Exploring the Role of Mispricing, Market Access and Life Cycle in Corporate Financial Decision-Making

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by

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ABSTRACT

Using an extensive sample of US firms over the period 1971-2008, this thesis examines important factors that are hypothesized to influence corporate decision making, namely: stock market mispricing; accessibility to external capital markets; and a firm's life cycle stage. First, this thesis examines the impact of stock market mispricing on various corporate policies. The results confirm the findings of Polk and Sapienza (2009) that mispricing affects corporate investment through the catering channel - the relation between investment and mispricing is positive. This relation is stronger for firms typified by shorter horizon investors. Stock market mispricing also influences others corporate policies through the catering channel - firms tend to rely on cash holdings and debt financing to finance catering investment. The analyses suggest that debt financing is a primary source of financing, while cash reserves is of secondary importance.

Second, this thesis explores a new aspect of financial flexibility – namely, the ability of a firm to adjust its internal and external sources of finance for corporate investment in response to stock market mispricing. Firms with greater access to external capital markets are more flexible in adjusting their sources of financing for corporate investment in response to mispricing. Specifically, firms with greater access tend to have lower (higher) investment-cash flow sensitivities in situations of overvaluation (undervaluation). In contrast, the investment-cash flow sensitivity of firms with limited access to external finance is negligibly affected by the level of mispricing.

Third, this thesis investigates the impact of a firm's life cycle stage on various corporate policies. Consistent with the notion that mature firms face relatively limited growth opportunities and have higher accumulated profits, firms tend to reduce investment, become

less reliant on external financing, hoard less cash, and pay higher dividends as they mature. All of the empirical results in this thesis are confirmed by a battery of robustness checks.

DECLARATION

Except where reference is made in the text of the thesis, this thesis contains no material which has been accepted for an award at another institution.

No other person's work has been used without due acknowledgement in the main text of the thesis.

[redacted]

Wing Chun Kwok

17/04/2014

Date

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Chapter 1

Introduction

The main theme of this thesis is corporate decision making – with a special focus on investment and financial policies, and to a lesser extent, the cash holdings and payout decisions. It is important to examine investment policy since capital expenditure represents such a major force of economic activities – for example, in 2013 it was estimated to contribute 22.20% to the World Gross Domestic Production (GDP).[1] Thus, investigating corporate investment policy is very likely to provide important insights into government policy decision making. It is also important to examine the financing decision due to its great relevance to investment policy in the presence of a wedge between the cost of internal and external financing.[2]

This thesis seeks to examine selected factors that are hypothesized to impact corporate decision making, namely: stock market mispricing; accessibility to external capital markets; and a firm's life cycle stage. Using an extensive sample of US firms over the period 1971-2008, these topics will be examined separately in three empirical chapters.[3] Each of these topics will now be briefly introduced.

There is a vast literature documenting evidence of stock market mispricing and its impact on corporate policies. For example, Baker and Wurgler (2002) find that mispricing affects the financing decision through market timing - overvalued (undervalued) firms will take

[1] "Investment (% of GDP) Data for all countries", (2013), (Economy Watch) Available: http://www.economywatch.com/economic-statistics/economic-indicators/Investment_Percentage_of_GDP/ (Accessed: December 5, 2013).

[2] The wedge between the cost of internal and external funds is a consequence of information asymmetry (Jensen and Meckling, 1976) and adverse selection problems (Myers and Majluf, 1984).

[3] Given the size of the stock market and aggregate fixed investment, the US market provides the best platform to examine corporate decision making.

advantage by issuing overvalued (repurchasing undervalued) equity. They find a negative relationship between the market value and the leverage of firms since firms tend to rely more (less) on equity and less (more) on debt when they are overvalued (undervalued). Mispricing not only affects the financing decision but also the investment decision. For example, the theoretical model of Stein (1996) suggests that firms tend to invest more (less) when they are overvalued (undervalued). Baker, Stein, and Wurgler (2003) examine this hypothesis and find that mispricing does have an impact on corporate investment through an equity issuance channel. Shleifer and Vishny (2003) find that stock price overvaluation will also lead to higher levels of investment in the form of mergers and acquisitions.

Polk and Sapienza (2009) document evidence of a catering channel, through which equity mispricing affects the investment decision directly, contrasting the previously documented indirect influence through the equity issuance channel in Baker et al. (2003). The catering theory suggests managers can boost the short-term share price by catering to investor sentiment if firms are mispriced according to their level of investment. Specifically, overvalued firms could undertake investment projects that have negative net present values (NPV) because the benefits obtained from the market's overvaluation of investment projects outweigh the loss from undertaking such value-destroying projects. Similarly, undervalued firms could forgo investment projects that have positive NPV because the cost of investment (i.e. market's undervaluation of projects) is greater than the value of investment.

In another stream of literature, a firm’s accessibility to external capital markets has been found to impact the investment decision. The pioneering study of Modigliani and Miller (1958) suggests that, in a perfect capital market, investment decisions are determined by the profitability of projects but not the sources of financing. In other words, the financing decision is irrelevant to corporate managers when making investment decisions. However, this theory cannot be applied to real-world capital markets, which are clearly imperfect. In the presence of information asymmetry, external funds become more costly than internal funds, and access to external capital markets is restricted or constrained, i.e. there are capital or financial constraints. For example, Jensen and Meckling (1976) suggest that a major consequence of information asymmetry is the asset substitution problem which leads to a higher cost of debt. Myers and Majluf (1984) show that an adverse selection problem will lead to a wedge between the cost of internal and external funds.

Based on Jensen and Meckling (1976), and Myers and Majluf (1984), Fazzari, Hubbard and Petersen (1988) recognize that the internal and external cost of funding differential creates a relevance for the availability of internal funds to corporate investment decisions. They find that investment of firms with limited access to external markets (i.e. financially constrained firms) would be more reliant on internal cash flow (i.e. higher *investment-cash flow sensitivities*). Kaplan and Zingales (1997) re-examine the relationship and find the opposite. Their explanation is that managerial risk aversion in constrained firms makes managers more cautious with their investment decisions, thus, these firms tend to underinvest even when there are sufficient internal funds to finance the project. Cleary (1999, 2006) provide support to the argument of Kaplan and Zingales (1997), and they document higher investment-cash flow sensitivities for financially unconstrained firms.

There is also a growing literature providing evidence that a firm's life cycle does influence its policy decisions. DeAngelo, DeAngelo and Stulz (2006) find that dividends are more likely to be paid by mature and established firms because they face relatively few attractive investment opportunities and have higher accumulated profits which indicate that they are in a self-financing stage. In contrast, young firms tend to be in a capital infusion stage since they have relatively abundant investment opportunities and limited cash flow, which make them less likely to distribute dividends. This is consistent with Fama and French (2001) who document a positive relation between profitability and the propensity to pay dividends, and a negative relation between investment opportunities and payout propensity. Recently, DeAngelo, DeAngelo and Stulz (2010) document evidence of the influence of firm maturity on the propensity to conduct seasoned equity offerings. They find that mature firms are less likely to conduct seasoned equity offerings even when they are overvalued.

Previous studies in the literature mainly examine the impact of mispricing on a given corporate policy (see e.g., Baker et al. (2003), and Polk and Sapienza, (2009) for investment policy; Baker and Wurgler (2002), and Dong, Loncarski, Horst and Veld (2012) for financial policy; Baker and Wurgler (2004a) for dividend policy). Motivated by this paucity of knowledge, the first contribution of this thesis is to examine how mispricing impacts various corporate policies through the catering channel. This analysis is presented in the first empirical chapter, Chapter 3. The purpose of this examination is to investigate the sources of financing used for catering investment. Such catering activities represent variations in the uses of funds which have to be matched by corresponding variations in the sources of funds. Managers can finance catering investment by: (i) reducing cash holdings, (ii) issuing debt security, and (iii) reducing/omitting payouts. Cash reserves are a natural source of financing for catering. Debt financing is another possible source of financing. Due to a signalling effect, it is implausible for managers to finance investment by equity since issuing equity would reduce share price which counters the purpose of catering.

In the first part of the analysis, the impact of mispricing on various corporate policies is examined. I do so by estimating static standalone equations of various corporate policies (investment, change in cash holdings, dividends and debt financing). Consistent with Polk and Sapienza (2009), I find a positive relation between the mispricing proxy and corporate investment. This indicates that managers cater to investor sentiment by adjusting their investment policy. The results also indicate that mispricing has a positive impact on debt issuance which suggests that managers rely on debt financing for catering. The mispricing proxy, however, has an insignificant impact on both cash holdings and dividend policies. In other words, there is no evidence to suggest that funds for catering come from cash reserves and dividend reductions. This is consistent with the previously documented evidence of dividend-smoothing and that dividends are sticky.

In the second part of the analysis, I estimate static standalone equations of various corporate policies across “short investor horizons” (high turnover) versus “long investor horizons” (low turnover) groups. I find that mispricing has a stronger (positive) impact on investment of the “short investor horizon” group. This is consistent with Polk and Sapienza (2009) that firms with shorter horizons cater more. The results also indicate that managers in firms with shorter investor horizons issue more debt and utilize more cash from cash reserves to finance catering. The impact of mispricing on dividends is statistically insignificant across the two groups. All empirical results are robust to alternative specifications.

Firms care about financial flexibility (see e.g., Graham and Harvey, 2001; Brounen, de Jong, and Koedijk, 2004; and Bancel and Mittoo, 2004). The majority of managers in the US list financial flexibility as the most important goal of financial policies (Almeida, Campello and Weisbach, 2011). Financial flexibility is important because it ensures funding for investment when profitable opportunities arise, and enables firms to access and restructure their financing to avoid financial distress in the face of negative shocks. Motivated by the importance of financial flexibility, the second empirical chapter of this thesis (Chapter 4) focuses on a new aspect of financial flexibility - the ability of a firm to adjust its internal and external sources of financing for corporate investment in response to stock market mispricing. Specifically, it examines whether firms with greater access to external capital markets are financially more flexible to react to and thus, take advantage of mispricing. This involves the investigation of the joint impact of firms’ accessibility to external capital markets and mispricing on *investment-cash flow sensitivity*. To my best knowledge, this is the first study to address this research question.

The main contribution is to investigate the interaction of accessibility to external capital markets, stock market mispricing and corporate investment. The key idea is that firms with greater access can easily adjust their sources of financing for investment which leads to greater *financial flexibility*. In periods of overvaluation (undervaluation) when external funds are cheaper (more costly), investment of firms with greater access would be less (more) dependent on internal funds. Thus, such firms should display lower (higher) investment-cash flow sensitivity during periods of overvaluation (undervaluation). On the other hand, firms with limited access to external capital markets will find it difficult, if not impossible, to raise external funds. Accordingly, investment of such firms would be more dependent on internal cash flow even during the periods of overvaluation. In other words, they are financially less flexible to react to mispricing.

Consistent with predictions, empirical results show that firms with greater access to external markets can more flexibly adjust their sources of financing (between internal and external funds) for investment in response to stock market mispricing. The investment-cash flow sensitivity of such firms is lower (higher) when overvalued (undervalued). In contrast, the results suggest that firms with limited access are unable to adjust their sources of financing for investment in response to stock market mispricing. The differences in their investment-cash flow sensitivities are statistically indifferent from zero between overvaluation and undervaluation periods.

This research question is related to Dong et al. (2012), who examine the interaction of mispricing and financial constraints for security issuance and find that unconstrained firms are more flexible in timing the external markets. This thesis extends their paper by investigating how firms can make use of their financial flexibility to also take advantage of mispricing by adjusting their internal and external sources of funds for corporate investment.

The last empirical chapter (Chapter 5) examines the impact of a firm's life cycle on various corporate policies. A firm's life cycle stage not only captures the level of retained earnings but also, to a certain extent, represents the investment opportunities it faces, so it should also influence other corporate policies. However, previous studies focus only on payout and equity financing policies and examine each policy in isolation. Also, these studies gauge the impact of life cycle in probability only. Motivated by this paucity of knowledge, this thesis extends the literature by relating the life cycle theory also to corporate investment, cash holdings and debt financing policies. The impact of the life cycle stage on these policies are measured in absolute term as well as probability.

First, young firms should invest more since they are in the expansion stage, and thus, face relatively abundant investment opportunities. Firms naturally tend to reduce investment as they mature since growth opportunities become limited. Second, firms tend to have higher accumulated profits as they mature, so mature firms should be less reliant on external financing. These firms should have sufficient internal funds for financing when the need arises. Third, Opler, Pinkowitz, Stulz and Williamson (1999) suggest that one of the main reasons firms hoard cash is for precautionary purposes. Given that mature firms are relatively well-established and profitable, they could easily raise funds when the need arises, so there is less need for building cash reserves.

The life cycle theory of corporate policies is examined using Fama and MacBeth's (1973) approach. Specifically, I employ linear regression models to investigate the impact on payout, external funds raised, investment and incremental cash holdings. Consistent with the idea that mature firms face relatively fewer growth opportunities and have higher accumulated profits, I find that firms invest less, issue less equity, hoard less cash and pay higher dividends as they mature.

To take a closer look at the impact of a firm's life cycle on corporate policies, I augment the regression equations to include interaction terms of firm life cycle with firm life cycle dummies, capturing the "young" versus "mature" stages. I find that investment and equity issuance decrease monotonically, and dividend payouts increase monotonically as firms mature. However, the influence on debt financing and cash holding policies are non-monotonic. Firms increase their reliance on debt financing as they move from the young to the intermediate stage, and then decrease as they move to the mature stage. Firms life cycle stage influences firms cash policy only when they become mature – firms reduce cash as they enter the mature stage.

I also use logit regression models to examine the impact of life cycle on the propensity to increase investment, raise external funds, hoard cash and pay dividends. I find that the propensities to increase investment and issue equity decrease monotonically as firms mature. The latter finding is consistent with that of DeAngelo et al. (2010). Consistent with DeAngelo et al. (2006), Denis and Osobov (2008), and Chay and Suh (2009), the propensity to pay dividends increases monotonically as firms mature. Firms are more likely to issue debt in the intermediate stage and less likely in the early and mature stages. The life cycle stage starts to influence the propensity to hoard cash only when firms enter the mature stage – mature firms are less likely to hoard cash. Overall, the evidence indicates that firm life cycle, which reflects a firm's financing needs, and reliance on internal versus external capital, is relevant to corporate policy decision making.

This thesis is organized as follows. Chapter 2 reviews the literature. Chapter 3, 4 and 5 present the details of the three empirical chapters. Each chapter includes the corresponding details of data and sampling, variables proxies, proposed hypotheses, empirical models and results. Chapter 6 concludes the thesis.

Chapter 2

Literature Review

2.1 Introduction

Traditional financial theory is based on many assumptions, with a major example being that financial markets are efficient - assets prices equal their fundamental values (on average), i.e. no mispricing is expected. However, recent research provides evidence of mispricing (see e.g., Fisher and Statman, 2000; Brown and Cliff, 2005; Baker and Wurgler, 2007; and Schmeling, 2007) and that manager might adjust their corporate policies in response to mispricing (see e.g., Baker et al., (2003), and Polk and Sapienza, (2009) for investment policy; Baker and Wurgler, (2002), and Dong et al. (2012) for financing policy; Baker and Wurgler, (2004a) for dividend policy).[4] The impact of stock market mispricing on various corporate policies is discussed in section 2.2.

Another major assumption is the absence of market imperfections such as information asymmetry. In other words, the wedge between the costs of internal and external funds does not exist (e.g., Modigliani and Miller, 1958). Therefore, corporate investment decision should be determined based on the profitability of projects – e.g., for independent projects, positive NPV cases should be accepted – the availability of internal funds is irrelevant. However, the availability of internal funds and the accessibility to external capital markets can become relevant to investment decision in an imperfect capital market where information asymmetry exists. This topic will be discussed in Section 2.3.

[4] Baker, Ruback and Wurgler (2012) provide a comprehensive review of the impact of mispricing on various corporate policies.

Another area that has attracted much interest is the life cycle theory of corporate policies. Miller and Modigliani's (1961) dividend irrelevance theorem suggests that, in a perfect capital market, corporate payout policy is irrelevant to a firm's value. However, payout policy becomes relevant in an imperfect world where capital markets are not frictionless. In the last few decades, numerous studies have focused on theories of corporate payout policy such as signalling (see e.g., Bhattacharya, 1979; and Miller and Rock, 1985), agency (see e.g., Easterbrook, 1984; and Jensen, 1986), catering (Baker and Wurgler, 2004a) and clientele (see e.g., Miller and Modigiliani, 1961; Elton and Gruber, 1970; and Kalay, 1982). However, empirical tests of these hypotheses provide mixed evidence. Recently, DeAngelo et al. (2006) provide evidence that a firm's life cycle stage explains the corporate payout decision. DeAngelo et al. (2010) find that life cycle also influences equity financing decisions. The impact of life cycle stage on various corporate policies will be discussed in Section 2.4.

2.2 Mispricing and Corporate Policies

2.2.1 Investment Policy

Stein (1996) suggests that the impact of mispricing on investment decision is more significant in equity-dependent firms. Such firms tend to fund their investment through equity issuance when they are overvalued. In addition, Baker et al. (2003) find that the relationship between Tobin's Q and corporate investment is particularly strong for equity-dependent firms. The argument of Stein (1996) is also supported by Shleifer and Vishny (2003) who find that overvaluation leads to higher levels of investment in the form of mergers and acquisitions.

Chirinko and Schaller (2001, 2004), Panageas (2003), Gilchrist, Himmelberg and Huberman (2005), and Schaller (2012) also examine the relationship between mispricing and investment. They all find that investment is sensitive to mispricing. In particular, Gilchrist et al. (2005) document evidence suggesting that dispersion of investor opinions lead to stock overpricing in the US market. As a result, firms tend to take advantage by equity issuance, causing an increase in real investment. Chirinko and Schaller (2001) provide evidence that investment is more sensitive to mispricing in Japan - bubbles led to an increase in investment by 6-9% in 1987-1989 which amounts to 1-2% of GDP. Schaller (2012) examines the effect of investor sentiment on hurdle rates and finds that firms tend to overinvest (underinvest) when sentiment is high (low).

Chang, Tam, Tan and Wong (2007) find a significantly positive relationship between corporate investment and stock market mispricing in Australia. Overvalued firms tend to overinvest by issuing overpriced shares. In contrast, undervalued firms tend to underinvest since it is unlikely that they will finance investment by issuing (undervalued) shares due to the major disadvantage this implies. Chang et al. (2007) also provide evidence supporting Stein (1996) - they find the impact of mispricing on investment more significant for equity-dependent firms.

Polk and Sapienza (2009) examine the 'catering' channel through which mispricing can affect corporate investment. The intuition is that if the market misprices firms according to their level of investment, managers might try to maximize short run share prices by catering to investor sentiment. The model of Polk and Sapienza (2009) assumes that firms invest at the optimal level when they are correctly priced. Firms could undertake investment projects that have negative net present values (NPV) as they become overvalued because the benefits obtained from market's overvaluation of investment projects outweigh the loss from undertaking such value-destroying projects. Similarly, firms could pass up projects that have positive NPV when they are undervalued because the cost of investment (i.e. market's undervaluation of projects) is greater than the value of investment. They propose that the sensitivity of investment to mispricing should be higher for firms with short-term investors or higher R&D intensity, because a short-term horizon makes overvalued investments more attractive, and the resolution of valuation uncertainty, which would eliminate any mispricing, takes longer for R&D projects than for others. Using discretionary accruals and share turnover to proxy for mispricing and investor horizons respectively, they obtain results supporting their argument.

2.2.2 Financial Policy

Baker and Wurgler (2002) document evidence that financial policy is influenced by mispricing through market timing. They find a negative relationship between the market value and the leverage of firms since firms tend to rely more (less) on equity and less (more) on debt when they are overvalued (undervalued). Baker and Wurgler's (2002) position is consistent with previous studies in the literature; Marsh (1982) who provides evidence suggesting that overvaluation causes firms to issue equity; Loughran, Ritter and Rydqvist (1994) who find that the relationship between stock market mispricing and aggregate IPO volume is significant; and Jung, Kim and Stulz (1996), and Hovakimian, Opler and Titman (2001) who find that overvalued firms tend to have higher seasoned equity issuance.

Baker and Wurgler (2000) investigate if equity issuance predicts market returns in the period 1927-1999. They find that the average value-weighted market return tends to be lower when last year's equity shares was in its top historical quartile. Henderson, Jegadeesh and Weisbach (2004) document evidence that is consistent with Baker and Wurgler (2000). Specifically, in their international study, they find that, in 12 out of the 13 countries that they examine, average market returns tend to be higher when share price was below-median last year. In their anonymous survey of CFOs of public corporations, Graham and Harvey (2001) find that stock prices are considered as the second-most important factors among others in the equity issuance decision.

There is also evidence suggesting that mispricing has an impact on the amount of debt issued. In particular, Speiss and Affleck-Graves (1999) find that the shares of straight debt and convertible issuers tend to underperform in 1975-1989, suggesting that the issuers were overpriced at the time of debt issuance. Richardson and Sloan (2003) also find a negative relation between net debt issuance and subsequent stock returns. Graham and Harvey (2001) document evidence that stock price is considered as the most important factor in the debt issuance decision.

Dong et al. (2012) examine the effects of market timing and pecking order on security issuance by Canadian firms by testing the interactions between market timing and financial constraints. Consistent with the idea that financially constrained firms are less flexible to time the market, they find that unconstrained firms are more likely to issue (repurchase) equity when they are overvalued (undervalued). The results indicate that pecking order theory is more likely to predict financing decisions for undervalued firms since overvalued firms have strong incentive to time the market which distorts the pecking order prediction that firms prefer debt to equity. Overall, the results suggest that a firm's financing decision is jointly determined by its financial constraint status and stock misvaluation.

2.2.3 Other Corporate Policies

Using the difference between the average market-to-book ratio of dividend payers and nonpayers as a proxy for dividend premium to measure the relative prices of payers and nonpayers, Baker and Wurgler (2004a) find that firms cater to investor sentiment by initiating (omitting) dividends when payers are trading at a premium (discount) to nonpayers. They also examine the relation between the rate of initiation and payers' future stock returns, and find a negative relation suggesting that firms initiate dividends when investors put relatively high valuations on payers.

Fama and French (2001) find that the percentage of dividend payers decreases from 66.5% in 1978 to 20.8% in 1999, and only a part of this is caused by the changing characteristics of firms towards small, unprofitable and strong growth. This "disappearance" of dividends coincides with the changing dividend premium documented by Baker and Wurgler

(2004b) – the sign of dividend premium switched from positive to negative in 1978 and remained negative through 1999. So the catering theory seems to explain the "disappearance" of dividends.

Derrien, Kecskes and Thesmar (2013) examine the joint impact of mispricing and investor horizons on various policies. The authors argue that when firms are underpriced, short-term investors would prefer less investment than long term investors. If managers cater to short-term investors, they would invest less, and raise less equity to finance investment. Managers would also choose to pay out more to shareholders because future cash flows are worth less to short-term investors. They provide evidences showing that long-term investors attenuate the impact of stock mispricing on corporate policies. Specifically, they find that for underpriced firms, investment and equity financing are increasing, and payouts are decreasing in investor horizons. They interpret this as evidence that mispriced firms time the market and adjust their corporate policies to cater to the preferences of short-term investors.

Harford, Kecskes and Mansi (2012) examine the impact of investor horizons on corporate cash holdings policy. The authors argue that investors with longer horizons monitor more because the benefits of monitoring are greater than the costs. Thus, the agency costs of cash holdings are lower for firms with longer investor horizons. They find that firms with longer investor horizons tend to hold more cash. When they have excess cash, they invest less and payout more to shareholders. The authors also find that the profitable use of excess cash leads to higher stock prices.

2.3 Accessibility to External Capital Markets and Corporate Investment

In a perfect capital market, corporate investment decisions are determined by the profitability of projects but not the sources of financing (Modigliani and Miller, 1958). In other words, the availability of internal funds is irrelevant to corporate managers when making investment decisions. However, this theory cannot be applied to real-world capital markets, which possess many imperfections. In the presence of information asymmetry, external funds become more costly than internal funds, and the access to external capital markets is restricted. For example, Jensen and Meckling (1976), who focus on the informational asymmetry between shareholders and debtholders, suggest that a major consequence of informational asymmetry is the asset substitution problem - shareholders have the incentive to undertake risky projects. As a result, it is likely that debt providers will charge a higher rate of return to compensate for the monitoring costs and the potential moral hazard problems (as asset substitution will reduce the value of debt). Another consequence of information asymmetry is the underinvestment problem (Myers, 1977). Specifically, firms might pass up positive NPV investment because it is too costly or even impossible to obtain external funds (assuming risky debt).

Thakor (1990) suggests that with costly external financing, firms will prefer projects that pay off quickly to maintain internal funds. Firms with insufficient internal funds or a higher frequency of new investments are more likely to make investment decisions based on the payback period. Moreover, firms might seek to attain a buffer of excess liquidity even though they have positive NPV projects in which to invest. Myers and Majluf (1984) discuss the impact of the informational asymmetry between existing and prospective shareholders. They show that firms will tend to avoid issuing equity since it signals negative information (e.g., that shares are currently overvalued). As a consequence firms might underinvest.

Hadlock (1998) examines the impact of insider ownership on investment-cash flow sensitivity, and he finds the relationship non-monotonic. Specifically, he provides evidence that investment-cash flow sensitivity first increases with insider ownership and then decreases when the entrenchment effect arises, which he argues it is consistent with asymmetric information problems.[5] The idea is that when insider ownership increases (i.e.

[5] According to Myers and Majluf (1984), firms underinvest because external funds are too costly.

the interests of managers become more aligned with those of shareholders), managers should internalize more of the mispricing on external financing due to information asymmetry. Therefore, they will be more cautious about raising external funds which makes firms more reliant on internal funds for investment, leading to higher investment-cash flow sensitivities.[6] At higher levels of insider ownership, when the entrenchment property becomes dominant, the incentives of managers to maximize shareholders' return is reduced, resulting in lower investment-cash flow sensitivities.

Based on Jensen and Meckling (1976) and Myers and Majluf (1984), (moral hazard and adverse selection problems will create an internal/external cost of funds "wedge"), Fazzari et al. (1988) recognize that the internal and external fund cost differential, creates a relevance for the availability of internal funds to corporate investment decisions. Indeed, Fazzari et al. (1988) are the first to examine the relationship between corporate investment and the availability of internal cash flow – the *investment-cash flow sensitivity*. They suggest that investment of firms with limited access to external capital markets (i.e. financially constrained firms) would be more reliant on internal cash flow. Over the period 1970-1984, they classify 422 US firms with low (high) dividend payout as constrained (unconstrained). They provide evidence that financially constrained firms tend to have greater investment-cash flow sensitivity coefficients.

Using the sample of Fazzari et al. (1988) and their own (*KZ)* index, Kaplan and Zingales (1997) re-examine the relationship and find that the investment of financially unconstrained firms tends to be more reliant on internal funds than their constrained counterparts, which contradicts the findings of Fazzari et al. (1988).[7] Their explanation is that managerial risk

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[6] Another possible explanation is that the information asymmetry problem will become more severe as insider ownership increases, which will further increase the cost of external funds. Thus, managers will be more reluctant to raise external funds as their ownership increases.

[7] The *KZ* index is computed using some quantitative and qualitative information from annual reports. Kaplan and Zingales (1997) claims this index is more representative of a firm's financial constraint status. However,

aversion in financially constrained firms make managers more cautious with corporate investment decisions, thus, financially constrained firms tend to underinvest even when there are sufficient internal funds to finance the project. Cleary (1999, 2006) provide support to the Kaplan and Zingales (1997) argument, and they document higher investment-cash flow sensitivities for financially unconstrained firms. Cleary (1999, 2006) argue that this is due to the benefits of building up financial slack. Since constrained firms devote some of their internal funds to build up financial slack, they tend to have lower investment-cash flow sensitivities.

Hovakimian (2006), in a US sample, finds that negative investment-cash flow sensitivity firms tend to have the lowest level of cash flows and highest growth opportunities, suggesting financially constrained firms exhibit lower investment-cash flow sensitivities. Two theoretical models of Moyen (2004) are able to reconcile the contradictory results of Fazzari et al. (1988) and Kaplan and Zingales (1997), using his unconstrained and constrained models, respectively.[8]

While most theoretical and empirical research work investigates the impact of financial constraints on corporate investment policy, Alti (2003) focuses on other cross-sectional patterns on corporate investment policy. He provides evidence suggesting that investment of firms that are small and young (i.e. more prone to information asymmetry and thus, have relatively restricted access to external capital markets) is more sensitive to the availability of internal funds. In addition, investment of firms with high growth opportunities and low dividend payouts tend to be more sensitive to internal cash flow.

Whited and Wu (2006) claim that there are several defects in the *KZ* index and it fails to capture the financial status of firms. Therefore, they construct a new index, namely the *WW* index.

[8] Recently, Cleary, Povel and Raith (2007), provide evidence suggesting that the relationship between investment and internal funds is U-shaped, which is consistent with the evidence of previous studies that the relationship is positive. Cleary et al. (2007) suggest that firms with extremely low levels of internal funds are induced to engage higher levels of investment since it will result in higher levels of revenue. In other words, investment is negatively related to internal funds for firms with low levels of internal funds.

Although the results are mixed, the common theme across all these studies is that managers can make use of the availability of internal funds in response to the internal versus external cost of funding differential for corporate investment.

2.4 Life Cycle Theory of Corporate Policies

Fama and French (2001) find that life cycle factors do influence the corporate payout decision. Specifically, they find that dividend paying firms are significantly larger, more profitable and face relatively fewer investment opportunities than firms that do not make a payout. In other words, dividend paying firms have the characteristics of mature firms and firms that do not pay dividends have the characteristics of young firms that face relatively abundant investment opportunities.

DeAngelo et al. (2006) explicitly examine the life cycle theory of dividends using a previously unconsidered factor – the earned/contributed capital mix. They measure the mix using the ratio of earned capital to total equity or total assets. They argue that such ratios are good proxies for a firm's life cycle stage because they measure a firm's reliance on internal and external financing. Young firms tend to be more reliant on external capital since they have abundant investment opportunities and low earning capacity and thus, have lower ratios. On the other hand, mature firms tend to be in self-financing stage since they are more profitable and have low potential to expand, thus, the ratios would be higher for them. DeAngelo et al. (2006) find a positive relation between the propensity to pay dividends and their life cycle proxies, providing support for their theory.

Grullon, Michaely and Swaminathan (2002) examine the signalling effect of dividend payout policy. They suggest that how financial markets react to the changes in firms' dividend payout is not a reflection of cash signalling but an indication of firms' maturity instead. Specifically, the increase (decrease) of firm's share price followed by the increase (decrease) of its dividend policy is driven by a significant decline (increase) in the systematic risk of firms but not by an increase (decrease) in firms' profitability. Kale, Kini and Payne (2012) also provide evidence showing support for the life cycle theory of dividend payout. They find that firms with a higher ratio of retained earnings to total assets are more likely to initiate dividend payments.

Denis and Osobov (2008) re-examine the life cycle theory of dividends in an international study which includes US, Canada, UK, Germany, France and Japan. They find that the propensity to pay dividends is affected by firm size, profitability, growth opportunities and the earned/contributed capital mix. Consistent with Fama and French (2001), they document that firms that are larger, more profitable and with a greater proportion of earned capital are more likely to be dividend payers. However, they find that the impact of growth opportunities on dividends is mixed.

von Eije and Megginson (2008) find no direct support for the life cycle theory. In their European study, there is no significant relation between the probability of paying dividends and the ratio of retained earnings to total equity. However, they do find that the propensity to pay dividends is positively related to some life cycle factors – firm size, age and past profitability.

In Australia, Coulton and Ruddock (2010) find that regular dividends remain the most popular mechanism for distributing earnings to shareholders. Consistent with DeAngelo et al. (2006), they also find a highly significant relation between payout policy and the earned/contributed capital mix.

DeAngelo et al. (2010) examine the influence of firm maturity on its propensity to conduct seasoned equity offerings. They document that firm's life cycle exerts significant influences on firm's propensity to conduct seasoned equity offerings and that the life cycle effect is stronger than that of the market timing effect. Specifically, mature firms are less likely to conduct seasoned equity offerings even when they are overvalued. Overall, the empirical evidence suggest that a firm's life cycle stage does influence corporate policy decision making.

Owen and Yawson (2010) examine the impact of life cycle on mergers and acquisitions (M&A) from the acquirer's perspective. In particular, they find that mature firms are more likely to participate in M&A activity. This is consistent with the hypothesis that young firms are unlikely to have sufficient resources in attempting acquisition and that old firms are slow in responding to changing conditions and thus, are less active in M&A activity.

2.5 Conclusion

Based on the literature review presented in this chapter, it is evident that financial markets are (in varying degrees) inefficient and that mispricing does exist. While the indirect impact of mispricing on corporate investment through the equity issuance channel is well-documented, the evidence of the catering channel is relatively limited. Although Polk and Sapienza (2009) demonstrate that managers cater to investor sentiment by adjusting investment policy, the influence of catering investment on other policies remains an unexplored area.

Market inefficiency has also caused a wedge between the costs of internal and external funds which makes the availability of internal funds relevant for investment decisions. Various pieces of research have been done in this area, and the general conclusion of the investment-cash flow sensitivity literature is that managers can make use of the availability of internal funds in response to the internal versus external cost of funding differential for corporate investment. While previous studies have examined the impact of mispricing on investment-cash flow sensitivity, they have not considered the influence of accessibility to external capital on the substitution between internal and external sources of financing for investment.

The life cycle literature has shown that corporate policies vary over different stages of the life cycle and the influence of life cycle can be more significant than other factors documented in the existing literature. Accumulated evidence also indicates that financial markets may react to the changes in firms' corporate policies and such reaction can be different in various stages of firms' life cycles. However, the majority of studies in the life cycle literature have focused on dividend policy. Given the significant influence of life cycle stages on firm characteristics, it is surprising that no research work has linked the life cycle theory to other corporate policies (e.g., investment and cash holdings).

Chapter 3

Testing the Impact of Catering Theory on Corporate Policies

3.1 Introduction

The impact of mispricing on corporate investment is well documented in the literature. Previous studies provide two explanations for this impact: (1) equity issuance hypothesis (Stein, 1996; and Baker et al., 2003); (2) catering hypothesis (Polk and Sapienza, 2009). Stein (1996) shows that the impact of mispricing on the investment decision is more significant in equity-dependent firms. These firms finance their investment through equity issuance when they are overvalued. Baker et al. (2003) find that mispricing does have an indirect impact on corporate investment through an equity issuance channel. For example, when firms are overvalued, managers can time the market by issuing overvalued equity and invest.

Polk and Sapienza (2009) document evidence of a catering channel, through which equity mispricing affects corporate investment decisions directly, contrasting the indirect influence documented in Baker et al. (2003). The catering theory suggests managers can boost up short term share price by catering to investor sentiment if firms are mispriced according to their level of investment. Specifically, overvalued firms could undertake investment projects that have negative net present values (NPV) because the benefits obtained from market's overvaluation of investment projects outweigh the loss from undertaking such value-destroying projects. Similarly, undervalued firms could forgo investment projects that have positive NPV because the cost of investment (i.e. market's undervaluation of projects) is greater than the value of investment.

This chapter extends Polk and Sapienza (2009) by investigating how mispricing influences various corporate policies through the catering channel. I first re-examine whether managers cater to investor sentiment by altering corporate investment policy and whether investor horizons influence managers' incentive to cater, as in Polk and Sapienza (2009). I then investigate the sources of financing used for catering investment. To the best of my knowledge, this is the first research work to address this latter question of the source of financing linking to catering behavior.

When a firm is overvalued, managers can cater to investor sentiment by wasting resources in negative NPV projects to boost short term share price (Polk and Sapienza, 2009). Such catering activity represents an increase in the uses of funds which have to be matched by a corresponding increase in the sources of funds so as to balance the cash flow accounting identity. A natural source of funds for catering is cash reserves. Another possible source is debt financing.[9] Due to signalling effect, it is implausible for managers to finance investment by equity since issuing equity would reduce share price which counters the purpose of catering.[10]

The empirical analysis is based on an extensive sample of 2,710 US firms over the period 1971-2008. Following Polk and Sapienza (2009), I use share turnover to partition firms into “short investor horizon” (high turnover) and “long investor horizon” (low turnover) groups. To distinguish between the catering channel and the equity issuance channel, I exclude firm observations with positive equity issuance.[11] Consistent with Baker et al. (2003), future return is employed to proxy for stock market mispricing. Following Chang, Dasgupta, Wong and Yao (2013), cash-flow statement data are employed when defining the uses and sources of cash flow so that cash flow identity holds for each observation.[12]

[9] First, equity overvaluation would increase debt capacity (Baker et al., 2003). Second, equity overvaluation would reduce credit risk and thus, the cost of debt (Baker, Ruback and Wurgler, 2007).

[10] Myers and Majluf (1984) show that firms tend to avoid issuing equity since it signals negative information (e.g., that shares are currently overvalued) to the market.

[11] This empirical setting follows that of Polk and Sapienza (2009).

[12] Chang et al. (2013) suggest that the consequence of defining various uses and sources of cash flow based on data from different sources (e.g., balance sheet, income statement and cash flow statement) is the violation of cash flow identity which leads to biased results.

In the first part of the analysis, the impact of mispricing on various corporate policies is examined. I do so by estimating static standalone equations of various corporate policies (investment, change in cash holdings, dividends and external financing). Consistent with Polk and Sapienza (2009), I find a positive relation between the mispricing proxy and corporate investment. This supports the view that managers cater to investor sentiment by adjusting their investment policy. The results also indicate that mispricing has positive impact on debt issuance which suggests that managers rely on debt financing for catering. The mispricing proxy, however, has insignificant impact on both cash holdings and dividend policies. In other words, there is no evidence to suggest that funds for catering come from cash reserves and dividend reduction. This is consistent with the previously documented evidence of dividend-smoothing and that dividends are sticky (see e.g., Guttman, Kadan and Kandel, 2010; Leary and Michaely, 2011; and Chen, Da and Priestley, 2012).

In the second part of the analysis, I estimate static standalone equations of various corporate policies across "short investor horizon" and "long investor horizon" groups. I find that mispricing has a stronger (positive) impact on investment of "short investor horizon" group. This is consistent with Polk and Sapienza (2009) that firms with shorter horizons cater more. The results also indicate that managers in firms with shorter investor horizons issue more debt and utilize more cash from cash reserves to finance catering. The impact of mispricing on dividends is statistically insignificant across the two groups. These latter findings are new to the literature.

The empirical results are robust to various plausible specifications. First, I re-estimate the models using an alternative mispricing proxy; a mispricing estimate generated by decomposition of Market-to-book assets ratio (Rhodes-Kropf, Robinson, and Viswanathan, 2005) (RKRV hereafter). Second, instead of estimating the models separately for "short investor horizon" and "long investor horizon" groups, I modify the empirical models to include a dummy variable of short investor horizon and an interaction term of mispricing with the short horizon dummy variable.

Previous studies in the literature mainly examine the impact of mispricing on a given corporate policy in isolation, ignoring the more interesting question of how the full set of policies are affected (see e.g., Baker et al. (2003) for investment policy; Baker and Wurgler (2002) for financial policy; Baker and Wurgler (2004a) for dividend policy). One exception is Derrien et al. (2013) who examine the joint impact of mispricing and investor horizons on investment, payout and financing policies. They provide evidence that mispriced firms time the market and adjust their corporate policies to cater to the preferences of short-term investors. However, I examine a catering theory that is isolated from market timing (i.e. equity issuance channel). Because the purpose of catering is to boost short-term share price for short-term investors, it is impractical for managers to simultaneously engage in market timing (e.g., issuing overvalued equity during overvaluation periods) since it would reduce the firm's share price which counters the purpose of catering.

The remainder of this chapter is organized as follows. Section 3.2 outlines the details of the data and sampling, variables proxies, proposed hypotheses and the empirical model. Section 3.3 presents the results. Section 3.4 documents a battery of robustness checks, and Section 3.5 concludes the chapter.

3.2 Empirical Framework

3.2.1 Data

The data are obtained from *Compustat* and *CRSP* over the period 1971 to 2008.[13] Consistent with the previous literature (e.g., Huang and Ritter, 2009), financial institutions and utilities are excluded from the sample.[14] Following Polk and Sapienza (2009), to distinguish between

[13] The sample begins in 1971 since cash flow statement data are not readily available before 1971.

[14] Financial institutions are excluded because they have relatively low physical capital investment. Utilities are excluded because they are under heavy regulation.

the catering channel and the equity issuance channel, I exclude firms with positive equity issuance from my sample.[15] Some additional data exclusions are warranted: firms with market capitalization of equity less than USD 10 million, with sales growth greater than 100%, and with annual sales less than USD 1 million are excluded.[16, 17] Following Polk and Sapienza (2009), only firm-years with December fiscal year-end are included so as to avoid overlapping observations. To control for the effect of outliers, all variables are winsorized at the 1st and 99th percentile.[18] The final sample consists of 2,710 firms producing almost 10,000 firm-year observations.

The variables in the following cash flow identity are defined using cash flow statement data:

$$CashFlow_{i,t} = \Delta CH_{i,t} + PAYOUT_{i,t} + INV_{i,t} - \Delta D_{i,t} - \Delta E_{i,t} \tag{3.1}$$

where change in cash holdings (ΔCH)*,* $PAYOUT$ and investment (*INV*) represent uses of funds while debt issuance (ΔD), equity issuance (ΔE) and *CashFlow* represent sources of funds.[19]

It is crucial to consider the format code (*scf*) when using cash flow statement data since different codes represent different variable definitions. The accounting standard SFAS #95, implemented in 1988, requires US firms to report the Cash Flow Statement (*scf*=7). Prior to 1988, firms might have reported Working Capital Statement (*scf*=1), Cash Statement by Source and Use of Funds (*scf*=2) or Cash Statement by Activity (*scf*=3). Table 3.1 presents the variable definitions and Table 3.2 reports the summary statistics.

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[15] I exclude firms with positive equity issuance in my sample to avoid the possibility that mispricing affects investment through the equity issuance channel.

[16] Small firms are excluded from the sample due to their limited access to public markets. Firms with abnormally high growth are also dropped because these firms tend to be involved in major corporate events.

[17] To minimize the sampling of financially distressed firms, firms with sales less than USD 1 million are dropped. This selection criterion is necessary because it is highly unlikely that financially distressed firms have sufficient resources to be involved in catering.

[18] This approach is also applied in the following two chapters (Chapters 4 and 5). The advantage is that it mitigates the impact of extreme values by assigning the cut-off value to values beyond the cut-off percentile.

[19] Following Gachev, Pulvino and Tarhan (2010), *CashFlow* is assumed to be exogenous.

Table 3.1:Variable Definitions

The accounting standard SFAS #95, implemented in 1988, requires US firms to report the Cash Flow Statement (*scf*=7). Prior to 1988, firms might have reported Working Capital Statement (*scf*=1), Cash Statement by Source and Use of Funds (*scf*=2) or Cash Statement by Activity (*scf*=3). Therefore, variable definitions in Panel A depend on the statement reported by firms. All variables in Panel A are deflated by lagged book value of total assets.

Variable		Definition
Panel A: Core variables		
INV	*scf=1*	capital expenditure + increase in investment + acquisition + other uses of funds - sale of PPE - sale of investment
	scf=2	same as *scf* = 1
	scf=3	same as *scf* = 1
	scf=7	capital expenditure + increase in investment + acquisition- sale of PPE - sale of investment - change in short-term investment - other investing activities
ΔCH	*scf=1*	cash and cash equivalents increase/decrease
	scf=2	same as *scf* = 1
	scf=3	same as *scf* = 1
	scf=7	same as *scf* = 1
PAYOUT	*scf=1*	cash dividends
	scf=2	same as *scf* = 1
	scf=3	same as *scf* = 1
	scf=7	same as *scf* = 1
ΔD	*scf=1*	long-term debt issuance - long-term debt reduction - changes in current debt
	scf=2	long-term debt issuance - long-term debt reduction + changes in current debt
	scf=3	same as *scf* = 2
	scf=7	same as *scf* = 2
ΔE	*scf=1*	sale of common and preferred stock - purchase of common and preferred stock
	scf=2	same as *scf* = 1
	scf=3	same as *scf* = 1
	scf=7	same as *scf* = 1

ΔWorkingCapital	*scf=1*	change in working capital
	scf=2	- change in working capital
	scf=3	same as *scf* = 2
	scf=7	- change in account receivable - change in inventory - change in account payable - accrued income taxes - other changes in assets and liabilities - other financing activities
CashFlow	*scf=1*	income before extra items + extra items & discontinued operation + depreciation & amortization + deferred taxes + equity in net loss + gains in sale of PPE & investment + other funds from operation + other sources of funds - Δ*WC*
	scf=2	same as *scf* = 1
	scf=3	same as *scf* = 1
	scf=7	income before extra items + extra items & discontinued operation + depreciation & amortization + deferred taxes + equity in net loss + gains in sale of PPE & investment + other funds from operation + exchange rate effect - Δ*WC*
Panel B: Proxies for *Investor Horizon*		
ShareTurnover		[Shares traded / Shares outstanding]
Panel C: Proxies for stock mispricing (*MP*)		
MP_{FR}		Future Return = [(Return$_{i,t+3}$/Return$_{i,t}$) – 1] x (-1)
Panel D: Control variables		
Q		Market to Book = [Market value of equity – Book value of equity + Book value of assets] / Book value of total assets
SalesGrowth		[Sales$_t$/Sales$_{t-1}$] - 1
Size		ln [Book value of assets]
Leverage		[Short-term debt + Long-term debt] / Book value of total assets
Tangibility		[Net PPE/Book value of total assets]
Panel E: Additional variables for robustness checking analysis		
MP_{RKRV}		(*ME-FVE*) / *BA* where: *FVE*= exp {fitted value of ln (ME) = f (BE, |NI|, D_{negNI}, Leverage)}

Table 3.2: Summary Statistics

Variable	*Obs.*	*Mean*	*Median*	*Std. Dev.*	*Min*	*Max*
Panel A: Core variables						
INV	9,873	0.085	0.059	0.150	-0.367	2.377
ΔCH	9,873	-0.002	0.000	0.083	-0.470	2.019
PAYOUT	9,873	0.015	0.003	0.026	0.000	0.170
ΔD	9,873	0.018	0.000	0.127	-0.468	1.572
ΔE	9,873	-0.006	0.000	0.020	-0.143	0
CashFlow	9,873	0.085	0.084	0.123	-2.182	0.711
Panel B: Proxies for *Investor Horizon*						
ShareTurnover	9,873	0.282	0.164	0.408	0.005	4.008
Panel C: Proxies for *MP* (stock mispricing)						
MP_{FR}	9,873	-0.614	-0.111	1.929	-12.009	0.967
Panel D: Control variables						
Q	9,873	1.319	1.051	0.956	0.497	18.772
SalesGrowth	9,870	0.061	0.054	0.228	-0.904	0.999
Size	9,873	5.402	5.202	2.209	-0.742	10.735
Leverage	9,830	0.271	0.259	0.196	0.000	0.878
Tangibility	9,867	0.385	0.346	0.239	0.000	0.938
Panel E: Additional variables for robustness checking analysis						
MP_{RKRV}	12,938	-0.030	-0.101	0.813	-1.970	9.211
VA_{RKRV}	12,938	1.369	1.253	0.489	0.648	4.705

Table 3.2 reports the variables' means, medians, standard deviations, and minimum and maximum values for the entire sample. A typical firm increases capital expenditure by 5.9% to 8.5% per year, generates cash flows that amount to approximately 8.5% of total assets, distributes dividends that range from 0.3% to 1.5% of total assets and holds a relatively constant amount of cash reserves. The summary statistics indicate that the cash flow identity (Equation 3.1) holds in my sample - the mean value of *CashFlow* is 0.085 and the sum of the mean values of the right hand side variables is 0.086. The difference of 0.001 is possibly caused by rounding error.

3.2.2 Proxies for Stock Market Mispricing and Investor Horizon

3.2.2.1 Stock Market Mispricing

Following Baker et al. (2003), future return is employed to measure mispricing. Future return is a good proxy for stock mispricing since overpriced (underpriced) stock is expected to experience a fall (rise) in price leading to lower (higher) future returns. Consistent with Baker et al. (2003), future stock return is computed as follows:

$$FutureReturn_{i,t} = \frac{P_{i,t+3}}{P_{i,t}} - 1 \tag{3.2}$$

where $P_{i,t}$ and $P_{i,t+3}$ represent the stock price at t and $t+3$, respectively. Firms with higher (lower) future returns are underpriced (overpriced). To ease interpretation, I multiply future return by -1, such that a higher (lower) value of this mispricing variable reflects overpriced (underpriced) firms.

3.2.2.2 Investor Horizon

Following Polk and Sapienza (2009), firm share turnover is used to measure investor horizon. Share turnover is measured as the average of the daily ratio of shares traded to shares outstanding at the end of each day, in $December_{t-1}$. Firms with above-median turnover are classified as "short horizon" (*SH*) while firms with below-median turnover classified as "long horizon" (*LH*). In an alternative classification scheme (tercile-sort), firms are partitioned into three groups based on turnover, the group with the highest (lowest) turnover is classified as short (long) horizon group, observations in the middle tercile are discarded. The advantage of this tercile-sort partition method is that it provides a clearer separation of short versus long horizon investors across firms.

3.2.3 Control Variables

Following the existing literature, I incorporate a range of control variables in the regressions. *SalesGrowth* is included to control for firms' growth prospects. *Size*, the natural log of book value of total assets, is included to control for the differences in capital investment policies due to firm size and maturity. *Leverage*, the total debt to total assets ratio, is included because it is negatively related to investment (Lang, Ofek and Stulz, 1996). *Tangibility*, net *PPE* scaled by total assets, is included because firms with greater assets tangibility can sustain more external financing (Almeida and Campello, 2007). *Firm* dummies are included to control for cross-sectional variation due to unobserved individual heterogeneity. *Year* dummies are added to control for time-series variation due to cyclical influences and unspecified time effects.

3.2.4 Empirical Models and Hypotheses

The baseline impact of mispricing on various corporate policies is examined by estimating the following static standalone equations:[20]

$$[CP]_y = \alpha_0 + \alpha_{MP}^{y} MP_{i,t} + \alpha_1 Q_{i,t-1} + \alpha_2 CashFlow_{i,t} + \sum_x \alpha_x X_x + \sum_i firm_i + \sum_t year_t + \varepsilon \quad (3.3)$$

$$\text{where}[CP]_y \in [INV, \Delta CH, PAYOUT, \Delta D] \quad (3.4)$$

[20] Chang et al. (2013) show that, as long as the cash flow identity holds, the estimated outcome of standalone equations is almost identical to simultaneously equations when the model is static and includes no lagged dependent variables as explanatory variables. They also show that it is unnecessary to employ dynamic models to mitigate the omitted lagged dependent variables biases, since the bias is negligible.

where *MP* is the proxy of mispricing which is higher (lower) for overpriced (underpriced) firms; *Q* is the proxy for investment opportunities, defined as the ratio of market value of assets to book value of total assets; *firm* represents firm-specific dummies; *year* represents year dummies; *X* are the control variables, namely, *SalesGrowth*, *Size*, *Leverage*, and *Tangibility*.

If firms are mispriced according to their level of investment, managers might be tempted to boost short term firm value by increasing (decreasing) investment when they are overpriced (underpriced). In other words, the core prediction is $\alpha_{MP}^{INV} > 0$. Catering investment represent an increase in uses of funds which has to be matched by a corresponding increase in the sources of funds, so as to satisfy the cash flow identity (equation (3.1)). Therefore, if firms do cater to investor sentiment by adjusting their investment policy, there must be some adjustment in cash holdings, and/or payout and/or financial policies. However, given the general practice of dividend smoothing, it is unlikely that managers would reduce dividends for catering. Debt financing seems to be a natural choice to provide funds for catering since equity overvaluation would increase debt capacity (Baker et al., 2003). Higher market value would also reduce default and credit risk, and thus, reduce the cost of debt. Alternatively, firms with ample cash reserves might use their own funds instead of accessing external capital markets. This gives rise to the first hypothesis:

Hypothesis I: $\alpha_{MP}^{INV} > 0$, $\alpha_{MP}^{\Delta CH} < 0$ and $\alpha_{MP}^{\Delta D} > 0$

Having established the baseline hypothesis, a "conditional" version of catering theory based on different investor horizons is the core focus (i.e. Long Horizon (*LH*) vs Short Horizon (*SH*)). Firms with shorter investor horizons should cater more since short-term investors are more prone to sentiment effects and will mostly care about short term share price. In other words, investment, cash holdings and debt financing of firms with shorter investor horizons are expected to be more sensitive to mispricing. This gives rise to the second hypothesis:

Hypothesis II: $\alpha^{INV}_{MP:SH} - \alpha^{INV}_{MP:LH} > 0$, $\alpha^{\Delta CH}_{MP:SH} - \alpha^{\Delta CH}_{MP:LH} < 0$ and $\alpha^{\Delta D}_{MP:SH} - \alpha^{\Delta D}_{MP:LH} > 0$

3.3 Empirical Results

Table 3.3 reports the results for tests of Hypothesis I (H_I: $\alpha^{INV}_{MP} > 0$, $\alpha^{\Delta CH}_{MP} < 0$ and $\alpha^{\Delta D}_{MP} > 0$) for the entire sample. As outlined earlier, future return (*FR*) is employed to proxy for mispricing and firms with positive equity issuance are excluded from the sample so that I maximize the power of my tests of the catering (versus the equity issuance) channel. The coefficient estimate for mispricing for the investment equation (α^{INV}_{MP}) is positive and

Table 3.3: The Impact of Mispricing on Corporate Policies – Future Return Proxy for Mispricing

This table reports the outcome of estimating Equation (3.3) for the entire sample, where Future Return is used to measure the level of stock mispricing. The data are obtained from COMPUSTAT and CRSP for the period 1971- 2008. The sample consists of 2,710 US firms. To distinguish between the catering channel and the equity issuance channel, firm observations with positive equity issuance are excluded. Firms excluded from the final sample: those with less than USD 10 million market capitalization, those with sales growth greater than 100% and those with annual sales less than USD 1 million. All regression equations are estimated with fixed *firm* and *year* effects. The estimation corrects for heteroskedasticity and clustering using the White-Huber estimator. Coefficients significant at the 10%, 5% and 1% levels are indicated by *, ** and ***, respectively, and associated t-statistics are presented in parentheses.

	Corporate Policy Regressions			
	(1) *INV*	(2) ΔCH	(3) *PAYOUT*	(4) ΔD
	H1: $a_{MP} > 0$	*H1*: $a_{MP} < 0$	*H1*: $a_{MP} = 0$	*H1*: $a_{MP} > 0$
MP	0.002*	0.000	0.000	0.002**
	(1.91)	(0.05)	(1.16)	(1.99)
Q	0.015***	-0.004	0.003***	0.013***
	(4.54)	(1.64)	(6.46)	(5.04)
CF	0.369***	0.317***	0.020***	-0.276***
	(13.02)	(15.48)	(7.62)	(11.08)
SaleGrowth	0.004	-0.005	0.000	0.003
	(0.83)	(1.52)	(0.16)	(0.84)
Size	-0.023***	-0.006*	0.001	-0.020***
	(4.68)	(1.88)	(0.87)	(4.29)
Leverage	-0.269***	0.003	-0.026***	-0.315***
	(11.89)	(0.31)	(11.31)	(15.40)
Tangibility	-0.079**	0.119***	-0.004	0.028
	(2.10)	(7.10)	(1.23)	(0.96)
Observations	9,873	9,873	9,873	9,873
R-squared	0.57	0.51	0.80	0.51

significant (at 10% level). This finding is consistent with Polk and Sapienza (2009) suggesting that mispricing does have a direct impact on investment, one that is not related to equity issuance. Further, the estimated coefficient for mispricing in the debt issuance equation ($\alpha_{MP}^{\Delta D}$) is also positive and significant. Consistent with previous evidence of dividend smoothing, mispricing has an insignificant impact on corporate payout policy. The estimated coefficient for mispricing in the cash holdings equation ($\alpha_{MP}^{\Delta CH}$) is also insignificant. Overall, the results in Table 3.3 provide a degree of support for Hypothesis I: overvalued firms do cater to investor sentiment by increasing investment, and that debt financing is the main source of funds for catering. However, these results are inconsistent with the prediction that overvalued firms cater to investor sentiment by reducing cash reserves.

Panel A of Table 3.4 reports the regression results for estimating equation (3.3) for long horizon (*LH*) versus short horizon (*SH*) groups, partitioned using the median-sort method. Consistent with Hypothesis II, the results indicate that firms typified by short horizon investors do cater more – the estimated coefficients for mispricing in the investment equation for the *SH* group ($\alpha_{MP:SH}^{INV}$: 0.004, significant at 1%) is higher than that for *LH* group ($\alpha_{MP:LH}^{INV}$: -0.001, insignificant at conventional levels). Moreover, the t-test in Panel B indicates that the difference between $\alpha_{MP:SH}^{INV}$ and $\alpha_{MP:LH}^{INV}$ is statistically significant.

For cash holdings, the estimated coefficient for mispricing of the *SH* group ($\alpha_{MP:SH}^{\Delta CH}$: -0.001, significant at 5% level) is significantly lower than that of the *LH* group ($\alpha_{MP:LH}^{\Delta CH}$: 0.001, insignificant at conventional levels). For debt issuance, the coefficient estimate on mispricing for the *SH* group ($\alpha_{MP:SH}^{\Delta D}$: 0.004, significant at 1% level) is also significantly higher than that for the *LH* group ($\alpha_{MP:LH}^{\Delta D}$: 0.000, insignificant at conventional levels). The impact of mispricing on payout is statistically insignificant across *SH* and *LH* groups. These findings suggest that managers of *SH* firms rely on cash reserves and debt financing for catering investment. Regarding the economic magnitude of this effect, a one-standard deviation change in the mispricing proxy have a stronger impact on debt issuance (0.82% of total assets) than cash holdings (0.25% of total assets).

Table 3.5 reports the regression results for estimating equation (3.3) for long horizon and short horizon groups, partitioned using the tercile-sort method. These results are consistent with those in Table 3.4 – firms with short horizon investors do cater more. The coefficient estimate on mispricing for investment of the *SH* group ($\alpha^{INV}_{MP:SH}$, 0.004) is greater than that of the *LH* group ($\alpha^{INV}_{MP:LH}$, -0.003) and the t-test indicates that the difference is statistically significant. Firms with shorter horizon investors finance extra catering investment by issuing more debt securities and availing more cash from cash reserves, as compared to their LH counterparts ($\alpha^{\Delta CH}_{MP:SH} < \alpha^{\Delta CH}_{MP:LH}$ and $\alpha^{\Delta D}_{MP:SH} > \alpha^{\Delta D}_{MP:LH}$, both differences are statistically significant).

Overall, the results in Tables 3.3, 3.4 and 3.5 confirm the findings in Polk and Sapienza (2009) that firms do cater to investor sentiment, and that firms with shorter horizon investors cater more. The results also indicate that while firms rely on both cash reserves and debt financing for catering investment, debt financing is of primary importance.

Table 3.4: Mispricing, Investor Horizon and Corporate Policies – Future Return Proxy for Mispricing (Median-Sort)

This table reports the outcome of estimating Equation (3.3), separately for firms typified by short horizon (*SH*) and long horizon (*LH*) investors. Future Return is used to measure the level of stock mispricing. The data are obtained from COMPUSTAT and CRSP for the period 1971- 2008. The sample consists of 2,710 US firms. To distinguish between the catering channel and the equity issuance channel, firm observations with positive equity issuance are excluded. Firms excluded from the final sample: those with less than USD 10 million market capitalization, those with sales growth greater than 100% and those with annual sales less than USD 1 million. All regression equations are estimated with fixed *firm* and *year* effects. The estimation corrects for heteroskedasticity and clustering using the White-Huber estimator. Coefficients significant at the 10%, 5% and 1% levels are indicated by *, ** and ***, respectively, and associated t-statistics are presented in parentheses.

	Corporate Policy Regressions							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	INV		ΔCH		*PAYOUT*		ΔD	
	HII: $a_{MP:SH} - a_{MP:LH} > 0$		*HII:* $a_{MP:SH} - a_{MP:LH} < 0$		*HII:* $a_{MP:SH} - a_{MP:LH} = 0$		*HII:* $a_{MP:SH} - a_{MP:LH} > 0$	
	LH	*SH*	*LH*	*SH*	*LH*	*SH*	*LH*	*SH*
	Panel A: Regression Results							
MP	-0.001	0.004***	0.001	-0.001**	0.001***	0.001***	0.000	0.004***
	(1.14)	(4.21)	(1.33)	(2.14)	(2.62)	(5.28)	(0.45)	(4.13)
Q	0.011***	0.016***	-0.000	-0.007***	0.007***	0.004***	0.012***	0.013***
	(5.14)	(7.35)	(0.05)	(5.70)	(17.87)	(12.72)	(6.32)	(6.52)
CF	0.366***	0.419***	0.236***	0.270***	0.050***	0.038***	-0.214***	-0.229***
	(22.40)	(23.50)	(24.28)	(28.56)	(16.23)	(14.53)	(14.78)	(14.11)
SaleGrowth	0.022***	0.017***	-0.000	-0.009***	-0.002**	-0.002***	0.021***	0.007**
	(5.52)	(4.32)	(0.15)	(4.28)	(2.02)	(3.06)	(5.92)	(2.02)
Size	-0.003**	-0.003***	-0.001**	0.000	0.003***	0.002***	-0.000	0.000
	(2.57)	(3.43)	(2.27)	(0.55)	(13.99)	(12.81)	(0.29)	(0.48)
Leverage	-0.047***	-0.054***	0.032***	0.020***	-0.034***	-0.020***	-0.061***	-0.069***
	(4.52)	(4.88)	(5.12)	(3.39)	(17.45)	(12.05)	(6.65)	(6.82)
Tangibility	0.074***	0.067***	-0.021***	-0.011**	0.013***	0.011***	0.051***	0.061***
	(8.70)	(7.14)	(4.20)	(2.28)	(8.11)	(7.96)	(6.79)	(7.14)
	Panel B: t-test Results: $\alpha_{MP:SH} - \alpha_{MP:LH} = 0$							
$\alpha_{MP:SH} - \alpha_{MP:LH}$	0.005***		-0.002**		0.000		0.003**	
t-stat	6.87		5.29		1.33		4.35	
P-value	0.0088		0.0214		0.2481		0.0369	
Observations	4,937	4,936	4,937	4,936	4,937	4,936	4,937	4,936
R-squared	0.17	0.18	0.12	0.17	0.26	0.20	0.08	0.07

Table 3.5: Mispricing, Investor Horizon and Corporate Policies – Future Return Proxy for Mispricing (Tercile-Sort)

This table reports the outcome of estimating Equation (3.3), separately for firms typified by short horizon (*SH*) and long horizon (*LH*) investors. Future Return is used to measure the level of stock mispricing. The data are obtained from COMPUSTAT and CRSP for the period 1971- 2008. The sample consists of 2,710 US firms. To distinguish between the catering channel and the equity issuance channel, firm observations with positive equity issuance are excluded. Firms excluded from the final sample: those with less than USD 10 million market capitalization, those with sales growth greater than 100% and those with annual sales less than USD 1 million. All regression equations are estimated with fixed *firm* and *year* effects. The estimation corrects for heteroskedasticity and clustering using the White-Huber estimator. Coefficients significant at the 10%, 5% and 1% levels are indicated by *, ** and ***, respectively, and associated t-statistics are presented in parentheses.

	Corporate Policy Regressions							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	INV		ΔCH		*PAYOUT*		ΔD	
	HII: $a_{MP:SH} - a_{MP:LH} > 0$		*HII*: $a_{MP:SH} - a_{MP:LH} < 0$		*HII*: $a_{MP:SH} - a_{MP:LH} = 0$		*HII*: $a_{MP:SH} - a_{MP:LH} > 0$	
	LH	*SH*	*LH*	*SH*	*LH*	*SH*	*LH*	*SH*
	Panel A: Regression Results							
MP	-0.003**	0.004***	0.002***	-0.001*	0.001**	0.001***	0.000	0.004***
	(2.17)	(3.31)	(2.75)	(1.69)	(2.51)	(4.06)	(0.28)	(3.13)
Q	0.006**	0.019***	-0.001	-0.007***	0.007***	0.004***	0.008***	0.015***
	(2.57)	(6.59)	(0.56)	(4.82)	(13.71)	(9.42)	(3.50)	(5.70)
CF	0.399***	0.405***	0.275***	0.248***	0.061***	0.037***	-0.175***	-0.236***
	(20.46)	(18.64)	(21.96)	(22.00)	(15.27)	(11.97)	(10.07)	(11.78)
SaleGrowth	0.027***	0.018***	-0.007**	-0.011***	-0.002*	-0.001	0.022***	0.008*
	(5.65)	(3.54)	(2.35)	(4.23)	(1.69)	(1.14)	(5.25)	(1.68)
Size	-0.003**	-0.004***	-0.002**	0.001*	0.003***	0.002***	-0.001	0.000
	(2.08)	(3.31)	(2.55)	(1.82)	(10.18)	(8.72)	(0.77)	(0.06)
Leverage	-0.040***	-0.064***	0.043***	0.022***	-0.039***	-0.019***	-0.055***	-0.075***
	(3.18)	(4.61)	(5.40)	(3.06)	(15.19)	(9.52)	(4.91)	(5.91)
Tangibility	0.064***	0.081***	-0.028***	-0.010	0.013***	0.012***	0.038***	0.075***
	(6.38)	(6.98)	(4.36)	(1.63)	(6.04)	(7.37)	(4.22)	(7.02)
	Panel B: t-test Results: $\alpha_{MP:SH} - \alpha_{MP:LH} = 0$							
$\alpha_{MP:SH} - \alpha_{MP:LH}$	0.007**		-0.003**		0.000		0.003	
t-stat	5.76		8.61		0.06		2.32	
P-value	0.0164		0.0033		0.8064		0.1278	
Observations	3,291	3,291	3,291	3,291	3,291	3,291	3,291	3,291
R-squared	0.20	0.19	0.16	0.07	0.29	0.19	0.07	0.08

3.4 Robustness Checks

3.4.1 Alternative Proxy for Mispricing - Decomposition of Market-to-Book Assets Ratio

The Market-to-book assets ratio (*M/B*) has been widely used as a proxy for mispricing. However, Baker et al. (2003) argue that its noisiness might render it unreliable in this role. Specifically, *M/B* not only captures mispricing but also contains information about investment profitability and measurement error due to accounting discrepancies between book capital and economic replacement costs. Therefore, to obtain a more reliable measure of mispricing, *M/B* (i.e. Tobin's *Q*) is decomposed into 2 components; (a) the fundamental-value-to-assets ratio (*VA*) and (b) the mispricing-to-assets ratio (*MP*). The former is used as a proxy of firms' investment opportunities and the latter is used as a proxy of mispricing. *VA* and *MP* are computed using the following equation:

$$MB = \frac{E^m - E^b + A^b}{A^b} = \frac{(E^m - v) + (v - E^b + A^b)}{A^b} = \frac{(E^m - v)}{A^b} + \frac{(v - E^b + A^b)}{A^b} = MP + VA \quad (3.5)$$

where E^m is the market value of equity; E^b is the book value of equity; A^b is the book value of total assets; and v is the fundamental value of equity. I compute v following Rhodes-Kropf, et al. (2005), which in turn allows us to produce an estimate of *MP* (MP_{RKRV}) and replace *Q* with VA_{RKRV} in the regression equation.

The fundamental value of equity is obtained by conducting annual, cross-sectional regressions separately for the 12 Fama and French industries. The regression equation is the logarithm of the market value of equity on the logarithm of the book value of equity, the absolute value of net income, an indicator function for negative net income observations, and the book leverage ratio. The exponential transformation of the fitted value from the estimated equation represents the fundamental value of equity.

Table 3.6 reports the outcome of testing Hypothesis I: $\alpha_{MP}^{INV} > 0$, $\alpha_{MP}^{\Delta CH} < 0$ and $\alpha_{MP}^{\Delta D} > 0$ using the mispricing measures based on the *RKRV* decomposition method. The estimated coefficients for α_{MP}^{INV} and $\alpha_{MP}^{\Delta D}$ are positive and significant at the 1% level. The estimated coefficient $\alpha_{MP}^{\Delta CH}$ is insignificant at conventional levels. Table 3.7 reports the result for tests of Hypothesis II ($\alpha_{MP:SH}^{INV} - \alpha_{MP:LH}^{INV} > 0$, $\alpha_{MP:SH}^{\Delta CH} - \alpha_{MP:LH}^{\Delta CH} < 0$ and $\alpha_{MP:SH}^{\Delta D} - \alpha_{MP:LH}^{\Delta D} > 0$) using the median-sort turnover classification scheme. Although the results are broadly consistent with the hypothesis, none of the t-tests show significance for the coefficient differences. Results in Table 3.8, based on the tercile-sort classification scheme, provides stronger support for Hypothesis II – all of the coefficient differences have the expected signs and are statistically significant. A plausible explanation for this variation in results is that tercile-sort method provides a clearer separation of firms with different investment horizons, thereby delivering a more powerful test. Overall, these results show that earlier findings are quite robust and are not driven by the choice of mispricing proxy.

3.4.2 Dummy Variable Representation of Different Investor Horizons

In the previous section, I follow Polk and Sapienza (2009) and estimate regressions separately for the long horizon and short horizon groups. As a robustness check, I modify equation (3.3) to include a dummy variable for firms classified as short horizon investor dominated and an interaction term of mispricing with the short horizon dummy variable (*MP*SH*):

$$[CP]_y = \alpha_0 + \alpha_{MP}^{y} MP_{i,t} + \alpha_{MS}^{y} MP_{i,t} * SH_{i,t} + \alpha_{SH}^{y} SH_{i,t} + \alpha_1 Q_{i,t-1} + \alpha_2 CashFlow_{i,t} + \sum_x \alpha_x X_x + \sum_i firm_i + \sum_t year_t + \varepsilon \quad (3.6)$$

Table 3.6: The Impact of Mispricing on Corporate Policies – RKRV Mispricing Proxy

This table reports the outcome of estimating (3.3) for the entire sample, where the Rhodes-Kropf et al. (2005) (RKRV) decomposition method is employed to measure the level of stock mispricing. The data are obtained from COMPUSTAT and CRSP for the period 1971- 2008. The sample consists of 2,710 US firms. To distinguish between the catering channel and the equity issuance channel, firm observations with positive equity issuance are excluded. Firms excluded from the final sample: those with less than USD 10 million market capitalization, those with sales growth greater than 100% and those with annual sales less than USD 1 million. All regression equations are estimated with fixed *firm* and *year* effects. The estimation corrects for heteroskedasticity and clustering using the White-Huber estimator. Coefficients significant at the 10%, 5% and 1% levels are indicated by *, ** and ***, respectively, and associated t-statistics are presented in parentheses.

	Corporate Policy Regressions			
	(1) *INV*	(2) ΔCH	(3) *PAYOUT*	(4) ΔD
	$H1: a_{MP} > 0$	$H1: a_{MP} < 0$	$H1: a_{MP} = 0$	$H1: a_{MP} > 0$
MP	0.015***	-0.004	0.003***	0.014***
	(4.70)	(1.20)	(5.66)	(5.35)
Q	0.034***	-0.003	0.006***	0.037***
	(5.72)	(0.59)	(8.10)	(7.56)
CF	0.368***	0.329***	0.022***	-0.281***
	(13.48)	(15.73)	(8.83)	(12.72)
SaleGrowth	0.007	-0.005	0.000	0.006*
	(1.57)	(1.41)	(0.13)	(1.76)
Size	-0.017***	-0.007**	0.001	-0.016***
	(3.61)	(2.52)	(1.60)	(3.83)
Leverage	-0.263***	0.009	-0.023***	-0.301***
	(12.36)	(0.93)	(10.69)	(15.51)
Tangibility	-0.036	0.120***	-0.007**	0.058**
	(1.19)	(7.38)	(2.43)	(2.39)
Observations	12,938	12,938	12,938	12,938
R-squared	0.57	0.49	0.80	0.53

Table 3.7: Mispricing, Investor Horizon and Corporate Policies – RKRV Mispricing Proxy (Median-Sort)

This table reports the outcome of estimating Equation (3.3), separately for firms typified by short horizon (*SH*) and long horizon (*LH*) investors. The Rhodes-Kropf et al. (2005) (RKRV) decomposition method is employed to measure the level of stock mispricing. The data are obtained from COMPUSTAT and CRSP for the period 1971- 2008. The sample consists of 2,710 US firms. To distinguish between the catering channel and the equity issuance channel, firm observations with positive equity issuance are excluded. Firms excluded from the final sample: those with less than USD 10 million market capitalization, those with sales growth greater than 100% and those with annual sales less than USD 1 million. All regression equations are estimated with fixed *firm* and *year* effects. The estimation corrects for heteroskedasticity and clustering using the White-Huber estimator. Coefficients significant at the 10%, 5% and 1% levels are indicated by *, ** and ***, respectively, and associated t-statistics are presented in parentheses.

	Corporate Policy Regressions							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	INV		ΔCH		*PAYOUT*		ΔD	
	HII: $a_{MP:SH} - a_{MP:LH} > 0$		*HII*: $a_{MP:SH} - a_{MP:LH} < 0$		*HII*: $a_{MP:SH} - a_{MP:LH} = 0$		*HII*: $a_{MP:SH} - a_{MP:LH} > 0$	
	LH	*SH*	*LH*	*SH*	*LH*	*SH*	*LH*	*SH*
	Panel A: Regression Results							
MP	0.010***	0.017***	-0.000	-0.006***	0.005***	0.003***	0.009***	0.015***
	(4.29)	(7.74)	(0.20)	(5.43)	(12.60)	(9.19)	(4.84)	(7.65)
Q	0.018***	0.028***	-0.009***	-0.015***	0.018***	0.010***	0.025***	0.026***
	(3.96)	(6.49)	(3.45)	(6.39)	(22.18)	(15.37)	(6.22)	(6.68)
CF	0.381***	0.397***	0.241***	0.313***	0.049***	0.047***	-0.226***	-0.199***
	(25.78)	(25.50)	(28.66)	(36.82)	(18.32)	(19.40)	(17.47)	(13.89)
SaleGrowth	0.020***	0.023***	0.000	-0.009***	-0.001**	-0.001***	0.018***	0.011***
	(5.78)	(7.15)	(0.04)	(5.18)	(2.37)	(2.80)	(5.94)	(3.81)
Size	-0.002*	-0.002**	-0.002***	-0.000	0.003***	0.002***	0.001	0.002**
	(1.95)	(2.21)	(2.98)	(0.51)	(19.05)	(16.83)	(0.98)	(2.25)
Leverage	-0.035***	-0.049***	0.023***	0.025***	-0.029***	-0.014***	-0.054***	-0.050***
	(3.55)	(4.68)	(4.08)	(4.43)	(16.12)	(8.51)	(6.30)	(5.19)
Tangibility	0.068***	0.076***	-0.019***	-0.015***	0.011***	0.012***	0.050***	0.067***
	(8.97)	(9.43)	(4.34)	(3.41)	(8.34)	(9.24)	(7.50)	(9.11)
	Panel B: t-test Results: $\alpha_{MP:SH} - \alpha_{MP:LH} = 0$							
$\alpha_{MP:SH} - \alpha_{MP:LH}$	0.007		-0.006		-0.002		0.006	
t-stat	1.47		2.44		1.02		1.32	
P-value	0.2251		0.1184		0.3118		0.2501	
Observations	6,469	6,469	6,469	6,469	6,469	6,469	6,469	6,469
R-squared	0.17	0.18	0.12	0.21	0.28	0.23	0.08	0.07

Table 3.8: Mispricing, Investor Horizon and Corporate Policies – RKRV Mispricing Proxy (Tercile-Sort)

This table reports the outcome of estimating Equation (3.3), separately for firms typified by short horizon (*SH*) and long horizon (*LH*) investors. The Rhodes-Kropf et al. (2005) (RKRV) decomposition method is employed to measure the level of stock mispricing. The data are obtained from COMPUSTAT and CRSP for the period 1971- 2008. The sample consists of 2,710 US firms. To distinguish between the catering channel and the equity issuance channel, firm observations with positive equity issuance are excluded. Firms excluded from the final sample: those with less than USD 10 million market capitalization, those with sales growth greater than 100% and those with annual sales less than USD 1 million. All regression equations are estimated with fixed *firm* and *year* effects. The estimation corrects for heteroskedasticity and clustering using the White-Huber estimator. Coefficients significant at the 10%, 5% and 1% levels are indicated by *, ** and ***, respectively, and associated t-statistics are presented in parentheses.

	Corporate Policy Regressions							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	INV		*ΔCH*		*PAYOUT*		*ΔD*	
	HII: $a_{MP:SH} - a_{MP:LH} > 0$		*HII*: $a_{MP:SH} - a_{MP:LH} < 0$		*HII*: $a_{MP:SH} - a_{MP:LH} = 0$		*HII*: $a_{MP:SH} - a_{MP:LH} > 0$	
	LH	*SH*	*LH*	*SH*	*LH*	*SH*	*LH*	*SH*
	Panel A: Regression Results							
MP	0.004	0.017***	-0.001	-0.006***	0.005***	0.002***	0.004*	0.016***
	(1.37)	(6.35)	(0.72)	(3.92)	(9.35)	(5.89)	(1.75)	(6.48)
Q	0.009	0.029***	-0.007**	-0.016***	0.020***	0.009***	0.017***	0.027***
	(1.59)	(5.73)	(2.32)	(5.84)	(19.45)	(11.40)	(3.60)	(5.72)
CF	0.437***	0.392***	0.269***	0.291***	0.054***	0.044***	-0.177***	-0.197***
	(24.32)	(20.33)	(25.33)	(28.74)	(15.94)	(15.40)	(11.55)	(11.00)
SaleGrowth	0.025***	0.021***	-0.004	-0.009***	-0.002***	-0.001	0.022***	0.011***
	(5.58)	(5.51)	(1.43)	(4.21)	(2.76)	(1.06)	(5.78)	(2.92)
Size	-0.002*	-0.002	-0.002***	0.001	0.003***	0.002***	0.000	0.002**
	(1.70)	(1.56)	(2.87)	(1.18)	(14.71)	(11.90)	(0.33)	(2.05)
Leverage	-0.033***	-0.060***	0.031***	0.028***	-0.031***	-0.014***	-0.054***	-0.057***
	(2.77)	(4.52)	(4.38)	(4.06)	(13.87)	(7.20)	(5.33)	(4.63)
Tangibility	0.062***	0.084***	-0.023***	-0.012**	0.010***	0.013***	0.040***	0.079***
	(6.70)	(8.37)	(4.27)	(2.20)	(5.62)	(8.41)	(5.08)	(8.45)
	Panel B: t-test Results: $\alpha_{MP:SH} - \alpha_{MP:LH} = 0$							
$\alpha_{MP:SH} - \alpha_{MP:LH}$	0.014**		-0.004		-0.002		0.012**	
t-stat	4.57		1.13		1.11		4.63	
P-value	0.0326		0.2874		0.2922		0.0314	
Observations	4,313	4,313	4,313	4,313	4,313	4,313	4,313	4,313
R-squared	0.19	0.18	0.15	0.22	0.30	0.22	0.06	0.07

The dummy variable (*SH)* takes a value of 1 (0) if a firm's turnover is above (below) the sample median. Hypothesis II is modified to test whether firms with shorter investor horizons cater more:

$$\textit{Hypothesis III}: \ \alpha_{MS}^{INV} > 0 \ , \ \alpha_{MS}^{\Delta CH} < 0 \text{ and } \alpha_{MS}^{\Delta D} > 0$$

Table 3.9 reports the results for the test of Hypothesis III. The results show that α_{MS}^{INV} and $\alpha_{MS}^{\Delta D}$ are both positive and significant while $\alpha_{MS}^{\Delta CH}$ is negative and also statistically significant. This is consistent with the hypothesis that firms with shorter horizons cater more. Based on this analysis I infer that managers rely on debt financing and cash reserves to provide finance for catering investment. In an alternative classification scheme, the horizon dummy variable takes a value of 1 (0) if a firm's turnover is in the top (bottom) tercile (33%) of distribution. Results, reported in Table 3.10, based on this classification scheme are strongly consistent with the findings shown in Table 3.9.

Table 3.9: The Impact of Mispricing on Corporate Policies – Dummy Variable Proxy for Investor Horizon and Future Return Proxy for Mispricing (Median-Sort)

This table reports the outcome of estimating Equation (3.6) for the entire sample, where Future Return is used to measure the level of stock mispricing. The data are obtained from COMPUSTAT and CRSP for the period 1971- 2008. The sample consists of 2,710 US firms. To distinguish between the catering channel and the equity issuance channel, firm observations with positive equity issuance are excluded. Firms excluded from the final sample: those with less than USD 10 million market capitalization, those with sales growth greater than 100% and those with annual sales less than USD 1 million. All regression equations are estimated with fixed *firm* and *year* effects. The estimation corrects for heteroskedasticity and clustering using the White-Huber estimator. Coefficients significant at the 10%, 5% and 1% levels are indicated by *, ** and ***, respectively, and associated t-statistics are presented in parentheses.

	Corporate Policy Regressions			
	(1) *INV*	(2) Δ*CH*	(3) *PAYOUT*	(4) Δ*D*
	H1: $a_{MS} > 0$	*H1*: $a_{MS} < 0$	*H1*: $a_{MS} = 0$	*H1*: $a_{MS} > 0$
MP	-0.001	0.001	0.001***	0.001
	(0.88)	(1.13)	(4.63)	(0.85)
*MP*SH*	0.005***	-0.002**	-0.000	0.003**
	(3.55)	(2.09)	(0.98)	(2.07)
SH	0.014***	-0.007***	-0.006***	0.003
	(4.39)	(3.82)	(10.56)	(0.99)
Q	0.014***	-0.004***	0.006***	0.013***
	(9.12)	(4.58)	(21.43)	(9.14)
CF	0.393***	0.256***	0.045***	-0.220***
	(32.59)	(37.77)	(22.13)	(20.32)
SaleGrowth	0.019***	-0.005***	-0.002***	0.013***
	(6.93)	(3.37)	(3.52)	(5.26)
Size	-0.003***	-0.000	0.002***	0.000
	(4.25)	(0.98)	(18.95)	(0.32)
Leverage	-0.050***	0.027***	-0.027***	-0.065***
	(6.60)	(6.34)	(21.21)	(9.43)
Tangibility	0.070***	-0.016***	0.012***	0.056***
	(11.11)	(4.45)	(11.54)	(9.84)
Observations	0.17	0.14	0.23	0.07
R-squared	9,873	9,873	9,873	9,873

Table 3.10: The Impact of Mispricing on Corporate Policies – Dummy Variable Proxy for Investor Horizon and Future Return Proxy for Mispricing (Tercile-Sort)

This table reports the outcome of estimating Equation (3.6) for the entire sample, where Future Return is used to measure the level of stock mispricing. The data are obtained from COMPUSTAT and CRSP for the period 1971- 2008. The sample consists of 2,710 US firms. To distinguish between the catering channel and the equity issuance channel, firm observations with positive equity issuance are excluded. Firms excluded from the final sample: those with less than USD 10 million market capitalization, those with sales growth greater than 100% and those with annual sales less than USD 1 million. All regression equations are estimated with fixed *firm* and *year* effects. The estimation corrects for heteroskedasticity and clustering using the White-Huber estimator. Coefficients significant at the 10%, 5% and 1% levels are indicated by *, ** and ***, respectively, and associated t-statistics are presented in parentheses.

	Corporate Policy Regressions			
	(1) *INV*	(2) ΔCH	(3) *PAYOUT*	(4) ΔD
	H1: $a_{MS} > 0$	*H1:* $a_{MS} < 0$	*H1:* $a_{MS} = 0$	*H1:* $a_{MS} > 0$
MP	-0.003**	0.002**	0.001***	0.000
	(2.15)	(2.56)	(4.54)	(0.24)
*MP*SH*	0.007***	-0.003***	-0.001*	0.003**
	(4.01)	(2.98)	(1.84)	(2.00)
SH	0.025***	-0.012***	-0.007***	0.009**
	(6.30)	(5.42)	(10.53)	(2.48)
Q	0.013***	-0.004***	0.005***	0.011***
	(6.95)	(4.05)	(16.64)	(6.73)
CF	0.398***	0.265***	0.050***	-0.207***
	(27.36)	(31.74)	(19.88)	(15.65)
SaleGrowth	0.022***	-0.010***	-0.001*	0.014***
	(6.43)	(4.82)	(1.92)	(4.58)
Size	-0.003***	-0.000	0.002***	-0.000
	(3.98)	(0.49)	(13.45)	(0.32)
Leverage	-0.054***	0.034***	-0.029***	-0.066***
	(5.80)	(6.27)	(18.00)	(7.85)
Tangibility	0.073***	-0.019***	0.013***	0.057***
	(9.51)	(4.33)	(9.54)	(8.12)
Observations	0.18	0.16	0.25	0.07
R-squared	6,582	6,582	6,582	6,582

3.5 Conclusion

This study examines whether stock market mispricing influences corporate investment through the catering channel and how this influences other corporate policy decisions. Consistent with Polk and Sapienza (2009), I find that firms do cater to investor sentiment by adjusting the level of investment when they are mispriced so as to boost short-term share price. The impact of mispricing on investment is found to be stronger for firms typified by shorter horizon investors since short-term investors are more prone to sentiment and care about short-term share prices.

This study also investigates the impact of mispricing on other corporate policies. I find that firms tend to rely on debt financing for catering investment. Firms only start to rely on cash reserves when they cater more - firms typified by shorter horizon investors avail themselves of cash from cash reserves and increase debt issuance to finance catering investment. Results suggest that debt financing is a primary source of financing, while cash reserves is of secondary importance. Consistent with previous evidence of dividend smoothing (Guttman et al., 2010; Leary and Michaely, 2011; and Chen et al., 2012), I find that dividend policy is insensitive to mispricing.

Chapter 4

Investment, Accessibility to External Financing and Financial Flexibility

4.1 Introduction

Firms and investors value corporate *financial flexibility*.[21] Financial flexibility can be defined as the ability of a firm to obtain and restructure its financing at a low cost to fund investment when profitable opportunities arise (Gamba and Traintis, 2008). Recent studies examine how a firm may build up its financial slack to preserve financial flexibility or to prevent itself from running into financial distress. For example, a firm may employ debt financing and simultaneously hold cash balances (Gamba and Traintis, 2008), or build up corporate liquidity before recession (Ang and Smedema, 2011), in order to preserve financial flexibility.

This chapter explores a new aspect of financial flexibility – namely, the ability of a firm to adjust its internal and external sources of financing for corporate investment in response to stock market mispricing. I provide evidence that firms with greater external market accessibility can utilize their financial flexibility to take advantage of stock market mispricing for corporate investment. My unique angle on this question involves investigating the joint impact of firms' accessibility to external capital markets and mispricing on the *investment-cash flow sensitivity*.

Traditional financial theory assumes perfect capital markets in which rational corporate investment decision-making is determined by the economic profitability of projects,

[21] See, among others, Graham and Harvey (2001), Brounen, de Jong, and Koedijk (2004), and Bancel and Mittoo (2004) for surveys that confirm this claim.

irrespective of the sources of financing used (Modigliani and Miller, 1958). In other words, the availability of internal funds is irrelevant to corporate managers when making investment decisions. However, in a more realistic setting of imperfect capital markets, financing decisions and the availability of internal funds may become relevant.

Myers and Majluf (1984) show that an induced adverse selection problem will create a wedge between the cost of internal and external funds. Jensen and Meckling (1976) and Myers (1977) show that a major consequence of information asymmetry is the moral hazard problem which leads to a higher cost of debt. Based on Jensen and Meckling (1976), Myers (1997), and Myers and Majluf (1984), numerous studies recognize that the internal and external funds cost differential can create a potential relevance for the availability of internal funds to corporate investment decisions. Fazzari et al. (1988) are the first to examine the relationship between corporate investment and the availability of internal cash flow – the *investment-cash flow sensitivity*. They find that financially constrained firms (i.e. firms with only limited access to external capital markets) would rely more on their internal cash flow to finance investment (i.e. there is a higher investment-cash flow sensitivity).[22] Kaplan and Zingales (1997) and Cleary (1999, 2006) re-examine this relationship and find the opposite – namely, that financially constrained firms have a lower investment-cash flow sensitivity. They argue that managers in constrained firms are more cautious in making investment. Therefore, they tend to underinvest even when they have sufficient internal funds to finance the project.[23] Although the results are mixed, the common theme across all these studies is that managers can make use of the availability of internal funds in response to the internal versus external funds cost differential for corporate investment.

[22] Griner and Gordon (1995) confirm that internal cash flow is an important determinant of corporate investment and the relation is caused by information asymmetry between managers and potential new shareholders.

[23] Lyandres (2007) shows that by altering the optimal investment timing, the relationship between the cost of external funds and investment-cash flow sensitivity is non-monotonic.

Traditional financial theory also assumes informationally efficient capital markets in which competition among rational investors and the existence of arbitrageurs would rule out (exploitable) mispricing. Contrary to the traditional view, however, a growing body of literature documents evidence of mispricing and managers adjust corporate financing and investment policies in response to such mispricing. [24] For example, an overvalued (undervalued) firm will take advantage through market timing by issuing overpriced (repurchasing underpriced) equity (Baker and Wurgler, 2002).[25] An equity-dependent firm will invest more (less) when it is overvalued (undervalued) (Stein, 1996; and Baker et al., 2003). An overvalued firm with more short-term investors will invest more in order to cater to the market sentiment (Polk and Sapienza, 2009). Stock price overvaluation will also lead to higher levels of investment in the form of mergers and acquisitions (Shleifer and Vishny, 2003).[26]

Using the US market as a platform, this chapter examines how firms can make use of their financial flexibility in adjusting their internal and external sources of funds for corporate investment to take advantage of mispricing. I first examine whether firms adjust their internal and external sources of financing for corporate investment in response to mispricing. I then investigate whether firms with greater (weaker) access to external capital markets are financially more (less) flexible in adjusting their sources of financing for corporate investment in response to mispricing. To the best of my knowledge, this is the first study to address this important research question.

My main contribution is to model and document new evidence on the interaction of three important dimensions in the decision-making matrix that managers face: accessibility to external financing, mispricing, and corporate investment. The key idea is that firms,

[24] See Baker et al. (2012) for a comprehensive review on how mispricing can affect corporate policies.
[25] Bayless and Diltz (1991) also show that firms tend to issue equity after increases in their share prices.
[26] Chirinko and Schaller (2001, 2004); Panageas (2003); and Gilchrist et al. (2005) also find that overvalued firms tend to increase their investment levels.

especially those with greater access to external financial markets, can adjust their internal and external sources of financing to take advantage of mispricing. In periods of overvaluation (undervaluation) when external funds are cheaper (more costly), firms would issue more (less) external funds so that investment by firms would be less (more) dependent on internal funds. Thus, firms should display lower (higher) investment-cash flow sensitivity during periods of overvaluation (undervaluation).

Moreover, one would expect that firms with greater access to external markets can react more easily to mispricing. Such firms can switch between external and internal financing when whichever of the two is cheaper, resulting in greater financial flexibility. In contrast, firms with limited access to external capital markets will find it difficult, if not impossible, to raise external funds. Such firms are financially less flexible in reacting to mispricing and more dependent on internal funds to finance their investment even during periods of overvaluation. Thus, firms with greater access to external markets should display greater changes in investment-cash flow sensitivity for each unit change in mispricing than their counterparts with limited access to external capital markets, i.e. they are more flexible in adjusting their sources of financing for corporate investment in response to mispricing.

The financial flexibility hypothesis is examined using a large sample that consists of 1,310 US manufacturing firms over the period 1971-2008. Firms are first classified into "limited access" versus "greater access" groups based on two proxies drawn from the literature, namely: debt rating (Almeida, Campello, and Weisbach, 2004); and the *WW* Index (Whited and Wu, 2006). I use future stock returns as a direct proxy of mispricing (Baker et al., 2003) and estimate the regression equations using OLS with standard errors clustered by firm, as in Petersen (2009).

For robustness, I employ two other regression estimation methods. First, I conduct the regression estimation using the Erickson and Whited (2000, 2002) Generalized Method of

Moments (GMM) procedure. It is well documented that the measurement error of *M*/*B* in investment equations biases the OLS coefficients (especially the cash flow coefficient) estimation in unknown directions (see e.g., Whited, 1992; and Erickson and Whited, 2000). Employing the GMM estimation procedure allows us to correct for the measurement and equation errors. Another problem of the analysis is also related to the market-to-book assets ratio. *M*/*B* is widely used in the literature as a proxy for mispricing (see e.g., Jung, Kim and Stulz, 1996; Baker et al., 2003; and Dong et al., 2012). Therefore, *M/B* does not only contain information about firm's investment profitability, but it also captures mispricing. To mitigate this problem, I employ Rhodes-Kropf et al. (2005) methodology to decompose the market-to-book assets ratio into two components: a fundamental component (*VA*) and a non-fundamental mispricing component (*MP*). I then estimate the equations using *VA* as a proxy of Tobin's *Q* and *MP* as a proxy of mispricing.

In the first part of analysis, the impact of mispricing on the investment-cash flow sensitivity is examined. Consistent with my predictions, the empirical results show that the investment-cash flow sensitivity of firms is smaller when the level of mispricing is higher. This result indicates that investment by firms is less (more) dependent on internal funds during periods of overvaluation (undervaluation).

In the second part of analysis, the impact of mispricing on the investment-cash flow sensitivity for firms with different levels of external market accessibility is examined. I find that firms with greater access to external capital markets can adjust more flexibly their sources of financing (between internal and external funds) for investment in response to stock market mispricing. The investment-cash flow sensitivity of such firms is lower (higher) when they are more overvalued (undervalued). On the other hand, the analysis suggests that firms with limited access to external capital markets are unable to adjust their sources of financing for investment in response to stock market mispricing. The difference in the estimated investment-cash flow sensitivities is statistically indistinguishable from zero between overvaluation and undervaluation periods. All of the empirical results are confirmed by a battery of robustness checks.

My results complement the findings of Dong et al. (2012) in showing that unconstrained firms do not only have the flexibility to time the external markets but also have the flexibility in adjusting their internal and external sources of funds for investment to take advantage of mispricing.

The remainder of this chapter is organized as follows. Section 4.2 presents a simple theoretical model to illustrate how firms can adjust their internal and external sources of financing for corporate investment in response to stock market mispricing and the proposed hypotheses. Section 4.3 outlines the details of the data and sampling, variables and proxies, and the empirical models. Section 4.4 presents the results, and Section 4.5 concludes the chapter.

4.2 A Simple Theoretical Illustration

I use a simple model to illustrate how firms can adjust their internal and external sources of financing for corporate investment in response to stock market mispricing and firms with greater access to external markets are more flexible in doing so.[27]

Consider a firm which has access to an investment opportunity. I denote I as the level of investment and m as a measure of investment productivity. I assume that the profits net of the amount invested is increasing and concave in I and its value is given by $F(I) = I - \frac{1}{2m}I^2$.

The firm has assets in place which generate cash flow denoted by c. In addition to the internal cash flow, the firm has access to external financial markets. I denote E and D as

[27] My model is based on the reduced form model of Kaplan and Zingales (1997) and Stein (2003). However, I allow for mispricing in my model and mispricing can influence firm's deadweight cost of external financing.

the level of equity and debt finance, respectively. The use of external finance involves deadweight costs.[28] I assume the deadweight costs of equity and debt are increasing and convex in E and D, respectively.[29] Specifically, the deadweight costs of equity and debt are given by:

$$h(k,\theta)\left(\frac{1}{2}E^2+E\right) \text{ and } r(k)\left(\frac{1}{2}D^2+D\right),$$

where k is a parameter that measures the level of firm's markets accessibility (or the level of firm's financial constraints), θ is a measure of the firm's equity mispricing,[30] $h(.,.) \geq 0$ and $r(.) \geq 0$ are the cost coefficients of equity and debt, respectively. More specifically, parameter θ increases monotonically with the firm's valuation, that is a firm is overvalued (undervalued) when $\theta > 0$ ($\theta < 0$). A higher value of k indicates the lower extent of a firm's external market accessibility (or the higher extent of a firm's financial constraints).

The deadweight costs of equity and debt are expected to be higher for firms with lower market accessibility (i.e. $h_k(.,.) \geq 0$and $r_k(.) \geq 0$).[31] For simplicity, I assume $r(k) = \bar{r}$ for $k < \bar{k}$, and $r(k) = \infty$ for $k \geq \bar{k}$, where $\bar{k}$ represents the level of k at which the

[28] The deadweight costs include agency costs that arise due to information asymmetry and other transaction costs. See e.g., Myers and Majluf (1984), Myers (1984), and Greenwald, Stiglitz and Weiss (1984) for the deadweight cost of equity and Myers (1977) for the deadweight cost of debt.

[29] A convex cost function has been widely used in the literature (e.g., Froot, Scharfstein, and Stein, 1993; and Stein, 2003). Altinkilic and Hansen (2000) show that debt and equity issuance costs consist of both a fixed cost and a convex variable cost. Leary and Roberts (2005) show that the observed dynamics of leverage ratios is consistent with a cost function of external finance that has a fixed and an increasing and weakly convex component.

[30] Since debt is informationally less sensitive, I assume that the firm's marketable debt is fairly priced. Note again that this assumption is merely for simplicity, results hold even if I allow debt to be mispriced in a similar way as equity.

[31] I use x with subscript y to represent the partial derivative of x with respect to y.

firm's credit is rationed.[32] This assumption implies that $r_k(k) = 0$ for $k < \bar{k}$, and for $k \geq \bar{k}$, the firm only has access to equity markets.[33]

The firm's equity can be mispriced by the financial markets. Parameter θ increases monotonically with the firm's valuation. Since overvaluation (undervaluation) can alleviate (aggravate) the deadweight cost of equity and the firm can take advantage through market timing by issuing overpriced (repurchasing underpriced) equity (see Baker and Wurgler, 2002), I assume $h_\theta(.,.) \leq 0$.[34] The impact of the firm's mispricing on the deadweight cost of equity, however, is assumed to be weaker when the firm has less access to financial markets – i.e. even if a firm with less capital market access is overvalued, given the same level of mispricing, it will likely find it difficult to issue its equity at a lower cost than that of a similar firm with greater capital market access.[35] Since $h_\theta(.,.) \leq 0$, this implies $h_{\theta k}(.,.) \geq 0$.[36]

The manager makes optimal investment and financing decisions to maximize the net profit of the existing shareholders:

$$\max_{I,E,D} I - \frac{1}{2m}I^2 - h(k,\theta)\left(\frac{1}{2}E^2 + E\right) - r(k)\left(\frac{1}{2}D^2 + D\right), \tag{4.1a}$$

$$\text{s.t. } I = c + E + D. \tag{4.1b}$$

The first order conditions of problem (1) are given by:

$$I^* = \frac{m(1 + h(c-1) + hD^*)}{1 + mh} \tag{4.2}$$

[32] In practice, the range of lending rates offered by banks is relatively small and banks would not offer different interest rates for different borrowers. This is because charging different interest rate or increasing collateral requirements can induce problems of adverse selection and moral hazard (see e.g., Stiglitz and Weiss, 1981). Stiglitz and Weiss (1981) show that there exists an optimal interest rate charged by banks and banks will not lend to an individual who offers to pay more than the optimal interest rate.

[33] Although the range of lending rates offered by banks is small, I would still expect $r_k(.)$ to be positive. Moreover, one may argue that the range of interest rates offered by marketable debt can be wider than banks. However, my assumption is merely for simplicity, one can show that my results hold even if $r_k(.) > 0$ and $r_k(.)$ is relatively small compared to $h_k(...)$. Please see Appendix for the case where $k \geq \bar{k}$.

[34] Overvaluation (undervaluation) is usually driven by optimistic market views at which firms may find easier in issuing equity.

[35] This view is consistent with the empirical findings of Dong et al. (2012).

[36] As we will see later, $h_{\theta k} \geq 0$ is not a necessary assumption for my results to hold, it is only sufficient.

and,

$$D^* = \frac{h(I^* - c + 1) - r}{h + r}, \tag{4.3}$$

where I^* and D^* represent the optimal level of investment and debt, and the optimal level of equity is given by the budget constraint (1b).[37]

If financial markets are informationally efficient (i.e. $h = r = \theta = 0$), financing decisions become irrelevant and the optimal level of investment is determined only by the productivity of investment (i.e. $I^* = m$). However, this simple model shows that financing decisions are relevant when the financial markets are informationally inefficient. I illustrate how firms can adjust their internal and external sources of financing for corporate investment in response to stock market mispricing and how firms with greater access to external markets are financially more flexible in doing so.

Substituting equation (4.3) into equation (4.2) and rearranging yields:

$$I^* = m\left(\frac{h + r - 2hr + hrc}{h + r + rmh}\right). \tag{4.4}$$

Differentiating equation (4.4) by c evaluates the investment-cash flow sensitivity in my simple model and yields:

$$\frac{dI^*}{dc} = \frac{mhr}{h + r + rmh} \geq 0. \tag{4.5}$$

Equation (4.5) suggests that when facing the deadweight costs of external financing, the firm would rely on its internal cash flow to finance its investment (see e.g., Fazzari et al., 1988; Kaplan and Zingales, 1997; and Stein, 2003).

Since mispricing influences the deadweight cost of equity, it would also affect how a firm might rely on its internal cash flow to finance its investment. A firm can adjust their internal and external sources of financing to take advantage of mispricing. In periods of

[37] Note that for notational simplicity, I suppress the terms $h(k, \theta)$ and $r(k)$ to h and r, respectively. Please see Appendix for the derivation of *FOCs* (4.2) and (4.3).

overvaluation (undervaluation) when equity funds are cheaper (more costly), firms would issue more (less) equity and consequently investment by firms would be less (more) dependent on internal funds. Thus, firms should display lower (higher) investment-cash flow sensitivity during such periods of overvaluation (undervaluation). This intuition can be shown by my model. Differentiating equation (4.5) by θ and simplifying yields:

$$\frac{d}{d\theta}\left(\frac{dI^*}{dc}\right) = \frac{mh_\theta r^2}{(h+r+rmh)^2} \leq 0. \tag{4.6}$$

Equation (4.6) suggests that a firm's investment would be less (more) dependent on its internal funds when there is an increase (a decrease) in misvaluation. This leads to the following hypothesis.

Hypothesis I (*Financial Flexibility Hypothesis*): Firms have lower (higher) investment-cash flow sensitivities in response to an increase (a decrease) in misvaluation.

If firms can flexibly adjust their internal and external sources of financing for investment in response to stock market mispricing (Hypothesis I), we would expect firms with greater access to external markets (i.e. lower *k*) are more flexible and thus more likely to achieve this – i.e. $\frac{d}{d\theta}\left(\frac{dI^*}{dc}\right)$ should be more (less) negative for firms with greater access to external markets (that are more financially constrained). Differentiating equation (4.6) by $k$and simplifying yields:

$$\frac{d}{k}\left(\frac{d}{\theta}\left(\frac{dI^*}{dc}\right)\right) = \frac{mr^2\left(h_{\theta k}(h+r+rmh)-2h_k h_\theta(1+rm)\right)}{(h+r+rmh)^3} \geq 0. \tag{4.7}$$

Equation (4.7) shows that firms with greater access to external markets (i.e. low *k*) can more easily react to mispricing. Such firms can switch between external and internal financing more flexibly for investment. This leads to the following hypothesis.

Hypothesis II (*Access-enhanced Financial Flexibility Hypothesis*): Investment-cash flow sensitivities are more (less) sensitive to mispricing for firms with stronger (weaker) access to the external markets.

Equation (4.7) only indicates that firms with lower access to external markets are less flexible in reacting to mispricing. I am also interested to see if limited access firms are financially flexible at all – i.e. are they able to adjust their financing sources in response to stock market mispricing? This leads to the following hypothesis.

Hypothesis III (*Inflexibility Hypothesis*): The investment-cash flow sensitivity of firms with limited access to the external markets is not sensitive to mispricing.

4.3 Empirical Framework

4.3.1 Data

The data are obtained from *Compustat* and *CRSP* over the period 1971 to 2008. Following Cleary (1999), Deshmukh and Vogt (2005), Huang and Ritter (2009), and Bushman, Smith and Zhang (2012), financial, services and utility industries are excluded from the sample.[38] Firms with market capitalization of equity less than USD 15 million or with less than 15 years data are excluded from the sample.[39, 40] Since this chapter examines how firms' may

[38] Financial and services industries are excluded because they have relatively low physical capital investment and utility industries are excluded because they are under government regulation.

[39] Gilchrist and Himmelberg (1995) suggest that linear investment models are likely to be inappropriate for small firms.

switch between internal and external sources of financing for investment to take advantage of mispricing, firms with negative cash flow are excluded. Firms with abnormal asset or sales growth (greater than 100%) are also eliminated because abnormal growth implies major corporate events (Almeida et al., 2004; and Almeida and Campello, 2007). To control for the effect of outliers, all variables are winsorized at the 1^{st} and 99^{th} percentile. The final sample consists of 1,310 firms producing over 25,000 firm-year observations.[41]

4.3.2 Proxies for Accessibility to External Financing

To test the impact of accessibility to external financing on financial flexibility, it is essential to classify firms into "limited access" and "greater access" categories based on reliable measures of the financing frictions faced by them. I employ two alternative proxies for firms' accessibility to external markets, namely: (a) debt rating (Almeida et al., 2004); (b) the *WW* Index (Whited and Wu, 2006).

Debt Rating. Firms with bond ratings have greater access to external capital markets than those with unrated debt. The former group of firms will find it easier and cheaper to raise external finds due to their superior credit rating. Following Almeida et al. (2004), I classify those firms that never had a bond rating during the sample period as the "limited access" group. As suggested by Almeida et al. (2004), the advantage of bond rating is that it measures the market's assessment of a firm's credit standing which represents firms' accessibility to external financing. Both long-term (*LD*) and short-term (*SD*) debt ratings are employed to proxy for firms' accessibility to external financing, and the associated limited access dummy variable is denoted $LimAcc_{DR}$.[42]

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[40] Gilchrist and Himmelberg (1995) include firms only if the data are available for the entire sample period. However, to avoid the introduction of excessive survivorship bias to subsequent analysis, I only require firms to have at least fifteen consecutive years' data.

[41] The final sample ends in 2005 because the definition of future return requires three years data forward.

[42] Firms are classified into the "limited access" group only if they never had their short-term and long-term debt rated, the rest of the sample is categorized as "greater access" group.

WW Index. The *WW* index is constructed using six variables which collectively represent firms' financial status; ratio of cash flow to total assets (*CashFlow*), dividend dummy variable (*DIV*), total debt to total assets ratios (*Leverage*), natural log of total assets (*Size*), three-digit industry sales growth (*ISG*), and sales growth (*SG*).

$$WW = -0.091 CashFlow_{i,t} - 0.062 DIV_{i,t} 0.021 Leverage_{i,t} - 0.044 Size_{i,t} + 0.102 ISG_{i,t} \\ -0.035 SG_{i,t} \quad (4.8)$$

According to Whited and Wu (2006), the index measures the level of external financing constraints faced by firms. The index is higher (lower) for financially constrained (unconstrained) firms. Constrained firms will find it harder and more costly to raise external funds since they are more subject to moral hazard and adverse selection problems. Therefore, firms with a higher (lower) *WW* index i.e. above (below) median, are classified into the "limited access" ("greater access") group.[43] The associated limited access dummy variable is denoted $LimAcc_{WW}$.

4.3.3 Proxies for Stock Market Mispricing

To examine how firms utilize their financial flexibility in different states of mispricing, some reliable proxies of stock market mispricing are also required. Following previous studies in the literature, two proxies for mispricing are employed; (a) Future return (e.g., Baker et al., 2003) and (b) Decomposition of market-to-book assets ratio (e.g., Rhodes-Kropf et al, 2005).

Future Return. Following Baker et al., (2003), future stock return is employed to proxy for mispricing. Future return is a good proxy for stock mispricing since overpriced (underpriced) stock is expected to experience a fall (increase) in price leading to lower

[43] Note that the "median-sort" method is employed merely for preserving the number of observations. Alternatively, I also conduct all my empirical analyses using a "tercile-sort" method. The results of this robustness test are documented later in this study.

(higher) future returns. Following Baker et al. (2003), future stock return is computed as follows:

$$FutureReturn_{i,t} = \frac{P_{i,t+3}}{P_{i,t}} - 1 \tag{4.9}$$

where $P_{i,t}$ and $P_{i,t+3}$ represent the stock price at t and $t+3$, respectively. Firms with higher (lower) future returns are underpriced (overpriced). To ease interpretation, I multiply future return by -1, such that a higher (lower) value of this mispricing variable reflects overpriced (underpriced) firms.

Decomposition of Market-to-Book Assets Ratio. The market-to-book assets ratio (*M/B*) is widely used as a proxy for mispricing. However, Baker et al. (2003) argue that its noisiness might render it unreliable in this role. *M/B* not only captures mispricing but also contains information about investment profitability and measurement error due to accounting discrepancies between book capital and economic replacement costs. Therefore, to obtain a superior measure of mispricing, *M/B* (i.e. Tobin's *Q*) is decomposed into 2 components; (a) the fundamental-value-to-assets ratio (*VA*) and (b) the mispricing-to-assets ratio (*MP*). The former is used as a proxy of firms' investment opportunities and the latter is used as a proxy of mispricing. *VA* and *MP* are computed using the following equation:

$$MB = \frac{E^m - E^b + A^b}{A^b} = \frac{(E^m - v) + (v - E^b + A^b)}{A^b} = \frac{(E^m - v)}{A^b} + \frac{(v - E^b + A^b)}{A^b} = MP + VA \tag{4.10}$$

where E^m is the market value of equity; E^b is the book value of equity; A^b is the book value of total assets; and v is the fundamental value of equity. I compute v following Rhodes-Kropf et al. (2005), which in turn allows us to produce an estimate of *MP* (MP_{RKRV}) and replace *Q* with VA_{RKRV} in the regression equation.

The fundamental value of equity is obtained by conducting annual, cross-sectional regressions separately for the 12 Fama and French industries. The regression equation is the logarithm of the market value of equity on the logarithm of the book value of equity, the absolute value of net income, an indicator function for negative net income observations, and the book leverage ratio. The exponential of the fitted value from the estimated equation represents the fundamental value of equity.

4.3.4 Control Variables

To avoid the possibility of biased results as a consequence of omitted variables in the regression equation, I incorporate a range of control variables. *Tobin's Q* (*Q*) is included to control for investment opportunities. *Size*, the natural log of total assets, is included to control for the differences in capital investment policies due to firm size and maturity. *Leverage*, the total debt to total assets ratio, is included because it is negatively related to investment (see Lang, Ofek and Stulz, 1996). *CashHoldings*, cash and marketable securities scaled by lagged total assets, is added to control for the effect of corporate liquidity on investment. *Sales*, sales deflated by beginning-of-period total assets, is added as a control variable because the demand for capital goods is affected by the level of a firm's sales (Fazzari et la., 1988). ΔNWC, the change in the difference between current assets and current liabilities scaled by lagged total assets, is included because working capital and capital investment are two major competing uses of funds (see Fazzari and Peterson, 1993). Mispricing proxy (*MP*) is also included to control for the direct impact of mispricing on investment (see Baker et al., 2003; and Polk and Sapienza, 2009). Finally, Kaplan and Zingales (1997) and Cleary (1999, 2006) argue that managers in constrained firms are more cautious and they tend to invest less. Thus, the accessibility to external financing dummy (*LimAcc*) is included to control for the effect of accessibility on investment.

4.3.5 Empirical Methods

The impact of mispricing on investment-cash flow sensitivity for firms is examined using the following empirical model:

$$Investment_{i,t} = (\alpha_1 + \alpha_{MP} MP_{i,t}) CashFlow_{i,t} + \alpha_2 Q_{i,t-1} + \alpha_3 MP_{i,t} + \sum_x \alpha_x Y_x + \sum_i firm_i + \sum_t year_t + \epsilon_{i,t} \quad (4.11)$$

where *Investment* is capital expenditure scaled by the beginning-of-period capital stock; *MP* represents the proxy for mispricing – the value of the variable is higher (lower) for overpriced (underpriced) firms; *CashFlow* is cash flow from operations scaled by lagged capital stock; *Q* is market-to-book ratio; *Y* represents all other control variables;[44] *firm* represents firm-specific dummies included to control for cross-sectional variation due to unobserved individual heterogeneity.

The baseline prediction from this model regarding investment-cash flow sensitivity is a positive sign, i.e. other things equal, with zero mispricing an increase in cash flow will be associated with an increase in investment, $\alpha_1 > 0$. I am interested in how firms adjust their investment-cash flow sensitivity in response to mispricing (overpricing). This is captured by the conditional cash flow coefficient in equation (4.11): $\alpha_1 + \alpha_{MP} MP_{i,t}$. Specifically, α_{MP} measures the rate at which the investment-cash flow sensitivity changes for each unit of increase in *MP* (i.e. increase in overpricing). Hypothesis I suggests that $\alpha_{MP} < 0$.

The impact of mispricing on investment-cash flow sensitivity for firms with different levels of accessibility to external financing is examined using the following augmented empirical model:

$$Investment_{i,t} = (\alpha_1 + \alpha_{LA} LimAcc_{i,t} + \alpha_{MP} MP_{i,t} + \alpha_{\Delta LM} LimAcc_{i,t} MP_{i,t}) CashFlow_{i,t} + \alpha_2 Q_{i,t-1} + \alpha_3 LimAcc_{i,t} MP_{i,t} + \alpha_4 LimAcc_{i,t} + \alpha_5 MP_{i,t} + \sum_x \alpha_x Y_x + \sum_i firm_i + \sum_t year_t + \epsilon_{i,t} \quad (4.12)$$

where *LimAcc* is the accessibility to external financing dummy variable which takes a value of unity for firms with limited access and zero otherwise. *LimAcc* is included to capture the

[44] I also conduct all the empirical analyses by controlling only for *Q*. The results of this robustness test are documented later in this study.

differences in financial flexibility between firms with greater access and firms with limited access to external markets. All variables utilized in this study are defined in Table 4.1. Table 4.2 reports the summary statistics for all variables.

Similar to equation (4.11), the adjustment of firms' investment-cash flow sensitivity in response to mispricing is captured by the conditional cash flow coefficient in equation (4.12): $\alpha_1 + \alpha_{MP} MP_{i,t} + \alpha_{\Delta LM} LimAcc_{i,t} MP_{i,t}$. Specifically, for firms with greater access to external markets, the coefficient α_{MP} measures the rate at which the investment-cash flow sensitivity changes for each unit increase of overpricing. Hypothesis I suggests that $\alpha_{MP} < 0$. For firms with limited access to external financing, the sum of the coefficients α_{MP} and $\alpha_{\Delta LM}$ capture the counterpart variation in their investment-cash flow sensitivity, the parameter $\alpha_{\Delta LM}$ captures the increment in variation in the investment-cash flow sensitivity for firms with limited access to external capital markets relative to their greater access counterparts, as the level of mispricing changes. Hypothesis II suggests that $\alpha_{\Delta LM} > 0$. Regarding the question of whether limited access firms are financially flexible at all, Hypothesis III predicts that $\alpha_{MP} + \alpha_{\Delta LM} = 0$.

I estimate equations (4.11) and (4.12) using three broad alternative methods. First, I estimate the equations using OLS with standard errors clustered by firm, as in Petersen (2009).[45] Although OLS estimation is widely used in the literature, recent studies cast doubt on its reliability in estimating the investment equation. One problem arises due to the use of *M/B* as a noisy proxy of Tobin's *Q* (see e.g., Whited, 1992; and Erickson and Whited, 2000). The measurement error of *M/B* in investment equations will bias the OLS coefficients

[45] As a further variation, I also estimate the regression equation using OLS and correct the estimation for heteroskedasticity and clustering using the White-Huber estimator, and these results are also reported later in this study.

Table 4.1: Variable Definitions

Variable	Definition
Panel A: Core variables	
Investment	[Cash paid for PPE − Sales of PPE] / Lagged capital stock where: PPE is plant, property & equipment
CashFlow	Cash flow from operations / Lagged capital stock
Panel B: Proxies for *LimAcc* (limited access to external financing) dummy variable	
$LimAcc_{DR}$	= 1 if firm has no debt rating
$LimAcc_{WW}$	= 1 if > median {value of Whited and Wu (2006) Index}
Panel C: Proxy for *MP* (stock mispricing)	
MP_{FR}	Future Return = [$Return_{i,t+3}$/$Return_{i,t}$] – 1
Panel D: Control variables	
Q	Market to Book = [Market value of equity – Book value of equity + Book value of assets] / Book value of total assets
Size	ln [Book value of assets]
Leverage	[Short-term debt + Long-term debt] / Book value of total assets
CashHoldings	[Cash + Short-term investment] / Lagged book value of total assets
Sales	Sales / Lagged book value of total assets
ΔNWC	Change in net working capital, where net working capital = [Current assets – Current liabilities] / Lagged total assets
Panel E: Additional variables for robustness checking analysis	
MP_{RKRV}	$(E^m - v) / A^b$ where: v = exp {fitted value of ln (ME) = f (BVE, |NI|, D_{negNI}, BVLev)}
VA_{RKRV}	$(v - E^b + A^b) / A^b$

Table 4.2: Summary Statistics

Variable	*Obs.*	*Mean*	*Median*	*Std. Dev.*	*Min*	*Max*
Panel A: Core variables						
Investment	25,554	0.248	0.201	0.206	0.000	5.017
CashFlow	25,554	0.476	0.328	0.674	0.000	14.059
Panel B: Variables underlying the proxies for *LimAcc* (limited access to external financing) dummy variable						
$LimAcc_{DR}$	25,554	0.445	0.000	0.497	0.000	1.000
WW	25,554	-0.331	-0.328	0.092	-0.579	-0.031
Panel C: Proxies for *MP* (stock mispricing)						
MP_{FR}	25,554	-0.207	-0.039	0.883	-11.875	0.966
Panel D: Control variables						
Q	25,504	1.566	1.249	1.086	0.496	23.945
Size	25,554	6.383	6.184	1.835	1.173	10.735
Leverage	25,514	0.213	0.205	0.205	0.000	0.878
CashHoldings	25,554	0.103	0.060	0.119	0.000	0.913
Sales	25,554	1.303	1.231	0.554	0.013	5.152
ΔNWC	25,260	0.012	0.010	0.064	-0.699	0.648
Panel E: Additional variables for robustness checking analysis						
MP_{RKRV}	29,765	0.205	0.032	0.826	-1.960	9.316
VA_{RKRV}	29,765	1.404	1.295	0.499	0.648	4.705

(especially the cash flow coefficient) estimation in unknown directions. To mitigate this problem, my second estimation strategy uses the Erickson and Whited (2000, 2002) Generalized Method of Moments (GMM) estimation procedure to correct for the measurement and equation errors. For robustness, I perform all third-, fourth- and fifth-order Generalized Method of Moments (GMM3, GMM4 and GMM5) for the estimations.[46]

A further problem of the analysis is also related to the market-to-book assets ratio. *M/B* is widely used in the literature as a proxy for mispricing (see e.g., Jung, Kim, and Stulz, 1996; Baker et al., 2003; and Dong et al., 2012). Therefore, *M/B* not only contains information about the firm's investment profitability but might also capture mispricing. To mitigate this problem, in my third estimation approach I employ a decomposition of market-to-book assets ratio method to estimate equations (4.11) and (4.12). Using equation (4.10), I decompose *M/B* into two components: a fundamental component (*VA*) and a non-fundamental mispricing component (*MP*). This method offers two advantages. First, it allows us to extract the fundamental component of *M/B* and provides a better proxy of *Q*. Second, it offers an alternative proxy of mispricing. I then estimate the equations by replacing *VA* as a proxy of *Q* and *MP* as a proxy of mispricing.

4.4 Empirical Results

Table 4.3 reports the regression results of equation (4.11) using: (1) OLS estimation and future return as a mispricing proxy, (2) GMM3, GMM4, and GMM5 estimation procedures and future return as a mispricing proxy, and (3) OLS estimation using decomposition of market-to-book assets ratio method.[47] The estimated coefficient α_{MP} has the expected sign (negative) in 4 out of 5 cases, supporting the financial flexibility hypothesis (Hypothesis I). All but two of these estimated coefficients are individually significant at conventional levels

[46] The STATA code for Erickson and Whited (2000, 2002) GMM estimation procedure can be found on Toni Whited's website at http://research.bus.wisc.edu/whited/ewestimators.html.

[47] To conserve space, I report only the coefficients of interest.

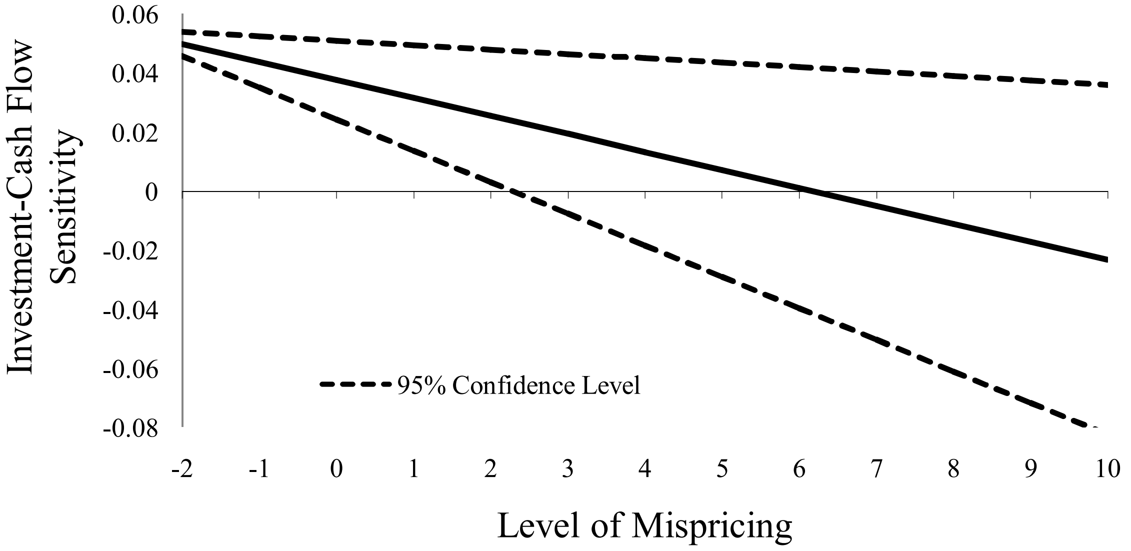
Table 4.3: Results for Modeling Mispricing and Financial Flexibility
This table reports the outcome of estimating Equation (4.11) outlined in the text. The dependent variable is Investment (scaled net investment in plant, property & equipment). All variable definitions are given in Table 4.1. The data are obtained from COMPUSTAT and CRSP for the period 1971- 2008. The sample consists of 1,310 US manufacturing firms (SICs 2000 to 3999). Firms excluded from the final sample: those with market capitalization of equity less than USD 15m or with less than 15 years of available data and those with negative cash flow and abnormal growth. Coefficients significant at the 10%, 5% and 1% levels are indicated by *, ** and ***, respectively, and associated t-statistics are presented in parentheses.

	Future Return				*RKRV*
	OLS	GMM3	GMM4	GMM5	OLS
CashFlow(CF)	0.076***	0.015*	0.038***	0.038***	0.081***
	(5.45)	(1.28)	(5.62)	(5.54)	(7.62)
*CF * MP*	0.002	-0.004	-0.008**	-0.006***	-0.007**
	(0.27)	(1.20)	(2.20)	(2.60)	(1.67)
MP	0.003	-0.000	0.002	-0.000	0.029***
	(1.07)	(0.05)	(0.82)	(0.02)	(6.20)
Q	0.028***	0.123***	5.227***	-2.151***	
	(8.26)	(11.48)	(43.51)	(2.57)	
VA_{RKRV}					0.053***
					(7.75)
R-sqaured	0.22				0.22
Observations	24,889	25,204	25,204	25,204	29,105

(the exceptions are the OLS regressions and GMM3 procedure using future return as mispricing proxy). These results generally suggest that firms exhibit lower (higher) investment-cash flow sensitivity during periods of overvaluation (undervaluation) and confirms that firms do utilize their financial flexibility to adjust their internal and external sources of financing to take advantage of mispricing.

To more deeply explore these findings, the solid line in Figure 4.1 graphically displays the impact of mispricing (*MP*) on the investment-cash flow sensitivity. This line is given by $\frac{\partial Investment}{\partial CashFlow} = (\alpha_1 + \alpha_{MP}MP)$, where the slope is α_{MP}. The 95% confidence bounds are shown by the two dotted lines and, thus, the sensitivity is statistically significant from zero if and only if the upper and lower bounds of the confidence interval are both above (or below) zero. According to the Figure 4.1, it is clear that the positive impact of cash flow on investment reduces as mispricing increases. This is consistent with the *Financial Flexibility Hypothesis* that firms substitute external financing for internal financing as they become more

Figure 4.1: The Impact of Mispricing on Investment-Cash Flow Sensitivity



overvalued. The investment-cash flow sensitivity becomes statistically insignificant from zero once mispricing reaches a value of 2.28. In other words, the positive sensitivity declines with mispricing and disappears once mispricing reaches that level. However, given that the maximum sample value of mispricing is 0.966, it suggests that the influence of mispricing on the investment-cash flow sensitivity never totally dominates the underlying positive sensitivity effect in my sample.

Table 4.4 reports the regression results for equation (4.12) using OLS estimation and future return as the mispricing proxy. Firms are distinguished between limited access and greater access categories based on debt rating and the *WW* index, as outlined earlier. Two key observations are worthy of note from Panel A of Table 4.4. First, in both cases the estimated coefficient α_{MP} has the expected (negative) sign and is statistically significant, clearly supporting Hypothesis I. Again, these results suggest that firms with greater access to external markets do utilize their financial flexibility to adjust their internal and external sources of financing to take advantage of mispricing.

Table 4.4: Results for Modeling Accessibility to External Financing, Mispricing and Financial Flexibility – Future Return Proxy for Mispricing

This table reports the results of equation (4.12) using OLS estimation with standard errors clustered by firm (Petersen, 2009) and Future Return as a proxy for stock mispricing. The dependent variable is Investment (scaled net investment in plant, property & equipment). All variable definitions are given in Table 4.1. The data are obtained from COMPUSTAT and CRSP for the period 1971- 2008. The sample consists of 1,310 US manufacturing firms (SICs 2000 to 3999). Firms excluded from the final sample: those with market capitalization of equity less than USD 15m or with less than 15 years of available data and those with negative cash flow and abnormal growth. Coefficients significant at the 10%, 5% and 1% levels are indicated by *, ** and ***, respectively, and associated t-statistics are presented in parentheses.

	DR	*WW*
Panel A: Regression Results		
CashFlow(CF)	0.133***	0.080***
	(9.82)	(6.08)
*CF * MP*	-0.020**	-0.024**
	(2.22)	(1.92)
*CF*LA*MP*	0.026***	0.027**
	(2.37)	(1.89)
Q	0.025***	0.029***
	(7.56)	(8.07)
R-squared	0.23	0.22
Observations	24,889	24,889
Panel B: F-Test Results		
$\alpha_{MP} + \alpha_{\Delta LM}$	0.006	0.003
F-Stat	0.86	0.21
P-value	0.3530	0.6506
Observations	24,889	24,889

Second, the coefficient estimates for $\alpha_{\Delta LM}$ are positive and, clearly supports the prediction of the greater access – more financially flexible hypothesis (Hypothesis II). Both of the estimated coefficients are individually significant at conventional levels. Results indicate that firms with limited access to external markets are less flexible (if not impossible) in adjusting their internal and external sources of financing for investment in response to mispricing. The investment of such firms is more dependent on internal cash flow than their greater access counterparts.

Panel B reports results for tests of Hypothesis III, the inflexibility hypothesis. F-tests are conducted to test whether $\alpha_{MP} + \alpha_{\Delta LM} = 0$. None of the F-tests show significance for the coefficient sum. This provides strong support for Hypothesis III - the investment-cash flow sensitivity of firms with limited access to external capital markets is statistically invariant to overvaluation and undervaluation episodes.

Table 4.5 reports the regression results of equation (4.12) using GMM3, GMM4, and GMM5 procedures. The GMM estimates provide support for my hypotheses. All of the estimated coefficients for α_{MP} have the expected (negative) sign and most (5 out of 6) of them are significant at conventional levels, reinforcing support for Hypothesis I. Results also provide some support for Hypothesis II. Most (5 out of 6) of the estimated coefficients for $\alpha_{\Delta LM}$ have the expected (positive) sign and all of these are significant at conventional levels. For Hypothesis III, most of the F-tests show insignificance for the sum of α_{MP} and $\alpha_{\Delta LM}$ which again finds strong support for Hypothesis III. The only exception is the GMM3 procedure where debt rating (*DR*) is used as a proxy for the degree of external market accessibility. However, the coefficient sum for limited access firms ($\alpha_{MP} + \alpha_{\Delta LM}$; 0.029) is greater than the coefficient for greater access firms (α_{MP}; -0.007) which suggests that limited access firms are less flexible (if not inflexible) to react to mispricing.

Table 4.6 reports the regression results of equation (4.12) using decomposition of market-to-book assets ratio method. The results reported in Table 4.6 are similar to that of in Table 4.4. All of the estimated coefficients for α_{MP} have the expected sign and are significant at conventional levels, providing strong support for Hypothesis I. However, results provide little support for Hypothesis II, with only one of the estimated coefficients for $\alpha_{\Delta LM}$ have the expected sign but it is not significant at conventional levels. F-tests, give some support for Hypothesis III - they show insignificance for the sum of α_{MP} and $\alpha_{\Delta LM}$ in the case where the *WW Index* is employed to proxy for accessibility to external markets. However, the coefficient sum is statistically significant in the *DR* case.

Table 4.5: Results for Modeling Accessibility to External Financing, Mispricing and Financial Flexibility – Future Return Proxy for Mispricing

This table reports the results of equation (4.12) using GMM estimation procedures (Erickson and Whited, 2000; 2002) and Future Return as a proxy for stock mispricing. The dependent variable is Investment (scaled net investment in plant, property & equipment). All variable definitions are given in Table 4.1. The data are obtained from COMPUSTAT and CRSP for the period 1971- 2008. The sample consists of 1,310 US manufacturing firms (SICs 2000 to 3999). Firms excluded from the final sample: those with market capitalization of equity less than USD 15m or with less than 15 years of available data and those with negative cash flow and abnormal growth. Coefficients significant at the 10%, 5% and 1% levels are indicated by *, ** and ***, respectively, and associated t-statistics are presented in parentheses.

GMM3	*DR*	*WW*
Regression Results		
Q	0.122***	0.115***
	(11.74)	(11.77)
CashFlow (CF)	0.031**	-0.041**
	(1.77)	(2.23)
*CF * MP*	-0.007	-0.014*
	(0.80)	(1.46)
*CF*LA*MP*	0.036***	0.023**
	(3.17)	(1.72)
F-Test Results		
$\alpha_{MP} + \alpha_{\Delta LM}$	0.029	0.009
F-Stat	4.36	0.30
P-value	0.0368	0.5845
Observations	25,204	25,204
GMM4	*DR*	*WW*
Regression Results		
Q	0.004***	5.708***
	(5.91)	(44.84)
CashFlow (CF)	0.033***	0.006
	(2.77)	(0.53)
*CF * MP*	-0.022***	-0.037***
	(3.34)	(4.59)
*CF*LA*MP*	0.033***	0.018*
	(3.35)	(1.60)
F-Test Results		
$\alpha_{MP} + \alpha_{\Delta LM}$	0.011	-0.019
F-Stat	0.88	1.76
P-value	0.3477	0.1852
Observations	25,204	25,204
GMM5	*DR*	*WW*
Regression Results		
Q	5.421***	5.480***
	(6.52)	(3.41)
CashFlow (CF)	0.024***	0.025***
	(2.38)	(2.48)
*CF * MP*	-0.032***	-0.014**
	(6.13)	(2.13)
*CF*LA*MP*	0.031***	-0.003
	(3.28)	(0.34)
F-Test Results		
$\alpha_{MP} + \alpha_{\Delta LM}$	-0.001	-0.017
F-Stat	0.02	2.37
P-value	0.8855	0.1238
Observations	25,204	25,204

Table 4.6: Results for Modeling Accessibility to External Financing, Mispricing and Financial Flexibility – RKRV Mispricing Proxy

This table reports the results of equation (4.12) using OLS estimation with standard errors clustered by firm (Petersen, 2009) and the Rhodes-Kropf et al. (2005) (RKRV) method to measure the level of stock mispricing. The dependent variable is Investment (scaled net investment in plant, property & equipment). All variable definitions are given in Table 4.1. The data are obtained from COMPUSTAT and CRSP for the period 1971- 2008. The sample consists of 1,310 US manufacturing firms (SICs 2000 to 3999). Firms excluded from the final sample: those with market capitalization of equity less than USD 15m or with less than 15 years of available data and those with negative cash flow and abnormal growth. Coefficients significant at the 10%, 5% and 1% levels are indicated by *, ** and ***, respectively, and associated t-statistics are presented in parentheses.

	DR	*WW*
Panel A: Regression Results		
CashFlow(CF)	0.130***	0.100***
	(9.08)	(10.86)
*CF * MP*	-0.009**	-0.008***
	(1.94)	(2.47)
*CF*LA*MP*	0.001	-0.001
	(0.12)	(0.20)
VA_{RKRV}	0.052***	0.057***
	(8.06)	(8.66)
R-squared	0.23	0.23
Observations	29,105	29,105
Panel B: F-Test Results		
$\alpha_{MP} + \alpha_{\Delta LM}$	-0.008	-0.009
F-Stat	3.26	2.20
P-value	0.0714	0.1379
Observations	29,105	29,105

There are several potential problems in this empirical setting that might lead to inaccurate results. To ensure that the results are robust, I conduct extra empirical analyses using alternative settings which are reported in Table 4.7. First, I re-estimate equation (4.12) using OLS and correct the estimation for heteroskedasticity and clustering using the White-Huber (*WH*) estimator. The results are highly consistent with that estimated using OLS with standard errors clustered by firm.

To avoid the possibility of biased results as a consequence of omitted variables in the regression equations, various control variables were included. As a robustness check, I re-estimate equation (4.12) by controlling only for *Q*. The results are similar to that of controlling for all variables. In other words, the potential problem of omitted variables does not seem to be an issue.

The classification scheme for external financing accessibility relies on the "median-sort" method because it preserves the number of observations for empirical analysis. To provide a clearer separation of "limited access" and "greater access" firms, I re-estimate equation (4.12) using the "tercile-sort" method. Specifically, a firm is classified into the "limited access" ("greater access") group if its WW index score is in the top (bottom) tercile (33%) of the distribution. Once again, the results provide strong support for all hypotheses.

Bushman et al. (2012) argue that the indirect cash flow proxy typically used in all previous studies of investment-cash flow sensitivity (earnings before depreciation) not only serves as a proxy for internal cash flow, but is also a noisy proxy for non-cash working capital. Accordingly, I employ a direct cash flow proxy – cash flow from operations. To ensure that the results are not driven by the choice of cash flow definition. I also conduct the empirical analysis using the conventional cash flow proxy (earnings before depreciation). The results are similar to that of using free cash flow from operation as a cash flow proxy.

Overall, the outcome of the robustness tests reported in Table 4.7 provides strong support for all hypotheses. First, all but one of the estimated coefficients for α_{MP} have the expected (negative) sign and several of them are significant at conventional levels reinforcing support for Hypothesis I. Second, all but one of the estimated coefficients for $\alpha_{\Delta LM}$ have the expected (positive) sign and 5 out of 7 are significant at conventional levels, supporting the predictions of Hypothesis II. None of the F-tests show insignificance for the sum of α_{MP} and $\alpha_{\Delta LM}$, which is clearly in favor of Hypothesis III.

Table 4.7: Results for Modeling Accessibility to External Financing, Mispricing and Financial Flexibility – Alternative Empirical Settings

This table reports the results of equation (4.12) using alternative empirical settings and Future Return as a proxy for stock mispricing. The dependent variable is Investment (scaled net investment in plant, property & equipment). All variable definitions are given in Table 4.1. The data are obtained from COMPUSTAT and CRSP for the period 1971- 2008. The sample consists of 1,310 US manufacturing firms (SICs 2000 to 3999). Firms excluded from the final sample: those with market capitalization of equity less than USD 15m or with less than 15 years of available data and those with negative cash flow and abnormal growth. Coefficients significant at the 10%, 5% and 1% levels are indicated by *, ** and ***, respectively, and associated t-statistics are presented in parentheses.

	WH Estimator		*Controlling only for Q*		*Tercile-Sort*	*Conventional CF Proxy*	
	DR	*WW*	*DR*	*WW*	*WW*	*DR*	*WW*
Panel A: Regression Results							
CashFlow(CF)	0.121***	0.067***	0.122***	0.065***	0.110***	0.136***	0.082***
	(5.31)	(6.63)	(8.57)	(5.72)	(9.11)	(8.32)	(5.42)
*CF * MP*	-0.013	-0.014*	-0.015*	-0.014	-0.024*	0.006	-0.012
	(1.19)	(1.48)	(1.53)	(1.18)	(1.59)	(0.42)	(0.99)
*CF*LA*MP*	0.020**	0.020**	0.023**	0.020*	0.028*	-0.003	0.015
	(1.66)	(1.81)	(2.02)	(1.45)	(1.64)	(0.22)	(1.07)
Q	0.029***	0.031***	0.039***	0.042***	0.024***	0.024***	0.028***
	(8.80)	(8.99)	(10.86)	(11.47)	(5.67)	(7.29)	(8.01)
R-squared	0.39	0.39	0.17	0.17	0.23	0.23	0.22
Observations	24,889	24,889	25,204	25,204	16,546	24,889	24,889
Panel B: F-Test Results							
$\alpha_{MP} + \alpha_{\Delta LM}$	0.007	0.006	0.008	0.006	0.004	0.003	0.003
F-Stat	2.31	1.16	1.87	0.78	0.24	0.14	0.17
P-value	0.1289	0.2809	0.1714	0.3779	0.6212	0.7091	0.6767
Observations	24,889	24,889	25,204	25,204	16,546	24,889	24,889

4.5 Conclusion

This study examines the joint impact of accessibility to external financing and mispricing on investment-cash flow sensitivity. I perform the empirical analysis on a sample of US manufacturing firms, over the period 1971 to 2008. I find that firms with greater access to external capital markets are financially more flexible in adjusting their financing policies, compared to firms with limited access, in response to their own stock mispricing. Moreover, the investment-cash flow sensitivity of limited access firms is negligibly affected by the level of mispricing.

Chapter 5

Testing the Impact of Life Cycle Theory on Corporate Policies

5.1 Introduction

In this study, I examine the importance of life cycle theory as a determinant of corporate decisions, including investment, cash holdings, payout, and financing decisions. It is important to look at a firm's life cycle stage because the influence of firm characteristics on corporate policy decision making, varies from one stage to another. Moreover, organizational structures, business strategies and firms experience differ at each stage (Adizes, 1979; and Miller and Friesen, 1984). However, very little research has been done on the influences of life cycle on various corporate policies. Recent exceptions include DeAngelo et al. (2006, 2010) and Grullon et al. (2002).

DeAngelo et al. (2006) is one of the first studies to examine the impact of firm maturity on payout policy. They use the mix of earned and contributed capital (i.e. the ratios of retained earnings to total equity (*RETE*) and to total assets (*RETA*), respectively) to proxy for a firm's life cycle. The advantage of the earned/contributed capital ratio is that it indicates whether a firm is in its capital infusion stage (i.e. young) or self-financing stage (i.e. mature). DeAngelo et al. (2006) find that dividends are more likely to be paid by mature firms because agency cost of free cash flow encourages firms to distribute profits through payouts. In contrast, young firms are less likely to distribute dividends because the cost of information asymmetry and other flotation costs force them to set high plowback rates.

Grullon et al. (2002) examine the signalling effect of dividend payout policy. They provide evidence showing that the reaction of financial markets to the changes in firms' dividends payout is not a reflection of cash signalling but rather an indication of firms' maturity.

DeAngelo et al. (2010) investigate the influence of firm maturity on its propensity to conduct seasoned equity offerings. They find that mature firms are less likely to conduct seasoned equity offerings even when they are overvalued.

This study extends the literature by relating firm life cycle theory to other corporate decisions, including investment, cash holdings and financing decisions. First, young firms should invest more since they are in expansion stage, and thus, face relatively abundant investment opportunities. Firms reduce investment when they are mature as growth opportunities become limited. Second, firms tend to have higher accumulated profits as they mature, so mature firms should be less reliant on external financing. These firms should have sufficient internal funds for financing when the need arises. Third, Opler et al. (1999) suggest that one of the main reasons firms hoard cash for precautionary purposes. Given that mature firms are relatively well-established and profitable, they could easily raise funds when the need arises, so there is less need of building cash reserves.

I also develop a simple theoretical model to illustrate how a firm's investment activity, external finance, and cash policies evolve over various stages of the life cycle. The model provides the following predictions. First, firms increase their investment when they are young and reduce their investment when they become more mature. Second, more mature firms tend to issue less (or may retire) equity, since they are facing higher costs of adverse selection. Third, due to their limited capacity in servicing debt, firms tend to issue very little (or not issue) debt when they are young, they will gradually issue more debt in their intermediate stages, and issue less (or retire) debt when they become more mature. The prediction regarding the effect of firms' maturity on their cash policy is unclear. Firms may reduce their cash holdings when they are young due to the high investment demand and costly equity financing. They may hoard more cash in their intermediate stages and reduce cash holdings when they become more mature.

I test the model's empirical implications using US data which comprises more than 11,000 firms with more than 88,000 firm-years observations over the 1973-2008 period. The regression analysis applies the Fama and MacBeth (1973) method.

Following DeAngelo et al. (2006), and Owen and Yawson (2010), I employ the earned/contributed capital ratio as a proxy for firm life cycle. Consistent with the idea that mature firms face relatively less growth opportunities and have higher accumulated profits, I find that firms invest less, issue less equity, hoard less cash and pay higher dividends as they mature.

To take a closer look at the impact of firms' life cycle on corporate policies, I augment the regression equations to include interaction terms of firm life cycle with firm life cycle dummies, namely young and mature stages. I find that investment and equity issuance decrease monotonically, dividend payouts increase monotonically as firms mature. However, the influence on debt financing and cash holding policies are non-monotonic. Firms increase their reliance on debt financing as they move from the young to the intermediate stage, and then decrease as they move to the mature stage. Firm life cycle stage influences a firm's cash policy only when they become mature – firms reduce cash as they enter the mature stage.

Logit analysis is also undertaken to investigate the influence of life cycle on the propensity to increase investment, raise external funds, hoard cash and pay dividends. I find that the propensities to increase investment and issue equity decrease monotonically as firms mature. The latter finding is consistent with that of DeAngelo et al (2010). Consistent with DeAngelo et al (2006), Denis and Osobov (2008), and Chay and Suh (2009), the propensity to pay dividends increases monotonically with firms maturity. Firms are more likely to issue debt in the intermediate stage and less likely in the early and mature stages. Life cycle stage starts to influence the propensity to hoard cash only when firms enter the mature stage – mature firms are less likely to hoard cash.

To address the potential endogeneity between a firm's life cycle and its corporate policies, I employ the Two Stage Least Squares (2SLS) procedure. I use the average earned/contributed capital ratios of the industry, firms with similar size and growth, respectively, as instruments. Results are generally consistent. Overall, the evidence indicates that firm life cycle, which reflects a firm's financing needs, and reliance on internal and external capital, is relevant to corporate policy decision making.

The remainder of this chapter is organized as follows. Section 5.2 provides a simple theoretical illustration. Section 5.3 outlines the proposed hypotheses and the empirical models. Section 5.4 outlines the details of the sample, and presents the results. Section 5.5 concludes the chapter.

5.2 A Simple Theoretical Illustration

Denote m as the measure of a firm's maturity, and m increases as a firm becomes more mature. Consider a firm at stage m has access to a production technology. Further, denote I as the level of the firm's investment and $\theta(m)F(I)$ as its corresponding value of production. F is an increasing and concave production function $(\text{i.e. } F' > 0 \text{ and } F'' < 0)$ and θ measures the firm's growth opportunities at stage m. Let's assume that the evolution of growth opportunities over a firm's life cycle follows an S-shaped curve as depicted in Figure 5.1, which implies $\theta'(m) \geq 0$ for some $m \leq \bar{m}$ and $\theta'(m) < 0$ for some $m > \bar{m}$.

The characteristic of an S-shaped life cycle curve is supported by Rogers's theory of diffusion and adoption of a new product (Rogers, 1962). An S-shaped sales growth life cycle curve is well-documented in the literature (see e.g., Porter, 2004; Rogers, 1962; Patton, 1959; Polli and Cook, 1969; Brockhoff, 1967; and Polli, 1968). Although Rogers's theory is commonly used to describe the evolution of sales growth of an industry or a new product, it has also been widely applied to describe a firm's life cycle (see e.g., Kimberly and Miles, 1980; Quinn and Cameron, 1983; and Miller and Friesen, 1984). The rationale behind the application of Rogers's theory on a firm's growth life cycle is that; sales are low in a new firm, because few consumers are aware of the goods (or services) provided. With more firm experience, market power and consumer recognition and acceptance, sales begin to increase at an increasing rate. However, the rate of growth in sales will diminish as more competitors enter the market. Sales will reach a plateau when a firm matures. Finally, sales will eventually taper off as most of the mass market has already purchased the products or new substitutes appear in the market. A firm failing to innovate in this stage will lead to declining sales.

Note that the results in this paper do not rely on the assumption of an S-shaped life cycle curve. Previous studies also document a Bell-shaped life cycle curve (see e.g., Polli and Cook, 1969; Porter, 2004; Buzzell, 1966; Frederixon, 1969; and Headen, 1966). The results also hold for any Bell-shaped life cycle curves.[48]

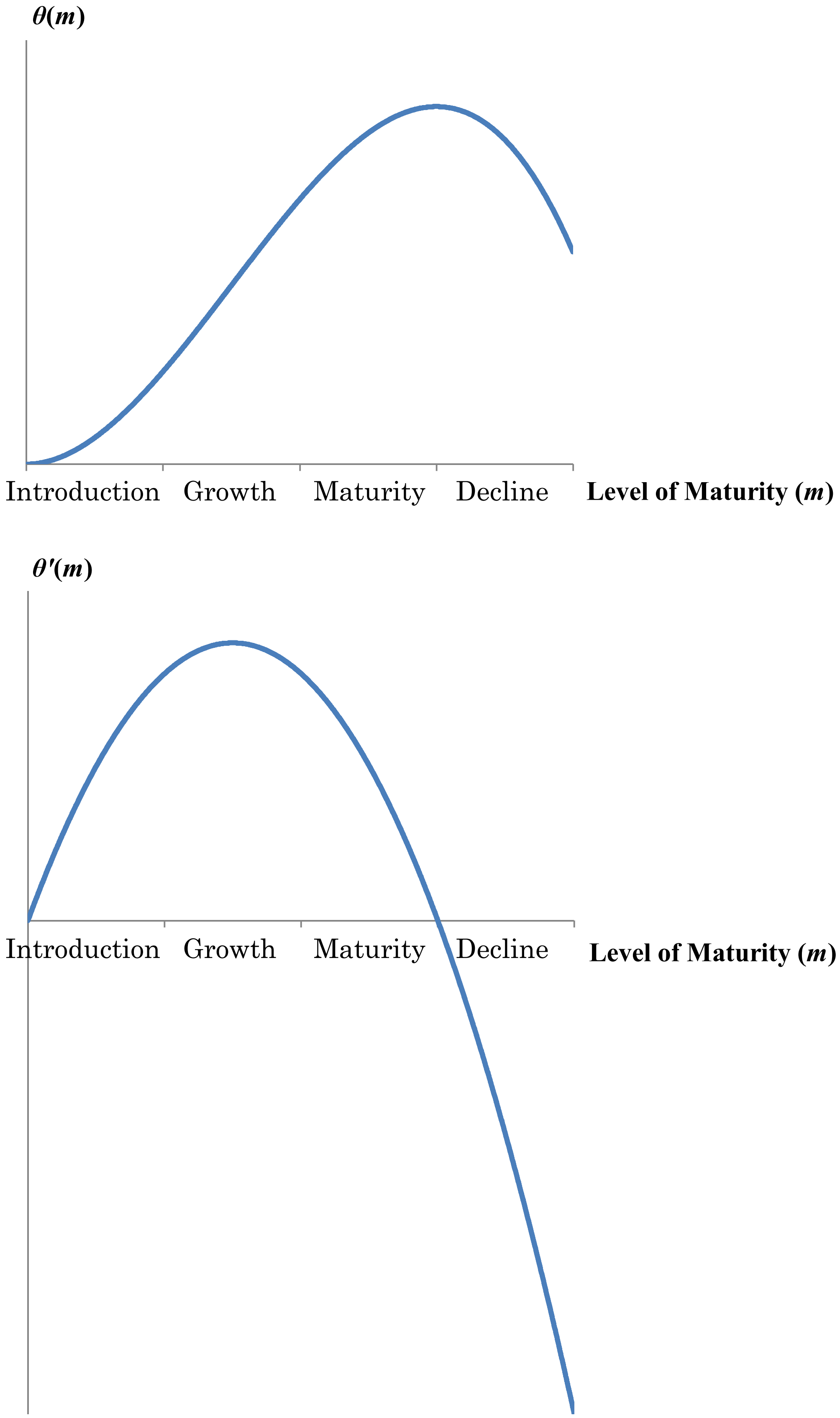
The firm also has assets in place which generate cash flow denoted by $c(m)$. I assume that $c(m)$ increases in earlier years and decreases when the firm becomes mature (see e.g., Miller and Friesen, 1984).[49] This pattern is well-documented in the business strategy literature (e.g., Porter, 2004).

The firm has access to external financial markets. I denote E and D as the level of equity and debt finance, respectively. The use of external finance involves deadweight costs.[50] I denote $H(E,m)$ and $G\big(D,c(m)\big)$ as the deadweight costs of equity and debt

[48] I can also view θ as the number of available investment opportunities and F as the value per unit of investment opportunity; or θ as the gross profit margin per unit of production and F as the number of units of production. Both investment opportunities and the gross profit margin of a firm are expected to increase in the earlier stage and decrease as the firm becomes more mature. Note that this assumption does not allow firms to influence the shape of the growth curve via product innovation and repositioning. Moreover, the objective of this simple model is not to examine what factors drive an S-shaped corporate life cycle. Instead, given an S-shaped corporate life cycle, this model examines how firms' corporate policies change as they age.

[49] This assumption implies that $c'(m) \geq 0$ for some $m \leq \dot{m}$ and $c(m) < 0$ for some $m > \dot{m}$.

Figure 5.1: S-shape Characterisation of the Firm Growth Life Cycle



[50] See e.g., Myers and Majluf (1984), Myers (1984), and Greenwald, Stiglitz and Weiss (1984) for the deadweight cost of equity and Myers (1977) for the deadweight cost of debt.

finance, respectively, where H and G are increasing and convex with respect to the level of equity and debt (i.e. $H_1 > 0, H_{11} > 0, G_1 > 0$ and $G_{11} > 0$).[51]

The deadweight cost of equity is also a function of the firm's maturity. Firms' investment needs generally exceed internally generated funds in their earlier years; hence firms issue equity in their earlier years to finance value-enhancing investment. In later years, however, firms' internal funds exceed their investment needs, thus adverse selection problems become more severe (DeAngelo and DeAngelo, 2006; and DeAngelo et al., 2006). In other words, mature firms that issue equity, when the market views it unnecessary, send a strong signal of equity overvaluation. Thus, the cost and the marginal cost of equity are assumed to be higher when the firm becomes more mature (i.e. $H_2 > 0, H_{12} > 0$).

The influence of a firm's maturity on the deadweight cost of debt is less straightforward. A firm's cost of debt is influenced by its ability in servicing its debt and a firm with more (less) cash flow has stronger (weaker) ability. Thus, I assume the cost and the marginal cost of debt reduces as the level of the firm's cash flow increases (i.e. $G_2 < 0, G_{12} < 0$).

For dividend policy, I follow DeAngelo et al. (2006) by assuming that firms incorporate the life cycle trade-off between the benefits and costs of retention when making their payout decisions. Thus, after-dividend cash retention is not influenced by the life cycle trade-off. Nevertheless, to account for the benefit (or cost) from holding cash (see e.g., Dittmar and Mahrt-Smith, 2007; and Faulkender and Wang, 2006), I denote $\bar{\pi}$ as the gross benefit (or cost) of cash holding.

The firm's manager who acts in the best interests of existing shareholders makes optimal investment, external financing, and cash holding decisions (I, E, D, C) in order to maximize the following objective function:

---

[51] A convex cost function has been widely used in the literature (e.g., Froot, Scharfstein, and Stein, 1993; and Stein, 2003). Altinkilic and Hansen (2000) show that debt and equity issuance costs consist of both a fixed cost and a convex variable cost. Leary and Roberts (2005) show that the observed dynamics of leverage ratios is consistent with a cost function of external finance that has a fixed and an increasing and weakly convex component.

$$\max_{I,E,C} \theta(m)\,F(I) - H(E,m) - G\big(D,c(m)\big) + \bar{\pi}C - I - C \tag{5.1a}$$

$$\text{s.t.} I + C = c(m) + E + D \tag{5.1b}$$

The first order conditions (*FOCs*) of problem (5.1) are:

$$\theta(m)F'(I) = 1 + G_1\big(D,c(m)\big) \tag{5.2}$$

$$H_1(E,m) = G_1\big(D,c(m)\big) \tag{5.3}$$

$$\bar{\pi} = 1 + G_1\big(D,c(m)\big) \tag{5.4}$$

Using *FOCs* (5.2) – (5.4), I can show that:

$$\frac{dI}{dm} = -\frac{F'}{\theta F''}\theta', \tag{5.5}$$

$$\frac{dE}{dm} = -\frac{H_{12}}{H_{11}}, \tag{5.6}$$

$$\frac{dD}{dm} = -\frac{G_{12}}{G_{11}}c', \tag{5.7}$$

and

$$\frac{dC}{dm} = \frac{(G_{11}-G_{12})}{G_{11}}c' + \frac{F'\theta'}{\theta F''} - \frac{H_{12}}{H_{11}}. \tag{5.8}$$

Equations (5.5) – (5.8) suggest the following predictions. First, firms increase their investment when they are young and reduce their investment when they become more mature. Second, more mature firms tend to issue less (or could retire) equity since they are facing higher costs of adverse selection. Third, due to their limited capacity in servicing debt, firms tend to issue very little (or not issue) debt when they are young, they will gradually issue more debt in their intermediate stages, and issue less (or retire) debt when they become more mature. The prediction regarding the effect of firms' maturity on their cash policy is unclear. Firms might reduce their cash holdings when they are young due to the high investment demand and costly equity financing. They might hoard more cash in their intermediate stages and reduce cash holdings when they become more mature.

Table 5.1: Descriptive Statistics – Firm Maturity and Corporate Policies

This table reports the mean values of corporate policies within each Life Cycle quintiles. Firms are sorted into five quintiles based on *RETE* and *RETA*, respectively. *INVT* is defined as capital expenditures scaled by lagged assets. *DISS* measures long-term (net) debt issuance. *EQUISS* measures net equity issuance scaled by lagged assets. *ΔCashHoldings* is defined as cash plus marketable securities scaled by lagged assets. *PAYOUT* is defined as cash dividends plus share repurchases scaled by lagged assets. All variable definitions are given in Table 5.2. The data are obtained from COMPUSTAT and CRSP for the period 1973- 2008. The final sample consists of over 11,000 US firms with CRSP share codes 10 or 11. Firms excluded from the final sample: those with abnormal growth and those with less than USD 10 million market capitalization.

Life Cycle Quintiles (*RETE*)		*INVT*	*DISS*	*EQUISS*	*ΔCashHoldings*	*PAYOUT*
Young	1	0.064	0.003	0.085	-0.010	0.170
	2	0.090	0.010	0.021	-0.013	0.152
	3	0.095	0.014	0.007	-0.008	0.171
	4	0.090	0.011	-0.002	-0.006	0.198
Mature	5	0.077	0.009	-0.016	-0.005	0.330
Life Cycle Quintiles (*RETA*)		*INVT*	*DISS*	*EQUISS*	*ΔCashHoldings*	*PAYOUT*
Young	1	0.064	0.001	0.086	-0.010	0.168
	2	0.093	0.020	0.015	-0.013	0.158
	3	0.092	0.015	0.008	-0.009	0.172
	4	0.090	0.010	0.000	-0.006	0.205
Mature	5	0.077	0.000	-0.012	-0.003	0.318

Table 5.1 reports the mean values of dividends, equity and debt financing, investment, and cash holdings of US firms for each life cycle quintile. The evolution of corporate policies over various stages of the life cycle is consistent with the predictions of equations (5.5) – (5.8).

5.3 Empirical Framework

5.3.1 Proxies for Life Cycle Stage

Following DeAngelo et al. (2006), and Owen and Yawson (2010), a firm's life cycle stage is measured by the mix of earned and contributed capital, i.e. the ratios of retained earnings to total common equity ($RETE$) and retained earnings to total assets ($RETA$). $RETE$ and $RETA$ are good proxies for a firm's financial life cycle stage since the composition of its equity and the extent to which its total assets are financed by earned equity indicate whether a firm is in a self-financing (i.e. firms with high $RETE$ or $RETA$) or capital infusion (i.e. firms with low $RETE$ or $RETA$) stage.[52]

5.3.2 Empirical Models

Regression and logit analyses are conducted to examine the impact of firms' life cycle on various corporate policies. The Fama and Macbeth (1973) approach is utilized for the analyses: cross-sectional regression and logit analyses are undertaken separately for each of the 36 sample years. Specifically, I use regression models to investigate the impact of life cycle stage on (a) dividend payout, (b) investment, (c) external financing, and (d) incremental cash holdings. I also undertake logit analysis to examine the impact of life cycle on the propensity to (a) pay dividends, (b) increase investment, (c) raise external funds, and (d) hoard cash.

The regression and logit analyses can be written as:

$$[CP]_y = \alpha_0 + \alpha_{LC}LC + \sum_i \alpha_{y,i}X_{y,i} + \varepsilon, \tag{5.9}$$

and

$$[CPDum]_y = \alpha_0 + \alpha_{LC}LC + \sum_i \alpha_{y,i}X_{y,i} + \varepsilon, \tag{5.10}$$

[52] I do not use firm age as a proxy for a firm's life cycle for the following reasons. First, the time required for firms to mature varies across industries. Second, firm age does not necessarily represent maturity. Some firms may stay in the same life cycle stage longer than others. Indeed, a younger firm might actually be more mature than an older firm. Third, the theoretical model in this paper requires firms to have more cash flow and earnings as they mature, this is obviously better represented by the earned to contributed capital mix.

where, LC is the proxy for firms' life cycle (alternatively, *RETE* or *RETA*), X_y are the control variables for corporate policy y. $[CP]_y$ is the corporate policy variable for policy y, where

$$[CP]_y \in [PAYOUT, DISS, EQUISS, INV, \Delta CH],$$

and *PAYOUT* is the sum of cash dividends and share repurchases;[53] *DISS* and *EQUISS* are long-term (net) debt issuance and (net) equity issuance, respectively; *INV* is capital expenditure and ΔCH is defined as changes in cash and marketable securities. $[CPDum]_y$ a is dummy variable for corporate policy y, where

$$[CPDum]_y \in [PAYOUTD, DISSD, EQUISSD, INVD, \Delta CHD]$$

And *PAYOUTD* equals 1 if *PAYOUT* > 0, 0 otherwise; *DISSD* (*EQUISSD*) equals 1 if *DISS* (*EQUISS*) > 0, 0 otherwise; *INVD* equals if $\Delta INV > 0$, 0 otherwise; and ΔCHD equals 1 if $\Delta CH > 0$, 0 otherwise.[54] All variables utilized in this study are defined in Table 5.2. Table 5.3 reports the associated summary statistics. In equations (5.9) and (5.10), coefficient α_{LC} measures the influence of firms' life cycle on the intensity and propensity of firms' corporate policies, respectively.

To further examine the impact of firms' life cycle on corporate policies, I augment the baseline model to include two interaction terms, *LC*YOUNG* and *LC*MATURE*. The extended model can be written as:

$$[CP]_y = \alpha_0 + \alpha_{LC}LC + \alpha_{LY}LC * YOUNG + \alpha_{LM}LC * MATURE + \textstyle\sum_i \alpha_{y,i}X_{y,i} + \varepsilon, \quad (5.11)$$

and

$$[CPDum]_y = \alpha_0 + \alpha_{LC}LC + \alpha_{LY}LC * YOUNG + \alpha_{LM}LC * MATURE + \textstyle\sum_i \alpha_{y,i}X_{y,i} + \varepsilon, \quad (5.12)$$

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[53] Following Chay and Suh (2009), the payout measure includes share repurchases due to its increasing importance as a payout method.

[54] $\Delta INV_{i,t} = INV_{i,t} - AVGINV_{i,t}, where\ AVGINV_{i,t} = \frac{INV_{i,t-1}+INV_{i,t-2}+INV_{i,t-3}+INV_{i,t-4}}{4}$. To avoid capturing investment volatility, I choose a 4-year period for the average investment (*AVGINV*). Results remain consistent when using 3- or 5-year period.

Table 5.2: Variable Definitions

Variable	Definition
Panel A: Core variables	
Investment	[Cash paid for PPE − Sales of PPE] / Lagged capital stock where: PPE is plant, property & equipment
DISS	Long-term (net)debt issuance / Lagged total assets
EQUISS	Net equity issuance / Lagged total assets
ΔCashHoldings	[ΔCash + ΔMarketable securities] / Lagged total assets
PAYOUT	[Dividend + Share repurchases] / Lagged total assets
InvestmentD	Equals 1 if*ΔInvestment* > 0, 0 otherwise
DISSD	Equals 1 if *DISS* > 0, 0 otherwise
EQUISSD	Equals 1 if *EQUISS* > 0, 0 otherwise
ΔCashHoldingsD	Equals 1 if*ΔCashHoldings* > 0, 0 otherwise
PAYOUTD	Equals 1 if*PAYOUT* > 0, 0 otherwise
Panel B: Proxies for Life Cycle Stage	
RETE	Retained earnings / Total earnings
RETA	Retained earnings / Total assets
Panel C: Control Variables	
TE/TA	Total Earnings / Total Assets
Sales Growth	$Sales_{i,t}$/ $Sales_{i,t-1}$
Size	ln [Book value of assets]
ROA	Operating income after depreciation / total assets
CashFlow Uncertainty (CFU)	Standard deviation of monthly stock returns during a year
CashFlow	Cash flow from operations scaled by lagged total assets
Q	Market to Book = [Market value of equity – Book value of equity + Book value of assets] / Book value of total assets
Inventory	Inventory / Total assets
Gross PPE	Gross PPE / Total assets
D/E Ratio	Total debt / Total equity
Leverage	[Short-term debt + Long-term debt] / Book value of total assets
Sales	Sales / Beginning of the period book value of total assets
Δ*NWC*	Change in net working capital, where net working capital = [Current assets – Current liabilities] / Lagged total assets
Acquisition	Acquisitions / Lagged total assets
Δ*STDebt*	Change in short term debt / Total assets

Table 5.3: Summary Statistics

Variable	*Obs.*	*Mean*	*Median*	*Std. Dev.*	*Min*	*Max*
Panel A: Core variables						
Investment	88,622	0.083	0.055	0.093	0.000	0.913
DISS	88,622	0.009	0.000	0.083	-0.366	0.553
EQUISS	88,622	0.019	0.000	0.117	-0.137	1.320
CashHoldings	88,508	-0.008	-0.005	0.125	-1.234	7.584
PAYOUT	77,418	0.181	0.080	0.331	-1.048	2.274
Panel B: Proxies for Life Cycle Stage						
RETE	88,622	-0.268	0.511	3.389	-33.114	1.219
RETA	88,622	-0.028	0.224	1.341	-35.106	0.767
Panel C: Control variables						
TETA	88,622	0.512	0.505	0.209	0.000	0.989
Sales Growth	87,854	0.114	0.101	0.243	-0.904	1.000
Size	88,622	5.295	5.128	1.854	-1.324	10.735
ROA	88,622	0.057	0.088	0.198	-2.859	0.391
CFU	87,612	0.136	0.118	0.078	0.020	0.533
CashFlow	87,961	0.063	0.081	0.163	-2.604	0.529
Q	84,927	1.800	1.291	1.752	0.496	27.796
Inventory	88,043	0.180	0.154	0.160	0.000	0.656
Gross PPE	88,262	0.538	0.472	0.356	0.000	2.068
D/E Ratio	88,400	0.736	0.389	1.620	-8.218	16.770
Leverage	88,364	0.222	0.204	0.183	0.000	0.878
Sales	88,489	1.337	1.210	0.856	0.000	5.152
Δ*NWC*	86,393	0.022	0.013	0.097	-0.699	0.869
Acquisition	84,934	0.022	0.000	0.069	-0.004	0.699
Δ*STDebt*	88,523	0.000	0.000	0.007	-0.175	0.200

where $YOUNG$ ($MATURE$) is a dummy variable which takes a value of one if a firm's earned/contribute capital ratio is in the bottom (top) tercile (33%) of distributions, zero otherwise. In equations (5.11) and (5.12), the coefficient sum $(\alpha_{LC} + \alpha_{LM})$ measures the influence of firms' life cycle on young firms' corporate policies, while α_{LC} and $\alpha_{LC} + \alpha_{LM}$ measure the impact of life cycle on firms in intermediate and mature stage, respectively.

5.3.3 Control Variables

Following previous studies in the literature, I include a variety of control variables in the models.

Investment Model. *CashFlow* is included in the regression due to the well-documented evidence of *investment-cash flow sensitivity* (Fazzari et al., 1988; and Kaplan and Zingales, 1997). *Q*, which captures investment opportunities, is also included (Tobin, 1969). *Size*, the natural log of total assets, is included to control for the differences in capital investment policies due to firm size and maturity. Lang, Ofek and Stulz (1996) suggest that it is important to control for financial leverage (*Leverage*) because it is negatively related to investment. Cash (*CashHoldings*) is added to control the effect of corporate liquidity on investment. *Sales* is defined sales deflated by beginning of the period value of total assets. It is added to control for the effect of changes in demand which is not captured by *Q*. The change in net working capital (ΔNWC) is included because working capital and capital investment are two major competing uses of funds (Fazzari and Peterson, 1993). ΔNWC is defined as the change in the difference between current assets and current liabilities scaled by book value of total assets.

Debt and Equity Models. *CashFlow* is included as a control variable because of its negative impact on external financing (Leary and Roberts, 2005). *Q* is included because the attractiveness of investment opportunities should have influences on financial policy (Almeida and Campello, 2010). Following Almeida and Campello, I also control for *Size*. As suggested by Almeida and Campello (2010), firms might use internal wealth such as cash holdings (*CashHoldings*) and working capitals (*Inventory*) to mitigate the impact of cash flow shocks. Thus, I also control for these two variables. Finally, *Gross PPE* and *D/E ratio* are included as control variables because of their impacts on financial policy (Almeida and Campello, 2010).

Cash Holdings Model. *Cash Flow* is included because of the positive *cash-cash flow sensitivity* documented by Almeida et al. (2004). All other control variables follow those in Almeida et al. (2004): *Size* is included because of economies of scales in cash management. *Q* is included because cash policy is influenced by future investment opportunities for firms that have restricted access to external finance. *Expenditures*, *Acquisitions*, Δ*NWC* and Δ*STDebt* are included as control variables because firms might use their cash balances to finance investment, and working capital and short-term debt can be a substitute for cash holdings.

Dividend Model. *SalesGrowth* and *ROA* are included as control variables due to their impacts on corporate policies (Fama and French, 2001). Following DeAngelo et al. (2006), *Size* is also included as a control variable. Cash flow uncertainty (*CFU*) is included in the model since it is negatively related to a firm's payout as documented by Chay and Suh (2009). *Q* is included as a control variable since it captures investment opportunities which influence corporate payout policy (Fama and French, 2001). *CashHoldings* is also included because firms with higher amount of cash holdings tend to worry less about having insufficient funds for future investment opportunities, thus, might be more likely to pay dividends.

5.4 Empirical Analysis

5.4.1 Data

The data are obtained from *Compustat* and *CRSP,* covering the period 1973 to 2008.[55] Following DeAngelo et al. (2006), and Huang and Ritter (2009), financial (SIC 6000-6999) and utility (SIC 4900-4949) industries are excluded from the sample because the former have relatively low physical capital investment and the latter are under government regulation.[56] To control for the effect of outliers, all variables are winsorized at the 1st and 99th percentile.

[55] DeAngelo et al. (2006) choose 1973 as a starting point for their sample since *CRSP* expands to include Nasdaq firms in 1972. For consistency, my sample also starts in 1973.

[56] It is necessary to exclude utilities because their dividend decision might be a byproduct of regulation (Fama and French, 2001).

To ensure that firms are publicly traded, a firm is included in the sample only if it has *CRSP* share codes 10 or 11 and is incorporated in the US (*FIC*=USA) (Fama and French, 2001; and DeAngelo et al., 2006). Some additional data exclusions are necessary: firms with market capitalization of equity less than USD 10 million or firms with abnormal asset or sales growth (greater than are 100%) are also excluded.[57] The last criterion requires firms to have non-missing values for earnings before extraordinary items (DeAngelo et al., 2006), *RETE*, *RETA*, dividends, net equity issuance, long-term (net) debt issuance, investment and cash holdings. The final sample consists of more than 11,000 firms, producing over 88,000 firm-year observations.

5.4.2 Results

Table 5.4 reports the results of regression analysis of investment on life-cycle stage. Columns 1 and 2 present the outcome of estimating the baseline model in which *RETE* and *RETA* are used to proxy for firms' life cycle, respectively. The coefficient estimate for *RETE* and *RETA* are both negative. However, only the estimate for *RETA* is statistically significant at conventional levels (1% level). This suggests that firms tend to invest less as they become mature. A one-standard deviation increase in *RETE* (*RETA*) is associated with a decrease in *Investment* of 0.09% (2.36%) of total assets. Given that average total assets are $1155 million, the decrease in *Investment* is approximately $1 ($27) million. Columns 3 and 4 report results for estimating the extended model which includes two additional interaction terms (*LC*YOUNG* and *LC*MATURE*). The impact of firms' life cycle on investment policy for firms in young, intermediate and mature stage is given by $\alpha_{LC} + \alpha_{LY}$, α_{LC} and $\alpha_{LC} + \alpha_{LM}$, respectively. The results indicate that the amount of investment undertaken decreases as a firm matures – for example, in column 3, the impact of *RETE* on investment decreases from

[57] According to Gilchrist and Himmelberg (1995), a linear investment model is inappropriate for small firms. Small firms are dropped also because they tend to have severely limited access to the public market (Acharya, Almeida and Campello, 2007). Firms with abnormal growth are also excluded because it implies major corporate events (Almeida et al., 2004; and Almeida and Campello, 2010).

0.001 to -0.013 as firms enter the intermediate stage from the young stage, and it further decreases to -0.025 when firms reach the mature stage. This is consistent with the idea that mature firms tend to have less attractive investment opportunities and limited potential to expand.

Table 5.4: Life Cycle Stages and Corporate Investment Policy

This table reports the outcome of estimating Equations (5.9) and (5.11) as outlined in the text, where *RETE* and *RETA* are used to proxy for a firm's life cycle stage (*LC*). The dependent variable is *Investment* (scaled net investment in plant, property & equipment). *YOUNG* (*MATURE*) is a dummy variable which takes a value of 1 if a firm's earned/contributed capital mix is in the bottom (top) tercile, 0 otherwise. All variable definitions are given in Table 5.2. The data are obtained from COMPUSTAT and CRSP for the period 1973-2008. The sample consists of 11,544 US firms. Firms excluded from the final sample: those with less than USD 10 million market capitalization and those with abnormal growth (asset growth or sales growth greater than 1). The Fama and Macbeth (1973) approach is utilized for the analyses. Coefficients significant at the 10%, 5% and 1% levels are indicated by *, ** and ***, respectively, and associated t-statistics are presented in parentheses.

	(1)	(2)	(3)	(4)
	RETE	*RETA*	*RETE*	*RETA*
LC	-0.000	-0.017***	-0.013***	-0.036***
	(0.75)	(4.03)	(3.61)	(3.62)
*LC*YOUNG*			0.014***	0.037***
			(3.74)	(3.47)
*LC*MATURE*			-0.012***	-0.018***
			(10.47)	(4.83)
TETA	-0.103***	-0.090***	-0.100***	-0.070***
	(6.76)	(6.93)	(6.81)	(6.52)
CashFlow	0.320***	0.336***	0.331***	0.338***
	(6.53)	(6.59)	(6.49)	(6.61)
Q	0.009***	0.008***	0.008***	0.008***
	(10.48)	(10.21)	(11.09)	(10.93)
Size	-0.002***	-0.002***	-0.001***	-0.001***
	(7.47)	(5.87)	(3.06)	(3.39)
Leverage	-0.035***	-0.037***	-0.043***	-0.043***
	(6.87)	(6.68)	(7.70)	(7.52)
CashHoldings	-0.051***	-0.053***	-0.053***	-0.054***
	(8.90)	(9.18)	(9.34)	(9.78)
Sales	-0.013***	-0.013***	-0.012***	-0.012***
	(13.48)	(13.13)	(13.28)	(13.12)
ΔNWC	0.239***	0.252***	0.245***	0.250***
	(5.71)	(5.75)	(5.63)	(5.68)
Intercept	0.137***	0.131***	0.139***	0.127***
	(17.24)	(17.36)	(16.06)	(16.77)
R^2	0.16	0.16	0.16	0.17
N	82,450	82,450	82,450	82,450

Table 5.5: Life Cycle Stages and Debt Financing Policy
This table reports the outcome of estimating Equations (5.9) and (5.11) as outlined in the text, where *RETE* and *RETA* are used to proxy for a firm's life cycle stage (*LC*). The dependent variable is *DISSU* (long term net debt issuance / lagged total assets). *YOUNG* (*MATURE*) is a dummy variable which takes a value of 1 if a firm's earned/contributed capital mix is in the bottom (top) tercile, 0 otherwise. All variable definitions are given in Table 5.2. The data are obtained from COMPUSTAT and CRSP for the period 1973-2008. The sample consists of 11,544 US firms. Firms excluded from the final sample: those with less than USD 10 million market capitalization and those with abnormal growth (asset growth or sales growth greater than 1). The Fama and Macbeth (1973) approach is utilized for the analyses. Coefficients significant at the 10%, 5% and 1% levels are indicated by *, ** and ***, respectively, and associated t-statistics are presented in parentheses.

	(1)	(2)	(3)	(4)
	RETE	*RETA*	*RETE*	*RETA*
LC	0.002***	0.020***	0.020***	0.032***
	(4.90)	(5.85)	(9.22)	(7.59)
*LC*YOUNG*			-0.019***	-0.006
			(8.71)	(0.94)
*LC*MATURE*			-0.008***	-0.011***
			(6.50)	(4.13)
TETA	-0.094***	-0.103***	-0.096***	-0.102***
	(17.15)	(15.34)	(17.50)	(16.87)
CashFlow	-0.072***	-0.083***	-0.076***	-0.083***
	(11.16)	(12.60)	(11.43)	(12.81)
Q	0.003***	0.004***	0.003***	0.004***
	(3.89)	(4.81)	(3.90)	(4.69)
Size	0.000	-0.000	-0.000	-0.000
	(0.98)	(0.21)	(0.64)	(0.72)
CashHoldings	0.018***	0.016***	0.018***	0.018***
	(3.70)	(3.41)	(3.72)	(3.73)
Inventory	-0.007**	-0.010***	-0.010***	-0.010***
	(2.08)	(2.81)	(3.06)	(3.15)
Gross PPE	0.007***	0.008***	0.007***	0.008***
	(3.02)	(3.48)	(2.87)	(3.42)
D/E Ratio	-0.008***	-0.008***	-0.008***	-0.008***
	(15.58)	(14.94)	(15.69)	(14.75)
Intercept	0.014***	0.013***	0.055***	0.059***
	(4.40)	(4.06)	(9.63)	(10.01)
R^2	0.07	0.07	0.07	0.07
N	83,446	83,446	83,446	83,446

Table 5.5 reports results of estimating equations (5.9) and (5.11) using net debt issuance as the dependent variable. The results show that the amount of debt issued is greater for firms with higher *RETE/RETA* – the coefficient estimates for *RETE* and *RETA* are both positive (0.002 and 0.020 in column 1 and 2, respectively) and significant at the 1% level. A one-standard deviation shock in *RETE* (*RETA*) leads to a change in debt issuance of 0.73% (2.68%) of total assets, which amounts to roughly $8 ($31) million. Results of estimating the extended model, in columns 3 and 4, indicate a non-monotonic influence of life cycle stage

on debt financing – for example, in column 3, the impact of life cycle increases from 0.001 (insignificant) to 0.020 as firms enter the intermediate stage from the early stage and then decreases to 0.012 as firms become mature. In other words, firms tend to issue less debt when they are young since they have limited ability to service debt. They rely more on debt in their intermediate maturity when the need for funds is great, and finally reduce their reliance on debt financing as they enter the mature stage.

Table 5.6 presents the results for another financing policy, net equity issuance. For the baseline model, the coefficient estimates for *RETE* and *RETA* are both negative (-0.003 and -0.025, respectively) and significant at the 1% level. This indicates that the amount of net equity issued is greater for young firms (lower *RETE/RETA*) – a one-standard deviation increase in the life cycle proxies *RETE* (*RETA*) is associated with a decrease in equity issuance of 0.94% (3.34%) of total assets. Results of estimating the extended model indicate a monotonic relationship between firm's life cycle and net equity issuance – the coefficient estimate/sum decreases from -0.002 to -0.026 and then to -0.033 in column 3, and decreases from -0.019 to -0.045 and further drops to -0.062 in column 4. This is consistent with the notion that mature firms have higher accumulated profits and limited growth opportunities, and thus, face a higher cost of adverse selection.

Table 5.7 presents the results for cash holdings policy. Column 1 and 2 of Table 5.7 show that the amount of incremental cash holdings is negatively (significant at the 1% level) related to firm's life cycle stage.[58] Firms hoard less cash as they mature - a one-standard deviation increase in *RETE* (*RETA*) is associated with a decrease in change in cash holdings of 0.51% (1.56%) of total assets. Columns 3 and 4 demonstrate that the impact of life cycle on cash holding policy is not significantly different between firms in the young and intermediate stages. Only the coefficient estimate for *LC*MATURE* is statistically significant

[58] Following Almeida et al. (2004), *Investment*, *Acquisitions*, Δ*NWC* and Δ*STDebt* are included as control variables.

Table 5.6: Life Cycle Stages and Equity Financing Policy

This table reports the outcome of estimating Equations (5.9) and (5.11) as outlined in the text, where *RETE* and *RETA* are used to proxy for a firm's life cycle stage (*LC*). The dependent variable is *EQUISS* (net equity issuance / lagged total assets). *YOUNG* (*MATURE*) is a dummy variable which takes a value of 1 if a firm's earned/contributed capital mix is in the bottom (top) tercile, 0 otherwise. All variable definitions are given in Table 5.2. The data are obtained from COMPUSTAT and CRSP for the period 1973-2008. The sample consists of 11,544 US firms. Firms excluded from the final sample: those with less than USD 10 million market capitalization and those with abnormal growth (asset growth or sales growth greater than 1). The Fama and Macbeth (1973) approach is utilized for the analyses. Coefficients significant at the 10%, 5% and 1% levels are indicated by *, ** and ***, respectively, and associated t-statistics are presented in parentheses.

	(1)	(2)	(3)	(4)
	RETE	*RETA*	*RETE*	*RETA*
LC	-0.003***	-0.025***	-0.026***	-0.045***
	(7.52)	(6.81)	(9.76)	(8.74)
*LC*YOUNG*			0.024***	0.026***
			(9.78)	(5.07)
*LC*MATURE*			-0.007***	-0.017***
			(5.55)	(6.52)
TETA	0.080***	0.089***	0.086***	0.108***
	(10.44)	(12.71)	(10.95)	(13.51)
CashFlow	-0.292***	-0.273***	-0.283***	-0.269***
	(11.92)	(11.06)	(11.45)	(11.03)
Q	0.014***	0.012***	0.014***	0.013***
	(20.55)	(17.53)	(19.42)	(17.54)
Size	-0.002***	-0.001**	0.000	0.000
	(4.70)	(2.26)	(1.41)	(0.18)
CashHoldings	-0.088***	-0.088***	-0.088***	-0.088***
	(13.22)	(13.03)	(12.79)	(12.87)
Inventory	-0.043***	-0.040***	-0.033***	-0.032***
	(9.63)	(8.96)	(7.95)	(7.86)
Gross PPE	0.015***	0.013***	0.017***	0.015***
	(6.70)	(5.42)	(6.66)	(5.69)
D/E Ratio	0.004***	0.004***	0.004***	0.004***
	(8.58)	(8.69)	(7.97)	(8.59)
Intercept	-0.011***	-0.012***	-0.014***	-0.022***
	(5.06)	(4.14)	(6.10)	(7.98)
R^2	0.35	0.36	0.36	0.37
N	83,446	83,446	83,446	83,446

(at the 1% level), which indicates that firms tend to save less cash in the mature stage than in the other two stages of the life cycle. One possible explanation is that since mature firms are relatively established and well-known, they can raise funds with little difficulty. This is consistent with Opler et al. (1999) that the precautionary purpose is one of the main reasons for corporate managers to hoard cash.

Table 5.8 presents the results for corporate payout policy. The reported results indicate that the amount of total payout is positively (significant at the 1% level) related to firms' life

Table 5.7: Life Cycle Stages and Cash Holdings Policy

This table reports the outcome of estimating Equations (5.9) and (5.11) as outlined in the text, where *RETE* and *RETA* are used to proxy for a firm's life cycle stage (*LC*). The dependent variable is *ΔCashHoldings*, defined as the sum of cash and marketable securities scaled by lagged total assets. *YOUNG* (*MATURE*) is a dummy variable which takes a value of 1 if a firm's earned/contributed capital mix is in the bottom (top) tercile, 0 otherwise. All variable definitions are given in Table 5.2. The data are obtained from COMPUSTAT and CRSP for the period 1973-2008. The sample consists of 11,544 US firms. Firms excluded from the final sample: those with less than USD 10 million market capitalization and those with abnormal growth (asset growth or sales growth greater than 1). The Fama and Macbeth (1973) approach is utilized for the analyses. Coefficients significant at the 10%, 5% and 1% levels are indicated by *, ** and ***, respectively, and associated t-statistics are presented in parentheses.

	(1)	(2)	(3)	(4)
	RETE	*RETA*	*RETE*	*RETA*
LC	-0.001***	-0.010***	-0.002	-0.000
	(2.80)	(3.67)	(0.73)	(0.05)
*LC*YOUNG*			0.001	-0.005
			(0.32)	(0.89)
*LC*MATURE*			-0.007***	-0.019***
			(5.52)	(7.92)
TETA	-0.004	-0.001	-0.003	0.005
	(1.11)	(0.29)	(0.74)	(1.40)
CashFlow	0.138***	0.150***	0.142***	0.150***
	(18.87)	(17.22)	(18.80)	(17.31)
Q	0.001	0.000	0.001	0.000
	(1.26)	(0.20)	(1.26)	(0.56)
Size	-0.001*	-0.000	-0.000	-0.000
	(1.77)	(1.05)	(0.70)	(0.74)
Investment	-0.188***	-0.191***	-0.191***	-0.193***
	(23.04)	(24.34)	(23.90)	(24.38)
Acquisitions	-0.242***	-0.244***	-0.245***	-0.246***
	(13.14)	(13.20)	(13.26)	(13.27)
ΔNWC	-0.280***	-0.273***	-0.278***	-0.274***
	(23.46)	(20.50)	(22.15)	(20.65)
ΔSTDebt	-9.000***	-8.951***	-8.986***	-8.962***
	(13.94)	(13.98)	(13.91)	(13.99)
Intercept	0.014***	0.013***	0.014***	0.011***
	(4.40)	(4.06)	(4.17)	(3.38)
R^2	0.35	0.35	0.35	0.35
N	79,421	79,421	79,421	79,421

cycle. Firms increase corporate payout as they age. A one-standard deviation increase in *RETE* (*RETA*) is associated with an increase in payout (dividends and share repurchase) of 0.80% (3.90%) of operating income. The results of the extended model reveal that the relationship is monotonic. In other words, firms tend to pay higher dividends as they enter the mature stage, when the agency costs of free cash flow are higher.

Table 5.8: Life Cycle Stages and Corporate Payout Policy

This table reports the outcome of estimating Equations (5.9) and (5.11) as outlined in the text, where *RETE* and *RETA* are used to proxy for a firm's life cycle stage (*LC*). The dependent variable is *PAYOUT*, defined as the sum of dividends and share repurchases scaled by lagged assets. *YOUNG* (*MATURE*) is a dummy variable which takes a value of 1 if a firm's earned/contributed capital mix is in the bottom (top) tercile, 0 otherwise. All variable definitions are given in Table 5.2. The data are obtained from COMPUSTAT and CRSP for the period 1973-2008. The sample consists of 11,544 US firms. Firms excluded from the final sample: those with less than USD 10 million market capitalization and those with abnormal growth (asset growth or sales growth greater than 1). The Fama and Macbeth (1973) approach is utilized for the analyses. Coefficients significant at the 10%, 5% and 1% levels are indicated by *, ** and ***, respectively, and associated t-statistics are presented in parentheses.

	(1)	(2)	(3)	(4)
	RETE	*RETA*	*RETE*	*RETA*
LC	0.004***	0.072***	0.034***	0.112***
	(2.91)	(7.37)	(5.36)	(9.67)
*LC*YOUNG*			-0.036***	-0.106***
			(5.51)	(8.06)
*LC*MATURE*			0.090***	0.118***
			(9.19)	(10.54)
TETA	0.094***	0.050***	0.085***	-0.032**
	(6.40)	(4.22)	(6.22)	(2.25)
SalesGrowth	-0.240***	-0.233***	-0.202***	-0.198***
	(12.79)	(12.29)	(12.78)	(12.08)
Size	0.015***	0.013***	0.010***	0.012***
	(9.74)	(8.33)	(7.52)	(8.01)
ROA	-0.375***	-0.438***	-0.525***	-0.556***
	(9.50)	(10.54)	(14.16)	(15.03)
CFU	-0.542***	-0.494***	-0.411***	-0.435***
	(11.73)	(9.83)	(9.43)	(9.31)
Q	0.009***	0.012***	0.011***	0.012***
	(4.52)	(6.28)	(5.93)	(5.92)
CashHoldings	0.313***	0.314***	0.313***	0.312***
	(13.06)	(13.21)	(12.43)	(12.49)
Intercept	0.138***	0.146***	0.114***	0.163***
	(10.52)	(11.24)	(8.83)	(12.45)
R^2	0.10	0.10	0.12	0.11
N	73,700	73,700	73,700	73,700

Table 5.9 reports the results of logit analysis for the baseline and extended models, relating to all five corporate policies discussed previously. From Panel A, it is apparent that mature firms have lower propensity to issue equity, to build cash reserves and to increase investment. Such firms, however, have a higher propensity to issue debt and to payout free cash flows, either through dividends or share repurchases. Panel B provides similar results in the context of the extended specification – the influence of life cycle stage on investment, equity financing and payout are monotonic. However, the relationship between life cycle and

Table 5.9: Life Cycle Stages and Corporate Policies – Logit Analysis

This table reports the Logit regression results of estimatingEquations (5.10)and (5.12) outlined in the text, where *RETE* and *RETA* are used to proxy for a firm's life cycle stage (*LC*). To conserve space, the tableonly presents the key LC-related coefficient estimates. The dependent variables are *InvestmentD* (dummy variable which equals 1 if *ΔInvestment*> 1, 0 otherwise), *DISSUD* (dummy variable which equals 1 if *DISS* > 0, 0 otherwise), *EQUISSD* (dummy variable which equals 1 if *EQUISS* > 0, 0 otherwise), *ΔCashHoldingsD* (dummy variable which equals 1 if *ΔCashHoldings*> 0, 0 otherwise) and*PAYOUTD* (dummy variable which equals 1 if *PAYOUT*> 0, 0 otherwise). *YOUNG* (*MATURE*) is a dummy variable which takes a value of 1if a firm's earned/contributed capital mix is in the bottom (top) tercile, 0 otherwise. All variable definitions are given in Table 5.2. The data are obtained from COMPUSTAT and CRSP for the period 1973-2008. The sample consists of 11,544 US firms. Firms excluded from the final sample: those with less than USD 10 million market capitalization and those with abnormal growth (asset growth or sales growth greater than 1). The Fama and Macbeth (1973) approach is utilized for the analyses. Coefficients significant at the 10%, 5% and 1% levels are indicated by *, ** and ***, respectively, and associated t-statistics are presented in parentheses.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	InvestmentD		*DISSD*		*EQUISSD*		*CashHoldingsD*		*PAYOUTD*	
	RETE	*RETA*	*RETE*	*RETA*	*RETE*	*RETA*	*RETE*	*RETA*	*RETE*	*RETA*
					Panel A: Baseline Model					
LC	-0.015	-0.329***	0.096***	0.423***	-0.056***	-0.721***	-0.021*	-0.313***	0.110***	1.370***
	(1.21)	(3.74)	(5.60)	(6.25)	(5.51)	(7.87)	(1.83)	(4.69)	(3.72)	(6.21)
					Panel B: Extended Model					
LC	-0.559***	-1.191***	0.334***	0.506***	-0.591***	-1.641***	-0.040	-0.019	0.931***	2.458***
	(9.99)	(10.14)	(5.43)	(4.45)	(13.61)	(18.55)	(0.84)	(0.16)	(11.72)	(11.54)
*LC*YOUNG*	0.570***	1.035***	-0.246***	0.310	0.595***	1.607***	0.036	-0.331	-0.931***	-2.173***
	(10.00)	(7.29)	(3.99)	(1.38)	(14.15)	(14.16)	(0.71)	(1.40)	(11.85)	(13.58)
*LC*MATURE*	-0.018	-0.018	-0.236***	-0.619***	-0.649***	-0.672***	-0.136***	-0.342***	0.828***	0.498***
	(0.43)	(0.21)	(7.54)	(8.10)	(14.71)	(9.06)	(3.77)	(3.90)	(14.81)	(4.46)

debt financing is non-monotonic – the propensity to issue debt is the highest for firms in the intermediate stage of their life cycle. Firm life cycle stage influences cash holding policy only when firms are mature – firms are unlikely to hoard cash in the mature stage.

5.4.3 Robustness Check

The potential endogeneity between a firm's life cycle and its corporate policies might lead to biased and inconsistent estimates. For example, I argue that young firms (that have low *RETE*/*RETA*) are in the stage of expansion and face relatively abundant investment opportunities, and thus, have a higher level of investment. However, it is possible that a higher level of investment indicates a firm's maturity - a high level of investment leads to less retained earnings and thus, lower *RETE*/*RETA*.

To mitigate this endogeneity problem, I re-estimate the model using the Two Stage Least Squares (2SLS) procedure. In the first stage, the endogenous variable (*LC*) is regressed on the instrumental variables as well as the exogenous explanatory variables in the model (Equation 5.9). In the second stage, the model (Equation 5.9) is then regressed on the predicted value from the first stage.

Firms in the same industry operate in highly similar business environments. Moreover, firms with similar size and growth are likely to exhibit a similar life cycle stage. Therefore, I use the earned/contributed capital mix of the industry, firms with similar size and growth, respectively, as the instrumental variables. These ratios are ideal instruments since they are correlated with a firm's life cycle but are not affected by its corporate policy decisions.

I compute the instrumental variables as follows. First, all firm-year observations are sorted into 30 groups by size, sales growth, and operating income growth, respectively. I then compute the average *RETE* and *RETA* on each group. The associated instrumental variables are denoted: LC_{SIZE}, LC_{SG} and LC_{OIG}. Similarly, all firm-year observations are sorted by 3-digit industry (SIC) code and the average *RETE* and *RETA* of each group are computed.

The associated instrumental variable is denoted: LC_{IND}. The four average life cycle measures are then used as instrumental variables in the 2SLS procedure to extract the exogenous component of the life cycle proxy.

Panel A of Table 5.10 reports the result of 2SLS using all of the instruments, and I observe that the impact of life cycle on various corporate policies remain consistent with earlier findings. In Panels B and C, I examine alternative combinations of instrumental variables; LC_{IND}, LC_{SIZE} and LC_{SG}, and LC_{IND}, LC_{SIZE} and LC_{OIG}, respectively. Again, the results remain robust. Overall, the analysis in Table 5.10 indicate that earlier results are not caused by the endogeneity problem of the life cycle proxy.

Table 5.10: Life Cycle Stages and Corporate Policies – Two Stage Least Squares (2SLS)
This table reports the outcome of estimating Equations (5.9) using the 2SLS procedure, where *RETE* and *RETA* are used to proxy for a firm's life cycle stage (*LC*). All variable definitions are given in Table 5.2. The data are obtained from COMPUSTAT and CRSP for the period 1973-2008. The sample consists of 11,544 US firms. Firms excluded from the final sample: those with less than USD 10 million market capitalization and those with abnormal growth (asset growth or sales growth greater than 1). The Fama and Macbeth (1973) approach is utilized for the analyses. Coefficients significant at the 10%, 5% and 1% levels are indicated by *, ** and ***, respectively, and associated t-statistics are presented in parentheses.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Investment		*DISS*		*EQUISS*		*CashHoldings*		*PAYOUT*	
	RETE	*RETA*	*RETE*	*RETA*	*RETE*	*RETA*	*RETE*	*RETA*	*RETE*	*RETA*
Panel A - Instruments: LC_{IND}, LC_{SIZE}, LC_{SG} and LC_{OIG}										
LC	-0.003	-0.067***	0.000	0.007***	-0.003***	-0.034***	-0.000	-0.008**	0.013**	0.150***
	(1.50)	(3.89)	(0.32)	(2.48)	(4.96)	(6.33)	(0.55)	(1.97)	(2.14)	(4.04)
Panel B - Instruments: LC_{IND}, LC_{SIZE} and LC_{SG}										
LC	-0.004	-0.070***	0.000	0.006**	-0.003***	-0.035***	-0.000	-0.007*	0.013**	0.144***
	(1.55)	(3.90)	(0.51)	(1.95)	(4.67)	(6.03)	(0.71)	(1.69)	(2.13)	(3.92)
Panel C - Instruments: LC_{IND}, LC_{SIZE} and LC_{OIG}										
LC	-0.004	-0.070***	-0.000	0.005*	-0.003***	-0.035***	-0.000	-0.007*	0.014**	0.164***
	(1.61)	(3.84)	(0.22)	(1.88)	(4.93)	(6.30)	(0.52)	(1.71)	(2.09)	(4.09)

5.5 Conclusion

This study examines the importance of life cycle theory as a determinant of corporate policies: payout, investment, financing and cash holdings. In particular, this study examines whether a firm's life cycle stage influences the amount of resources allocated to each policy and affects the probability of altering the allocation process. The empirical analysis was performed on the sample of US firms, using a sample drawn from the period 1973 to 2008. It was found that firms increase payout, reduce investment and equity issuance as they mature. Firms rely more heavily on debt financing in the intermediate stage of their life cycle, than in young and mature stages. Evidence suggests that firms do not hoard cash in young and intermediate stages and reduce cash reserves when they become mature.

The propensity to payout was also found to be increasing in firm's maturity. Firms are less likely to increase investment and to issue equity as they mature. Firms are also more likely to issue debt in immediate stage and less likely to do so in early and mature stages. Results indicate that life cycle stage starts to influence the propensity to hoard cash only when firms enter mature stage – mature firms are less likely to hoard cash.

Firm life cycle is important to corporate decision making. Firm characteristics, growth opportunities, corporate culture and organization structure change gradually as firms mature. Because many of these changes are irreversible, firms behave differently in various life cycle stages. Therefore, the role of life cycle in corporate decision making cannot be ignored. This chapter contributes to the literature by providing evidence that confirms the impact of life cycle on corporate decision making.

Chapter 6

Conclusion

In this thesis, factors that are hypothesized to influence corporate decision making are investigated, and this has led to three main conclusions.

The first empirical chapter (Chapter 3) examines whether stock market mispricing affects corporate investment through the catering channel and how this influences other corporate policy decisions. Consistent with Polk and Sapienza's (2009) catering theory of investment, I find that stock market mispricing has a positive impact on corporate investment and this influence is isolated from the equity issuance hypothesis suggested by Baker et al. (2003). The impact is found to be stronger for firms typified by shorter horizon investors. Firms tend to rely on cash reserves and debt financing to finance catering investment. The results indicate that debt financing is a primary source of financing, while cash reserves is of secondary importance. Consistent with previous evidence of dividend smoothing, I find that dividend policy is insensitive to mispricing. The chapter contributes to the literature by addressing the source of financing linking to catering behavior.

A possible extension to the research area is to examine if managers engage in self-catering. Because the remuneration package of managers is often related to firm value, it is would be interesting to investigate if managers cater for themselves and how the differences in remuneration affect managerial incentives to cater.

The second contribution of this thesis (Chapter 4) is to explore a new aspect of financial flexibility. This was done by investigating the joint impact of accessibility to external market and mispricing on investment-cash flow sensitivity. Firms with greater access to external capital markets are financially more flexible in adjusting their sources of financing for investment, compared to firms with limited access, in response to their own stock mispricing. In contrast, firms with limited access are inflexible in adjusting their financing policies - the investment-cash flow sensitivity of these firms is negligibly affected by the level of mispricing.

The results are important since capital investment is one of the major components of GDP. Understanding the sources of financing for investment may provide important insights into government policy decision making. The chapter can be extended by investigating the impact of financial flexibility on the cost of capital for investment and whether this explains the findings of Bhandari (1988), Chan and Chen (1991), and Fama and French (1992) that firms with greater access to external markets tend to have higher firm value. Moreover, the financial flexibility hypothesis can also be examined on corporate cash holdings policy - the joint impact of accessibility to external markets and mispricing on the cash-cash flow sensitivity.

Third, the influence of a firm's life cycle stage on various corporate policies is examined in the last empirical chapter (Chapter 5). Previous studies focus only on payout and equity financing policies and examine each policy in isolation. Also, these studies gauge the impact of life cycle only in terms of its effect on the probability of financial decision making. The chapter contributes to the literature by proposing and investigating the linkage between the life cycle stage and corporate investment, cash holdings and debt financing policies. The impact of the life cycle stage on these policies are assessed both in terms of the likelihood and intensity of corporate decisions. The empirical results reveal that a firm’s life cycle stage does affect the amount of resources allocated to each policy and the probability of altering the allocation process. Firms increase payout, reduce investment and equity issuance as they mature. Firms rely more heavily on debt financing in the intermediate stage of their life cycle, than in the young and mature stages. The evidence suggests that firms do not hoard cash in young and intermediate stages and reduce cash reserves when they become mature. The propensity to payout was also found to be increasing in a firm's maturity. Firms are less likely to increase investment and to issue equity as they age. Firms are also more likely to issue debt in the immediate stage and less likely to do so in the early and mature stages. Results indicate that the life cycle stage starts to influence the propensity to hoard cash only when firms enter the mature stage – mature firms are less likely to hoard cash.

A limitation of the life cycle analysis is the unavailability of private firm data. The analysis would have been more comprehensive if the impact of life cycle on private firms' policies were included. It is also interesting to see how corporate policies change after private firms go public, or after public firms go private. Future research could also examine whether firm life cycle drives the recent trends in corporate policies, including increasing cash holdings (Bates, Kahle, and Stulz, 2009), decreasing dividends (Fama and French, 2001), and decreasing average debt maturity (Custodio, Ferreira, and Laurean, 2013). To sum up, this thesis provides evidence that corporate decision making is strongly influenced by stock market mispricing, a firm's accessibility to external capital markets and its life cycle stage.

Appendix

Some Technical Details

Comparative statics for the case when $k < \bar{k}$:

In Section II, I consider only the optimal investment and financing decisions for firms with $k < \bar{k}$. Now, I also consider the case where $k \geq \bar{k}$. For $k \geq \bar{k}$, the firm only has access to equity markets. We can rewrite problem (1) as:

$$\max_{I,D} I - \frac{1}{2m} I^2 - h(k,\theta)\left(\frac{1}{2}E^2 + E\right), \quad \text{(A1a)}$$

$$\text{s.t.} I = c + E. \quad \text{(A1b)}$$

The first order condition of problem (A1) is given by $I^* = \frac{m(1+h(c-1))}{1+mh}$. By differentiation, we can show that, $\frac{dI^*}{dc} = \frac{mh}{1+mh} \geq 0$, $\frac{d}{d\theta}\left(\frac{dI^*}{dc}\right) = \frac{mh_\theta}{(1+mh)^2} \leq 0$, and $\frac{d}{dk}\left(\frac{d}{d\theta}\left(\frac{dI}{dc}\right)\right) = \frac{mh_{\theta k}(1+mh)-2m^2 h_k h_\theta}{(1+mh)^3} \geq 0.$

Derivation of *FOCs* (4.2) and (4.3):

By equation (A1b), we have:

$$E = I - c - D. \quad \text{(A2)}$$

Substituting equation (A2) into (A1a) and differentiating equation (A1a) by I and D, respectively yields:

$$-\frac{1}{m} I - h(k,\theta)(I - c + D + 1), \quad \text{(A3)}$$

$$h(k,\theta)(I-c-D+1)-r(k)(D+1). \quad \text{(A4)}$$

Both equation (A3) and (A4) are equal to zero at the optimal level of investment and debt (I^* and D^*). Therefore, we can derive *FOCs* (4.2) and (4.3) by setting equation (A3) and (A4) equal to zero and rearranging in terms of I^* and D^*, respectively.

Bibliography

Acharya, V., Almeida, H. and Campello, M. (2007), Is cash negative debt? A hedging perspective on corporate financial policies, *Journal of Financial Intermediation*, 16, 515-554.

Adizes, I. (1979), Organisational passages: Diagnosing and treating life-cycle problems in organisations, *Organisational Dynamics*, 8, 3–25.

Almeida, H. and Campello, M. (2007), Financial constraints, asset tangibility, and corporate investment, *Review of Financial Studies*, *20*, 1429-1460.

Almeida, H. and Campello, M. (2010), Financing frictions and the substitution between internal and external funds, *Journal of Financial and Quantitative Analysis*, *45*, 589-622.

Almeida, H., Campello, M. and Weisbach, M. S. (2004), The cash flow sensitivity of cash, *Journal of Finance*, 59, 1777–1804.

Almeida, H., Campello, M. and Weisbach, M. S. (2011), Corporate financial and investment policies when future financing is not frictionless, *Journal of Corporate Finance*, 17, 675-693.

Alti, A. (2003), How sensitive is investment to cash flow when financing is frictionless?, *Journal of Finance*, 58, 707–722.

Altinkilic, O. and R. S. Hansen (2000), Are there economies of scale in underwriting fees? Evidence of rising external financing costs, *Review of Financial Studies*, 13, 191-218.

Ang, J. and Smedema, A. (2011), Financial flexibility: Do firms prepare for recession?, *Journal of Corporate Finance*, 17, 774-787.

Baker, M., Ruback, R. S. and Wurgler, J. (2007), Behavioral corporate finance: A survey, in *Handbook in Corporate Finance: Empirical Corporate Finance*, edited by Espen Eckbo, Elsevier/North Holland.

Baker, M., Ruback, R. S. and Wurgler, J. (2012), Behavioral corporate finance: An updated survey, in *Handbook of the Economics of Finance*, edited by George Constantanides, Milton Harris, and Rene Stulz, Elsevier/North Holland.

Baker, M., Stein, J. and Wurgler, J. (2003) When does the market matter? Stock prices and the investment of equity-dependent firms, *Quarterly Journal of Economics*, 118, 969-1006.

Baker, M. and Wurgler, J. (2000), The equity share in new issues and aggregate stock returns, *Journal of Finance*, 55, 2219–2257.

Baker, M. and Wurgler, J. (2002), Market timing and capital structure, *Journal of Finance*, 57, 1–32.

Baker, M. and Wurgler, J. (2004a), A catering theory of dividends, *Journal of Finance*, 59, 1125-1165.

Baker, M. and Wurgler, J. (2004b), Appearing and disappearing dividends: The link to catering incentives, *Journal of Financial Economics*, 73, 271-288.

Bancel, F. and Mittoo, U. (2004), Cross-country determinants of capital structure choice: A survey of European firms, *Financial Management*, 33, 103-132.

Bates, T., Kahle, K. and Stulz, R. (2009), Why do US firms hold so much cash than they used to?, *Journal of Finance*, 65, 1985-2021.

Bayless, M. and Diltz, D. (1991), The relevance of asymmetric information to financing decisions, *Journal of Business Finance and Accounting*, 18, 331-344.

Bhandari, L. C. (1988), Debt/equity ratio and expected common stock returns: Empirical evidence, *Journal of Finance*, 43, 507-528.

Bhattacharya, S. (1979), Imperfect information, dividend policy, and 'The bird in the Hand' fallacy, *Bell Journal of Economics*, 10, 259-270.

Brockhoff, K. (1967), A test for the product life cycle, *Econometrica*, 35, 472-484.

Brounen, D., de Jong, A. and Koedijk, K. (2004), Corporate finance in Europe: Confronting theory with practice, *Financial Management*, 33, 71-101.

Brown, G. and Cliff, M. (2005), Investor sentiment and asset valuation, *Journal of Business*, 78, 405-440.

Bushman, R., Smith, A. and Zhang, X. (2012), Investment cash flow sensitivities really reflect related investment decisions, Working Paper, University of North Carolina.

Buzzell, R.(1966), Competitive behavior and product life cycles, *in New Ideas for Successful Marketing*, John Wright and Jac Goldstucker, eds., American Marketing Association, Chicago, 1696.

Chan, L. K. and Chen, N. (1991), Structural and return characteristics of small and large firms, *Journal of Finance*, 46, 1467-1484.

Chang, X., Dasgupta, S.,Wong, G. and Yao, J. (2013), The allocation of internal cash flow? The effect of misvaluation and costly external financing, Working Paper, Hong Kong University of Science and Technology.

Chang, X., Tam, L., Tan, T. and Wong, G. (2007), The real impact of stock market mispricing – Evidence from Australia, *Pacific-Basin Finance Journal*, 15, 388-408.

Chay, J. and Suh, J. (2009), Payout policy and cash-flow uncertainty, *Journal of Financial Economics*, 93, 88-107.

Chen, L., Da, Z. and Priestley, R. (2012), Dividend smoothing and predictability, *Management Science*, 58, 1834-1853.

Chirinko, R. S. and Schaller, H. (2001), Business fixed investment and ‘bubbles’: The Japanese case, *American Economic Review*, 91, 663-680.

Chirinko, R. S. and Schaller, H. (2004), Glamour vs. value: The real story, Working Paper, Emory University.

Cleary, S. (1999), The relationship between firm investment and financial status, *Journal of Finance,* 54, 673-692.

Cleary, S. (2006), International corporate investment and the relationships between financial constraint measures, *Journal of Banking and Finance*, 30, 1559-1580.

Cleary, S., Povel, P. and Raith, M. (2007), The U-shaped investment curve: Theory and evidence, *Journal of Financial and Quantitative Analysis*, 42, 1-40.

Coulton, J. and Ruddock, C. (2010), Corporate payout policy in Australia and a test of the life-cycle theory, *Accounting and Finance*, 51, 381-407.

Custodio, C., Ferreira, M. and Laureano, L. (2013), Why are US firms using more short-term debt?, *Journal of Financial Economics*, 108, 182-212.

DeAngelo, H. and DeAngelo, L. (2006), The irrelevance of the MM dividend irrelevance theorem, *Journal of Financial Economics*, 79, 293-315.

DeAngelo, H., DeAngelo, L. and Stulz, R. (2006), Dividend policy and the earned/contributed capital mix: A test of the life-cycle theory, *Journal of Financial Economics*, 81, 227-254.

DeAngelo, H., DeAngelo, L. and Stulz, R. (2010), Seasoned equity offerings, market timing, and the corporate lifecycle, *Journal of Financial Economics*, 95, 275-295.

Denis, D. and Osobov, I. (2008), Why do firms pay dividends? International evidence on the determinants of dividend policy, *Journal of Financial Economics*, 89, 62-82.

Derrien, F., Kecskes, A. and Thesmar, D. (2013), Investor horizons and corporate policies, *Journal of Financial and Quantitative Analysis*, Forthcoming.

Deshmukh, S. and Vogt, S. (2005), Investment, cash flow, and corporate hedging, *Journal of Corporate Finance*, 11, 628-644.

Dittmar, A. and Mahrt-Smith, J. (2007), Corporate governance and the value of cash holdings, *Journal of Financial Economics*, 83, 599-634.

Dong, M., Loncarski, I., Horst, J. and Veld, C. (2012), What drives security issuance decisions: Market timing, pecking order, or both?, *Financial Management*, 41, 637-663.

Easterbrook, F. (1984), Two agency-cost explanations of dividends, *American Economic Review*, 74, 650-659.

Elton, E. and Gruber, M. (1970), Marginal stockholders' tax rates and the clientele effect, *Review of Economics and Statistics*, *52,* 68-74.

Erickson, T. and Whited, T. (2000), Measurement error and the relationship between investment and "q", *The Journal of Political Economy*, 108, 1027-1057.

Erickson, T. and Whited, T. (2002), Two-step GMM estimation of the error-in-variables model using high-order moments, *Econometric Theory*, 18, 776-799.

Fama, E. and French, K. (1992), The cross-section of expected stock returns, *Journal of Finance*, 47, 427-465.

Fama, E., and French, K. (2001), Disappearing dividends: Changing firm characteristics or lower propensity to pay?, *Journal of Financial Economics*, 60, 3-43.

Fama, E. and Macbeth, J. (1973), Risk, return and equilibrium: Empirical tests, *Journal of Political Economy,* 81*,* 607-636.

Faulkender M. and Wang, R. (2006), Corporate financial policy and value of cash, *Journal of Finance*, 61, 1957-1990.

Fazzari, S. M., Hubbard, R. G. and Petersen, B. C. (1988), Financing constraints and corporate investment, *Brookings Paper on Economic Activity*, 1, 141-206.

Fazzari, S. M. and Petersen, B. C. (1993), Working capital and fixed investment: New evidence on financing constraints, *RAND Journal of Economics*, 24, 328-342.

Fisher, K. and Statman, M. (2000), Investor sentiment and stock returns, *Financial Analysts Journal*, 56, 16-23.

Frederixon, M. (1969), An investigation of the product life cycle concept and its application to new product proposal evaluation within the chemical industry, *Ph.D. dissertation*, Michigan State University.

Froot, K., D. Scharfstein, and J. C. Stein (1993), Risk managements coordinating corporate investment and financing policies, *Journal of Finance*, 48, 1629-1658.

Gachev, V., Pulvino, T. and Tarhan, V. (2010), The interdependent and intertemporal nature of financial decisions: An application to cash flow sensitivities, *Journal of Finance*, 65, 725-763.

Gamba, A. and Traintis, A. (2008), The value of financial flexibility, *Journal of Finance*, 63, 2263-2296.

Gilchrist, S. and Himmelberg, C. P. (1995), Evidence on the role of cash flow in reduced form investment equations, *Journal of Monetary Economics*, 36, 541–572.

Gilchrist, S., Himmelberg, C. P. and Huberman, G. (2005), Do stock price bubbles influence corporate investment?, Federal Reserve Bank of New York staff reports.

Graham, J. and Harvey, C. (2001), The theory and practice of corporate finance: Evidence from the field, *Journal of Financial Economics*, 60, 187-243.

Greenwald, B., J. E. Stiglitz, and A. Weiss (1984), Informational imperfections in the capital market and macroeconomic fluctuations, *American Economic Review*, 74, 194-199.

Griner, E. and Gordon, L. (1995), Internal cash flow, insider ownership, and capital expenditures: A test of the pecking order and managerial hypotheses, *Journal of Business Finance and Accounting*, 22, 179-199.

Grullon, G., Michaely, R. and Swaminathan, B. (2002), Are dividend changes a sign of firm maturity?, *Jounral of Business*, 75, 387-423.

Guttman, I., Kadan, O. and Kandel, E. (2010), Dividend stickiness and strategic pooling, *Review of Financial Studies*, 23, 4455-4495.

Hadlock, C. J. (1998), Ownership, liquidity, and investment, *The RAND Journal of Economics*, 29, 487-508.

Harford, J., Kecskes, A. and Mansi, S. (2012), Investor horizons and corporate cash holdings, Working Paper, the University of Washington.

Headen, R. (1966), The introductory phases of the life cycle for new grocery products: Consumer acceptance and competitive behavior, *Ph.D. dissertation*, Harvard University, Cambrigde.

Hovakimian, A., Opler, T. and Titman, S. (2001), The debt-equity choice, *Journal of Financial and Quantitative Analysis*, 36, 1-24.

Hovakimian, G. (2006), The determinants of investment-cash flow sensitivity, Working Paper, Fordham University, Graduate School of Business, New York.

Huang, R. and Ritter, J. R. (2009), Testing theories of capital structure and estimating the speed of adjustment, *Journal of Financial and Quantitative Analysis*, 44, 237-271.

"Investment (% of GDP) Data for all countries", (2013), (Economy Watch) Available: http://www.economywatch.com/economic-statistics/economic-indicators/Investment_Percentage_of_GDP/ (Accessed: December 5, 2013).

Jensen, M. C. (1986), Agency costs of free cash flow, corporate finance, and takeovers, *The American Economic Review*, 76, 323-329.

Jensen, M. C. and Meckling, W. H. (1976), Theory of the firm: Managerial behavior, agency costs and ownership structure, *Journal of Financial Economics*, 3, 305-360.

Jung, K., Kim, Y. and Stulz, R. (1996), Timing, investment opportunities, managerial discretion, and the security issue decision, *The Journal of Financial Economics*, 42, 159-186.

Kalay, A. (1982), The ex-dividend day behavior of stock prices: A re-examination of the clientele effect, *Journal of Finance,* 37, 1059-1070.

Kale, J., Kini, O. and Payne, J. (2012), The dividend initiation decision of newly public firms: Some evidence on signaling with dividends, *Journal of Financial and Quantitative Analysis*, 47, 365-396.

Kaplan, S. N. and Zingales, L. (1997), Do investment-cash flow sensitivities provide useful measures of financing constraints?, *Quarterly Journal of Economics,* 112, 169-215.

Kimberly, J. and Miles, R. (1980), The organizational life cycle, Jossey-Bass, San Francisco

Lang, L., Ofek, E. and Stulz, R. (1996), Leverage, investment, and firm growth, *Journal of Financial Economics*, 40, 3-29.

Leary, M. T. and Michaely, R. (2011), Determinants of dividend smoothing: Empirical evidence, *Review of Financial Studies*, 24, 3197-3249.

Leary, M. T., and Roberts, M. R. (2005), Do firms rebalance their capital structures? *Journal of Finance*, 60, 2575-2619.

Loughran, T., Ritter J. and Rydqvist, K. (1994), Initial public offerings: International insights, *Pacific-Basin Finance Journal*, 2, 165-199.

Lyandres, E. (2007), Costly external financing, investment timing, and investment-cash flow sensitivity, *Journal of Corporate Finance*, 13, 959-980.

Marsh, P. (1982), The choice between equity and debt: An empirical study, *Journal of Finance,* 37, 121-44.

Miller, D. and Friesen, P. (1984), A longitudinal study of the corporate life cycle, *Management Science*, 30, 1161-1183.

Miller, M. and Modigliani, F. (1961), Dividend policy, growth and the valuation of shares, *Journal of Business*, 34*,* 411-433.

Miller, M. and Rock, K. (1985), Dividend policy under asymmetric information, *Journal of Finance,* 40, 1031-1051.

Modigliani, F. and Miller, M. H. (1958), Cost of capital, corporation finance and the theory of investment, *American Economic Review*, 48, 261-297.

Moyen, N. (2004), Investment-cash flow sensitivities: Constrained versus unconstrained firms, *Journal of Finance*, 59, 2061-2092.

Myers, S. C. (1977), Determinants of corporate borrowing, *Journal of Financial Economics*, 5, 147-175.

Myers, S. C. (1984), The capital structure puzzle, *Journal of Finance*, 39, 575-592.

Myers, S. C. and Majluf, N. S. (1984), Corporate financing and investment decisions when firms have information that investors do not have, *Journal of Financial Economics*, 13, 187–221.

Opler, T., Pinkowitz, L., Stulz, R. and Williamson, R. (1999), The determinants and implications of corporate cash holdings, *Journal of Financial Economics*, 52, 3-46.

Owen, S. and Yawson, A. (2010), Corporate life cycle and M&A activity, *Journal of Banking and Finance*, 34, 427-440.

Panageas, S. (2003), Speculation, overpricing, and investment: Theory and empirical evidence, Working Paper, MIT.

Patton, A. (1959), Stretch your product's earning years: Top management's stake in the product life cycle, *Management Review*, 47, 9-14.

Petersen, M. (2009), Estimating standard errors in finance panel data sets: Comparing Approaches, *The Review of Financial Studies*, 22, 435-480.

Polk, C. and Sapienza, P. (2009), The stock market and corporate investment: A test of catering theory, *Review of Financial Studies*, 22, 187-217.

Polli, R. (1968), A test of the classical product life cycle by means of actual sales histories, *Ph.D. dissertation*, University of Pennsylvania.

Polli, R. and Cook, V. (1969), Validity of the product life cycle, *Journal of Business*, 42, 385-400.

Porter, M. (2004), Competitive strategy: techniques for analyzing industries and competitors, First Free Press Export Edition.

Quinn, R. and Cameron, K. (1983), Organizational life cycles and shifting criteria of effectiveness: some preliminary evidence, *Management Science*, 29, 33-51.

Rhodes-Kropf, M., Robinson, D.T. and Viswanathan, S. (2005), Valuation waves and merger activity: The empirical evidence, *Journal of Financial Economics*, 77, 561-603.

Richardson, S., and Sloan, R. (2003), External financing and future stock returns, Working Paper, University of Pennsylvania.

Rogers, E. (1962), *The diffusion of innovations*, The Free Press, New York.

Schaller, H. (2011), The economic effect of sentiment, Working Paper, Carleton University.

Schmeling, M. (2007), Investor sentiment, herd-like behavior and stock returns: Empirical evidence from 18 industrialized countries, Working Paper.

Shleifer, A. and Vishny, R.W. (2003), Stock market driven acquisitions, *Journal of Financial Economics*, 70, 295–312.

Spiess, K. and Affleck-Graves, J. (1999), The long-run performance of stock returns following debt offerings, *Journal of Financial Economics*, 54, 45-73.

Stein, J. C. (1996), Rational capital budgeting in an irrational world, *Journal of Business*, 69, 429–455.

Stein, J. C. (2003), Chapter 2 Agency, information and corporate investment, *Handbook of the Economics of Finance*, 1, 111-165.

Stiglitz, J. and Weiss, A. (1981), Credit rationing in markets with imperfect information, *American Economic Review*, 71, 393-410.

Thakor, A. V. (1990), Investment myopia and the internal organization of capital allocation decisions, *Journal of Law, Economics and Organization*, 6, 129-154

Tobin, J. (1988), Discussion of financing constraints and corporate investment by Fazzari, Steven, R. Glenn Hubbard, and Bruce Petersen, *Brookings Paper on Economic Activity*, 1, 141–206.

von Eije, H. and Megginson, W. (2008), Dividends and share repurchases in the European Union, *Journal of Financial Economics*, 89, 347-374.

Whited, T. (1992), Debt, liquidity constraints, and corporate investment: Evidence from panel data, *The Journal of Finance*, 47, 1425-1460.

Whited, T. M. and Wu, G. (2006), Financial constraints risk, *Review of Financial Studies*, 19, 531-559.