothing by firms in general since the financial crisis (2007-2009). For example, a recent study by Nguyen and Tran (2016) has shown that dividend smoothing and signaling have been practiced by firms across various sectors in the US.

The above study finds support for the value signaling literature of neoclassical economics, as has been explained in the current thesis, which suggests the use of costly signaling for reputation building, along with mitigating opacity problems.

However, similar studies have not focused specifically on bank holding companies where the nature of signaling is also much more complex, as has been found throughout this thesis.

8. During the financial crisis, as the aforementioned studies have also found, there was a significant rise in external financial constraints, specifically the cost of capital rise, coupled with the cost of regulations in banking industry being on a steep rise. However, given this rise in cost, signaling and smoothing practices have been continued by banks. Hence, this calls for a more comprehensive cost-benefit analysis of signaling and smoothing against the rise in regulatory and external finance costs.

Hence, an extension of the current empirical work would be to investigate the future impact of dividend or payout smoothing in general on the future cost of capital.

An inter country-based investigation could be further built upon, which might demonstrate the impact of regulatory differences on the continuation of smoothing since the crisis, as the aforementioned work has shown that there are some Asian economies which have not been able to maintain smoothing in the post-crisis era.

Does dividend smoothing has benefits of strong market reactions: some critical closing thoughts?

Larkin et al (2016) have provided comprehensive evidence for dividend smoothing practices across industries. However according to the very authors dividend smoothing has less significant impact on the share prices in the capital markets, and rather is driven by the demand of the investors clientele. Specifically, the retail investors are less likely to hold the dividend smoothing stocks, whereas the mutual funds and institutional investors are more attracted towards the same.

Hence based on the above mentioned study too, signaling nature of dividend smoothing can be inferred, which indicates that smoothing is a signal for the specific investor clientele. In the current thesis it has been shown throughout that information content of smoothing is specifically related to the information sensitive depositors and creditors in general, a finding which is also consistent with studies like of Forti and Sciozer (2015).

Another growing theory is that managers practise dividend smoothing for establishing credibility among the investors. If there is a positive change in the dividends, then such change is perceived as to be a permanent change which is backed by the regular smoothing activities.

In the current thesis some structural break results have been provided, which have shown after the positive enhancement of the dividend pay out levels (for example during the financial crisis) managers have been reluctant to change the adjustment rates/ speed of smoothing. Such changes might be more prominent for the bank holding companies, as in the current thesis, since Larkin et al (2016) have not got significant results for the non-banking firms. Another finding is also that for non-financial firm's interaction of dividend smoothing and dividend enhancements have less significant impact on the share prices.

Hence overall it is not obvious from the findings on the non-banking firms that dividend smoothing practices have generated significant positive price reactions, however there is no doubt from the findings of the extant general literature as well as the current thesis that pay out smoothing by the banking firms have signaling content for the investors.

Larkin et al (2016) have also provided strong evidence for insignificant impact of dividend smoothing on the cost of capital of non-financial firms, which also calls into question the basic underlying theoretical assumptions since Lintner (1956). The earlier theoretical assumption was that if investors are concerned about dividend smoothing then that should reflect in the higher price and hence less equity returns, or in other words the investors should want less return from such stocks.Hence a more relevant explanations for the value signaling aspect of dividend smoothing seems to stem from investor clientele effect. In the seminal works Miller and Modigliani were also in the view that in the presence of investor clientele dividend policy of managers would change significantly. One such change in the dividend policy is certainly the dividend smoothing decision.

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Appendix 1

The current appendix contains description of data and variables, and extra tables or results from TOBIT, LOGIT and VAR estimations. These extra results are provided for a further robustness check, as well as for some extra explanatory variables, namely the dummy variables.

Data and variables

The revised thesis version contains three panel data sets(time period being from 1990-2015), one, a restricted data set of only positive pay out values (2900 observations), two, an expanded data set of dividend pay out omission (3685 observations), and three a data set of (6700 observations) dividend per share pay out values which has been provided in the appendix as an extra result or for further robustness. Along with the main pay out measures (cash dividends, dividend per share, total dividends, and net share repurchases) every data set contains the bank level control variables (as discussed in details in the main thesis in the second chapter). Bank level opacity variables, namely, spread, tangibility, turnover and size are used for all the data sets.

As was suggested by the examiners, dividend omission data has been used to mitigate any possible sample selection bias. Detailed results for VAR estimations for all data sets, however, show that the nature and significance of impact of opacity variables on the pay outs have remained similar, supporting the underlying hypotheses. Theoretically also there is an established literature of 'counter signaling' (Chung and Eso, 2013) which maintains that omission or cut back of pay outs can also be considered as costly signals to capital markets.

Challenge faced during data mining was mainly matching bank level data between two sources: COMPUSTAT and CRSP, initially a large data base from COMPUSTSTAT was accessed, but there was recurring problem of missing data, mainly for price or market variables which were important for constructing opacity variables like spread and turnover, and controls such as earnings per share, and pay out variables such as dividend per share. Hence a careful and rigorous matching was done between COMPUSTAT and CRSP data bases based on company name or sticker for the years involved.

COMPUSTAT DATA BASE

The main data source used for the current thesis is the WRDS platform which has COMPUSTAT and CRSP data bases. The types of firms in the current thesis are the active bank holding firms. COMPUSTAT provides data for North American Bank holding firms, mainly fundamentals or balance sheet data, where as CRSP provides data on market variables. There are different frequencies of data available, for the current thesis quarterly bank level data is used. In many contemporary studies annual bank level data is used, however quarterly data can capture the partial adjustment process of pay outs in more details.

COMPUSTAT BANK FUNADAMENTALS URL:

https://wrds-www.wharton.upenn.edu/pages/support/data-overview/wrds-overview-compustat-north-america-global-and-bank/

Opacity: opacity is a general terms used to mean the degree of information asymmetry between the insider managers and the outsider share holders (or other types of investors like debt holders/ depositors in the context of banking firms). Assets held by firms can also be termed as opaque if they are difficult to value in the market, for example the opaque loan portfolio held by the banking firms. Bank loan portfolios are opaque since there is a high degree of information asymmetry between the potential investors/ buyers of such loans and the inherent default rates. In the current study opacity of banking firms relates to the asymmetry of information about quality of bank assets, or future profitability of banks. Opacity may also mean the asymmetry of information between the different types of investors, for example between the less informed and more informed equity holders.

All such opacity problems generates adverse selection, and, or moral hazard problems in financial markets. In the context of banking firms the severity of the problems is even higher since bank holding firms are considered to be relatively more opaque than the non financial firms.

Risk Shifting: Risk shifting is a general term used for the phenomenon of excessive risk taking by the banking firms in specific, and in the process shifting the cost and consequences of such risk taking to the depositors while benefitting the share holders. Risk shifting is widely observed in banking industry (as discussed in the chapter four on risk shifting by BHCs), mainly due to the presence of explicit or implicit bail out guarantees by the regulators. Hence presence of such safety nets actually increases the moral hazard problem in banking, meaning that bankers then have less incentive to monitor the borrowers, and hence practice bad lending which further enhances the overall default risk level.

There are various forms of risk shifting which are described in the chapter four of the current thesis.

SPECIFIC VARIABLE NAMES AND DESCRIPTIONS

Bank pay out variables	**Variable definition**	**Data Source**
Dividend per share	Quarterly dividends paid in per share term	COMPUSTAT&CRSP
Cash dividend paid DVPD	Total money value of the cash dividends paid quarterly by the BHCs	COMPUSTAT&CRSP
Stock dividend per share	Quarterly measure of stock dividends paid in money value term on a par share basis	COMPUSTAT & CRSP

Share buyback	Quarterly measure of amount of share buy back by the BHCs in money term (USD)	COMPUSTAT&CRSP
Total dividend payed DVT	Quarterly value of total dividends paid out, comprising cash and stock dividends in money value term	COMPUSTAT&CRSP
Bank specific adjustment speed	Calculated based on the modified partial adjustment model: bank specific adjustment speed on a quarterly basis	
Bank specific half-life period	Computed based on the modified partial adjustment model: quarterly for individual firms	
Bank specific explanatory variables		
AT: Size	Computed as the natural logarithm of the total assets for individual bank holding firm	COMPUSTAT&CRSP
Tangibility/ Intangibility(INTAN)	Measure of transparency: ratio of tangible/intangible assets to total assets	COMPUSTAT&CRSP
Turnover	Natural logarithm of total shares volume traded in a quarter	COMPUSTAT&CRSP
Spread	The standard measure adopted here is the difference between the average bids and ask prices in the end of the respective quarters.	COMPUSTAT&CRSP
Capital adequacy	Capital adequacy ratio is calculated by taking the ratio of the equity capital and the risk-weighted assets.	COMPUSTAT&CRSP

Credit growth	This is a measure of the growth rate of the loan portfolio, which is obtained by subtracting the last period's loan portfolio value from the current loan portfolio value and dividing it by the previous year's portfolio value.	
Loan risk	This is a measure of risk of the bank loan portfolio, which is obtained by the ratio of non-performing assets to total loans.	
Default risk	A proxy is used for such default risk level , which is a dummy variable, equal to one if the equity capital to total asset ratio is less than 2%, which indicates very high default risk bank, and 0 otherwise. In the third section of the thesis default risk measures are increased.	
Financial crisis dummy	In the current thesis, crisis dummy is used, which captures the banking crisis period, i.e. the dummy has the value 1 if for the quarters between 2007 third quarter and 2009 first quarter, and 0 otherwise.	
Leverage	Leverage capital is obtained by dividing liabilities by equity capital, a standard measure of capital structure.	COMPUSTAT&CRSP
Deposit to total asset ratio	Ratio of deposit volume to total asset of a BHC, this measure is a standard measure for type of risk shifting	COMPUSTAT&CRSP
INTPN: Interest Paid - Net		COMPUSTAT&CRSP

Bank specific lifecycle controls		
Retained earnings to total asset ratio	Retained earnings in every quarter to total assets in the balance sheet	COMPUSTAT&CRSP

Interest expense to total asset ratio	Interest expenditure in every quarter to total asset in the balance sheet	COMPUSTAT&CRSP
Retained earnings to capital employed ratio	For every quarter	COMPUSTAT&CRSP
Common equity to total asset ratio	For every quarter	COMPUSTAT &CRSP
	Standard capital ratios	COMPUSTAT
CAPR1: Risk-Adjusted Capital Ratio - Tier 1 CAPR2: Risk-Adjusted Capital Ratio - Tier 2		
CEQ: Common/Ordinary Equity - Total		COMPUSTAT
RE: retained earnings		COMPUSTAT
TIE: total interest expense		COMPUSTAT

Other important variables needed for constructing the pay out variables, or as controls:

CSHPRI: Common Shares Used to Calculate Earnings Per Share – Basic

CSHO: Common Shares Outstanding

CSTK: Common/Ordinary Stock (Capital)

DLTT: Long-Term Debt – Total

OPREPSX: Earnings Per Share - Diluted - from Operations

DPDC: Deposits - Demand – Customer

DPLTB: Deposits - Long-Term Time - Bank

Gvkey: Global Company Key

Fyear: Data Year – Fiscal

Indfmt: Industry Format

Tic: Ticker Symbol

Conm: Company Name

STALT: Status Alert

List of acronyms

1. SOA: speed of adjustment, referring to various types of pay outs, namely, dividend pay outs and share repurchases.
2. Half Life: Time taken in terms of quarters by the respective BHCs to adjust towards 50% of the target pay outs level.
3. BHC: bank holding companies.
4. NPV: net present value.
5. EMH: efficiency market hypothesis.
6. Separating Equilibrium: if the signal sent by the firms in a market with information asymmetry problems (adverse selection or moral hazard) is costly enough, such that only high value firms can bear such cost, then equilibrium would be generated in which outside investors could distinguish between low and high quality firms and price them accordingly. Such an equilibrium is called as a separating equilibrium. In theoretical modeling this is achieved when certain constraints, like participation and incentive compatibility are maintained.
7. VAR: vector auto regression (as explained in the methodology section of the second chapter).
8. DPS: dividend per share of the respective bank holding companies.
9. G causality: Granger Causality test for VAR (explained in the methodology section of the second chapter).
10. VECM: vector error correction model.
11. ETM: Earnings Trend Model.
12. GMM: General Method of Moments
13. Reta : retained earnings to total asset mix
14. Ceta: common equity to total asset mix/ratio
15. Ieta: interest expenditure to total asset ratio
16. Npata: non performing asset to total asset ratio
17. Lags: one quarter or one period lag, in some VAR models: L1

Extra TOBIT results

The extra results for TOBIT regressions in the appendix for the full sample data provides results for the probabilistic impact of opacity dummy variables and the crisis dummy variables on the pay out variables: dividend per share, net share repurchases, and cash dividends. Dummy opacity variables: size dummy, spread dummy, turn over dummy and tangibility dummy take the value 1 if the level is greater than the median level of the variable or 0 otherwise. Crisis dummy takes the value 1 if the observation is between the crisis period (2007-09 as explained earlier) or else 0.The control variables remain same through out.

dividendspershare~r	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
sizedummy	.0374567	.0062074	6.03	0.000	.0252867	.0496267
crisis1	-.0208258	.0099928	-2.08	0.037	-.0404174	-.0012342
cetalag	.0179668	.0515696	0.35	0.728	-.0831389	.1190725
retalag	2.033137	.1441499	14.10	0.000	1.750522	2.315753
ieta	.6788063	.0105785	64.17	0.000	.6580664	.6995461
earningspersharelag	-.0000701	.0001594	-0.44	0.660	-.0003826	.0002425
npatal	-.0055433	.00123	-4.51	0.000	-.0079547	-.0031319
_cons	-.0108643	.0061604	-1.76	0.078	-.0229421	.0012135
/sigma	.1839654	.0023118			.1794329	.1884979

dividendspershare~r	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
spreaddummy	.0296442	.0062324	4.76	0.000	.0174252	.0418633
crisis1	-.0274006	.0101365	-2.70	0.007	-.0472738	-.0075274
cetalag	.037785	.0515632	0.73	0.464	-.0633082	.1388782
retalag	1.955997	.1442523	13.56	0.000	1.673181	2.238814
ieta	.6836717	.010643	64.24	0.000	.6628054	.7045381
earningspersharelag	-.0000921	.0001598	-0.58	0.565	-.0004054	.0002213
npatal	-.006248	.0012341	-5.06	0.000	-.0086675	-.0038286
_cons	-.0066212	.0060616	-1.09	0.275	-.0185053	.0052629
/sigma	.1844399	.0023159			.1798994	.1889804

logcashdividendlag	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
sizedummy	.6094307	.1058209	5.76	0.000	.4019617	.8168996
crisis1	-.1008602	.1677499	-0.60	0.548	-.4297451	.2280247
cetalag	-.9364985	.8827728	-1.06	0.289	-2.667234	.7942367
retalag	-.3463681	2.470765	-0.14	0.889	-5.190467	4.497731
ieta	.6005063	.3742317	1.60	0.109	-.1332001	1.334213
earningspersharelag	0005498	.0028364	0.19	0.846	-.0050111	.0061107
npatal	-.0339447	.0188908	-1.80	0.072	-.0709814	.003092
_cons	1.227621	.1100452	11.16	0.000	1.01187	1.443372
/sigma	3.276177	.0078211			3.260843	3.291511

totalsharesrepurc~r	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
sizedummy	1.276773	.1176004	10.86	0.000	1.046209	1.507336
crisis1	-.4198506	.1854146	-2.26	0.024	-.7833684	-.0563328
cetalag	-.377361	.9751772	-0.39	0.699	-2.289261	1.534539
retalag	-49.63824	2.826963	-17.56	0.000	-55.18069	-44.09579
ieta	5.898942	.4152691	14.21	0.000	5.084779	6.713105

earningspersharelag	-.4184982	.0370278	-11.30	0.000	-.4910936	-.3459028
npatal	.0909036	.0207973	4.37	0.000	.050129	.1316782
_cons	5.377136	.1219248	44.10	0.000	5.138095	5.616178
/sigma	3.60069	.0425409			3.517286	3.684095

totalsharesrepurc~r	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
turnoverdummy	.5543466	.1183981	4.68	0.000	.3222191	.7864741
crisis1	-.4245483	.1880366	-2.26	0.024	-.7932067	-.0558899
cetalag	-.2466479	.9950472	-0.25	0.804	-2.197505	1.704209
retalag	-50.48502	2.86337	-17.63	0.000	-56.09885	-44.87119
ieta	6.443495	.4173482	15.44	0.000	5.625255	7.261734
earningspersharelag	-.4096641	.0375262	-10.92	0.000	-.4832367	-.3360915
npatal	.0729076	.0210061	3.47	0.001	.0317238	.1140914
_cons	5.692556	.1225897	46.44	0.000	5.452211	5.932901
/sigma	3.6501	.0431118			3.565576	3.734623

One-sample t test

totalsharesrepurc~r	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
spreaddummy	.436766	.1197486	3.65	0.000	.2019909	.671541
crisis1	-.5044273	.1903781	-2.26	0.008	-.8776764	-.1311782
cetalag	.3119618	.9880018	0.32	0.752	-1.625082	2.249005
retalag	-51.59368	2.874048	-17.95	0.000	-57.22844	-45.95891
ieta	6.327068	.4211847	15.02	0.000	5.501308	7.152829
earningspersharelag	-.4040578	.0375938	-10.75	0.000	-.4777629	-.3303528
npatal	.0729897	.0210439	3.47	0.001	.0317317	.1142476
_cons	5.74514	.1224515	46.92	0.000	5.505066	5.985215
/sigma	3.656376	.0431741			3.571731	3.741022

One-sample t test						
Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
ratio	989	1.906665	.558021	17.54885	.8116225	3.001708
mean = mean(ratio)				t = 3.4168		
Ho: mean = 0				degrees of freedom = 988		
Ha: mean < 0		Ha: mean != 0		Ha: mean > 0		
ttest ratio == 1						
One-sample t test						
Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
ratio	989	1.906665	.558021	17.54885	.8116225	3.001708
mean = mean(ratio)				t = 1.6248		
Ho: mean = 1				degrees of freedom = 988		
Ha: mean < 1		Ha: mean != 1		Ha: mean > 1		
Pr(T < t) = 0.9477		Pr(|T| > |t|) = 0.1045		Pr(T > t) = 0.0523		

As is evident from the above regression tables that the impact of opacity dummy and the crisis dummy variables are significant at 5% level in most of the cases for pay out variables, and significantly the impacts on net share repurchase variable is significant, which is in keeping with the results obtained in the main thesis, which again supports the substitution hypothesis.

As another robustness check for the regression results the below LOGISTIC regression results are obtained with the full sample. Here the pay out variable used is total dividend pay out in Log form and the net share repurchases. The control variables are kept same through out.

Logistic Regression Results

Logistic regression Number of obs = 3943

LR chi2(6) = 500.18

Prob> chi2 = 0.0000

Log likelihood = -1884.8294					Pseudo R2 = 0.1171	
logdividendtotal	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
size	.1594306	.0299302	5.33	0.000	.1007686	.2180926
ceta	4.915707	1.428592	3.44	0.001	2.115717	7.715696
dta	-.7324417	.5634161	-1.30	0.194	-1.836717	.3718335
reta	21.66966	1.291882	16.77	0.000	19.13762	24.20171
ieta	29.45075	12.89563	2.28	0.022	4.175776	54.72572
npatal	.0163651	.0125299	1.31	0.192	-.0081932	.0409233
_cons	-1.276828	.2689915	-4.75	0.000	-1.804041	-.749614

Logistic regression Number of obs = 3943

LR chi2(6) = 478.39

Prob> chi2 = 0.0000

Log likelihood = -1895.7241 Pseudo R2 = 0.1120

logdividendtotal	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
tangibility	13.27452	4.698796	2.83	0.005	4.065045	22.48399
ceta	5.306361	1.419761	3.74	0.000	2.52368	8.089042
dta	.1032767	.5489737	0.19	0.851	-.972692	1.179245
reta	21.86303	1.299462	16.82	0.000	19.31614	24.40993
ieta	13.09097	12.08126	1.08	0.279	-10.58787	36.76981
npatal	.0217599	.013074	1.66	0.096	-.0038647	.0473845
_cons	-.3532264	.1759815	-2.01	0.045	-.6981439	-.0083089

Logistic regression Number of obs = 3943

LR chi2(6) = 613.16

Prob> chi2 = 0.0000

Log likelihood = -1828.3422 Pseudo R2 = 0.1436

logdividendtotal	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
turnover	-.1343478	.0114667	-11.72	0.000	-.1568222	-.1118734
ceta	8.8392	1.53619	5.75	0.000	5.828322	11.85008
dta	-.0393808	.5608613	-0.07	0.944	-1.138649	1.059887
reta	20.1939	1.292908	15.62	0.000	17.65985	22.72795
Ieta	20.48251	12.46526	1.64	0.100	-3.948944	44.91397
npata	.0076902	.0113132	0.68	0.497	-.0144833	.0298636
_cons	-.2316943	.1605649	-1.44	0.149	-.5463958	.0830072

Logistic regression Number of obs = 3943

LR chi2(6) = 514.77

Prob> chi2 = 0.0000

Log likelihood = -1877.5365 Pseudo R2 = 0.1206

logdividendtotal	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
sizelag	.1480259	.0295335	5.01	0.000	.0901413	.2059105
cetalag	6.45157	1.481774	4.35	0.000	3.547346	9.355794
dtalag	-.5638763	.5510053	-1.02	0.306	-1.643827	.5160742
retalag	21.93717	1.301176	16.86	0.000	19.38692	24.48743
earningspersharelag	.012822	.0122913	1.04	0.297	-.0112685	.0369126
npatal	5.950931	2.285801	2.60	0.009	1.470844	10.43102
_cons	-1.245878	.2551047	-4.88	0.000	-1.745874	-.7458816

Logistic regression Number of obs = 3943

LR chi2(6) = 496.12

Prob> chi2 = 0.0000

Log likelihood = -1886.8601 Pseudo R2 = 0.1162

logdividendtotal	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
tangibilitylag	12.81133	4.662334	2.75	0.006	3.673319	21.94933
cetalag	6.749086	1.458002	4.63	0.000	3.891455	9.606717
dtalag	.1278229	.5392528	0.24	0.813	-.9290931	1.184739
retalag	21.9846	1.309838	16.78	0.000	19.41737	24.55184
earningspersharelag	.0167182	.0127362	1.31	0.189	-.0082443	.0416808
npatal	4.485911	2.231952	2.01	0.044	.1113647	8.860457
_cons	-.4506262	.1700459	-2.65	0.008	-.78391	-.1173423

Logistic regression Number of obs = 3943

LR chi2(6) = 500.38

Prob> chi2 = 0.0000

Log likelihood = -1884.7337 Pseudo R2 = 0.1172

logdividendtotal	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
intangibilitylag	-8.59696	2.448367	-3.51	0.000	-13.39567	-3.798249
cetalag	6.089751	1.453646	4.19	0.000	3.240658	8.938844
dtalag	-.0277887	.5420708	-0.05	0.959	-1.090228	1.034651
retalag	22.10711	1.309973	16.88	0.000	19.53961	24.67461
earningspersharelag	.0141395	.0124548	1.14	0.256	-.0102713	.0385504
npatal	4.958855	2.25187	2.20	0.028	.5452721	9.372438
_cons	-.0780469	.1475702	-0.53	0.597	-.3672793	.2111855

Logistic regression Number of obs= 3943

LR chi2(6) = 513.22

Prob> chi2 = 0.0000

Log likelihood = -1878.312 Pseudo R2 = 0.1202

logdividendtotal	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
spreadlag	-.06322	.0123864	-5.10	0.000	-.0874969	-.0389432
cetalag	6.711531	1.462961	4.59	0.000	3.84418	9.578882
dtalag	.0249284	.544327	0.05	0.963	-1.041933	1.09179
retalag	22.39263	1.311021	17.08	0.000	19.82308	24.96218
earningspersharelag	.0137905	.012494	1.10	0.270	-.0106972	.0382783
npatal	5.672629	2.144344	2.65	0.008	1.469792	9.875465
_cons	-.0911216	.1447164	-0.63	0.529	-.3747604	.1925173

Logistic regression Number of obs = 2340

LR chi2(6) = 15.54

Prob> chi2 = 0.0164

Log likelihood = -67.473091 Pseudo R2 = 0.1033

totalsharesrepurchasedquarter	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf. Interval]	
sizelag	1.117824	.2660812	0.47	0.640	.7010637	.7010637
cetalag	3.79e+24	6.34e+25	3.38	0.001	2.17e+10	6.62e+38
dtalag	295.104	1482.51	1.13	0.258	.0156244	.0156244
retalag	6.24e-14	9.51e-13	-1.99	0.046	6.58e-27	.5914002
earningspersharelag	1.025043	.0690589	0.37	0.714	.8982457	1.169739
npatal	.7619051	.8503083	-0.24	0.807	.0854939	6.789951
_cons	2.369489	4.326765	0.47	0.637	.06612	84.91349

VAR Extra Results

Though in the main thesis there have been VAR results provided both for an unrestricted sample and a restricted sample, here a larger sample with dividend omission data is further used. The limitation with this sample is that this data set is obtained only with dividend per share data. The results however strongly supports the VAR outputs and nature of impacts obtained earlier.

Number of obs = 6,557	
Log likelihood = 3707.595	AIC = -1.126611
FPE = .0011111	HQIC = -1.1216
Det(Sigma_ml) = .0011064	SBIC = -1.112117

Equation	Parms	RMSE	R-sq	chi2	P>chi2
dividendspersh~r	7	.145622	0.2093	1735.543	0.0000
size	7	.228758	0.9723	230441.6	0.0000

		Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
dividendspersharepaydatequarter							
ividendspersharepaydatequarter							
	L1.	.3094738	.0115653	26.76	0.000	.2868063	.3321414
	size						
	L1.	.016787	.0013781	12.18	0.000	.014086	.0194881
	ceta	-.0463098	.0473836	-0.98	0.328	-.1391799	.0465603
	dta	-.0509286	.0257327	-1.98	0.048	-.1013638	-.0004933
	reta	.75441	.0484175	15.58	0.000	.6595135	.8493064
	ieta	3.370535	.5360553	6.29	0.000	2.319886	4.421184
	cons	-.0770175	.0114599	-6.72	0.000	-.0994786	-.0545565
size							
dividendspersharepaydatequarter							
	L1.	.0426035	.0181679	2.34	0.019	.006995	.078212
	size						
	L1.	.9847149	.0021649	454.86	0.000	.9804719	.988958
	ceta	-.1747091	.0744349	-2.35	0.019	-.3205988	-.0288193
	dta	.1470576	.0404236	3.64	0.000	.0678288	.2262864
	reta	.1322536	.076059	1.74	0.082	-.0168194	.2813265
	ieta	-.7298422	.8420898	-0.87	0.386	-2.380308	.9206235
	cons	.1219859	.0180024	6.78	0.000	.0867018	.15727

Number of obs = 6,557						
Log likelihood = -11618.67				AIC = 3.548168		
FPE = .1191245				HQIC = 3.553179		
Det(Sigma_ml) = .1186169				SBIC = 3.562662		

Equation	Parms	RMSE	R-sq	chi2	P>chi2
dividendspersh~r	7	.146361	0.2013	1652.096	0.0000
size	7	2.36702	0.1462	1122.639	0.0000

		Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
dividendspersharepaydatequarter							
ividendspersharepaydatequarter							
	L1.	.3204768	.0115526	27.74	0.000	.2978341	.3431194
	size						
	L1.	.0064889	.0007214	8.99	0.000	.005075	.0079029
	ceta	-.0442812	.0476657	-0.93	0.353	-.1377042	.0491419
	dta	.0133953	.0252635	0.53	0.596	-.0361203	.0629108
	reta	.7354079	.0486925	15.10	0.000	.6399723	.8308435
	ieta	2.641599	.5345423	4.94	0.000	1.593916	3.689283
	cons	.0292248	.0061455	4.76	0.000	.0171799	.0412698
size							
dividendspersharepaydatequarter							
	L1.	2.084634	.1868341	11.16	0.000	1.718446	2.450822
	size						
	L1.	.3225249	.0116671	27.64	0.000	.2996578	.3453919
	ceta	-2.215602	.7708736	-2.87	0.004	-3.726486	-.7047172
	dta	.3582887	.4085738	0.88	0.381	-.4425012	1.159079
	reta	2.34958	.78748	2.98	0.003	.8061477	3.893013
	ieta	.863308	8.644885	0.10	0.10	-16.08036	17.80697
	cons	1.227613	.099388	12.35	0.000	1.032816	1.42241

Number of obs = 6,557						
Log likelihood = 31570.37				AIC = -9.625245		
FPE = 2.26e-07				HQIC = -9.620234		
Det(Sigma_ml) = 2.25e-07				SBIC = -9.610751		

Equation	Parms	RMSE	R-sq	chi2	P>chi2
dividendspersh~r	7	.147089	0.1933	1571.032	0.0000
size	7	.003232	0.8777	47051.68	0.0000

		Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
dividendspersharepaydatequarter							
ividendspersharepaydatequarter							
	L1.	.3365081	.0114388	29.42	0.000	.3140886	.3589276
	size						
	L1.	-.7845929	.2002096	-3.92	0.000	-1.176997	-.3921892
	ceta	-.0902129	.0481349	-1.87	0.061	-.1845556	.0041298
	dta	.0082931	.0254691	0.33	0.745	-.0416254	.0582116
	reta	.7477931	.0489106	15.29	0.000	.6519302	.843656
	ieta	2.703252	.5386405	5.02	0.000	1.647536	3.758968
	cons	.0579516	.0071971	8.05	0.000	.0438454	.0720577
size							
dividendspersharepaydatequarter							
	L1.	-.0004296	.0002514	-1.71	0.087	-.0009223	.000063
	size						
	L1.	.93473	.0043997	212.45	0.000	.9261068	.9433533
	ceta	.000147	.0010578	0.14	0.889	-.0019262	.0022202
	dta	-.0004602	.0005597	-0.82	0.411	-.0015572	.0006368
	reta	-.0002459	.0010748	-0.23	0.819	-.0023525	.0018607
	ieta	.0965041	.0118369	8.15	0.000	.0733043	.1197039
	cons	.0006292	.0001582	3.98	0.000	.0003192	.0009391

Number of obs = 6,557						
Log likelihood = -3495.567				AIC = 1.070479		
FPE = .009999				HQIC = 1.07549		
Det(Sigma_ml) = .0099563				SBIC = 1.084973		

Equation	Parms	RMSE	R-sq	chi2	P>chi2
dividendspersh~r	7	.147161	0.1925	1563.047	0.0000
size	7	.678898	0.9006	59379.88	0.0000

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
dividendspersharepaydatequarter						
ividendspersharepaydatequarter						
L1.	.3375442	.0114381	29.51	0.000	.315126	.3599625
size						
L1.	.0026824	.0008991	2.98	0.003	.0009202	.0044447
ceta	-.0926022	.0485074	-1.91	0.056	-.187675	.0024705
dta	-.0026876	.0261844	-0.10	0.918	-.0540082	.0486329
reta	.7712669	.0494021	15.61	0.000	.6744406	.8680932
ieta	2.856657	.5475322	5.22	0.000	1.783514	3.929801
cons	.0075662	.0131188	0.58	0.564	-.0181462	.0332787
size						
dividendspersharepaydatequarter						
L1.	.1459548	.0527675	2.77	0.006	.0425325	.2493771
size						
L1.	.9385966	.0041479	226.28	0.000	.9304668	.9467264
ceta	.7364119	.2237793	3.29	0.001	.2978125	1.175011
dta	.6050561	.1207967	5.01	0.000	.3682989	.8418134
reta	-.5614795	.2279068	-2.46	0.014	-1.008169	-.1147905
ieta	-10.70847	2.525932	-4.24	0.000	-15.65921	-5.757735
cons	.795353	.0605212	13.14	0.000	.6767337	.9139723

Two-sample t test with unequal variances

Variable	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
logcas~d	3,685	1.523037	.0334099	2.028122	1.457533	1.58854
logdiv~l	3,685	1.904276	.0364985	2.21561	1.832717	1.975835
combined	7,370	1.713656	.0248382	2.13233	1.664966	1.762346
diff		-.3812394	.0494809		-.4782363	-.2842426
diff = mean(logcashdividend) - mean(logdividendtotal)					t = -7.7048	
Ho: diff = 0			Satterthwaite's degrees of freedom = 7311.14			
Ha: diff < 0		Ha: diff != 0		Ha: diff > 0		
Pr(T < t) = 0.0000		Pr(|T| > |t|) = 0.0000		Pr(T > t) = 1.0000		

Logcash: log of cash dividends paid, Log div: Log value of total dividend paid.

Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
panel	3,685	43.15142	29.67957	1	105
fiscaldata~r	3,685	20038.1	58.2999	19811	20132
quarter	3,685	3318.87	1964.09	5	6665
size	3,685	7.385198	1.463582	3.331597	14.4053
sizelag	3,685	7.371864	1.462366	3.133928	14.4053
ceta	3,685	.0914546	.0294859	-.0353205	.3345781
cetalag	3,685	.0916211	.029372	-.0353205	.3345781
dta	3,685	.0701281	.0733167	0	.4439754
dtalag	3,685	.0699365	.0739741	0	.4730755
tangibility	3,685	.0171335	.0086351	0	.0583998
tangibilit~g	3,685	.0171517	.0086287	0	.0575578
intangibil~y	3,685	.0100754	.0154105	0	.1997587
intangibil~g	3,685	.0100091	.0153605	0	.1997587
reta	3,685	.0409431	.0381746	-.19602	.1628012
retalag	3,685	.0410462	.0382257	-.1988622	.1605832

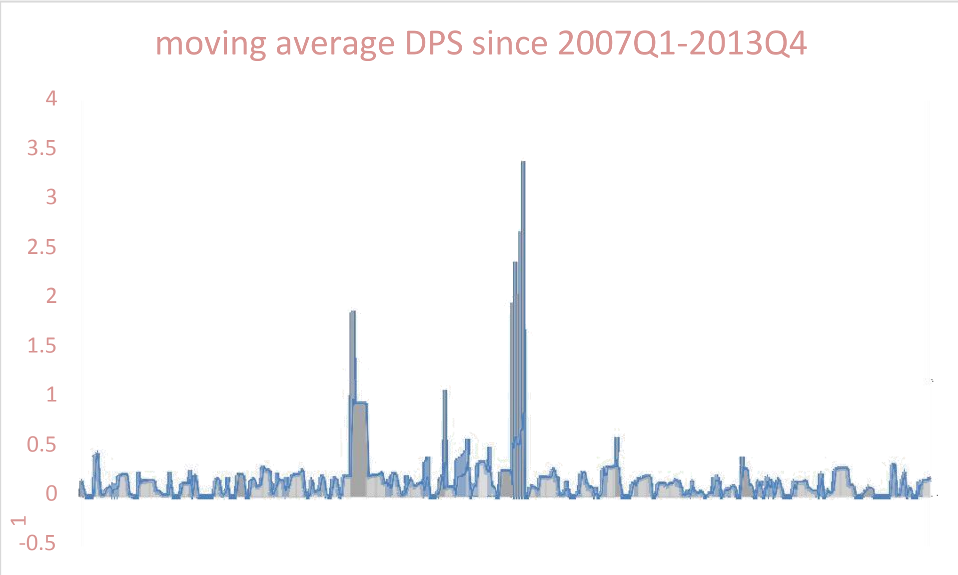
ieta	3,685	.0058378	.0034563	0	.0660021
ietalag	3,685	.0058366	.0034575	0	.0660021
dividendsp~r	3,685	.1423083	.175876	0	3.3902
dividendlag	3,685	.1421439	.1696949	0	2.6791
logdividen~l	3,685	1.904276	2.21561	-6.214608	9.348623
logdividen~g	3,685	1.88258	2.226312	-6.907755	9.348623
cashdividend	3,685	67.29864	354.2809	.001	6990
logcashdiv~d	3,685	1.523037	2.028122	-6.907755	8.852236
logcashdiv~g	3,685	1.495432	2.040598	-4.961845	8.852236
earningspe~e	3,685	1.913921	19.27733	-62.61	1153.17
earningspe~g	3,685	1.932777	19.36936	-62.61	1153.17
npata	3,685	.0131871	.1177284	0	7.055584
npatal	3,685	.0133596	.1180966	0	7.055584
divpershar~r	3,685	.1429119	.1710049	0	3.3902
dividendex~g	3,685	.1434703	.1658688	0	2.6791
turnover	3,685	13.58046	2.269858	6.214608	21.82201
turnoverlag	3,685	13.55666	2.272071	6.214608	21.82201
spread	3,685	2.073791	2.376277	0	34
spreadlag	3,685	2.105454	2.447193	0	34

Variable	Obs	Mean	Std. Dev.	Min	Max
size	2,914	7.427284	1.387227	4.346088	14.4053
ceta	2,914	.0947378	.0276233	0	.3345781
dta	2,914	.0691349	.0727562	0	.4439754
tangibility	2,914	.0171626	.0080085	0	.0583998
intangibil~y	2,914	.0094477	.0143807	0	.1997587
reta	2,914	.0469541	.0310761	-.1202497	.1628012
ieta	2,914	.0059442	.0031771	0	.0259125
dividendsp~r	2,914	.1799609	.1798363	.01	3.3902
logdividen~l	2,914	2.01033	2.165124	-6.214608	9.348623
cashdividend	2,914	79.96451	392.5566	.001	6990
logcashdiv~g	2,914	1.645384	2.118872	-4.828314	8.852236
earningspe~e	2,914	2.016839	21.59628	-18.93	1153.17
npata	2,914	.0134472	.1315856	0	7.055584
turnover	2,914	13.59638	2.280513	8.006368	21.82201
spread	2,914	2.127927	2.329166	0	34

GRAPHS

Graph 1

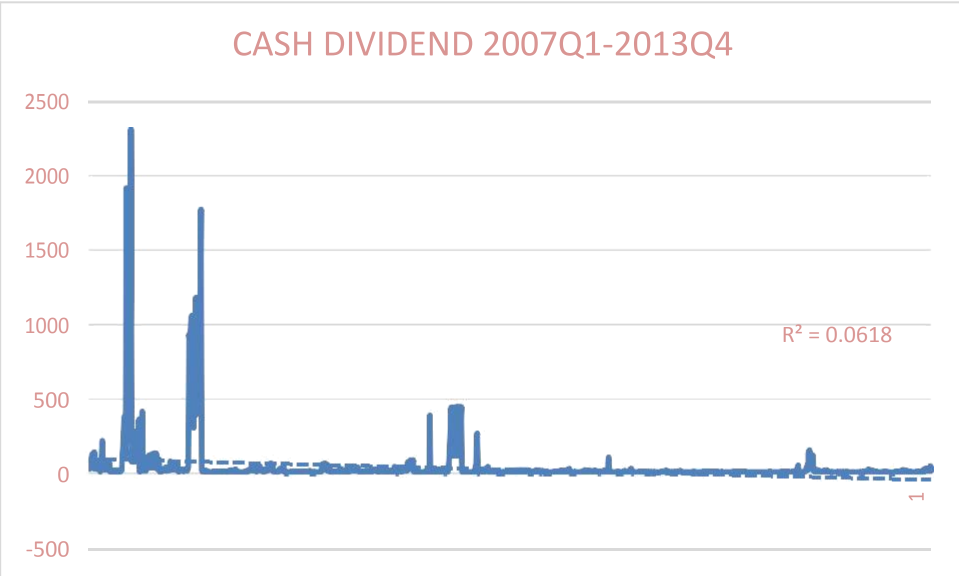
Initially the data universe consisted of all the bank holding companies based on the merged data from COMPUSTAT and CRSP since 1980Q1 to 2015Q4, however due to significant missing data for share repurchases, and consistent dividend pay outs, some constraints were put on the data. The main constraint put on the selection of data was that only those bank holding companies would be selected which had maintained consistency in dividend pay outs for the last 4 quarters in any particular year. With this constraint it is observed that the no of omission for dividend pay outs in the final sample has reduced to zero, and also there is a drastic improvement in the omission of share repurchases data. One consistent finding is that since 2000 there has been regular share repurchases by such bank holding companies which have also opted for regular dividend pay outs, however since the latter half of the financial crisis there has been sharp increase in the share repurchases as compared to a decline in the cash dividend pay outs. Some graphical exposition of these trends have been shown in this appendix section.



Above is the graphical exhibition of the moving (quarterly) average of dividend per share paid out by the bank holding companies in the sample, from 2007Q1 to 2013Q4. The main reason for this graph is to describe the pattern of dividend pay outs over the crisis period. One clear message is that there has been a steady pay out by the BHCs with some sharp peaks/ spikes, which refers to some bank holding companies in specific during the very period. Here the subsample consists of 1320 firm quarter periods.

The linear trend line also do show that the pay out has been steady over the firm quarter periods. This finding is in keeping with some recent studies, for example Floyd etal (2015), which have observed that BHCs have pursued a stable pay out strategy despite regulatory pressure to cut back dividends and build up more capital.

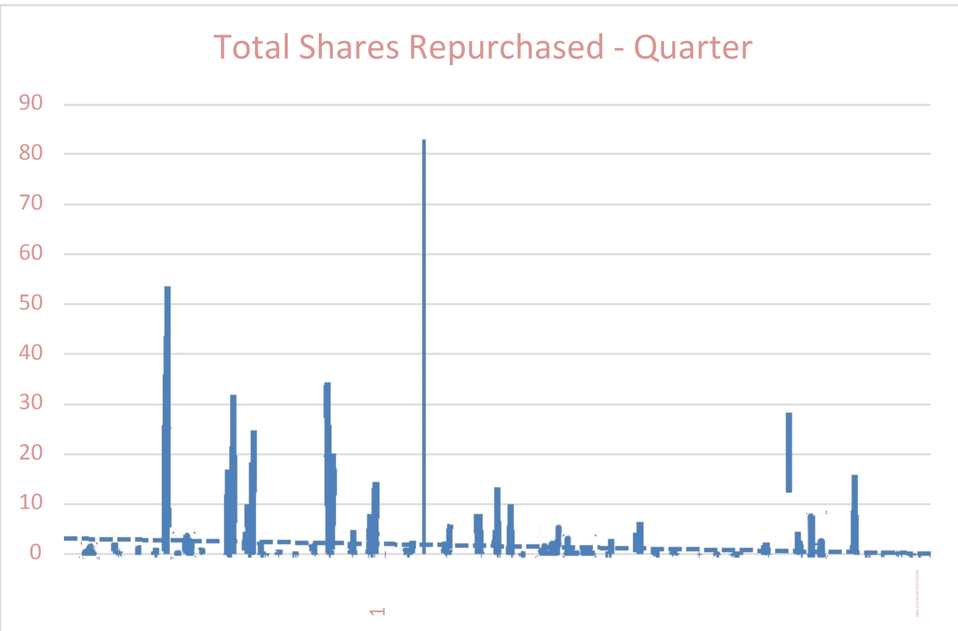
The current thesis has explained the very trend from different perspectives: neoclassical value signalling, life cycle factors, smoothing of pay outs as well as whether risk shifting has been exhibited via pay outs where the finding was insignificant.



The above graphical display is of the total cash dividend amount paid out by the bank holding companies in the sample over the period 2007-2013 quarterly. Here again the period is chosen to reflect any significant change or trend over the crisis period and beyond. Though linear trend line shows a small decline in the cash dividend amount in the later quarters after the crisis period, overall the cash dividends have been quite persistent. Here the subsample consists of 1350 firm quarter periods.

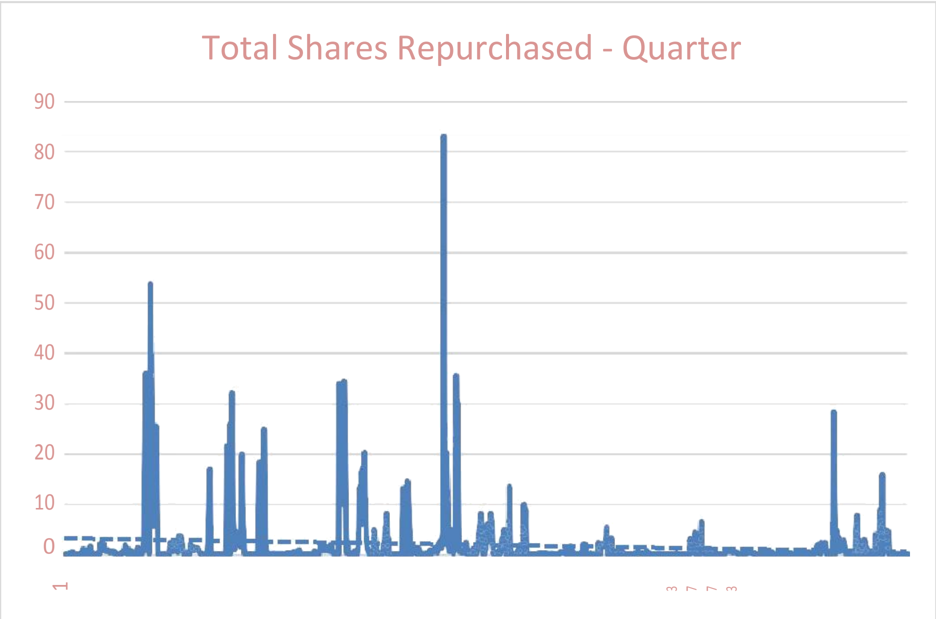
Here however the importance of the other types of pay outs is called for, and in the current thesis, share repurchases and stock dividends have also been considered along with the total pay out values. Cash dividend pay outs certainly relates with the free cash flow theory, and in the banking sector due to severe agency conflict cash dividends can play more important roles as compared to the non-banking firms. For partial adjustment of pay outs, in the thesis it is observed that managers do use cash dividends per share basis for smoothing more than any other type of pay outs.

There are some significantly larger peaks in the start of the crisis period rather, which has reduced over time, however this may not be risk shifting or wealth transfers from depositors/ creditors to shareholders, rather value signalling during downturn.



As mentioned in the thesis there has been a long standing debate on whether the share repurchases as another pay out tool is a perfect substitute of dividends. In the theoretical models, like of Bhattacharya's (1979) 'bird in the hand fallacy', share repurchases have been conceptualised as perfect substitutes. However certainly there are tax consequences, and shareholder clientele effects. Here the subsample consists of 3850 firm quarter periods.

The above graph shows the trend of share repurchases by the bank holding companies in the sample, over quarters for a larger period than the crisis period of 2007-2009. It is evident that in the earlier periods there has been some irregular spikes but the pay out via share repurchases has been irregular. There has been omission of share repurchases for a considerable number of quarters. Floyd et al (2015) and others have also found that the trend of share repurchases has caught up only in the later years.



The above graph now shows the trend of share repurchases by the BHCs for the crisis period quarters, rather than from very early periods. Here the pay outs are very regular and omission of share repurchases is rare. This finding further supports the view that since crisis the banking firms have changed strategies towards share repurchases, which is also impacted by the

Regulatory pressures. Here the graph contains 980 firm quarter periods covering the 2007 onwards.

OUTPUTS FOR THE PARTIAL ADJUSTMENT MODEL

The current section builds up a three step partial adjustment model aiming to achieve two fold analysis, one, analyse the direct impact of bank level opacity on bank specific adjustment speeds of pay outs, two after such adjustment speeds are measured using the partial adjustment model further indirect impacts of the bank specific characteristics on speeds of adjustments are measured.

The following partial adjustment model has been developed, which is a modified partial adjustment model following Oliver etal (2015), Flannery and Rangan (2006) among others. In this form, a bank's current pay out ratio (or DPS) is a weighted average of its target pay out ratio and the previous period's pay out ratio, where the weight λ has the closed range (0,1), with a stochastic term, as below.

DPSi,t= λ DPSi,t* + (1-λ)DPSi,t-1 + ei,t….(1)

Hence ever period a bank can adjust towards the target level by λ proportion, which implies that smaller is the λ greater is the rigidity of the bank to change dividend pay outs towards the target. Hence, λ is considered as the speed of adjustment (SOA), and (1-λ) the portion of dividend pay out which is inertial. However since the target level is unobserved, and is a function of bank specific heterogeneities, it is further modelled as a function of bank level, and bank specific factors, as shown below:

$$DPS^{*} = \beta X + \nu i + \mu t \; \ldots .(2)$$

In the above equation x is the vector of firm specific characteristics, and the two error terms represents heterogeneity across space and time. At this stage for firm specific factors we have used standard life cycle variables following the very literature. Substituting 2 in 1 the following equation is generated.

DPSi,t= λ(β xi,t-1 + νi +μt) + (1-λ)DPSi,t-1 + ei,t ….(3)

Again as the standard literature (Flannery and Rangan (2006), Lemmon et al. (2008),Huangand Ritter (2009), and Gropp and Heider (2010)) suggest that in the presence of lagged dependent variable with a short panel data, using fixed effect models can generate biasedestimates for λ. Hence following the recent estimations (Oliver et al, 2015, Flannery and Hankins (2013)) a system GMM estimation of the model (3) is adapted here by the author. Again we assume that each banking firm will have its own SOA factor, which is again a function of some bank specific variables, which can be captured in the following way:

$\lambda i,t = \lambda 0+\alpha Zi,t\text{-}1$, where Z is the vector of firm specific variables, here we use the opacity level as one of such firm specific variables to explicitly measure the impact of degree of information asymmetry on the adjustment process. hence substituting again this in 3 we get, DPS*-DPS =(λ+αZ)(βx + ν+μ–Y)+e …(4)

Again the last term in the bracket can be expressed as the difference between the target level and the lagged dependent variable, this can be termed as GAPi,t-1, hence symbolically the partial adjustment model can now be written as

Yi,t-Yi,t-1 =(λ0+αZi,t-1)GAPi,t-1+ei,t ...(5)

Overall following Jiang, Hong and Molleneaux (2015), who have used a similar partial adjustment model for investigating capital structure adjustment of bank holding firms, the estimation of the above steps have been done. Hence the first step which contains the lagged dependent variable has been estimated using system GMM method, whereas the remaining steps have been estimated using standard panel data fixed effect estimation method. There have been a huge literature on such estimation methods, specifically on the advantages on using GMM estimation techniques for panel data models. Following is the brief account of the three steps in which the partial adjustment model is run in the current paper. The paper follows studies by Flannery and Rangan (2006), De Jonghe and Oztekin (2015), and Xiang et al (2015) among others for a three step partial adjustment model, which allows for bank specific and time varying pay out targets and heterogeneous adjustment speeds. First a constant adjustment speed λ is assumed for all banking firms for measuring target pay outs for each quarter, this is the first step of the model. In the second step the gap between the actual pay out level and the estimated target pay out level for each bank is used to measure the varying speed of adjustment for each bank. Finally, in the third step, the varying target pay outs for each bank is re-estimated using the varying speed of adjustment measured from the second step.

In a partial adjustment model, a bank's current pay out level/ pay out ratio ($k_{i,t}$) is a weighted average of its target ($k^*_{i,t}$) and its previous period's (in the current study previous quarter) pay out level/ ratio, $K_{i,t} = \lambda K^*_{i,t} + (1-\lambda)K_{i,t-1} + \mu_{i,t}$ (2). Substituting the equation 1 into the equation 2 we get the following equation: $K_{i,t}=\lambda\beta X_{t-1}+(1-\lambda)K_{i,t-1}+\mu_{i,t}$ (3). However the assumption of the constant speed of adjustment can be relaxed, and we can have a firm specific adjustment speed which varies over time or bank quarters: $\lambda_{i,i}=\Lambda Z_{i,t-1}$, where Z is another firm specific characteristics vector. Hence we get the equation(4) as $K_{i,t}-K_{i,t-1}=\Lambda Z_{i,t-1}(\beta X_{i,t-1}-K_{i,t-1})+\mu_{i,t}$.

Then the model is estimated in a three step procedure. Assuming a constant adjustment speed λ a standard partial adjustment model is estimated in (3), for this step the estimation technique is system GMM (as explained earlier, and here the widely cited study of De

Jonghe and Oztekin (2015) is followed, who have used system GMM mainly for the presence of the lagged dependent variable). The main purpose for the first step is to calculate an initial set of estimated β s , which are then used to measure the initial estimates of the target pay outs by the banks, $K^{*}_{i,t} = \beta X_{i,t-1}$, for each bank quarter. These estimates are likely to be biased since λ is assumed to be constant.

Hence in the second step, the gap between the estimated and the actual pay outs by banks in the previous quarter is estimated, say, $G_{i,t}$, which is then substituted in the equation (3), $G_{i,t} = \beta X_{i,t-1} - K_{i,t-1}$ (5), hence $K_{i,t} - K_{i,t-1} = \Lambda Z_{i,t-1} G + \mu_{i,t}$ (6), where G is the estimate of the gap as defined.

The equation (6) is used to calculate the estimates of Λ, which is required for estimating the varying speeds of adjustments of the banking firms for each quarter. The varying speed of adjustment is given by the formula, $\lambda_{i,t} = (\Lambda) Z_{i,t-1}$.Hence the estimation of varying speed of adjustment comprises the second step of the model.

In the third step the pay out measures are re-estimated by using the varying speed of adjustment obtained in the second step into the equation (3), hence after re-arranging the equation we have the following equation, $K_{i,t} - K_{i,t-1}(1 - \Lambda Z_{i,t-1}) = \beta \Lambda Z_{\iota,\tau-1} X_{i,t-1} + \mu_{i,t}$(7), where the estimated values have been used for Λ , in this step bank specific adjustment speed is used for measuring the bank specific and time varying pay out targets, which can be perceived as the optimal pay outs.

The table below provides results for the first step of the partial adjustment model, which is used to estimate the target pay outs under the constraint of constant adjustment speed of the BHCs (COMPUSTAT-CRSP). Following Oliviera et al (2014) the estimation technique for the first step has been system GMM, since this is dynamic partial adjustment model, all explanatory variables are one period lagged to control for any possible endogeneity problem. Variables are explained in the data and variables section. *, **, ***, represents significance at 10%, 5%, and 1% levels respectively.

	DPS				TOTAL DIVIDEND PAY				TOTAL PAY			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
No. of observations	3358	3358	3358	3358	3360	3360	3360	3360	3395	3395	3395	3395
const	-0.058	0.071	0.049	0.034	-0.021	0.355	0.315	0.301	-0.372	0.734	0.589	0.745
	(0.000)	(0.000)	(0.000)	(0.000)	(0.762)	(0.000)	(0.000)	(0.000)	(0.137)	(0.000)	(0.002)	(0.000)
Common Equity/TA	0.159	0.123	0.178	0.199	0.506	0.771	0.811	0.825	1.137	1.119	2.136	2.778
	(0.116)	(0.232)	(0.082)	(0.049)	(0.229)	(0.185)	(0.162)	(0.155)	(0.468)	(0.481)	(0.298)	(0.176)
RE/TA	0.737	0.711	0.683	0.648	-0.111	-0.981	-1.004	-1.021	0.027	-0.150	3.025	2.289
	(0.000)	(0.000)	(0.000)	(0.000)	(0.736)	(0.092)	(0.086)	(0.080)	(0.982)	(0.901)	(0.131)	(0.253)
Non-Perf. Assets/ TA	0.007	0.007	0.005	0.007	0.004	0.067	0.066	0.067	-0.298	-0.308	-0.091	-0.079
	(0.753)	(0.775)	(0.814)	(0.773)	(0.965)	(0.474)	(0.480)	(0.473)	(0.381)	(0.367)	(0.781)	(0.810)
Size	0.015***				0.017**				0.143			
	(0.000)				(0.043)				(0.000)			
TANGIBILITY		-1.047				-2.407				-3.903		
		(0.002)				(0.365)				(0.428)		
TURNOVER			0.012				0.103				0.302	
			(0.884)				(0.809)				(0.000)	
SPREAD				0.008				0.005				0.030
				(0.000)				(0.325)				(0.094)
DPS t-1	0.331	0.352	0.356	0.333								
	(0.000)	(0.000)	(0.000)	(0.000)								
LOG DIV					0.941	0.838	0.838	0.838				
					(0.000)	(0.000)	(0.000)	(0.000)				
TOTAL PAY t-1									0.676	0.686	0.516	0.521
									(0.000)	(0.000)	(0.000)	(0.000)

Table 2 section 2

The table below provides results for the second step of the partial adjustment model, which is used for estimating bank specific speeds of adjustments, namely of dividend per share (First four columns), total dividend pay outs (column 5-8), and of total pay outs including share repurchases (as explained in the variables section) (columns 9-12). Following Oliviera et al (2014) this step is estimated using fixed effect estimator for panel regressions. Significance levels are represented in the similar way. Detailed explanation of the impacts are discussed in the result sections. All explanatory variables are one period lagged to control for any possible endogeneity problem.

R-squared	**0.319**		**0.317**		**0.322**		**0.318**		**0.063**		**0.061**		**0.061**		**0.062**		**0.090**		**0.088**		**0.088**		**0.090**	
Adjusted R-squared	0.298		0.297		0.301		0.297		0.034		0.033		0.032		0.033		0.063		0.060		0.060		0.062	
F(109, 3574)	15.37		15.24		15.57		15.29		2.20		2.15		2.13		2.17		3.25		3.15		3.15		3.23	
P-value(F)	0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000	
cons	0.014	***	0.017	***	0.014	***	0.015	***	0.073	***	0.075	***	0.077	***	0.075	***	0.279	***	0.320	***	0.316	***	0.286	***
CE/TA LAG	0.095	***	0.205	***	0.172	***	0.120	***	-0.067		0.210	**	0.272	***	-0.025		-0.367		1.396	***	1.354	***	-0.324	
RE/TA LAG	0.130	***	0.101	***	0.091	***	0.125	***	0.128		0.008		0.009		0.126		1.213	**	0.661		0.652		1.256	**
NPA/TA LAG	0.000		0.001		0.000		0.001		-0.047	*	-0.048	**	-0.047	**	-0.047	*	-0.050		-0.045		-0.045		-0.047	
SIZE LAG	0.001	***							0.005	***							0.022	***						
TANGIBILITY LAG			-0.091								-0.585								-0.207					
SPREAD LAG					0.002	***							0.001								0.001			
TURNOVER LAG							0.047	**							0.212	**							1.116	***

Table 3 section 2

The following table provides results for the third step of the partial adjustment model (EQUATION) which is used to estimate the bank specific target pay outs, which are based on varying adjustment speeds of such pay outs, which vary across banks as well as over periods. Following Oliviera et al (2014) a standard fixed effect estimator is used in this step for estimation of the coefficients. *.**,***, represents significance at 10%, 5%, and 1% levels respectively. All explanatory variables are one period lagged to control for any possible endogeneity problem.

Dependent variable	TOTAL PAY				DPS				LOG_DIV_TOTAL			
Size	0.288***				0.012***				0.199***			
	(0.000)				(0.001)				(0.000)			
Common Equity/TA	-6.292	8.848	-7.498	12.017	0.229	0.926	0.492	0.900	-1.929	9.272	-1.339	9.319
	(0.272)	(0.026)	(0.265)	(0.001)	(0.347)	(0.000)	(0.077)	(0.000)	(0.620)	(0.000)	(0.762)	(0.000)
DEBT/TA	-1.742	2.426	-0.901	2.789	0.094	0.313	0.205	0.284	-4.153	-0.905	-3.372	-0.976
	(0.499)	(0.310)	(0.726)	(0.245)	(0.475)	(0.009)	(0.122)	(0.085)	(0.037)	(0.612)	(0.088)	(0.584)
RE/TA	20.594	18.201	22.040	18.657	0.731	0.775	0.775	0.585	3.709	1.941	4.235	2.537
	(0.000)	(0.002)	(0.000)	(0.002)	(0.004)	(0.002)	(0.002)	(0.084)	(0.204)	(0.515)	(0.150)	(0.383)
Turnover			15.48***				0.325				9.663***	
			(0.001)				(0.143)				(0.003)	
Spread				0.054				0.003				0.056
				(0.501)				(0.451)				(0.274)
Tangibility		-27.63				-1.05***				-8.32		
		(0.370)				(0.003)				(0.473)		
Non-Performing/TA	-0.307	-0.240	-0.246	-0.193	0.013	0.019	0.016	0.009	-2.297	-2.247	-2.273	-2.233
	(0.766)	(0.816)	(0.812)	(0.852)	(0.843)	(0.767)	(0.803)	(0.892)	(0.027)	(0.031)	(0.029)	(0.032)
Constant	0.225	0.216	0.222	0.227	-0.008	0.000	-0.005	-0.004	0.065	0.076	0.068	0.076
	(0.003)	(0.007)	(0.004)	(0.005)	(0.147)	(0.936)	(0.390)	(0.523)	(0.001)	(0.000)	(0.001)	(0.000)

SUMMARY OF THE THREE STEPS AS RUN ABOVE:

The above results in the three subsequent tables are based on the three steps of the modified partial adjustment model, as described earlier in the methodology section. The main aim of these tables are to estimate the bank specific variable adjustment speed. Based on the adjustment speed calculations the respective half-life periods are also estimated.

These values of speed of adjustments and half-lives are then used in the following tables for analyzing the signalling content of such measures. One critical consideration is that different sets of bank specific variables are used in these two sections, which means that the set of bank specific life cycle variables and opacity variables which are used in the three steps of the partial adjustment model, are not repeated for analyzing the further results on signalling.

The current thesis is the first such application for deciphering bank holding firms pay out smoothing measures, earlier attempts have been directed to measure bank specific adjustment speeds of capital structure adjustments (Oliver et al 2015, Jiang et al, 2015).

The table below provides results for the probabilistic impacts of the bank specific opacity and life cycle control variables on three dependent pay out variables, namely, dividend pershare (DPS), Log value of total cash dividend payed (CASH DIVIDEND), and money value of share repurchases. Opacity variables are as discussed earlier, namely, tangibility(TAN)), spread, and turnover, all the variables being lagged. The life cycle variables are size, common equity to total assets (CE/TA), retained earnings to total assets (RE/TA), interest expense to total assets (IE/TA),
And non performing assets to total assets (NPA/TA) ratios (variables discussed in the data section), crisis dummy (as discussed) is included.
For each regression time dummy is used. The estimation method is standard TOBIT regression. Coefficients of each variable is reported with significance levels, * implying p value<0.01, ** implying p value < 0.05, and * implying p value<0.10, meaning significance at 1%, 5%, and 10% levels respectively. The table provides impacts of opacity levels on different pay outs, and captures marked contrast between dividend signalling and share repurchase signalling (full discussion in result section).**

	DPS (1-4)				**CASH DIVIDEND (5-8)**				**SHARE REPURCHASE (9-12)**			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
No. of observations	3943	3943	3943	3943	3943	3943	3943	3943	3943	3943	3943	3943
SIZE LAG	0.374***				0.609***				1.27***			
TAN LAG		-0.0028*				-0.14*				-0.17*		
CISIS	-0.027***	-0.020 (0.000)***	-0.020 (0.000)***	-0.020 (0.000)***	-.100*	-.086	-0.113	-0.083	-.41**	-0.39*	-.42**	-.50**
CE/TA LAG	0.017	0.043	0.026	0.025	-.933	-.619	-.669	-.566	-.377	-0.323	-0.24	-0.233
RE/TA LAG	2.033***	1.999***	2.005***	1.956***	0.340	0.991*	0.981*	0.761*	-49.6**	-50.97**	-50.48**	-51.5**
IE/TA LAG	0.678***	0.697***	0.695***	0.683***	0.600	0.865**	0.815**	0.901**	5.89***	6.50***	6.44***	6.32**
TURNOVER LAG			0.0133**				0.540*				0.554***	
SPREAD LAG				0.029***				0.040				0.436**
EPS LAG	0.001	0.001	0.001	0.001	0.005	0.004	0.005	0.003	-.459***	-0.453**	-.409**	-.404**
NPA/TA LAG	-0.005***	-0.006***		-0.006***	-0.033**	-0.04**	-0.04*	-0.043*	0.090***	0.071**	0.072**	0.072**
Prob> chi2	0.000	0.000	0.000	0.000	0.000	0.029	0.000	0.000	0.000	0.000	0.000	0.000

Table above of this section provides results for the TOBIT model, where the dependent variables are dividend per share, total cash dividend pay out in log terms, and the money value of share repurchases (as described in the variables section). The reason for including different types of pay outs is that the general literature on dividend signalling or pay out signalling holds that impact of firm specific factors on the level of signalling may be different for different types of signalling.

The probabilistic impacts of the bank specific characteristics on the dividend per share level is in line with recent studies like Forti and Schiozer (2015). However in the above table the main signalling hypothesis is investigated, which following the seminal theoretical models like of Miller and Rocks (1985), hypotheses' that greater information asymmetry level will generate greater dividend pay outs for solving or mitigating the adverse selection of equity capital. Again as observed in the last table the results are in contradiction to the prediction of the pecking order theory, which predicts the opposite of the signalling theory.

Here the first four columns provide the results for the probabilistic impacts of the explanatory and control variables on the dividend per share levels. The first impact is of the size variable, which is one period lagged value relative to the dividend pay out, and the positive significant impact shows that greater is the size of the bank higher is the probability of paying out. Since the coefficients are of a probabilistic estimation they can not be interpreted in the same way as that for the linear model estimations, but the significant p values (which is indicated by the *) can reveal information about the greater or lower probability of pay outs.

The impact of size is according to the earlier table, which can be explained by either agency theory, or signalling theory. There can be either free cash flow problem faced by large banks (which is a critical issue in the financial crisis period, since that is argued to generate excessive risk taking), or the larger size can also show greater opacity in case of banks due to larger opaque assets, which is a different argument than the non banking firms, where the standard diversification or the reputation capital argument would predict that greater size represents less opacity instead.

The second main explanatory variable is the one period lagged tangibility value which is found to have significant negative probabilistic impact on the dividend per share level. This is again in accordance with the earlier causality model which supports the standard signalling hypothesis rather than the alternative hypothesis of pecking order theory.

Aivazian et al (2006) in a comprehensive econometric study have shown that firms which have better bond ratings are also those which have greater transparency in asset quality, and such firms also do smooth their pay outs. Hence this analysis will be critical in later section where investigation is based in the pay out smoothing of the banks in the sample. In this section the result is in harmony with the prediction of signalling theory.

The crisis dummy, which has been explained in the variable section, interestingly has a significant negative probabilistic impact on the dividend per share level. This finding is accordance with the results of Forti and Schiozer (2015), and hence similar to their finding the above results show that banks in the sample have at an average reduced dividend pay outs due to the impact of crisis, which can again be supported by the regulatory pressure of cutting back dividends and raising more capital.

Such negative impact of crisis is further investigated in details in the subsequent sections, where dividend smoothing, and later on possibility of risk shifting via dividend pay outs and smoothing is investigated, since there has been some recent claims by Achraya et al (2014) that crisis period may have produced risk shifting incentives to the larger banks in specific, who have maintained large dividend pay outs. The current analysis investigates whether such behaviour can be observed in general or not. As of now the above results do not support the view of risk shifting via dividend pay outs, rather supports the signalling view developed by Forti and Schiozer(2015), and Kuoku (2012). However one way the current analysis extends the above mentioned study is by investigating the impact of bank specific variables on other types of pay outs, specifically share repurchases which may throw some interesting insights.

In the above table the probabilistic impacts of the turnover lag and the spread lag remains positive and significant, which is consistent with the last VAR results which further provides support to the signalling story to mitigate adverse selection problem.

Among the bank specific control variables retained earnings, and one measure of default risk, namely non per performing assets to total asset ratio are found to have significant probabilistic impacts on the dividend per share levels.

The nature of impact of retained earnings is in line with the free cash flow theory (Jensen, 1986) and is also according to the general studies like by De Angelo et al (2006), where the banks with greater retained cash flow have found optimal to distribute larger dividends, which can also be considered as a signal for mitigating agency conflict.

The negative significant impact of the default risk measure on dividend pay outs is again in line with the recent study by Forti and Schiozer (2015), where banks with greater default risk level have found it optimal to cut back dividends, which may also be supported by the regulatory pressure of capital building or skin in the game approach.

Again this results are in line with recent studies and contradictory to the claim of Acharya et al (2014) that dividend s are used to expropriate the debt holders.

Overall the impacts on the dividend pay outs reveal the signalling behaviour of the banks to the debt holders in general. In the above table (TOBIT outputs) results the impact of the bank specific variables along with the opacity levels support the results for the dividend pay out per share level (which is the total dividend comprising stock, and cash dividend divided by the no of shares out standing). There is a strong evidence that both industrial firms and banks have increased dividend pay outs over years till the last financial crisis (Floyd et al, 2015). However the empirical studies argue that the reasons for increase in the pay out decisions are different in both cases. For the industrial firms the increase in dividend pay outs are also simultaneous with the increase in share repurchases, which is also evident in banks, as also in the current thesis.

However standard literature suggests that for the non banking industrial firms it is the free cash flow problem which stands out as the main reason for increasing dividend pays among the large firms (De Angelo et al, 2008). Again dividend increase in these firms are also consistent with the managerial reluctance to cut back dividends, which is again consistent with the dividend smoothing literature of Lintner (1956) to Brav et al (2005). However as Floyd et al (2015) observes the nature of signalling for banks dividend is fundamentally different from the industrial firms'.

The authors are in view that banks dividend signalling is more to convey future financial strength of the banks. This can be compared to the concept of value signalling as in the original signalling literature (for example in Miller and Rocks, 1985). The above results do support the original signalling theory as relative to the pecking order theory, or agency cost theory, though it is also clarified from the above results that the life cycle control variables also do have significant impacts on dividend pay outs.

The last four columns of the table above provides results for the impact of bank speciifc caharacterisctics on the share repurchases. Grullon et al (2002) have proposed the substitution hypothesis. According to this widely cited study there has been an increasing tendency to use funds otherwise used for dividends for share repurchases. This trend is increasing for the USA based firms in general.
Even more recent studies, for example, Andriosopolous et al (2013) have found that share repurchases have increased over the last 30 years along with the reluctance to cut back dividends. There are interesting theoretical as well as empirical observations on the substitutability between the dividend payments and the share repurchases.

Most of the early theoretical models, for example, by Bhatttacharya (1979) or Miller and Rocks (1985) have argued that these two pay out forms are perfect substitutes, since the source of transaction costs in these models are not associated with the choice between these pay outs. In Bhattacharya (1979) the source of cost associated with signalling is raising new capital, once a stable dividend pay out is committed by the manager.

However there is arguments on whether share repurchases can constitute signalling equilibrium, which separates good firms with future financial prospects from the bad firms with less financial prospects. Studies on substitution hypothesis have mentioned that since dividends attract institutional investors more than the share repurchases, undervalued firms signal via dividend pay outs rather than buy backs and that may create separating equilibrium.

Hence according to these studies there is no perfect substitutability between share repurchases and dividends. However its is also important to explain why then there is a simultaneous rise in buy backs along with dividend pay outs by industrial firms as well as banks. In the current thesis a comparative study of signalling content of these pay outs by banking firms is presented. Share repurchases by bank holding companies have increased drastically over the last few decade, and importantly over the last financial crisis (Floyd et al, 2015). Rather authors (Floyd et al, 2015) have been surprised by observing dividend rigidity among banks along with the rise in repurchases, since repurchases have greater flexibility, tax advantages and related benefits (Guay and Harford, 2008, Skinner, 2008).

There is some disagreement among the authors on whether share repurchases can be considered as costly signalling, since there is no ongoing commitment for share buy backs (Floyd et al, 2015) there is a view that they cannot be consistently used as signals.

However as shown in the current thesis, as well as recent studies, there is a persistency among the banks to maintain share repurchases along with dividend pay outs over considerable period of time. Hence it can be argued that share repurchases also do act as signals, and convey some important information to the information sensitive investors.

Baker and Wurgler (2012) have argued that changes in dividend per share is easy to observe, however it is difficult to gauge the magnitude of share repurchases[1].

In the current study the finding on bank share repurchases is compatible to the findings of Floyd et al (2015) which is that there has been a consistent and adjacent increase of share repurchases along with the rigidity of dividend pay outs by banks. However in the above mentioned study there is no investigation of information content of share repurchases along with that of the dividend pay outs by banks. The above table provides some of the information content of share repurchases which is supplemented by later results.

The lag value of size has the similar positive and significant impact on repurchases as on the dividend pay outs, which means that greater is the lag value of bank size higher is the probability of the banks to repurchase. Such result is consistent with the studies of Jgannath and Stephens (2002), and Andriosopoluous et al (2013) who have observed that the buyback programs are completed mostly by the larger firms. The last paper has also found that share buyback is positively associated with information disclosure for the firms in general.

In keeping with the finding that information disclosure and buy backs are positively associated the above results show that share buy backs are also impacted in the similar way by opacity levels (tangibility, spread and turnover measures) as the pay outs. These results suggest that buy backs can also be used by banks to signal financial strength of banks (Floyd et al, 2015), or as according to the signalling theory, mitigate

[1] There can be other difficulties in share repurchases, for example as observed by Ikenberry and Vermaelen (1995) that per share amount of repurchases is not reported, amounts paid out are not tied to specific periods, and in some cases after the repurchases are announced the action is carried out over few years' time.

adverse selection problems.

Specifically the study by Floyd et al (2015) finds that any pay out strategy by banks, whether dividend pay outs or buy backs can be related to signalling of future financial strength. The above results supports the view. However more bank specific results are reported in later tables.

Among the other bank specific control variables retained earnings has a strong negative probabilistic impact on the buy backs, which is expected since one reason for buy backs is to build up own capital by banks. The impact of profitability, as reflected in the EPS measure is also as expected in theory, i.e. less profitable firms go for more share buy backs. This also relates to the standard literature that undervalued firms prefer to go for buy backs more than the overvalued firms which may impact their equity prices positively.

Another striking result is the impact of lag nonperforming asset ratio on buy backs which is significantly positive, as compared to significantly negative on dividend pay outs. However this is also supported by the argument that if the default risk level increases for banks then there is incentive for the managers to cut back dividends and increase own capital, which can be again accomplished through increasing buy backs.

Overall the last two tables do suggest that there is enough evidence at the firm level to suggest that both pay outs and share buy backs can be used as signals for financial strength, or mitigation of adverse selection. However there are important differences between the respective signals too.

The first two tables in the current section has demonstrated that dividend pay outs as well as share repurchases by banks can be considered as costly signalling, which is based on general value signalling concept of the signalling theory (Bhattacharya, 1977, Miller and Rocks, 1985 and others).

However it is extremely critical to recognize that banking firms are different than the non-banking firms, and such differences are based on the specific features of banking which is absent among the industrial firms. There is a strong and sound literature which posits banks differently than non-banks (Berger et al, 1995, Calomiris and Wilson, 2004,Diamond and Dygvig , 1983, Kashayap et al, 2002, Laven, 2013). The main differences emerge from the fact that banks create liquidity by taking more liquid deposits as relative to the opaque and illiquid assets created as loans, hence they are highly leveraged and rely heavily on depositors for short term financing.

For high opacity it is very hard for the outsider investors to assess the quality and value of assets. Hence as recent studies like Forti and Schiozer (2015) suggest that banks do have responsibilities towards information sensitive creditors for maintaining confidence, where the dividends can act as costly signals for solvency. Again if the confidence of the creditors break down then the funding model of banking will also collapse which may lead to runs and various other costs of distress.

Hence dividend signalling by banks also reveals inherent fragility of banks (Floyd et al, 2015, Acharya et al, 2011). It is also true that banks are a more homogenous group than industrial firms, hence are vulnerable to more common shocks, such features also make dividends worthy signals to market in general.

Keeping these distinctions of banking firms in mind it is critical that information content of bank pay outs is investigated in more specificity, which is attempted in the table 3 of this section. Specifically probabilistic impact of bank specific levels of leverage, credit growth, capital adequacy, loan risk, are studied on the dividend pay outs and share repurchases. This analysis is an extension of standard analysis as posed by Forti and Schiozer (2015).