An Investigation of the Most Appropriate Capital Structure Theory and Leverage Level Determinants

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This thesis is dedicated to my parents.

Declaration

I declare that

i. the contents of this thesis have been composed entirely by myself, that the work contained is my own, and that all contributions from others have been clearly indicated and have been give due reference.

ii. The work has not been submitted for any other degree or professional qualifications.

Sung Hee Lew

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Abstract

This thesis examines capital structure theories and debt level determinants to develop a better understanding, and to establish the most appropriate theory to explain the behaviour of firms' debt and equity choices. It tests three major capital structure theories (e.g. the trade-off, pecking order and market timing theories) using static and dynamic statistical models and 13 capital structure determinants, based on three major capital structure theories. The study uses 4,598 sample companies from 11 countries and 27 industries over a 20 year period. This method provides a clear insight into firms' debt and equity choice behaviours.

The static trade-off theory is tested by first searching for similarities and differences between industries, countries and time periods and, second, by observing whether firms change their capital structures towards optimal levels and whether the coefficient signs are the same as the predictions. The 'stock price effect' on debt levels is used to examine the pecking order and market timing theories. The pecking order theory is likewise tested by confirming whether firms issue debt when they face a financial deficit. Furthermore, these theories are tested using cluster analyses. The sample examines 11 different characteristics, which include firm size, debt level, and bankruptcy probability. As each characteristic is related to one or more capital structure theories, the most appropriate theory can be derived, based on such characteristics.

There are five main findings. First, firms which are financial stable issue relatively more debt. Second, they have a preference for moderate debt levels and thus limit their bankruptcy probability. They also try to exploit opportunities from overestimated stock price by issuing stocks to increase cash inflows. Third, the effects from bankruptcy costs are greater than transaction costs in terms of capital structure adjustment. Fourth, during the sample period, firms continuously decrease leverage levels. Fifth, firms' characteristics and macro-economic factors affect their capital structure.

There are three main conclusions. First, the behaviour of firms appears generally aligned with the trade-off theory, although the pecking order and market timing theories also partially explain the equity issuance condition. Second, the 'equity and debt choice modes' can likewise be explained by the use of a theoretically combined approach, using the three major capital structure theories. In this approach, firms increase their value by both increasing debt for tax benefits and low adverse selection costs, and by issuing equity when the stock price is high. Third, this second conclusion implies that the trade-off, pecking order and market timing theories can be combined on the assumption that firms maximise their values under conditions of the existence of asymmetric information, tax shields and bankruptcy probability.

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List of Abbreviation

ASX: Australian Securities Exchange

ATX: Austria Stock Exchange, Wiener borse

BLUE: Best Linear Unbiased Estimator

CAC 40: Cotation Assistee en Continu 40 Index

CFO: Chief Financial Officer

DAX: Deutscher Aktien Index,

EDF: Expected Default Frequency

EMS: Emerging Market Score

EPS: Earnings Per Share

FASB: Financial Accounting Standards Board

FTSE 100: Financial Times and the London Stock Exchange 100 Index

GDP: Gross Domestic Product

GMM: general method of moments

I.I.D: Independent Identically Distributed

IPO: Initial Public Offerings

KOSPI: Korea Stock Price Index

MIB: Milano Italia Borsa

MM: Modigliani and Miller

NPV: Net Present Value

NYSE: New York Stock Exchange

OECD: Organization for Economic Cooperation and Development

OLS: ordinary Least Square

SEO: secondary equity offerings

S&P/TSX 60: Toronto Stock Exchange 60 Index

TAIEX: Taiwan Capitalisation Weighted Stock Index

TOPIX: Tokyo Stock Price Index

WACC: Weighted Average Cost of Capital

WFE: World Federation of Exchanges

Chapter I Introduction

This thesis investigates the answers to three questions related to 'capital structure decision.' First, is there an optimal capital structure? Alternately, is there a systemic difference in debt levels based on firms' various characteristics, such as country, industry, and between different time periods? Second, if there is an optimal capital structure, what are the most important capital structure determinants? Third, among the various different theories, which is the most appropriate capital structure theory for explaining firms' debt level changing behaviours?

These research questions follow logically from the first question: if there is an optimum gearing level, where is it and what determines it? The next question follows: what theory is the most appropriate to explain a firm's observed debt and equity choices, and its gearing alteration behaviours? There is currently no capital structure theory that can explain observed leverage level choice behaviours with a single general assumption (or explanation), although all theories seek ways to increase a firm's value or minimise its costs when faced with the issue of either equity or debt. Therefore, this thesis considers the probability of combining these theories together with firms' common motivation (value maximisation).

Even though the static trade-off and pecking order theories are based on different assumptions, both suggest that issuing debt is a better policy than issuing equity. In the pecking order theory, issuing debt lessens asymmetric information and issuing costs. In the static trade-off theory, issuing debt increases a firm's value by increasing its tax shield. This is the reason why Myers (2001) and Fama and French (2005) argue that one debt ratio changing behaviour can be interpreted in two different ways based on the two different theories. In addition, both theories also consider financial distress costs, although the pecking order theory argues that this is negligible.

In fact, in pecking order theory, using internal funds by accumulating retained earnings, is the best financing policy to minimise asymmetric information costs. Pecking order theory is one of the most important inertia theories (Welch, 2004). Inertia theory suggests that firms avoid any action to change their capital structure because of transaction costs (Welch, ibid.) and that capital structure change is deeply related to stock price changes. The latter implies that a firm's capital structure is changed by retained earnings and stock price changes, which alter the size of a firm's assets.

As described, in terms of the inertia theory (including pecking order theory), using internal funds (not issuing both equity and debt) is the best policy, and both trade-off and pecking order theories suggest that debt issuance is the better policy, rather than equity issuance. However, over the last twenty years, firms have decreased their debt levels by issuing equity. Our results also show that firms have actively issued equity and debt during the sample time period. Firms even issue equity and debt simultaneously.

This equity-issuing phenomenon cannot be explained by either the pecking order or inertia theory, where firms accumulate retained earnings when there is significant asymmetric information. A possible explanation for this result is that the financial distress risk increases globally in terms of the trade-off theory, or that asymmetric information costs are not great in terms of the pecking order theory. In fact, the best financing policy in the pecking order theory is issuing over-priced equity.

Considering the world economy over the last twenty years, the phenomenon of equity issuing might indicate that managements are more concerned with financial distress rather than with asymmetric information costs. Alternatively, equity issue might be reflected by the market participants' concerns. In other words, markets might have considered firms' financial stability more during the sample period. In addition, the results of this thesis also indicate that tax shields or issuing costs do not play an important part compared with other factors, such as industry trends or macro-economic impacts, viz. financial crises.

1.1 Motivation

The study of capital structure has raised the question of how firms have determined an appropriate debt level over the last sixty years. Early research by Chundson (1945) found that firms in the same industry had similar cash to asset ratios, and that those with more profits had lower leverage ratios. Even though capital structure theory has a long history, there is no theory that explains gearing ratio change by using one general assumption, rather than their special presumptions. Myers (2001) and Fama and French (2002) therefore confirmed that there is no theory that explains general capital structure decision methods; similarly, a recent working paper by Binsbergen et al. (2011) also mentions a lack of consensus with regard to optimal capital structures.

Capital structure theories are mainly based on three important assumptions, tax benefits, bankruptcy costs and asymmetric information. Myers (2001) arranges each specific assumption in terms of its theory, tax benefits and bankruptcy costs for the trade-off theory (Modigliani and Miller, 1963; Kraus and Litzenberger, 1973; Miller, 1977; Kane, 1984), underwriting costs and under-pricing of new securities for the pecking order theory (Myers, 1984; Myers and Majluf, 1984) and agency costs for the free cash-flow theory (Jensen and Meckling, 1976; Myers, 1977). Additionally, the market timing theory (Baker and Wurgler, 2002) shows that high stock prices reduce the gearing ratio.

Nevertheless, the determinants of one theory are often correlated with those of other theories because, as Megginson (1997) and Ross (1995) suggest, there are a number of common motivations for gearing ratio changing behaviour with regard to each theory. We presume that the common motivations are that firms try to increase their values and reduce their financial distress costs simultaneously. This correlation between theories can bring a risk of misinterpretation. According to Myers (2001), researchers may consider that generated results accord with one theory, but the financing decisions are actually engendered by another[1]. Similarly, Fama and French

[1] Myers (2001, p.91) mentions that "… *a statistical finding is often consistent with two or more competing capital structure theories.*"

(2005) imply that both trade-off and pecking order theories might be regarded as theories that help each other to explain some aspects of financing decision behaviours.

The first motivation of this thesis is to explain the three different capital structure theories using one principle in that all firms try to increase their values. The idea comes from Ross (1995), Megginson (1997) and Myers (2001). They assert that the common motivation associated with capital structure is about knowing whether there are ways to increase a firm's value by gearing level choice. This is achieved by having optimal debt levels, by the issuance of securities with high prices, and by accumulating operating profits based on the trade-off, market timing and pecking order theories, respectively. A large number of previous studies have shown that firms behave in this way. In other words, the three major theories can partially explain firms' debt and equity choice modes. This phenomenon implies that these three theories might be integrated in such a way as to explain increase in a firm's value.

The idea that firms search for ways to increase their own values can be equally applied to the behaviour of [potential] market participants. Consequently, the three major capital structure theories imply that market expectations about future cash flows, brought about by outside (including, potential) investors in a firm's securities, is the most important capital structure determinant. This arises because over- or under-valued security prices and the firm's high capital costs are signals from the financial market about the firm's future cash-flow expectations. In other words, asymmetric information costs in the pecking order theory and the cost of capital in the static trade-off theory are decided by the reaction of market participants based on a firm's actions (or expectations of the firms' future values). Therefore, the fact that both firms and external individuals attempt to increase their own value or wealth will decide the capital structure. In addition, according to Myers (2001), there is no work that focuses on external financing, e.g. equity or debt issue, which uses the relationship between internal and external investors.

The second motivation for this thesis is to find the most appropriate capital structure theory by investigating important 'gearing ratio choice determinants.' Previous research shows that different firms' characteristics and the macro-economic environment would bring about different 'debt ratio choice behaviours.' Thus, the investigation on into relationships between firms' characteristics and their 'debt or equity choice modes' will indicate the most appropriate capital structure theory, because each characteristic is related to one or more capital structure theories. Bankruptcy probability, for instance, is more likely to be related to the static trade-off theory.

Thereby, the observed leverage levels can be by-products of market participants' (both firm's and outside investor's) wealth increasing behaviours by considering a firm's characteristics (Hennessy and Whited, 2005).

1.2 Research objectives

> *Objective 1. To test if there are systematic patterns in debt ratios based on a firm's characteristics, e.g. different industries, countries and time periods.*

If there were no optimal capital structure, observed leverage levels would be randomly distributed. The fact is that having systemic differences in debt ratios, based on firms' characteristics, can prove that there are some desirable (or optimal) gearing levels and important capital structure determinants. Previous research has found differences in debt ratios caused by country differences, industrial differences and the firm's size (Scott, Jr. and Martin, 1975; Collins and Sekely, 1983; Mackay, 2005), the probability of bankruptcy, the previous years' gearing level and firm value (Ross, 1977), cultural differences (Sekely and Collins, 1988) and legal institutional differences (Wald, 1999). In Chapter 4, the systemic differences are tested across industries, countries and time.

Objective 2. To explain the new security issuing decision process using the notion of firms' value increasing behaviours. For instance, debt or equity choice modes are related to their stock prices in the financial market.

Jensen and Meckling (1976), Ross (1977), Noe (1988), Diamond (1989), Zwiebel (1996), Berkovitch (2000), Douglas (2006), and others explain capital structure based on asymmetric information. Asymmetric information raises the free cash-flow, pecking order and market timing theories. In particular, the pecking order and market timing theories suggest that new security issues (either IPOs or SEOs) depend upon securities' issuing prices in the market. Firms increase their values by issuing equity when stock prices are high and debt when asymmetric information is high.

Objective 3. To investigate the trade-off idea with tax shield and other costs and benefits, e.g. discounting issuance of securities, transaction costs, financial distress costs and other benefit factors viz. securities issuied at over-estimated value. That is to say, to examine how the idea of trade-off relationship between benefits and costs caused by gearing or debt equity choice modes can include the ideas from the pecking order and the market timing theories, in terms of a wider trade-off notion.

The traditional trade-off theory deals only with tax benefits and bankruptcy costs. Recently, the trade-off theory has begun to include the costs and benefits associated with agency problems (Fama and French, 2005). This implies that the territory of the trade-off theory is larger and includes more determinants, which possibly change a firm's value and capital structure. In other words, the wider trade-off theory includes all elements that can affect a firm's value due to gearing level alterations.

Objective 4. To determine the most appropriate capital structure theory by considering a firm's characteristics e.g. a firm's age, size, leverage level, bankruptcy probability, stock return, growth, profitability, asset tangibility, and different time periods.

As each capital structure model has key elements which explain some aspects of a firm's 'financial decision making policies' (Fama and French, 2005; Hovakimian et al., 2001), this thesis aims to tests three main capital structure theories, the trade-off, pecking order and market timing theories using the various characteristics (elements) of a firm. A characteristic, in our sample, is more closely related to a specific capital structure theory than to the other theories, in general. Bankruptcy probability, for example, is more closely related to the trade-off theory, than to the pecking order theory. Thus, this method raises the validity of certain capital structure theories if these elements show a strong association with a firm's debt ratio changing behaviours as these theories predict.

> *Objective 5. To investigate the most important capital structure determinants. As each debt ratio determinant is directly or indirectly related to one or more capital structure theories, these relationships between them will also indicate the most appropriate capital structure determinants.*

As will be described in Section 2.1, all different capital structure theories explain ways to increase a firm's value or to reduce its costs whilst altering gearing levels, although each theory suggests different methods. For instance, according to the static trade-off theory, firms try to achieve the optimal leverage level to increase their values, whereas in terms of the pecking order theory, they try not to lose their values caused by asymmetric information costs. As have already been mentioned, without doubt the two theories have a common motivation. Overall, this thesis tries to explain firms' 'leverage level adjustment behaviours' in terms of this common motivation.

1.3 Contributions

1.3.1 Contribution to theory

First, this thesis investigates the most appropriate capital structure theory in order to explain gearing ratio change with different characteristics. In this thesis we show that the debt ratio changing actions of firms are mainly explained by the trade-off theory, but the effect of tax benefits is not great. This study also finds that both the pecking order theory and the market timing theory only partially explain debt ratio changes.

For example, they cannot give us the reason why firms have continuously issued equity over the last twenty years, but they do show the negative relationship between gearing levels and profits.

Second, the results of this thesis show that transaction costs are the second most important matter, after bankruptcy costs. For example, firms adjust their capital structure more rapidly when they have financial problems. The results also show that firms generally change gearing ratios when ‘capital structure adjustment costs’ are low. This conclusion indirectly suggests that firms with good financial positions (ones which are likely have low adjustment costs), such as high stock returns or profitability, show fast adjustment performance. The overall conclusion is inconsistent with previous claims that ‘capital structure adjustment speed’ is primarily related to adjustment costs.

Third, this thesis finds that survival is the most important matter, and that other determinants, such as high-price-new-securities issuing or tax benefits, are of secondary importantance. The results continuously suggest the importance of bankruptcy probability. This indirectly implies the importance of the trade-off theory and ‘optimal capital structure existence.’

Fourth, the thesis might suggest that debt-equity choice can be a tactic to maximise a firm’s value by having extra incoming cash-flows. For example, 1) firms issue equity when stock prices are high, and 2) firms with high leverage levels come back to normal very quickly. This might be the firms who put themselves into high leverage by having more tax benefits, and come back to normal when they face financial difficulties. If they are truly in financial difficulty, they could not escape from it owing to high financing costs.

1.3.2 Contribution to methodologies

First, the use of cluster analysis using firm characteristics that is a major component of this research is new addition to the literature, although prior researchers have alluded to it. This is because firms with different characteristics are likely to behave differently. These clustered characteristics are related to one or more capital structure theories, as will be described in the next chapter. The cross-sectional relationships between capital structure and a firm's characteristics indicate the most important capital structure determinants and the most appropriate theory. Furthermore, our results using cluster analyses suggest different conclusions compared to the results using conventional regression methods. The firm's characteristics include country, economy, industry, stock prices, different time periods, size, age, bankruptcy probability, growth, and profitability.

Second, this thesis uses three different kinds of issuance, stock, debt and 'pure debt issuance' (net debt issue - net equity issue), for testing the pecking order theory. Previous research generally used leverage level change and debt issue for testing 'financial deficit' and firms' securities issuance behaviours. In particular, 'pure debt issue' has not been used before and can indicate what is a 'firm's true choice of security issuance.' This variable is important because, as firms occasionally issue equity and debt simultaneously, we can easily mis-understand the real purpose of issuing securities. Our results, using these three different issuances, indicate that equity issuance shows a stronger relationship with 'financial deficit' than does debt issuance. This is inconsistent with the pecking order theory.

Third, in this thesis, the analysis makes use of the General Method of Moments (GMM) as this addresses methodological issues relating to time series panel data since there is a high likelihood that variables that explain capital structure are highly correlated over time. It is therefore presumed that the results are more accurate than when using normal OLS. Furthermore, the GMM is a relatively new method in finance research, as well as capital structure research.

1.4 Structure of thesis

This thesis is organised into eight chapters and five appendices, all providing supplementary material.

The research motivations, objectives and contributions are outlined in Chapter 1.

Chapter 2 reviews the theoretical and empirical literature on capital structure and emphasis on them from a critical viewpoint. The three most important capital structure theories are explained with their relative determinants. Important capital structure determinants that affect new debt or equity issuing choices are introduced. The hypotheses based on capital structures continue in the following section. The hypotheses will be tested in later chapters.

Chapter 3 introduces the methodology related items, data set, static and dynamic models for statistical analyses. Static and dynamic analysing methods which will be used in later chapters are described. The criteria for a firm's characteristic decision; and data-snooping bias, caused by cluster analyses, are described in this chapter. For the bankruptcy probability decision, Altman's Z-score models are described. The models will be used in later chapters.

Chapter 4 examines Modigliani and Miller's irrelevance theory (1958), to find out whether there are systemic differences in debt ratio based on industry, country and time. The results show that leverage levels have changed over time and that there are similarities and differences in terms of debt ratios among industries and countries during the sample time period. The results imply that a firm's value might be affected by leverage levels and that there might be an optimal capital structure.

Chapters 5 and 6 compare three different major capital structure theories, trade-off, pecking order, and market timing theories, in order to decide which is the most valid. This comparison is based on the hypotheses from three major capital structure theories. We have considered these hypotheses in Chapter 2. Static and dynamic models are used for the analysis. In confirming the predictions of the three theories, the results indicate that the trade-off theory has the strongest validity. The results show that the pecking order theory does not indicate that firms with a funding requirement issue debt. Nor can the market timing theory generally explain the results in this chapter, because firms continuously release equity regardless of the equity price during the sample period.

Chapter 7 tests the three major capital structure theories, and describes the different debt-equity choice modes of firms, again based on firms' characteristics. The results in this chapter mainly indicate that the most important matter for firms is financial distress or survival. For example, firms shift gearing levels more rapidly if they are in financial difficulty; and those with relatively strong financial positions use more debt.

In conclusion, Chapter 8 examines whether the aims of the research have been achieved, describes the contributions to the research and indicates future studies which, based on this thesis, would widen the research area.

Finally, there are five appendices. The first appendix provides details of the number of sample firms based on industry, country and economy, and the theoretical background of a variable selection for analysis. The second appendix provides additional literature that describes, in detail, the capital structure theory's development with regard to tax and optimal debt levels. The third appendix describes statistical considerations when using panel data and variable choice criteria in statistical terms. The fourth and fifth appendices report the complete statistical results for Chapters 4 and 7.

Chapter II Literature review of capital structure theory

2.1 Introduction

Academic researchers have developed a number of capital structure theories. This chapter reviews these theoretical and empirical literatures, with particular emphasis on those theories that are examined from Chapter 4 to Chapter 7.

Since Modigliani and Miller (1958) published their seminal paper proposing the irrelevance theorem, the 'capital structure decision problem' has puzzled researchers, and they have begun to investigate the relationship between leverage levels and firms' values. In a perfect capital market, Modigliani and Miller argue that the value of firms is not affected by the choice of gearing ratio (see Section 2.1 of the Appendix 2 in which the full assumptions of irrelevance theory are described). This argument however, has been challenged by subsequent researchers, who have found that several other factors influence capital structure decisions. There are four major capital structure theories based on three assumptions. The four major capital structure theories are: (1) the static trade-off, (2) pecking order, (3) market timing, and (4) free cash-flow theories; and the three assumptions are: (1) the tax benefits of gearing, (2) bankruptcy costs and (3) asymmetric information. The static trade-off theory is based on the tax benefits of gearing and bankruptcy costs; and the pecking order, free cash-flow and market timing theories are based on asymmetric information. In this thesis, only three major capital structure theories, the static trade-off, pecking order, and market timing theories, with the exception of the free cash-flow theory, are tested across the chapters.

In the static trade-off theory, firms endeavour to maximise their value by balancing the tax benefits against financial distress cost. In other words, firms can increase their value by increasing the tax shield, as long as the bankruptcy costs do not exceed the tax benefits. The optimal capital structure is where the firm's value is maximised; and it is only the static trade-off theory that argues the existence of an optimum gearing level in the four major capital structure theories. To investigate whether firms change their debt ratios to achieve the optimal level, the ‘dynamic leverage level adjustment behaviours’ across time are tested. A drawback of the static trade-off theory is that this approach considers only one benefit (from a tax shield) and one cost (related to financial distress), even though the idea of the theory relates to the increasing of a firm’s value, and there are many other ways of increasing such a value. Therefore, as will be described later on, much empirical research indicates the unimportance of tax benefits and the denial of an optimal capital structure.

On the other hand, in the pecking order and market timing theories, firms do not consider increasing their value by leverage level choice. However, they do try to reduce asymmetric information costs, which are represented by new securities’ issuing costs. For instance, firms in the pecking order theory endeavour to minimise issuing costs, while those in the market timing theory try to increase their benefit by issuing stock at high (overvalued) prices. This implies that these theories also presume that firms attempt to increase their value by having overestimated issuing opportunities, or by avoiding the undervalued issuing from IPOs or SEOs. A drawback of these theories is that they only consider reducing the asymmetric information costs although there are other opportunities to increase benefits such as through the use of a tax shield.

As described, a leverage level at which a firm’s value is maximised by the choice of debt ratio is called an ‘optimal capital structure’ in the static trade-off theory. In the static trade-off world, a firm’s debt ratios, of course, move towards the optimal gearing level in order to increase their value. Namely, the optimal capital structure is a target gearing ratio that firms attempt to achieve. No other theory suggests the existence of an optimal capital structure. However, at the end of the pecking order article, Myers (1984) suggests a dynamic version of gearing ratio choice in the pecking order world. Fama and French (2005) named this as the ‘complex pecking order theory’ (see Section 2.2.4.1 in which the complex pecking order theory is explained, with a theoretical introduction and empirical research results). Myers (ibid.) argues that firms seek the temporal optimum gearing ratios (or optimum cash holding) and attempt to achieve them in order to increase their debt capacity when they come to borrowing to meet the firms’ future cash need (e.g. for new investment) in the complex pecking order theory. Therefore, the temporal target leverage level in the complex pecking order world is not the same as the optimal capital structure (or target) in the static trade-off theory. However, both theories indicate desirable target gearing levels. In other words, firms achieve their targets by maximising their value in terms of the trade-off theory, and by minimising their issuing costs (asymmetric information costs) according to the complex pecking order theory. This implies that the static trade-off theory and the pecking order theory have the same motivation, that is, to increase a firm’s value.

Last but not least, in practice there are many other elements that influence capital structure decisions. In a large number of empirical studies, capital structure is affected by other determinants such as industry, country and different periods of time (macro-economic conditions). These determinants might make it difficult to observe a typical ‘capital structure decision making behaviour’ on the part of firms. In other words, if firms have many capital-structure-decision determinants, they should consider all of them, which leads to a different ‘leverage ratio choice mode’ for each firm because all firms face different leverage level decision circumstances as regarding these various determinants. These determinants are not considered as being important debt ratio decision elements in the major capital structure theories. However, they are, in general, conceptually related to the major capital structure theories. Firm size and age, for example, are related to both bankruptcy costs and asymmetric information. A difference in time might be related to the asymmetric information costs that change over time as regarding financial market conditions.

The remainder of this chapter is organised as follows: Section 2.2 describes the major capital structure theories that are then tested in the subsequent chapters of this thesis. This section also shows how the different capital structure theories are connected. Section 2.3 introduces other important capital structure determinants that influence the leverage level. The determinants are indirectly related to the major capital structure theories, although they are not a major concern of these theories. Section 2.4 describes hypotheses based on different capital structure theories and determinants. These are the hypotheses that will be tested in later chapters. Finally, the main theoretical and research issues are summarised in Section 2.5.

2.2 Three major capital structure theories

The irrelevance theory put forward by Modigliani and Miller (1958) was proposed to operate under perfect capital market conditions. The resultant disagreement about the applicability of the theory led academic researchers to subsequently relax the conditions of perfect capital markets in line with the observed condition in the real world. The three major restrictions that academic researchers have focused on are: (1) the existence of tax shields, (2) bankruptcy costs and (3) asymmetric information. Figure 2.1 shows the 'major capital structure theories developments' with three critical restrictions. The figure shows that all these 'major capital structure theories' are affected by bankruptcy costs and incoming cash-flows. In other words, the incoming cash-flows are generated by maximising tax benefits in the static trade-off theory, and by maximising incoming cash-flows from the issue of new securities in the market timing theory, and minimising asymmetric information costs in the pecking order theory and in the free cash-flow theory.

At the end of Figure 2.1, it is illustrated that all theories converge to the 'wider trade-off theory,' which considers all the determinants that can change a firm's value when it chooses a leverage level. Moles et al. (2011) and Leland (1998) also imply that all theories should be jointly recognised in terms of capital structure determination. The 'wider trade-off theory' is based on Megginson's (1977) and Ross's (1995) arguments that leverage level choice is based on a common motivation that a firm seeks opportunities to increase its value by having the 'appropriate-capital-structure-choice modes.' In other words, the 'wider trade-off theory' enlarges traditional static trade-off theory by including all other costs and benefits that occur during the 'capital structure decision process' (Fama and French, 2005). Namely, unlike the original static trade-off theory that considers only two factors (tax benefits and bankruptcy costs), the idea of 'wider trade-off theory' is driven by the idea that firms consider all costs- and benefits-making opportunities, such as transaction costs, agency costs, tax shields, the issue of overvalued new-securities, and stock buybacks (or debt-for-equity swaps) when the stock price is low. All these matters can change a firm's value as a result of its mode of leverage level decisions. This thesis tests the wider trade-off theory by indicating how the three major capital structure theories together can explain firms' debt ratio changing behaviours.

Finally, Table 2.1 shows that each capital structure theory considers different assumptions when it comes to explaining firms' 'leverage level changes.' Since each theory concerns debt-equity-choice modes under different assumptions, the different explanations of 'leverage level changing behaviours' and optimal capital structure are expected. The table indicates that most theories consider financial distress costs and the value maximisation of a firm.

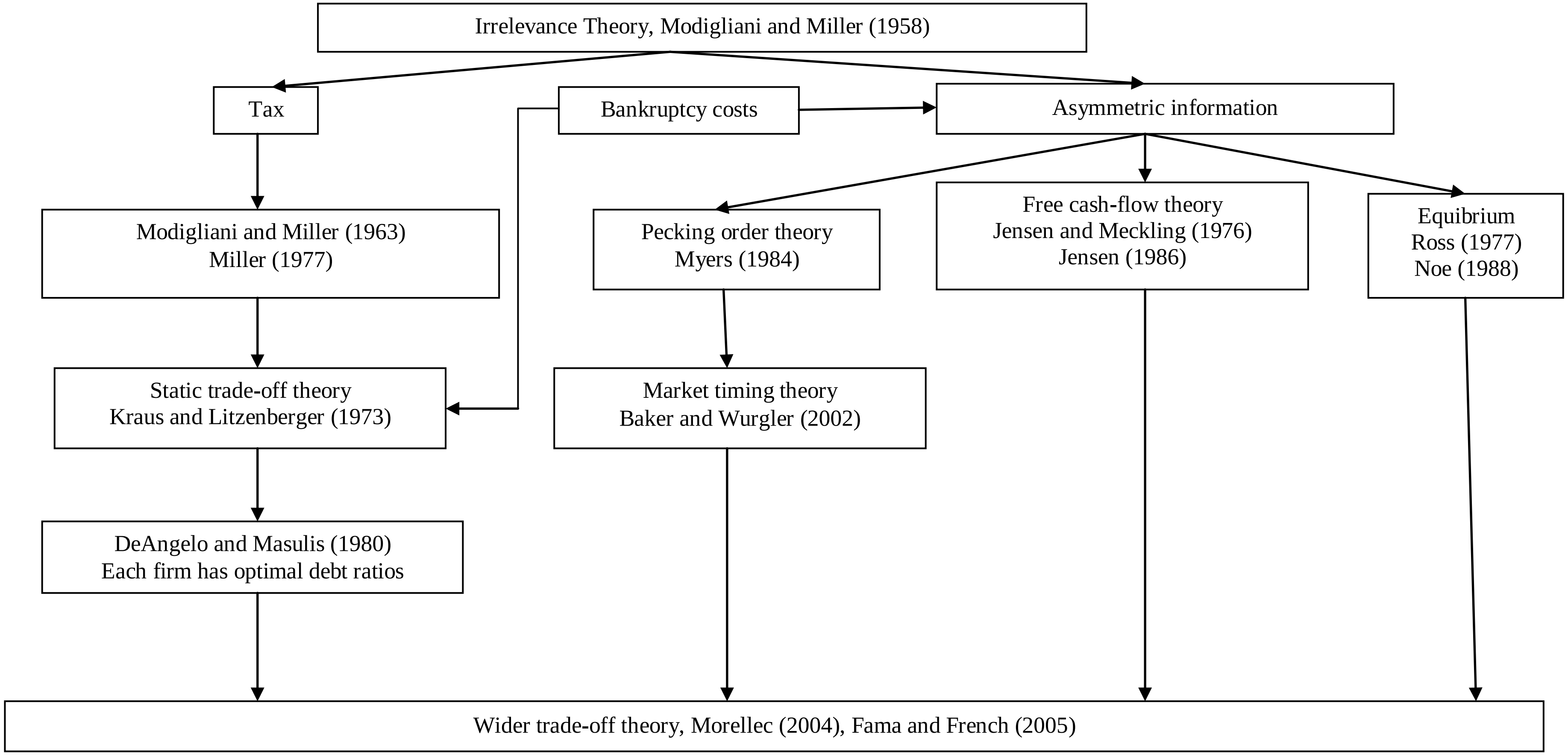
Table 2.1 Major considerations associated with different capital structure theories

Each capital structure theory considers gearing levels based on different assumptions which determine the different 'leverage level changing behaviours.' This table indicates that different capital structure theories are based on different assumptions.

	Perfect market	Tax	Financial distress costs	Market timing	Asymmetric information	Firm value maximisation
Irrelevance theory	√					
Static trade-off theory		√	√			√
Pecking order theory			√	√	√	√
Market timing theory			√	√	√	√
Free cash-flow theory			√		√	
Wider trade-off theory		√	√	√	√	√

Figure 2.1 Capital structure theories development

Using three major restrictions on capital structure decisions and by studying previous research which is related to these restrictions, we create Figure 2.1. Major capital structure theories have been developed through the addition of some further assumptions since Modigliani and Miller's (1958) irrelevance theory which was assumed to operate under perfect capital market conditions. Modigliani and Miller (1963) then relaxed the perfect capital market assumption by considering tax shields, and Kraus and Litzenberger (1973) introduced the static trade-off theory as operating under two conditions: tax benefits, and bankruptcy costs. The pecking order, free cash-flow and market timing theories have been developed based on an asymmetric information assumption. Recently, economists have opened up the idea of the trade-off theory to involve more 'firm-value-changing opportunities' when firms choose leverage levels.



2.2.1 Taxes and debt ratios

Modigliani and Miller (1963) amend their irrelevance theory. They address the tax effect and find that, owing to tax shields on interest, gearing increases the value of a firm. Their model does not take bankruptcy costs into account. Furthermore, Miller (1977) shows that, when personal tax is taken into account, the irrelevance theory is still right, and argues that bankruptcy costs are too small to consider. Extending Miller's analysis, DeAngelo and Masulis (1980) assert that each firm has a different optimal gearing ratio, based on different debt and equity issuing prices, earnings and tax rates. In other words, this unique optimal leverage level leads to capital structure differences across industries, time and tax rates (see Appendix 2, which gives a full explanation of Modigliani and Miller, 1958; and their later amendment, 1963; Miller, 1977; and DeAngelo and Masulie's model, 1980).

2.2.1.1 How big is the tax shield?

In Modigliani and Miller's (1963) amended theorem, a firm's value is increased as leverage levels increase, which is caused by tax shields. However, in the pecking order theory, this assumption is less important because, it assumes that the tax benefits are generally smaller than asymmetric costs (Shyam-Sunder and Myers, 1999).

On the other hand, a large number of previous articles have proved the existence of the taxation effect. Kemsley and Nissim (2002) and Graham (2003), for instance, estimate the tax shield at about 10% of a firm's value and Korteweg (2010) estimates about 5.5% within a controlling homogeneity industry. Huizinga et al. (2008) also show that multi-national firms vary their capital structures across countries in which they operate because when there is a change of tax policy in a country, the tax shield leads to a change in debt ratio. Moreover, Graham (2003) and Booth et al. (2001) show that the tax rate is positively related to a firm's leverage ratio. Similarly, Desai et al. (2004) show, by using multi-national affiliates, that the debt ratio rises by 2.8% if local tax rates increase by 10%. Guenther and Willenborg (1999), Poterba and

Weisbenner (2001) and Klein (2001) also find indirectly that personal taxes affect share trading volumes and share prices (Dai, 2008).

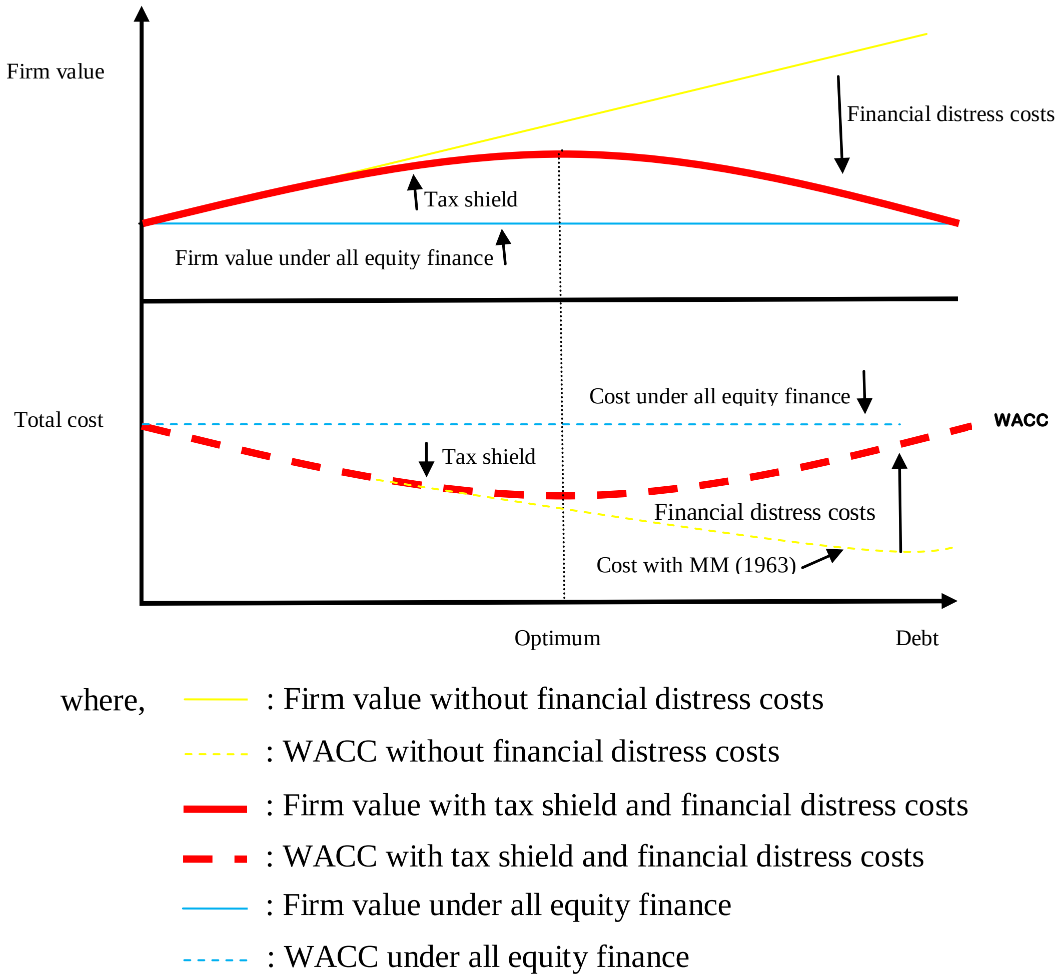
Without a doubt, taxes affect a firm's value as well as leverage levels, even though the importance is not as much as Modigliani and Miller (1963) expected. Furthermore, a number of previous studies, such as Shefrin (2007) and Beattie et al. (2006), find that tax is not a major matter compared with survival. The overall implications of tax benefits are, therefore, that there are tax shields but (direct and indirect) bankruptcy costs in static trade-off theory and asymmetric information costs in the pecking order theory reduce them; and in the static trade-off theory, bankruptcy costs might be greater than the tax shields. Bankruptcy costs are discussed in Section 2.2.2.1.

2.2.2 Trade-off theory

Kraus and Litzenberger (1973) suggest the static trade-off theory in an imperfect capital market condition, using two assumptions, (1) bankruptcy costs and (2) tax shield. On the one hand, as the leverage ratio increases, a firm's value also increases because of the tax shield effect. On the other hand, the cost of capital increases as the gearing level rises by increasing the probability of bankruptcy. Contrary to Modigliani and Miller's (1963) proposition, the static trade-off theory asserts that bankruptcy costs overwhelm the tax shield when firms have too much debt. At least, from the empirical evidence, if a firm has too high a gearing level, the probability of bankruptcy increases rapidly. Thus, the firm selects its leverage level to obtain the lowest cost of capital (generally, minimising its Weighted Average Cost of Capital (WACC)) to maximise firm value. Figure 2.2 illustrates the changes of WACC as a firm increases its leverage level. Damodaran (1999) and Altman (1984) suggest that the optimum debt level is achieved when tax shields and bankruptcy costs are the same; at which time the WACC is minimised (Ross et al., 1995: Appendix 2 in which the relationship between debt level, WACC and optimal debt level is explained). As Figure 2.2 illustrates it is the relationship between debt level and WACC that decides the optimal leverage level.

Figure 2.2 Optimal capital structure in static trade-off theory

The static trade-off theory assumes that firms balance the tax shields against financial distress costs. The WACC (Weighted Average Cost of Capital) indicates that an optimal capital structure is placed where the firm's highest market value is at the same point at which the WACC is at its lowest level.



2.2.2.1 Bankruptcy probability and costs

Modigliani and Miller's (1963) and Miller's (1977) argument is that bankruptcy costs are not great compared to the tax shield; and, in terms of asymmetric information theories, such as those of Myers (1984), Myers and Majluf (1984), Harvey et al. (2004) and others, agency costs are greater than bankruptcy costs. All this research suggests that bankruptcy costs are too small to be considered.

Miller (1977) argues that bankruptcy costs are not important compared to tax shields in a determining a firm's value. He adds that bankruptcy costs are "*mainly [about] the* *bankruptcies of individuals, with small businesses, mostly proprietorships and typically undergoing liquidation rather than reorganization* (p.262).” These matters are generally not related to the firm’s value, especially for big firms. Similarly, Haugen and Senbet (1978) argue that direct bankruptcy costs are small [1% of a firm’s value according to Warner (1977) for example] and liquidation costs, including indirect costs, are not related to bankruptcy costs. For example, the liquidation costs of unprofitable firms are a matter of capital budgeting, rather than capital structure; and if the firm is likely to go bankrupt it needs to go into liquidation or to be sold to new stock buyers. If the firm is sold in the competitive financial market, new shareholders regard the direct and indirect bankruptcy costs when they buy the firm; namely, the price will fetch a fair price with regard to all other costs and benefits; and the liquidation occurs when dismantled-asset values exceed market values. Therefore bankruptcy costs do not greatly affect a firm’s value.

However, DeAngelo and Masulis (1980), Marsh (1982), Mayers and Smith (1990), Bris et al. (2006) and others show that bankruptcy costs significantly affect the financial structure of a firm. Therefore, firms with high bankruptcy costs cannot hold too much debt even though there are tax benefits. Previous research shows that bankruptcy costs are even greater than tax benefits. Shefrin (2007), for example, argues that tax shields are a secondary matter [compared with survival]. Beattie et al. (2006) find that, in the UK, ‘long-term survivability’ is the most important capital structure determinant and, in the US, financial flexibility and credit ratings are the most important factors (Graham and Harvey, 2001). Furthermore, Graham (2000) adds that if firms increase their leverage levels up to a certain point where their increasing-marginal-tax-shield effect becomes zero and moves towards a negative (the point where ‘kink’ becomes less than one[2] or the lowest WACC), these firms would obtain up to 15% of their values, but firms use just 9.7% tax shield, because managers might consider that the costs of financial distress are too severe to increase leverage levels to obtain full benefit from the tax shield effect. Recent working

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[2] Graham (2000, p.1902) defines kinks as “*…the ratio of the amount of interest required to make the tax rate function slope downward (in the numerator) to actual interest expense (in the denominator).*” In other words, increasing interest rate is greater than increasing tax benefit after the point of kink if a firm raises its debt level.

papers by Binsbergen et al. (2010; 2011) also argue that the cost of using too little debt is smaller than the cost of using too much debt. All this literature indicates the importance of bankruptcy costs in capital structure theories.

There are two kinds of bankruptcy costs, direct and indirect (Warner, 1977). Direct costs occur when a firm goes bankrupt, but indirect costs can occur before bankruptcy. Direct bankruptcy costs include fees for lawyers, accountants, and other professionals, and the managerial costs involved in administering the bankruptcy. On the other hand, Altman (1984) indicates that indirect bankruptcy costs include the reduction of product demand, increasing production costs due to increasing tension between raw material suppliers and firms, and leaving key employees, are all significant. From the causality study by Opler and Titman (1994), highly leveraged firms lose market shares to less leveraged rivals in the event of an industry's downturn.

There are a number of previous articles that have studied bankruptcy costs. They show a wide range of such costs. For example, Warner (1977), using 11 bankrupt railroad companies, shows that the average direct bankruptcy costs are just about 1% of a firm's value prior to bankruptcy. Ang et al. (1982) estimate the administrative costs of bankruptcy at 7.5%. Altman (1984) suggests that bankruptcy costs are between 11% and over 20% of a firm's value, based on one year prior to the bankruptcy. He separates the bankruptcy costs into direct and indirect costs and suggests that the direct and indirect bankruptcy costs are 6.2% and 10.5% of a firm's value, respectively. Andrade and Kaplan (1998) also estimate that financial distress costs are between 10% and 20% of a firm's value. Bris et al. (2006) add that bankruptcy costs vary, and are predictable from each case, and that these costs are approximately between 2% and 20% of assets. Therefore, in general, managers are more concerned about bankruptcy than tax benefits from debt, particularly where smaller firms' bankruptcy costs are more important than tax shields (Mayers and Smith, 1990).

Last but not least, Damodaran's formula[3] (1999: see Section 2.3 in Appendix 2 for the related topics) documents that expected bankruptcy costs can be calculated by multiplying the actual bankruptcy costs (BC) that firms have to spend when they go into bankruptcy by the bankruptcy probability (π_a); namely, $BC \times \pi_a$. As described, Bris et al. (2006) also suggest that bankruptcy costs are predictable. Furthermore, Altman (1993) documents that bankruptcy can be predictable by as much as two reporting periods before the bankruptcy happens. There are two ways to assess bankruptcy probability: (1) using accounting financial data, and (2) using market stock price data, based on the 'structural models' (see Section 1.2.2. in Appendix 1, in which both accounting- and market-based bankruptcy probability models are fully explained). Altman's Z-score (1968), modified Z-score (2000), Emerging Market Score model (EMS, 2005) and Ohlson's O-score models (1980) are based on an accounting measure. The distance to default model (EDF: Expected Default Frequency) by using the Black-Sholes-Merton approach (Merton, 1974) is based on stock prices. Agarwal and Taffler (2008), who make comparisons between accounting-based and market-based bankruptcy prediction models, indicate that there is little difference between them in terms of predictive accuracy. In this thesis, the accounting-based measures are used.

2.2.2.2 Wider trade-off with other costs

Unlike the assumption of the traditional static trade-off theory that only considers tax shields and bankruptcy costs, in the real world there are a number of other opportunities to increase a firm's value and to decrease its costs, when it comes to a firm choosing its debt levels. Therefore, the wider trade-off theory considers more determinants associated with generation of costs and benefits in line with debt ratio changes.

For example, Hovakimian et al. (2004), Morellec (2004), Frank and Goyal (2009) and others consider the cost of agency problems. Morellec (2004) includes the

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[3] The value of leveraged firms $=(FCFF_0(1+g)/(\rho_u-g))+t_cD-\pi_aBC$, where $FCFF_0(1+g)/(\rho_u-g)$: the unleveraged firm's value, FCCF: the current after-tax operating cash-flow to the firm, ρ_u: the unlevered cost of equity, g: the expected grow rate, tc: tax rate, D: debt, π_a: the probability of bankruptcy, and BC: present value of bankruptcy cost

agency problem between shareholders and managers, as well as between tax benefits and bankruptcy costs in his study of trade-off capital structures. He explains observations of low debt levels, in practice, using agency costs. Fama and French (2005) also consider the benefits of free cash-flows and the cost of conflicts between stockholders and bondholders, by explaining the costs and benefits of the trade-off theory. They imply that the pecking order theory is only about the cost of issuing new securities caused by asymmetric information; and the issuing cost may be no more than a transaction cost. Overall, all these studies suggest the same motivation as traditional trade-off theory though they take more variables into account.

2.2.2.2.1 Agency costs in the capital structure decision

Since Berle and Means (1932), research on the consequences of the separation of ownership and control of firms started (Myers, 2001) and the agency theory as studied by Jensen and Meckling (1976) builds on previous work by Fama and Miller (1972) (Harris and Raviv, 1991). Since Jensen and Meckling (1976), agency problems have become an important matter in the capital structure theory (Bancel and Mittoo, 2004). There are generally two different agency problems, which exist between shareholders and bondholders, and between shareholders and managers.

Jensen and Meckling (1976) document three agency costs caused by increasing debt. They argue that high debt is the cause of (1) losing opportunities to increase a firm's wealth, (2) monitoring and bonding expenditures [4], and (3) bankruptcy and reorganisation costs. Importantly, they suggest that bankruptcy costs and reorganisation costs are agency costs. Myers (1977) suggests the existence of an under-investment problem, caused by a conflict between shareholders and bondholders, similar to the arguments put forward by Jensen and Meckling (1976) and Leland and Toft (1996). They mention that firms with high debt ratios need to give enough compensation to bondholders, such as renegotiating debt contracts or shortening debt maturity. Therefore, firms with good investment opportunities cannot

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[4] Bonding costs are paid to agents to guarantee that borrowers will not harm the principal by taking any action (Jensen and Meckling, 1976).

invest when they have high leverage levels, as it could be of more benefit to bondholders than to shareholders (Brounen et al., 2006). As described, Leland and Toft (1996) suggest short-term debt, and Green (1984) suggests convertible debt to solve this under-investment problem.

There are also agency problems between shareholders and managers. As the managers are employed by the stockholders, it is not necessary for them to invest all their efforts into managing the firms. To entice managers to use all their ability to increase the firm's value, they are offered stock options or stocks by the shareholders. Harris and Raviv (1991) also argue that inefficiency in managing firms can be reduced if managers hold the firms' equity or the firms use more debt.

2.2.2.2.2 Transaction costs

Myers (1984), in the pecking order theory, suggests the presence of 'capital structure adjustment costs' and suggests how they are related to the trade-off theory. He points out that:

> *Large adjustment costs could possibly explain the observed wide variation in actual debt ratios, [...] If adjustment costs are large, [...] then we ought to give less attention to refining our static trade-off stories and relatively more to understanding what the adjustment costs are, why they are so important and how rational managers would respond to them* (p.587).

This implies that transaction costs reduce the effects of the trade-off theory. Moreover, under the traditional static trade-off view, transaction costs are not included in the theory. Transaction cost, however, is an important factor as part of the dynamic trade-off and the pecking order theories. Hennessy and Whited (2005) also suggest the important role of transaction costs in the capital structure movement towards optimal debt ratios. If transaction costs were nil or negligible, firms would change debt ratios immediately, and the leverage levels would always be at an optimal level. In the real world, firms could not change them immediately because there are transaction costs involved. In practice, firms adjust their capital structure infrequently and in clusters (Hovakimian et al., 2004; Leary and Roberts, 2005). This also implies that transaction costs, together with bankruptcy costs and tax benefits, play a major role when explaining ‘dynamic capital structure adjustment behaviours.’ In other words, the pecking order theory might be part of a wider trade-off theory in the bigger picture, because issuing costs in the pecking order theory is a kind of transaction cost.

2.2.3 Dynamic capital structure adjustment

‘Dynamic capital structure adjustment’ is based on the static trade-off theory because it argues that firms try to achieve optimal leverage levels. Firms, in general, cannot maintain optimal leverage levels for various reasons. For example, companies have too much (or too little) revenue to stay at the optimal level, and they prepare cash for new investment purposes. In the dynamic trade-off theory, when firms deviate from target debt ratios by more than their tolerable ranges, they attempt to return to the optimal or normal levels. The dynamic trade-off theory, therefore, focuses more on the behaviour of firms than on the static situation.

Studies by Fischer et al. (1989) and Hovakimian et al. (2004) suggest that, with the existence of agency costs, firms passively change their capital structure by earnings and losses, and let the debt ratios deviate from the target until adjustment costs are exceeded by the cost of having a non-optimal leverage level. It is, therefore, the expected debt ratio changes, based on dynamic movements, which point in the same direction as the (complex) pecking order theory, as long as the ‘capital structure adjustment cost’ is greater than the staying costs in the non-optimal capital structure (see Section 2.2.4.1, which describes the details of complex pecking order theory). This implies that profits and losses from a firm’s operation of business are negatively and positively related, respectively, to debt ratios, until the firm adjusts its capital structure. A large body of research, such as that of Mitton (2007), Antoniou et al. (2008), Hennessy and Whited (2005), and many others shows the same results with this argument.

2.2.3.1 Target capital structure

A large number of researchers have been continuously looking for the optimal debt ratio because the trade-off theory is accepted if there is an optimal capital structure (or a target leverage level). The target should be an optimal debt level at which firms will have a maximal value. When a firm's capital structure is not at the optimal level, the firm, as a matter of course, moves toward the targets to increase its value.

According to Graham and Harvey (2001), 71% of Chief Financial Officers (CFOs) have target debt ratios and they like to remain at that chosen leverage levels (Fischer et al., 1989; Goldstein et al., 2001). Bancel and Mittoo (2004) also show that two-thirds of firms in the UK, Germany and the Netherlands have target debt ratios and that 10% of them attempt to maintain strict targets. Leary and Roberts (2005) also find that companies try to stay within optimal levels in terms of capital structure. In addition, Remmers (1974) and Masulis (1983) argue that firms like to have stable capital structures if their leverage levels are in efficient ranges, such as the average for a certain industry. Recently, Lemmon et al. (2008) observe that debt ratios are stable whether they are at low or high levels. Furthermore, Harford et al. (2009) show the existence of capital structures by studying the acquisition of firms. They show that, after completing an acquisition, firms go back to their normal debt level, generally within five years. These facts imply that firms attempt to sustain their capital structure at their preferred debt levels, though we do not know whether the levels are optimal.

Contrary to this, much previous research has asserted no target debt ratios. For instance, Miller (1977) questions why debt ratios change so little if the optimal capital structure is a matter of balancing debt ratio. Baker and Wurgler (2002) state that debt ratios are decided by issuing new stocks, and firms just issue new equities when stock prices are high. Hennessy and Whited (2005) also argue that capital structure is decided by lagged cash-flows from investments and Tobin's Q. This implies that leverage levels are decided by residual effects from a firm's operation of business and stock price alterations, rather than a manager's will. This is consistent with the pecking order and inertia theories.

2.2.3.2 Dynamic capital structure adjustment

The capital structure adjusting process is mostly concerned with three factors: (1) debt ratio changing speed, (2) the availability of new projects and (3) adjustment costs. As described, Fischer et al. (1989), Hovakimian et al. (2004) and Leary and Robert (2005) show infrequent capital structure adjustments. They argue that there will be too much cost if firms adjust their gearing levels frequently.

There are more studies that investigate 'capital structure adjustment speed' and the factors that affect this speed. Damodaran (1999), for example, indicates that firms decrease their leverage levels gradually by the implementation of new good projects which use new debt. Namely, a firm can increase or decrease its leverage level by the implementation of a project. Fama and French (2002) and Opler et al. (1999) show that firms adjust debt ratios toward their targets at different speeds (Driffield et al., 2005). Antoniou et al. (2008) also show that firms, in different countries, move towards their targets at different speeds, with French firms being the fastest and Japanese firms being the slowest. Furthermore, Jalilvand and Harris (1984) argue that the speed of adjustment vary over time and companies, and also mention that a firm's size, interest rates, and stock prices affect the adjustment speed. With regard to these previous studies, we can expect that firms adjust their capital structures, which in turn are affected by various elements.

2.2.4 Pecking order theory

Myers (1984) and Myers and Majluf (1984) explain the 'debt and equity issue' using asymmetric information. According to Myers (2001), the pecking order theory would achieve the same conclusion as Modigliani and Miller (1963) if there was no asymmetric information problem. In the world where asymmetric information exists between market participants however, external investors have less information than management. Thus, external investors ask for discounted prices for new issues of stocks or bonds (Autore and Kovacs, 2004); otherwise internal investors would benefit because they could release new securities with the wrong information. Therefore, in the pecking order theory, firms generally issue secure securities first, because external investors require small discounts on them. There is a hierarchy of confidence from a secure security to a less secure one, based on security types. By using the hierarchy, firms can minimise asymmetric information costs. The best policy in the pecking order theory is to use internal funds and issue debt, if necessary.

However, from the study by Fama and French (2005) at least, during their sample period, from 1973 to 2002, more than 67% of the sample firms issue some equities each year, and a small number of firms repurchase equity to offset the issuance. This implies that asymmetric information may bring the opposite result (e.g. over-estimated stock prices), or that managements are risk averse or pessimistic, or that asymmetric information costs are not as high as Myers thought. This thesis also arrives at a similar conclusion in that firms had more net stock issues than net debt issues during the sample period.

In addition, as firms use only internal funds, there is no optimal leverage level in the pecking order theory (Shyam-Sunder and Myers, 1999). Debt ratio is just changed by an imbalance of inward and outward cash-flows, such as operating income, dividends and investment. Shyam-Sunder and Myers (ibid.) also mention that, if financial distress costs are ignored, firms, in general, issue debt. Conversely, firms issue equity when they face high financial distress costs, or when managers are less optimistic. This is consistent with the static trade-off theory.

2.2.4.1 Complex pecking order theory

Myers (1984, pp.589-590) suggests "*…an 'optimal dynamic issue strategy' for firms under asymmetric information*" called the 'complex (or modified) pecking order theory,' which considers asymmetric information, new investment opportunities and financial distress costs. He explains this by saying that "*…we could start with a story based on asymmetric information and expand it by adding only those elements of the static trade-off […]*" Myers, therefore, suggests an equity issue when asymmetric information is low. This implies issuing equity when the stock price is abnormally high (over-estimated or fair-priced) in the market.

Fama and French (2005, p.31) suggest a firm's behaviour within the complex pecking order theory as: "*…firms balance current and expected future financing costs.*" Firms, therefore, lower dividend payouts and leverages, issue equity when agency costs are low, and accumulate retained earnings to increase the debt capacity for future large-scale investment (Fama and French, 2002). This model, as Fama and French mention, might be a hybrid theory between the trade-off and the pecking order theories. This complex pecking order theory implies that firms should consider their capital structure in the longer term than is the case with the simple pecking order theory. Therefore, there is no target debt ratio according to the simple pecking order theory (Myers, 1984) whereas, under the complex model a company may have a temporal target capital structure for its future needs.

In other words, in the trade-off theory, optimal capital structure leads to high firm values, while the temporal target debt ratios in the complex pecking order theory lessen financing costs. Fama and French (2002) therefore assert that low leverage firms attempt to increase their debt levels with the trade-off theory, but not with the complex pecking order theory when they have investment opportunities (see Section 6.3.3 for more details).

2.2.5 Market timing and pecking order theory

According to Shefrin (2007), market timing, financial flexibility and issuing costs are the primary matters with regard to deciding on capital structure, at least in the short-term, and traditional considerations, such as taxes and the cost of financial distress, are secondary matters. Miller (1977) has already noticed that, during economic expansion, leverage levels tend to fall because equity financing increase with a bull stock market. In other words, firms simply issue new securities whenever the financial market conditions favour issuing, namely issuing at low (asymmetric) costs (Opler et al., 1999; Mayer, 1984; Mayer and Majluf, 1984; Lucas and McDonald, 1990; Baker and Wurgler, 2002).

Graham (1973) asserts a firm's general behaviour based on financial market conditions as:

[…] most new issues are sold under 'favourable market conditions' – which means favourable for the seller and consequently less favourable for the buyer […] this is one aspect of general tendency to sell new securities of all types when conditions are most favourable to the issuer […] Bull market periods are usually characterized by the transformation of a large number of privately owned businesses into companies with quoted shares […] In many cases the issues lose 75% and more of their offering price (pp.139-144).

Namely, that the market is favourable to the seller, meaning that stocks are over-priced in the market which benefits companies.

There are a large number of empirical studies about the relationship between security issues and market conditions. Brau and Fawcett (2006) argue that CFOs rely strongly on overall stock market conditions for the timing of their IPOs. Korajczyk et al. (1991) and Leary and Roberts (2005) show, for instance, that equity issues are clustered after earning announcements. Leary and Roberts (2005) also show that 'capital structure adjustments' are made when security issuing costs are low. In the market timing theory, as Baker and Wurgler (2002) argue, the leverage level is decided by an accumulation of residual effects from the new security issuances under good market conditions. That is, the present gearing ratio is an outcome of historical IPOs and SEOs, and is no more than market timing.

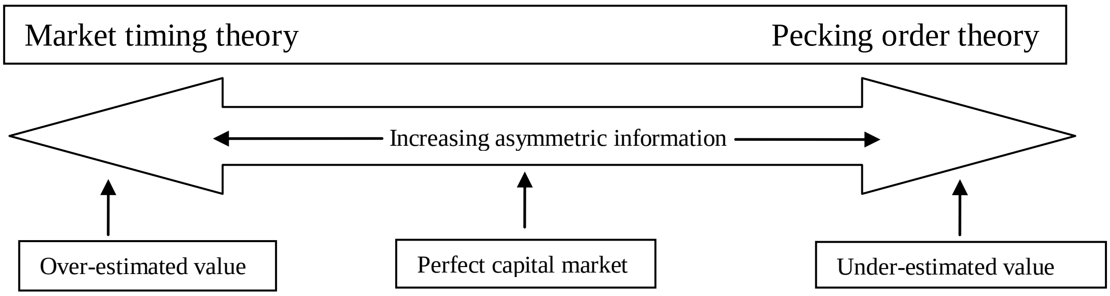
This also implies that CFOs attempt to maximise firms' incoming cash-flows by selling stocks when the stock price is high, or bonds when interest rates are low. This not only increases cash-flows for firms, but also increases their values. This is consistent with the pecking order theory, which suggests that firms only use internal funds because newly issueed securities are discounted by the market, and the firms make a loss on the issue. On the contrary, the market timing theory suggests that firms issue equity when the stock price is high (namely, when overvalued) and the firms make profits on the issue. The market timing theory, therefore, is another version of the pecking order theory. This idea is consistent with a large body of earlier research. For example, according to Elliott et al. (2008), since the market timing theory uses misvaluation of stock prices in the financial market, the conclusion of Baker and Wurgler (2002) is a sort of extension of Myers' (1984) pecking order theory.

2.2.5.1 Market timing and asymmetric information

As discussed above, both the pecking order theory and the market timing theory are based on asymmetric information. In the pecking order theory, a firm's value is under-estimated by market participants owing to the scepticism with regard to management's announcement of the firm's future cash-flow, whereas outside investors over-estimate the firm's future cash-flow due to asymmetric information in the market timing theory (Yuan, 2005). In other words, both a firm's over- and under-estimated values are caused by high asymmetric information. If there is no asymmetric information or a low level of asymmetry, a firm's value should be close to the intrinsic value. Furthermore, as the pecking order and market timing theories assume the opposite market situation, the phenomena of the pecking order and the market timing theories never appear simultaneously. Using the ideas from Myers (1984), Baker and Wurgler (2002) and Yuan (2005), we create Figure 2.3 which illustrates firms' values in terms of the pecking order theory and the market timing theory under the condition of the existence of asymmetric information.

Figure 2.3 The relationship between market timing and pecking order theories

Using the ideas from Myers (1984), Baker and Wurgler (2002) and Yuan (2005), we create Figure 2.3 which illustrates firms' values in terms of the pecking order theory and the market timing theory under the condition of the existence of asymmetric information. The figure illustrates that a firm's value is [near] its intrinsic value in a perfect capital market situation. However, under an asymmetric information condition, external investors can over- or under-estimate a firm's value. If they over-estimate a firm's value, then the market timing theory will be applicable, whereas if they under-estimate it, then it is assumed that the pecking order theory is relevant. As the pecking order and the market timing theories assume an opposite market situation, the phenomena of the pecking order theory and the market timing theory never appear simultaneously.



Even though asymmetric information obstructs equity issues, firms continuously issue equity. Myers (1984, p.585) notices that, from the manager's viewpoint, *"…firms will issue equity only when it is overpriced, and debt otherwise."* Myers and Majluf (1984, p.220) also argue that "*…[one] way to build financial slack was by issuing of stocks when manager's information advantage is small.*" This argument is supported by empirical research (e.g. Baker and Wurgler, 2002; Elliott et al., 2008; Bessler et al., 2011; and others).

Elliott et al. (2008), for instance, suggest two reasons for equity issue under asymmetric information conditions: (1) the asymmetric information cost is not significant unlike the argument of the pecking order theory (Fama and French, 2002); and (2) managers have superior information about the future of a firm's prospects. In other words, internal managers expect that future earnings will not be as great as external investors expect. As Elliott et al. (ibid.) mention, the second reason is based on external investors' irrationality. Similarly, Autore and Kovacs (2010) also argue that adverse selection costs are low when: (1) firms release all private information to the market (Korajczyk et al., 1991); (2) investors have better prospects than managers (Dittmar and Thakor, 2007; Autore and Kovacs, ibid.); and (3) firms face periods of business expansion (Choe et al., 1993).

This indicates that the pecking order theory (including the market timing theory) and the static trade-off theory, are fundamentally the same. Both theories try to reduce financing costs. In other words, in the pecking order theory, firms try to reduce asymmetric information costs, while in the static trade-off theory they try to minimise the weighted average cost of capital (WACC) in order to maximise their value. Using the same logic, in the pecking order theory, firms maximise their value by minimising financing costs. Flannery and Rangan (2006) also conclude that the pecking order theory is a part of the trade-off theory, rather than a unique leverage determinant.

In short, our argument is that the trade-off, pecking order and market timing theories are all based on costs and benefits, and together with value maximising motivation.

2.3 The other capital structure determinants

We have considered different capital structure theories with tax benefits, bankruptcy costs, and asymmetric information costs. A number of previous pieces of research have shown that capital structure is affected by some other determinants, such as country, industry, firm size, firm age and market situations. Thus, we need to consider these determinants, which are generally related to the economic environment, and a firm’s characteristics. These determinants are used in the thesis as criteria for a firm’s characteristics.

2.3.1 Country

Antoniou et al. (2008) suggest that capital structure is decided by a firm’s own characteristics, as well as, by the environmental situation and the traditions in which they are operating. Notably, they assert that the same capital structure determinants affect leverage level in the same ways with different strengths in different countries. Song and Philippatos (2004), Rajan and Zingales (1995), Daskalakis and Psillaki (2008) and others show there exists capital structure differences between countries.

In addition, Booth et al. (2001) and Jong et al. (2008) argue that the debt ratio differences are caused by country-specific factors such as GDP growth and capital market development.

One notable issue in the matter of country is that each country has a different economic philosophy and history. For example, Collins and Sekely (1983), by using different cultural groups, argue that capital structures are, significantly different in places where the headquarters of companies are and that a country more significantly affects capital structures than industry. Wald (1999) suggests that different countries may have different sensitivities towards bankruptcy probability; namely, firms in the US are more sensitive than Japanese firms. Moreover, Anglo-Saxon countries (particularly the US and the U.K) generally follow the classical microeconomic market theory viewpoint compared with European nations. German and Japanese economies are more likely to be classified as welfare economies (Galbraith, 1991; Dore, 2000). Even though firms in the UK and the US are in the same Anglo-Saxon economy, US firms are more competitive and pro-shareholders than British firms (Dore, 2000). There are also historical differences between the two groups of economies. Unlike the Anglo-Saxon economies, the industrial development of Japan, Germany and France is led by their governments, an idea which has been followed in South Korea (hereafter Korea) and Taiwan.

The second distinguishable matter is the legal system. The UK, the US, Canada and Australia's legal systems are based on a common law system. France, Germany, Italy, Austria, Japan, Korea, and Taiwan follow a civil (code) law system[5] (Antoniou et al., 2008; La Porta et al., 2000). Jong et al. (2008) find, by using the definition of La Porta et al. (1998), the importance of legal enforcement, e.g. creditor or shareholder rights protection. Jong et al. (2008) show, for instance, that legal enforcement increases the strength of the bond market. La Porta et al. (2000) also argue that firms in countries with better protection of small shareholders pay more dividends. Contractual priority is also different between countries. For example, while Britain

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[5] On some occasions, Korea, Japan and Taiwan are classified as hybrid systems. (Antoniou, Guney and Paudyal, 2008)

and Germany have tough bankruptcy procedures, this is not the case in the US (Hackbarth et al., 2007). Hackbarth et al. (2007) argue that when contractual priorities can be easily violated, firms are more likely to go to the financial market for financing instead of going to a bank. In fact, firms in the US finance about 25% of their total debt from the market, but less than 1% in Germany and only 4.4% in Britain (Rajan and Zingales, 1995).

Thirdly, firms rely on different financing methods across countries. Firms in the Anglo-Saxon economy, for example, are more likely to be financial market based for finance but those in the European economy (particularly France and Germany) and Japan are more likely to be bank based when it comes to finance (Antoniou et al., 2008). Antoniou et al. (2008) expect that firms in bank-orientated economies have lower agency costs between borrowers (firms) and creditors (banks). We may presume that European economy firms also suffer less from asymmetric information matters because firms in the European Continent borrow more from banks.

Fourth, the different conglomerate systems associated with different countries lead to capital structure differences. Korea and Japan have similar company systems called '*Chaebol*' and '*Keiretsu'* respectively. Big Japanese firms come under the heading of '*Keiretsu'* and are connected to banks. The banks hold the stock of firms that are in a '*Keiretsu'* group and the firms borrow from these banks (Morck and Nakamura, 1999). The largest lenders in 72% of Japanese firms were one of the firm's top five shareholders in 1980 (Sheard, 1989). Firms within the group of '*Keiretsus*' have different capital structures, and show different performances when they are in financial distress, compared with firms that do not relate to '*Keiretsus*' (Hoshi et al., 1990). For example, firms under '*Keiretsu*' invest and sell more when they are in financial distress than firms that do not have a special relationship with '*Keiretsu*.' Since banks are shareholders and bondholders of firms at the same time, there are fewer agency problems; and as the banks appoint executives who represent their benefits, there is an appropriate monitoring system.

Unlike Japan, there is no proper monitoring system in Korean '*chaebols*' even though they generally have a high level of debt. For example, the five largest '*chaebols*' in Korea lent 20% of outstanding debt and made 75% of new borrowings in 1996 (Campbell II and Keys, 2002). In some ways, Korean '*chaebols*' are between German and Japanese models (Gugler et al., 2004). They are like German firms, as the families of founders still control the companies though they have a very small portion of equity like Japanese firms. In Japan, unlike Korean '*chaebols*,' the families of founders cannot control companies, even though the families have a small portions of equity like in the Korean '*chaebols*.'

Fifth, the managing system also shows the difference between countries, based on economic philosophy. For example, the Anglo-Saxon economy, e.g. the US or the UK, has external boards as well as executives (Gugler et al., 2004). Continental economies, on the other hand, are more likely to have firms that belong to the ultimate owners, and have '*Aufsichtsrats*' that represent employees and other stockholders (small stockholders). These '*Aufsichtsrats*' come from Austria, Germany and France, and are generally in the European Continental economy. This difference brings a different financial structure. Generally, firms held by ultimate owners have higher levels of debt ratio compared with firms whose ownership is widely spread (Agrawal and Mandelker, 1987; Gonedes et al., 1988).

Last but not least, as a matter of course, capital structure is also affected by political conditions. Qi et al. (2010) assert that financial markets and the costs of debt are affected by political rights and legal institutions. They studied 39 countries and found that greater political rights are associated with a lower cost of debt. They also explain that political stability leads to the stability of debt contracts and the macro-economic situation. Demirgüç-Kunt and Maksimovic (1999) indicate that institutional differences between developed and developing countries explain the use of long-term debt. They find that firms in developed countries have more long-term debt.

Overall, we can conclude that capital structure is influenced by factors related to countries, which are due to different laws, cultures, economic philosophies, corporate governance systems and political stability. Furthermore, Antoniou et al. (2008) add that: (1) lessons learned from one economy are not necessarily a generalisation with regard to firms operating in other economies; (2) while managers decide their capital structures, they consider not only a firm's specific factors, but also general market conditions; and (3) firms go towards their target debt ratios at different speeds across countries.

2.3.1.1 Macro-economic factors

Most previous research has ignored the effects of macro-economic factors (Antoniou et al., 2008). Inflation and the GDP growth rate in a country, for example, influence the capital structure. For instance, if a country has a high rate of inflation, or has a rapidly developing economy, firms in that country would use more debt than firms who are in a country in recession or in a stable developing stage. Booth et al. (2001) show that the proportion of liquid liabilities is positively related to the GDP and is negatively connected to inflation, though Stonehill and Stitzel (1969) mention that high debt ratios could hedge high levels of inflation. Fitzpatrick and Ogden (2011) also find that recession significantly affects the bankruptcy of high leveraged firms.

In this research, long-term interest rates, real GDP growth, GDP deflator and stock and bond market capitalisation are considered as country macro-economic indicators (see Section 7.11). The average interest rates and GDP deflators have generally reduced in the second period (1999-2008) compared with the first period (1989-1998) in the sample countries. The real GDP growths show a stable rate of change over time during the sample period.

Table 2.2 Average long-term interest rate, real GDP growth and GDP deflator[6]

The averages long-term interest rates, real GDP growth and GDP deflators are described during the two sample time periods (1989-1998 and 1999-2008) in the table. The data with regard to each country's long-term interest rates, real GDP growth and GDP deflator are collected annually at the end of each year, from 1989 to 2008. Here, LT: long-term, GDP: Gross Domestic Product

	LT Interest rate (%)		Real GDP growth (%)		GDP deflator (%)	
	89- 98	99- 08	89- 98	99- 08	89- 98	99- 08
Australia	9.11	5.75	3.7	3.39	1.9	3.81
Austria	6.99	4.44	2.54	2.36	2.08	1.6
Canada	8.04	4.77	2.14	2.95	1.92	2.74
France	7.44	4.37	1.94	2.04	1.81	1.87
Germany	6.87	4.22	2.51	1.66	2.38	0.86
Italy	9.76	4.62	1.32	1.31	2.84	2.39
Japan	4.29	1.48	2.05	1.31	0.9	-1.12
Korea	-	5.52	5.98	4.39	7.15	1.87
Taiwan[7]	-	-	5.95	4.57	3.73	0.96
UK	8.53	4.81	2.11	2.62	4.11	2.41
USA	6.95	4.69	3.02	2.66	2.46	2.77

2.3.1.2 Financial market condition

As described, market timing is closely related to the issuing choice with regard to new securities. Therefore, if stock prices are positively related to issuing stock, stock indices are also positively related to IPOs and SEOs. Namely, when the stock indices increase more than a certain level (GDP growth, for example), firms should issue more stock. This strategy brings more cash-inflows to the firms, than for firms who issue stocks in a bear market.

According to Table 2.3, Korea, Britain, the US and Taiwan have seen a big shift in average stock price indices between the first and the second period. Austria, Korea and Taiwan show big differences in standard deviations between these periods. Therefore, we may presume that Korea and Taiwan have shifted their debt ratios the most if the capital structure changes are related to stock prices. In fact, Korea, Japan, Taiwan and Australia have changed their gearing ratios the most (see Chapter 4).

[6] OECD Factbook 2007 except the data for Taiwan

[7] The data of real GDP and GDP deflator are from the International Monetary Fund, World Economic Outlook Database, October 2007, http://www.imf.org/external/pubs/ft/weo/2007/02/weodata/weoselgr.aspx.

Table 2.3 Average change in stock indices

The indices are selected from the representable index in each country. The values are an average of stock index changes and standard deviations in each year for each index. The data with regard to each country's stock price indices are collected annually at the end of each year from 1987 to 2005, with the exception of Taiwan. For the Taiwanese index, TAIEX, we use annual average values from the Taiwan stock market.

		First period (87- 96)		Second period (97- 05)	
	Indices	Average changes (%)	Standard deviations	Average changes (%)	Standard deviations
Australia	ASX	9	0.19	9	0.10
Austria	ATX	16	0.42	17	0.24
Canada	S&P/TSX60	9	0.14	1	0.16
Germany	DAX	15	0.21	9	0.26
France	CAC40	12	0.23	1	0.25
Great Britain	FTSE100	11	0.14	3	0.15
Italy	MIB	5	0.18	9	0.20
Japan	TOPIX	3	0.22	5	0.30
Korea	KOSPI	6	0.29	23	0.37
Taiwan	TAIEX	13	0.14	4	0.25
United States	NYSE	13	0.13	7	0.14

Table 2.5 also shows capital market developments by following the definition of Jong et al. (2008). The table presents market capitalisation as a proxy of stock market development, and bond market capitalisation as a proxy of bond market development. Booth et al. (2001) indicate the importance of market capitalisation. They find a negative relationship between stock market capitalisation and debt ratios, and a positive relationship between bond market capitalisation and debt ratios. Deesomsak et al. (2004) also presume a negative relationship between debt ratio and stock market capitalisation, because increasing stock issue in the financial market implies a decreased debt ratio; and find the negative association, as they have assumed. Giannetti (2003) suggests that high bond market capitalisation increases the ability of firms to access the bond market. Figures 2.4 and 2.5 show both stock-market-capitalisation to GDP and bond-market-capitalisation to GDP. The figures show that stock-market-capitalisation to the GDP ratio is greater than the bond-market-capitalisation to the GDP ratio, throughout the time period under consideration. However, the figures also indicate that the bond-market-capitalisation to GDP increases faster.

Finally, Table 2.4 shows the major topics and authors of studies into capital structure in terms of country characteristics.

Table 2.4 Country related topics and authors in the studies of capital structure

Topic	Authors
Macro-economic factors	Booth et al. (2001), Jong et al. (2008), Antoniou et al. (2008)
Financial market system	Rajan and Zingales (1995), Antoniou et al. (2008), Sheard (1989), Hoshi et al. (1990), Gugler et al. (2004), Qi et al. (2010), Demirgüç-Kunt and Maksimovic (1999)
Legal system	Antoniou et al. (2008), La Porta et al. (1998, 2000), Jong et al. (2008), Hackbarth et al. (2007)
Culture	Collins and Sekely (1983), Wald (1999), Galbraith (1991), Dore (2000)
Firms' organisation	Gugler et al. (2004), Agrawal and Mandelker (1987), Gonedes et al. (1988)
Capital market development	Jong et al. (2008), Deesomsak et al. (2004), Giannetti (2003), Booth et al. (2001)

Table 2.5 Bond and stock market capitalisation from the sample countries

The table presents market and bond capitalisation and the number of listed firms in each country. Source: Financial data from the World Federation of Exchange (WFE), GDP data from the International Monetary Fund, and the World Economic Outlook Database. Data of bond market capitalisation of France are from Euronext Paris. In 2002, Euronext Amsterdam, Euronext Brussels, Euronext Lisbon, and Euronext Paris were consolidated into a single entity. In the Canadian data, TSX group included Toronto Exchange and TSX venture from 2002. In the Korean data, the Korea Exchange figures include Kosdaq. In Germany, the Deutsche Böse excludes the market segment "Freiverkehr." Market capitalisation=share price × number of shares outstanding. Bond market capitalisation=total listed bonds value, the number of listed firms is the number of domestically incorporated companies on the countries' stock exchanges. na: no data.

	Market capitalisation				Number of Listed firms		Bond market capitalisation			
	$ Billions		% of GDP				$ Billions		% of GDP	
Countries	1998	2008	1998	2008	1998	2008	1998	2008	1998	2008
Austria	35.5	76.3	16.7	18.4	128	118	122.9	372.6	57.9	89.8
France	na	na	na	na	na	na	886.8	na	60.2	na
Germany	1,086.8	1,110.6	49.7	30	662	832	na	na	na	na
Italy	566	522.1	46.4	22.6	243	300	na	52.2	na	2.3
Japan	2,439.6	3,356.4	63.3	68.3	3,162	3,786	4,472.7	12,587.7	116	256.3
S. Korea	114.6	470.8	31.8	50.7	748	1,793	277.8	654.8	77.1	70.5
Taiwan	260.5	356.7	94.3	91.2	437	722	36.6	114.2	13.3	29.2
Australia	328.9	683.9	88.2	67.4	1,222	2.009	68.3	na	18.3	na
Canada	543.4	1,033.5	88.1	68.9	1,433	3,841	na	na	na	na
U.K	2,372.7	1,868.2	162.9	69.7	2,423	3,096	1,232.7	2,734.4	84.7	102
US	12,648	11,738	144	81	8,449	6,449	na	na	na	na

Figure 2.4 Stock market capitalisation over GDP (share price × number of shares outstanding/GDP

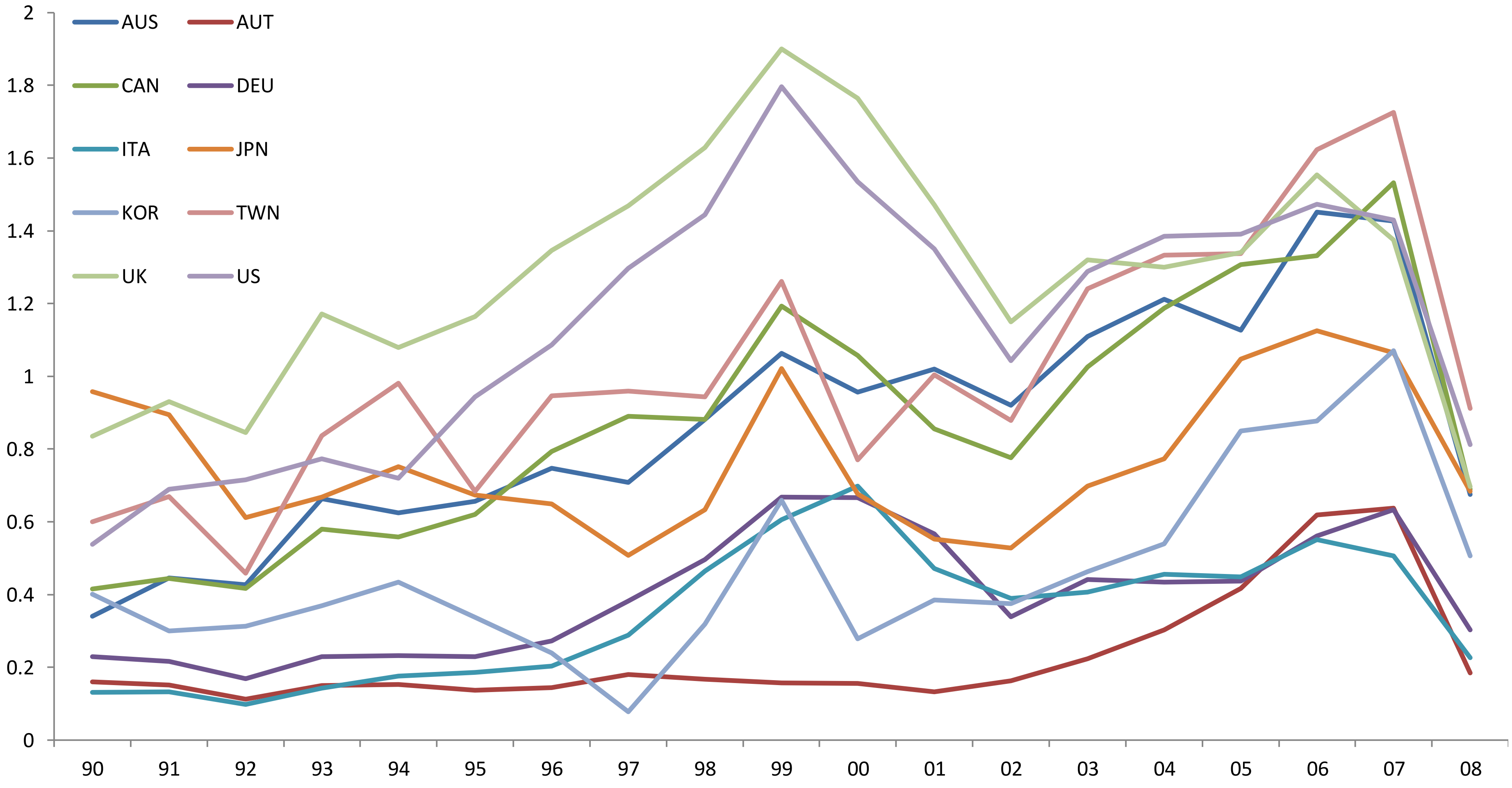
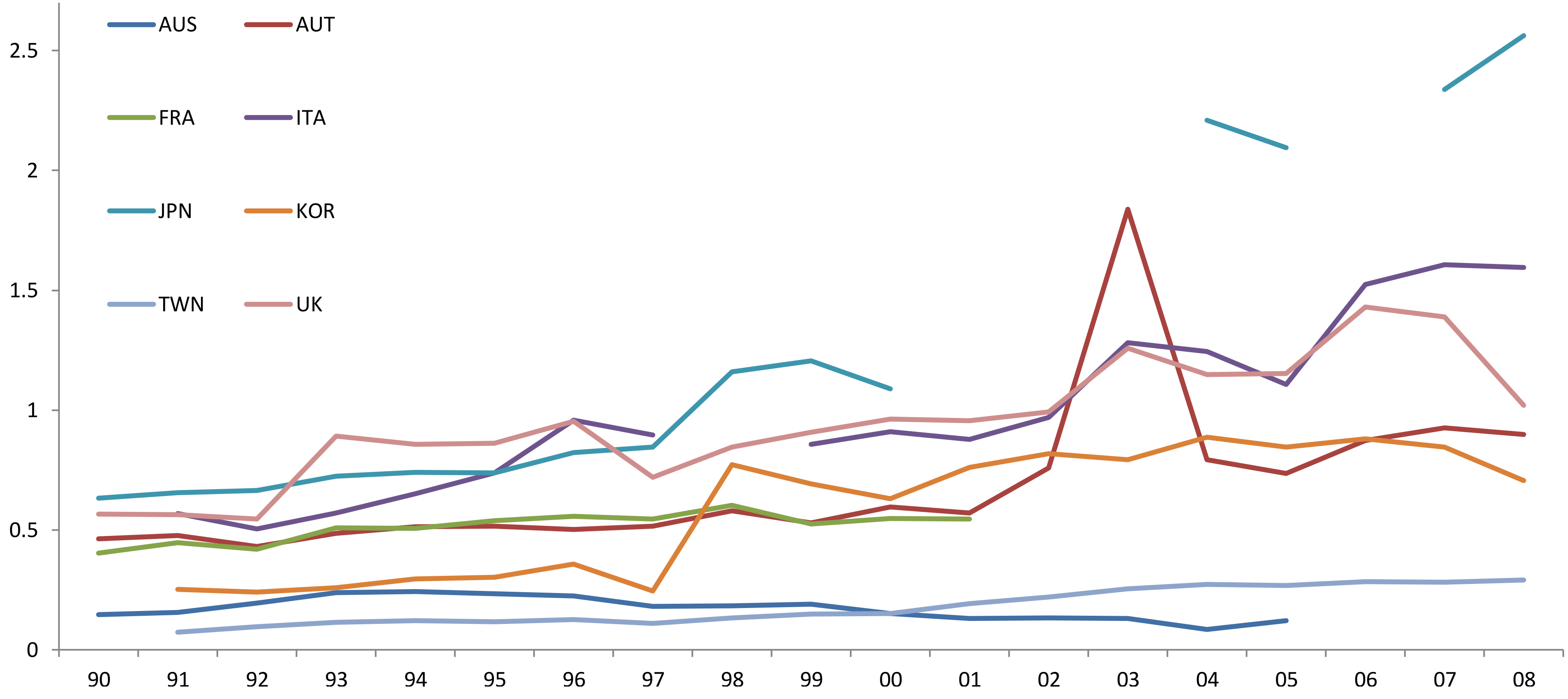


Figure 2.5 Bond market capitalisation over GDP (total listed bonds value/GDP)

Note, that the discontinuity of lines for some countries is caused by a lack of data for certain years.



2.3.2 Industry

Industry is related to several factors in the capital structure theory, such as bankruptcy costs, liquidation value, asymmetric information, collateral value and macro-economic industrial trends. Firms with tangible assets could retain more value when firms go into bankruptcy, than firms with intangible assets, because tangible assets will have a higher liquidation value and fewer asymmetric information costs. For example, firms with high levels of asset tangibility, such as, firms in the hotel or marine transportation industries (see Chapter 4), therefore, have more debt.

Scott, Jr. and Martin (1975) examine industry's influence on financial structure by considering 12 different industries and suggest the importance of industry factors in financial structure decisions because there are clear differences in debt ratios between industries. Purnanandam (2008), Graham and Harvey (2001) and Chevalier (1995) also suggest that industry characteristics are the most basic factors in capital structure policy, that firms have a similar debt ratio within the same industry, and that, in general, firms retain their debt ratios over time. Harris and Raviv (1991) also mention, by citing prior research, that it is widely agreed that firms in drugs, instruments and food industries have low leverage, while firms in paper, steel and the airline industry have high leverage, while telephone and gas utilities are among the highest leveraged industry group.

Moreover, Hovakimian et al. (2001) show that firms slowly adjust their debt ratios towards the industry average. In addition, Graham and Harvey (2001) offer modest evidence that financial managers consider the leverage levels of competitors. They also argue that the factor of industry is important for credit ratings. Similarly, Maksimovic and Phillips (1998) find that firms in fast growing industries do not go bankrupt easily, compared with firms in slower growing industries.

2.3.3 Firm size

It is widely accepted that a firm's size is positively associated with its debt level, since large or multi-product firms are generally less risky than small ones (Ojah and Marnique, 2005; Daskalakis and Psillaki, 2008). The firm's size is related to several topics in the capital structure theory, such as asymmetric information, financial distress costs, transaction costs, and accessibility to the financial market.

Demirgüç-Kunt and Maksimovic (1999) find that firms use different financing institutions based on their size. They argue that the leverage use of large firms is related more to financial market activity than to the banking sector. On the other hand, small firms' debt ratios are more likely to be related to the banking sector, as they do not have the ability to access the public market and attempt to avoid issuing costs (Hackbarth et al., 2007). Similarly, as small firms have higher asymmetric costs, using bank debt would be cheaper (Frank and Goyal, 2003).

In addition, the firm's size also relates to the length of financing. Titman and Wessels (1988), Demirgüç-Kunt and Maksimovic (1999) and Hackbarth et al. (2007) argue that large firms use more long-term debt. Titman and Wessels (1988) add that the transaction costs of small firms are too high to finance long-term debt. Furthermore, Jalilvand and Harris (1984) suggest that large firms adjust capital structure faster for long-term debt than do small firms. This may imply that adjusting costs are smaller for larger firms. This is consistent with our results.

2.3.4 Firm history (age)

It is likely to be presumed that firms with a long history have a higher reputation for debt repayment and they have lower asymmetric formations. Diamond (1989) argues that firms frequently borrow using short-loans, in order to increase their reputation, and then use long-term debt later on. Therefore, long history firms probably borrow more. Hackbarth et al. (2007) mention that young firms do not have enough bargaining power and use bank debt, generally because of the barriers to entering public financial markets and because financing costs could be expensive. Since younger firms have higher asymmetric costs, using bank debt would be cheaper in terms of the pecking order theory. This also implies that young firms use less debt.

On the other hand, Harris and Raviv (1991) suggest lower debt ratios for firms with a longer history because these firms generally use low risk projects in order to build their reputation for repaying their debt. Overall, we can presume that a firm's age relates to the asymmetric information, transaction costs, and bankruptcy probability in the capital structure theory.

2.3.5 Time

The financial markets conditions, economic cycle and economic impact on the world economy alter over time. Consequently, firms use this changing trend as opportunities to increase their value and to decrease their financing costs as changing their debt ratios. For example, the study by Bates et al. (2009) shows that firms' cash holdings in the U.S. have continually increased since 1980, while debt levels have continued to decrease because industry is reorganised based on Information Technology (IT) and on more risky industries. Hovakimian et al. (2001) also suggest that firms change their target gearing ratios over time. This suggestion implies that the capital structure policy should adapt to economic trends and macro-economic changes.

First, the financial market condition is not the same over time. Bull and bear markets exist in the financial markets in order. Opler et al. (1999) argue that information asymmetries can change over time. When information asymmetries are high, the firm would experience difficulties when it comes to accessing the financial markets (Antunovich, 1996 cited by Opler, 1999), because markets would under-price a firm's securities more severely.

Second, macro-economic trends or cycles also influence the capital structure. Many firms in the financial market will face the same situation. For example, at the end of the 1990s, many dot-com companies went public and their stock prices hit the roof (Bates et al., 2009). This phenomenon was observed on a global scale.

There is one other example of economic influence on capital structure. Following the credit crunch in the United States caused by the sub-prime mortgage crisis, the Korean financial market also showed bad performances over the next year. The Korean Financial Supervisory Service (FSS) announced that the number of firms which went public and who issued new stocks had decreased by about 70% and 10.9% respectively until October, 2008 compared with the year before.[8] This implies that firms do not issue stocks with low prices unless they face financial difficulties.

2.3.6 Observed gearing ratio patterns

We have reviewed several important capital structure theories with their different assumptions and phenomena and have considered other determinants which are likely to influence companies' debt ratio choices. Furthermore, Megginson (1997) points out nine clear patterns in leverage levels. These nine patterns are consistent with some theories, but do not follow their rules entirely. It is therefore a good idea to consider these patterns for a better understanding of capital structure. The nine patterns that were observed in terms of debt ratios show: 1) that capital structure has differences between countries 2) that industries demonstrate patterns in that firms in the same industries have a similar debt ratio around the world 3) that there is a negative relationship with profitability 4) there is a tax influences, but it is not decisive on its own 5) there is a negative relationship with the perceived costs of financial distress 6) there is a positive consideration on the part of old shareholders with leverage-increasing events and, vice versa 7) firms are little affected by transaction cost changes 8) firms are affected by ownership structures, though the relationship is ambiguous and 9) that [non-distressed] firms tend to achieve their target debt ratios.

2.4 Predicted signs and hypotheses with capital structure theories

This section produces the predicted signs based on different capital structure theories. The table shows the differences and similarities of predicted signs with different capital structure theories. The predicted signs are generally similar between theories. As Myers (2001) mentions, this might be evidence for the correlation between capital structure theories. Flannery and Rangan (2006) also conclude that the pecking order theory is a part of the trade-off theory, rather than a unique leverage determinant,

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[8] Younhapnews, internet version, 16 Dec, 2008.

because the variable ‘financial deficit’ does not change the other variables’ signs and significant levels.

Table 2.6 Summary of predicted signs with different capital structure theories

The table shows the differences and similarities of predicted signs with different capital structure theories. The predicted signs are generally similar between theories.

	Static trade-off theory	Dynamic trade-off theory	Simple pecking order theory	Complex pecking order theory	Market timing theory
Market-to-book	-	-	-	-	-
Financial slack					
Firm size	+		+/-	+	
Asset tangibility	+		+/-		
Capital expenditure	+/-		+	-	
Tax rate	+				
Earnings volatility	-	-		-	
R&D expense/asset	+/-		+	-	
ROA(profitability)	+	-	-	-	
Bankruptcy probability	-	-	-	-	

2.4.1 The hypotheses of trade-off theory

Hypothesis 1. Tax is positively associated with debt issuance.

Since Modigliani and Miller (1963), tax levels should be positively related to leverage levels because higher tax levels increase tax shields. This implies that higher tax levels entice firms to increase debt levels to have more tax shields.

Hypothesis 2. Earnings volatility is negatively associated with debt issuance.

Earnings volatility increases the probability of bankruptcy by increasing lower expected tax rates and higher expected bankruptcy costs (Fama and French, 2002).

Hypothesis 3. Profitability is positively associated with debt issuance.

Firms with high profitability could have high target debt ratios (Kayhan and Titman, 2007; Hovakimian et al., 2004) because they can have higher tax shields. In the pecking order theory, ROA (return on asset) increases net cash-income that in turn decreases debt levels (Donaldson, 1961) but in the trade-off theory, ROA allows firms to have more valuable assets and higher debt ratios (Hovakimian et al., 2001).

Hypothesis 4. Firm size is positively associated with debt issuance.

Hovakimian et al. (2001) hypothesise that bigger firms have lower volatility in cash-flows that allow them to use bigger tax shields and reduce bankruptcy costs. Titman and Wessels (1988) and Fama and French (2002) also expect a positive association between firm size and leverage levels, since large firms are generally more diversified in product lines, and probably they could access the bond market with lower costs.

Hypothesis 5. Capital expenditure is negatively/positively associated with debt levels.

Frank and Goyal (2009) predict that growth (capital expenditure, market-to-book ratio) reduces debt levels because firms with high growth opportunities have a greater firm value. Capital expenditure typically has greater collateral value compared to R&D expense, and this can increase debt levels.

Hypothesis 6. Research and development expenses are positively/negatively associated with debt levels.

Research and development expenses (R&D) are related to future growth, just as is capital expenditure (Goyal et al., 2002), so it is possible that growth opportunities increases stock price. Graham (2000) and Cloes et al. (2006) suggest that R&D expenses are positively related to financial distress, which could increase bankruptcy costs. These could be negatively associated with debt levels because R&D increases future uncertainty in cash-flows compared with capital expenditure.

Hypothesis 7. Asset tangibility is positively associated with debt issuance.

Frank and Goyal (2009) predict that asset tangibility is positively associated with debt levels because high asset tangibility reduces financial distress costs.

Hypothesis 8. The market-to-book ratio is negatively associated with debt levels.

When we use ‘market based debt ratio’, high stock prices increase the asset value, and total debt levels will be reduced by them.

Hypothesis 9. Bankruptcy probability is negatively associated with debt levels.

Since bankruptcy probability increases bankruptcy costs, a firm will reduce such costs by reducing its debt level.

2.4.2 The hypotheses of the pecking order theory

In the pecking order theory, the most important matter is asymmetric information costs.

Hypothesis 1. Market-to-book ratio is negatively associated with debt levels.

There can be two reasons for this. First, a high market-to-book ratio may represent lower asymmetric information costs. Second, since a high market-to-book ratio is understood as being a high growth opportunity in the market, firms may finance with equity to reserve future borrowing (or financial flexibility).

Hypothesis 2. Capital expenditure is positively associated with debt levels.

Capital expenditure is a proxy of growth and leads to cash-outflows. Thus, it increases the financial deficit (Shyam-Sunder and Myers, 1999; Frank and Goyal, 2009) and needs to be financed with debt issuance.

Hypothesis 3. R&D expenses are positively associated with debt levels.

R&D expenses likely increase an adverse selection and financial deficit (Frank and Goyal, 2009). Unlike capital expenditure, R&D expenses involve fewer tangible assets and this increases more severe asymmetric information (Fama and French, 2002).

Hypothesis 4. Profit is negatively associated with debt levels.

Profitability is independent of the leverage level in the pecking order model (Kayhan and Titman, 2007) because the pecking order theory is about costs associated with asymmetric information. In the pecking order theory, financing costs, even for debt, are more expensive than the costs from internal capital. Thus, there is a negative relationship (Hovakimian et al., 2004) because profits will be accumulated as an internal fund for future investment.

Hypothesis 5. Firm size is positively/negatively associated with debt levels.

Firm size has a positive relationship with the leverage level, as larger firms have less asymmetric information than smaller firms, and this reduces asymmetric information costs. This is, however, extended by Frank and Goyal (2009) in that if firms reduce asymmetric information, then they can issue equity without an adverse selection matter.

Hypothesis 6. Asset tangibility is positively/negatively associated with debt levels.

Bharath et al. (2009) argue that asset tangibility and firm size, as proxies of asymmetric information, presume a positive relationship with debt ratio. Frank and Goyal (2009) however, predict a negative relationship because asset tangibility reduces asymmetric information and firms can issue equity with low costs.

2.4.3 The hypothesis of market timing

Hypothesis 1. Market-to-book ratio is negatively associated with leverage levels.

The variable 'market-to-book ratio' is the most important variable in the market timing theory. This is because firms issue equity when the stock price is high. The market timing hypothesis does not predict profitability, because it is only concerned with overvalued stock prices.

2.4.4 Dynamic models

2.4.4.1 Dynamic trade-off theory

Hypothesis 1. Profit is negatively associated with debt levels.

The predicted result of dynamic trade-off is similar to the (complex) pecking order theory in some aspects, such as that firms accumulate their losses and earnings in their capital structures (Leary and Roberts, 2005). However, it has a different reasoning from the pecking order theory. Firms accumulate cash from operating profits, owing to 'capital structure adjustment costs.' Firms will change their leverage levels when the adjustment costs are smaller than the costs caused by a deviated debt ratio. Thus, if adjustment costs are low enough or the deviation costs caused by staying at a non-optimal leverage level are high enough, a firm will change its gearing level.

Hypothesis 2. Market-to-book ratio is negatively associated with debt levels.

Market-to-book ratio is negatively related to debt levels as the higher the market-to-book ratio, the lower the capital structure adjustment costs (Hovakimian et al., 2004). High market-to-book ratios reduce the costs of issuance, as well as the agency costs of future under-investment.

Hypotheses 3 and 4. Earnings volatility and bankruptcy probability are negatively associated with debt levels.

They have the same reasons as for the static trade-off theory in Section 2.4.1.

2.4.4.2 Complex pecking order theory

Hypotheses 1 and 2. Capital expenditure and R&D expense are negatively associated with debt levels.

When preparing future investment, firms need to increase future debt capacity. Therefore, expected investment (capital expenditure and R&D expenses) is negatively associated with debt levels because firms keep a 'low-risk debt capacity' for future large investment purposes (Fama and French, 2002); and they keep accumulating capital for 'future low-risk debt capacity,' for future financing, and for the new investment. Myers (1977) shows that firms with high leverage costs and high growth opportunities have low levels of debt ratio, as high financing costs could lead to future under-investment. This implies that firms with high growth opportunities are, generally, negatively associated with the issuing of debt.

Hypothesis 3. Market-to-book ratio is negatively associated with debt levels.

In the pecking order theory, firms never issue equity unless they face serious financial problems, or the issuing costs are cheaper than using internal funds. Myers (1984, p.590) argues that "*if the information asymmetry disappears from time to time, then the firm clearly should stock up with equity before it reappears.*" This implies that when stock prices are abnormally high in the market, then firms should issue equity.

Hypothesis 4. Profitability is negatively associated with debt levels.

Myers (1984) suggests that in a dynamic version of the pecking order theory, high growth firms reduce debt levels for future investment without issuing equity (for debt capability).

Hypothesis 5. Earnings volatility is negatively associated with debt levels.

High earnings volatility leads to low leverage levels because high earnings volatility increases the volatility of cash-inflows that makes future investments unavailable (Fama and French, 2002).

Hypothesis 6. Firm size is positively associated with debt levels.

Fama and French (2002) assume a positive relationship with debt levels because larger firms have a less risky cash-flow. They also have low asymmetric information costs.

Hypothesis 7. Bankruptcy probability is negatively associated with debt levels.

Fama and French (2002) imply that both simple and complex pecking order theories suggest that firms with a high bankruptcy probability issue equity.

2.4.5 Predicted signs from previous studies

To sum up, according to all the theories that we have considered, there are differences and similarities in the debt ratio predictions from different theories. Table 2.7 summarises the different expectations, based on previous studies.

Table 2.7 Summary of predicted signs from previous research associated with different capital structure theories

This table presents the predicted signs from various previous pieces of research associated with different capital structure theories. Some determinants such as inflation and financial slack, show different signs, even in the same theory. This implies that authors have different opinions about the roles of some determinants within the same capital structure theory. Importantly, as we have seen from Table 2.5, most signs show the same expectations, even with different capital structure theories.

Determinants	Static trade-off		Dynamic trade-off	
	Signs	Authors	Signs	Authors
Market-to-book	-	Hovakimian et al. (2004) Frank and Goyal (2009)	-	Hovakimian et al. (2004)
Firm size	+	Hovakimian et al. (2001) Frank and Goyal (2009)		
Inflation	-	DeAngelo and Masulis (1980) Desai et al. (2004) Huizinga et al. (2008)		
	+	Stonehill and Stitzel (1969) Myers (2001)		
Asset tangibility	+	Jensen and Mckling (1976) Fama and French (2002) Frank and Goyal (2009)		
Capital expenditure	-	Frank and Goyal (2009) Fama and French (2002)		
Tax rate	+	DeAngelo and Masulis (1980) Huizinga et al. (2008) Hovakimian et al. (2001)		
Earnings volatility	-	Titman and Wessels (1988) Fama and French (2002)[9]		
R&D expense	-	Titman and Wessels (1988) Hovakimian et al. (2001) Fama and French (2002)		
ROA (profitability)	+	Fama and French (2002) Kayhan and Titman (2007) Hovakimian et al. (2004) Hovakimian et al. (2001) Donaldson (1961)	-	Hovakimian et al. (2004)
Bankruptcy probability	-	DeAngelo and Masulis (1980) Hovakimian et al. (2001)		

[9] They predict the relationship between the volatility of net cash-flows and leverage compared with the relationship between earnings volatility and leverage in the trade-off theory.

Table 2.7 Continued

Determinants		Agency theory		Simple Pecking order
	Signs	Authors	Signs	Authors
Market-to-book			-	Fama and French (2002) Kayhan and Titman (2007)
			+	Frank and Goyal (2009)
Financial slack	-	Myers and Majluf (1984)		
	+	Jensen (1986), Stulz (1990)		
Firm size			+	Bharath et al. (2009)
			-	Frank and Goyal (2009)
Asset tangibility	+	Harris and Raviv (1991)	+	Bharath et al. (2009)
			-	Frank and Goyal (2009)
Capital expenditure			+	Frank and Goyal (2009)
R&D expense			+	Fama and French (2002)
ROA (profitability)	+	Ross (1977)	-	Myers (1984) Bolton and Scharfstein (1990) Fama and French (2002) Kayhan and Titman (2007)
	-	Jensen (1986)		
Bankruptcy probability	+	Harris and Raviv (1991)	-	Fama and French (2002)
Determinants		Complex pecking order		Market timing
	Signs	Authors	Signs	Authors
Market-to-book	-	Myers (1984)	-	Elliott et al. (2008) Baker and Wurgler (2002) Myers (1984)
Firm size	+	Fama and French (2002)		
Capital expenditure	-	Fama and French (2002)		
Earnings volatility	-	Fama and French (2002)		
R&D expense	-	Fama and French (2002)		
ROA (profitability)	-	Baker and Wurgler (2002) Myers (1984) Fama and French (2002)		
Bankruptcy probability	-	Fama and French (2002)		

2.5 Summary of review and conclusions

This chapter reviews the theoretical and empirical literature in terms of the capital structure. Various hypotheses, based on this literature review, will be tested in later chapters. Collating the major capital structure theories by considering similarities between them, this thesis endeavours to introduce one general debt-ratio-choice explanation. The major tools for combination are searching for the important capital structure determinants by testing our hypotheses, and indicating that firms' debt ratio changing behaviours are motivated by firms' value maximisation.

From Table 2.6, the predicted signs are similar in different capital structure theories. This table supports the Myers' (2001) argument that major capital structure theories might be correlated with one another. Namely, one observed fact is often consistent with two or more capital structure theories, and it is not clear whether the observed fact originates from one specific theory. This thesis argues that this correlation is caused by Megginson's (1997) and Ross' (1995) common motivation that capital structure policies maximise the value of firms.

This chapter also describes the additional determinants that probably influence the gearing ratio decision, whereas major capital structure theories do not seriously take them into account. These determinants are used in the later part of this thesis to investigate the most appropriate capital structure theory and to understand firms' financing modes.

Chapter III Methodology

3.1 Introduction

This chapter discusses research methods that are based on, and related to, capital structure theories. As the static trade-off and pecking order theories have different assumptions with regard to firms' equity and debt issuing choices, the two theories should be tested by different methodologies. For example, the static trade-off theory is based on a firm's static leverage level with gearing determinants, whilst the pecking order theory is more related to debt and equity choice. In addition, unlike the static trade-off theory, the dynamic capital structure and complex pecking order theories suggest that firms adjust their leverage levels. If we use the 'dynamic partial adjustment method,' which provides 'capital structure adjustment speed,' we will have evidence of whether firms change their leverage levels. Thus, the static and dynamic models are described in this chapter.

As this thesis uses cluster analyses in Chapter 7, we describe the inevitability of bias owing to using this method. In other words, beside asymmetric information costs, bankruptcy costs and tax shields, firms' characteristics, such as their size and age also affect capital structure. Thus, cluster analyses that are based on those firms' characteristics are used to investigate different debt-equity choices. Additionally, as the cluster effect can lead to a bias, justification is given as to why and how cluster analysis is appropriate for this research. Finally, the criteria involving a firm's characteristics, which are used in later chapters, are introduced with the support of previous research that justifies the choice of a firm's characteristics.

The structure of this chapter is as follows: Section 3.2 describes the data used in this thesis. Section 3.3 describes statistical methodologies with different capital structure analyses. Static and dynamic models are introduced; and the ways of obtaining target debt ratios are introduced with some examples. Section 3.4 presents the details of firms' characteristics with a consideration of the capital structure. It explains the purpose of data clustering and why clustered data, based on a firm's characteristics, is important when it comes to studying that firm's capital structure.

3.2 Data

Firms' fiscal data were collected from Thomson One Banker for 11 countries and 27 industries over a 20 year period. There are 4,598 sample companies.

The sample consists of all companies that had the following characteristics: (1) the company had to be quoted on a stock exchange (2) the headquarters were in one of the following countries, Australia, Canada, Britain, the United States, Austria, Germany, France, Italy, Japan, Korea and Taiwan (3) the main activity of the company had to be in at least one of the following industries, Aluminium, Steel, Heavy Construction, Delivery Service, Marine Transportaion, Automobiles, Brewers, Distillers and Vintners, Soft Drink, Food Products, Home Construction, Health Care Providers, Biotechnology, Drug Retailers, Broad-line Retailers, Broadcasting and Entertainment, Airlines, Gambling, Hotels, Travel and Tourism, Fixed Line Telecommunications, Mobile Telecommunications, Computer Services, Internet, Software, Computer Hardware and Semiconductors (4) the required data was available in Thomson One Banker and (5) the company had to be in operation in at least two of the years between 1989 to 2008 inclusive.

Concerning the share issues included in the empirical work, we consider all share issues including conversions of debt to equity and conversions of preferred shares to common equity. Unfortunately, we are unable to separately identify share issues to external investors from those issued to employees as part of a remuneration package.

The real GDP is from the OECD Factbook, and the GDP deflator has been obtained from the International Monetary Fund (IMF) and the World Economic Outlook Database. The long-term interest rates come from the OECD Factbook, with the exception of Taiwan. The data for stock price indexes are collected from the World Federation of Exchanges (WFE) and the Taiwanese Stock Market. Tax data were taken from the websites www.worldwide-tax.com and www.globalpropertyguide.com, the Federation of International Trade Association (FITA), the Austrian Federal Ministry of Finance, KPMG in Canada, and OECD. Table 3.1 summarises the data and their sources.

The sample countries were chosen from three different groups of economies (which are also refered to as economic system or an economic capitalism), based on the Anglo-Saxon economy (including, Australia, Canada, the United Kingdom and the United States), the European Continental economy (including, Austria, Germany, France, and Italy), and the Far Eastern economy (including, Japan, Korea and Taiwan). The Anglo-Saxon economy is a market-based model, and the European Continental economy is a bank-based model in financial terms (Rajan and Zingales, 1998; Sauve and Scheure, 1999). There are also differences in their legal systems (La Porta et al., 1998, 2000). The East Asian economy is, in general, placed between them, both legally and ideologically. The theoretical back-ground and differences between different economies are described in Sections 2.3.1 and 3.4.2.

Table 3.1 Data and their origin

The table summarises the data which are used in the thesis, and their sources.

Data	Origin
Firm's fiscal data	Thomson One Banker
Real GDP	OECD Factbook, 2007
GDP deflator	IMF, World Economic Outlook Database
Long-term interest rates	OECD Factbook
Stock price index	World Federation of Exchanges, and Taiwanese Stock Market
Taxes	www.worldwide-tax.com, www.globalpropertyguide.com the Federation of International Trade Association (FITA), the Austrian Federal Ministry of Finance, KPMG in Canada, and OECD.

3.3 Static and dynamic methods

3.3.1 Static versus partial adjustment model

As the static model assumes a single period, there is no assumption of a going concern and it presumes that there is no time-lag between regressors and regressand. This implies that the static model is more compliant with regard to theories that do not change debt ratios over time, such as the pecking order theory, the irrelevance theorem and the static trade-off theory.

However, if firms have optimal capital structures and adjust their debt ratios, then the static model suffers from mis-specification, because those variables relate to both optimal leverage levels and ‘capital structure adjustment costs’ (Banerjee et al., 1999). The dynamic approaches are more likely to comply with theories that suggest optimal debt levels or changing debt levels, based on a firm’s internal and external conditions, such as the dynamic trade-off theory.

Therefore, the theories need to be tested differently, based on their assumptions, and it is worthwhile using both methods in order to examine different capital structure theories.

3.3.1.1 Static model

Let us presume a simple regression model, as described by Equation (3.1):

$$Y_{i,t} = \alpha + \sum_{i=1}^{n}\sum_{k=1}^{n}\sum_{t=1}^{n}\beta_{i,t}X_{i,t,k} + u_{i,t} \qquad (3.1)$$

where, $Y_{i,t}$ is the debt ratios of firm i at time t, $X_{i,k,t}$ is a matrix for k variables of i firms at time t, and the vector residual $\varepsilon_{i,t}$.

The static model shows a contemporaneous relationship between dependent and independent variables (Wooldridge, 2006). In this static model, all regressors are independently related to dependent variables. In other words, the regressors are exogenous, and the error term is independently and identically distributed (i.i.d). If the regressand, y_t, is simultaneously affected by one or more regressors, it would be endogenous. If this is the case, using instrumental variables may be a better methodology. As this thesis uses panel data, it is more likely to be the case that there are endogeneity problems between variables (see Section 3.1 in the appendix 3, in which full details of statistical considerations, using panel data are described).

3.3.1.2 Dynamic models.

A dynamic model is defined by a dependent variable (y_t) that depends upon a lagged dependent variable (y_{t-1}), and that becomes an independent variable of y_t. Davidson and Mackinnon (2004, p.215) say that "*…the lagged dependent variable, y_{t-1}, appears among regression in the dynamic models.*" Hence, a general dynamic regression model is formed by the formula;

$$y_t = f(y_{t-1}, X_1, X_2, ...) + \varepsilon_t,\ \varepsilon_t \sim IID(0, \sigma^2) \tag{3.2}$$

Most time series models and 'dynamic panel data models' are dynamic models. "*Panel data sets, consisting of cross sections observed at several points in time, may exhibit both characteristics*" (Green, 2003, p.192). Thus, a dynamic panel data model is described by the following formula:

$$y_{i,t} = f(y_{i,t-1}, ...) + \varepsilon_{i,t},\ \varepsilon_{i,t} \sim IID(0, \sigma^2) \tag{3.3}$$

Therefore, by using dynamic panel data models, we can simultaneously analyse cross-sectional and time series data. Since the model of dynamic capital structure choice has been proposed by Kane, Marcus and McDonald (1984, 1985) and Goldstein et al. (2001), it has developed and has been widely used in optimal capital structure studies.

3.3.1.3 Partial adjustment process in capital structure change

As Kayhan and Titman (2007) show, there are optimal capital structures and firms move slowly towards them. We have to know what the target debt ratios are under the dynamic theory assumption.

There are several ways to obtain target leverage levels. For example, there is the industry median leverage (Elliott et al., 2008), the historical mean of a firm's leverage levels (Shyam-Sunder and Myers, 1999), and the three-year moving average of a firm's gearing levels (Jalilvand and Harris, 1984), as well as estimated values by using Tobit regression (Hovakimian et al., 2001; Kayhan and Titman, 2007) or normal cross-sectional regression (Fama and French, 2002; Byoun, 2008). According to Kayhan and Titman (2007), the values of predicted target leverage are similar whether we follow either the Tobit model or the normal regression model.

3.3.1.3.1 Industry average

DeAngelo and Masulis (1980), Masulis (1983) and Hovakimian et al. (2001) suppose that firms move their debt level towards an industry average, while they search for the optimum debt levels. This implies that firms consider the industrial average leverage level as a target leverage ratio. Industry median leverages are also often used as a proxy for target debt ratio (Frank and Goyal, 2009; Faccio and Masulis, 2005).

The fact that firms consider industry-average-debt-ratio as their target leverage implies that firms in the same industry change their leverage levels in the same direction and that capital structures are affected by the same economic circumstances in the industry.

3.3.1.3.2 Estimated optimum leverage

The optimal debt ratio can be obtained by using the the Tobit regression model and the ordinal least square (OLS) model. Let us presume that D_t^* is an optimal leverage at time t; then the estimated target leverage is given by the following regression if the optimal leverage is decided by the sum of $x_{k,i,t}$:

$$D_{i,t}^* = \sum_k \beta_k x_{k,i,t} + \varepsilon_{i,t} \qquad (3.4)$$

where, firms are described by subscript i = 1, 2, …N, time by t=1, 2, … T, and capital structure determinants by k=1, 2, …K. The residual $\varepsilon_{i,t}$ is assumed to be serially uncorrelated with the mean zero and can be heteroskedastic (Ozkan, 2001).

If the optimal leverages (D_t^*) are reliable target debt ratios, then the expected deviations from target ratios are significantly positive or negative in the real regression analyses (in Formula 3.6). If they are not, then we could presume that the optimal leverages (D_t^*) are poor target leverages, or that there are no target debt ratios, and the coefficient of leverage deviation from Equation (3.6) will not be significant and will not be different from zero (Hovakimian et al., 2001).

3.3.1.3.3 Partial adjustment process

As a number of economic models suggest, current behaviour depends on past behaviour. Using panel data, we can estimate a dynamic model on an individual level (Verbeek, 2008).

$$\Delta y_t = \phi_0 \Delta X_t - (1-\lambda)[y_{t-1} - \alpha - \beta X_{t-1}] + \varepsilon_t \quad (3.5)$$

Formulation (3.5) is an example of the error-correction model, where, (1-λ) is the adjustment parameter, and the adjustment speed is measured by it. The independent variable X_t is randomly given and is uncorrelated with error term ε_t. More importantly, from Equations (3.1) and (3.5), Y_t is decided by X_t and X_{t-1} together. If X_t is simultaneously decided upon with Y_t, then independent variable, X_t, and error term, ε_t, will be correlated, $E\{X_t \varepsilon_t\} \neq 0$, and OLS would be not consistent. The special case of the error-correction model (3.5) is a partial adjustment model (3.6) in order to prevent the correlation.

$$Y_t - Y_{t-1} = \lambda(Y_t^* - Y_{t-1}) \quad (3.6)$$

where, Y_t^* : optimal or desired level of Y_t, same to D^*

As the partial adjustment model uses Y_t^*, and as Y_t^* differs from the actual value of Y_t, the "*adjustment to its optimal level corresponding to* X_t (independent variables) *is not immediate*," unlike in the static linear model (Verbeek, 2008, p.326).

According to the details of our research survey, in the area of financial study, Kennan (1979) modified Gould's (1968) application to creat a partial adjustment model for analysing optimum stock price levels: $\Delta X(t) = N(d(t) - X(t-1))$, is the same as Equation (3.6), where $d(t)$: desired level of stock price, X: actual stock price, and N: the adjustment coefficient.

Appling Kennan's (1979) model, the 'partial adjustment capital structure model' can be described by the following formula:

$$D_{i,t} - D_{i,t-1} = \lambda(D^*_{i,t} - D_{i,t-1}) \tag{3.7}$$

where, $D_{i,t}$: actual leverage at time t, $D_{i,t-1}$: actual leverage at time t-1, $D^*_{i,t}$: optimal leverage at time t, and λ is the adjustment speed in every year.

The value of λ is between one and zero (1 > λ > 0). In a frictionless world, λ should be one. In the real world, firms adjust their capital structure lumpily (Leary and Roberts, 2005) because of the existence of adjustment costs.

Formula (3.7) can be described as:

$$D_{i,t} = (1-\lambda)D_{i,t-1} + \lambda D^*_{i,t} \tag{3.8}$$

This can be described as follows, after considering Formula (3.4):

$$D_{i,t} = (1-\lambda)D_{i,t-1} + \sum_k \lambda\beta_k x_{k,i,t} + \lambda\varepsilon_{i,t} \tag{3.9}$$

Formula (3.9) can be written as (Ozkan, 2001; Byoun, 2008):

$$D_{i,t} = \gamma_0 D_{i,t-1} + \sum_k \gamma_k x_{k,i,t} + u_{i,t} \tag{3.10}$$

where, γ_0 = 1-λ, γ_k =λβ_k, $u_{i,t}$ = λ$\varepsilon_{i,t}$

Since γ_0 is (1-λ), when λ is 1, then γ_0 is zero. This implies that actual leverage is the same as the target leverage, or that firms have changed their capital structure immediately. This is possible when there are no adjustment costs. In the imperfect real world, this cannot be realistic. On the other hand, when λ is 0, then γ_0 becomes one. This implies that firms hardly change their capital structure, or that the change is infinitely slow.

3.4 Firms' characteristics

It is possible that firms' debt ratios and their choices may be affected by their characteristics. Bankruptcy costs and new security issuing costs depend upon a firm's characteristics (see Chapter 2 in which a large number of previous studies were reviewed and where we examined the relationship between debt ratio choice and firms' characteristics). For example, 'capital structure adjustment speeds' can be changed by a firm's circumstances, such as the size, the firm's age, financial condition and diversification of product lines (Driffield et al., 2005; Jalilvand and Harris, 1984). This thesis, therefore, analyses debt ratios using these various different characteristics. In this section, we describe the cluster analyses and data-snooping bias that can occur when data are classified by some criteria, e.g. by leverage level or profitability and so forth, and justify the grouping process, based on capital structure theories by introducing the criteria used in previous research.

3.4.1 Cluster effect

We use cluster analyses in Chapter 7. In other words, the data set is clustered and analysed based on various standards, such as tangibility, bankruptcy probability and others. Thus, it is highly likely that the data are correlated with a firm's characteristics. This is called a 'cluster effect.' If there are 'cluster effects' in the sample, either random effect or fixed effect can be used (see Appendix 3, Section 3.1.1 in which the fixed and random effects are fully described). The cluster effect, however, allows us to find unobserved effects when we use a whole data set (Wooldridge, 2006). Namely, cluster analysis itself can be a purpose of the research (White, 2000), as we will discuss in the next section. Additionally, as cluster analysis raises the data-snooping bias, the next section will discuss the biases caused by data clustering.

3.4.1.1 Data-snooping bias

A firm's characteristics are closely related to the grouping of the data set. In this thesis, an important analytical method is a comparison of how debt ratio determinants differently affect debt-equity choice based on a firm's characteristics. This grouping can be related to the data-snooping bias (Lo and Mackinlay, 1990). Sullivan et al. (1999) suggest that data-snooping bias is an important matter in finance and economics, and can occur in the modelling of financial theories, the identification of factors and in cross-sectional tests. Lo and MacKinlay (1990, p.433) explained the term of data-snooping by citing Aldous (1989, p.252):

> *There is a huge area of "data-snooping statistics" where you have a family of test statistics T (a) whose null distribution is known for fixed a, but where you use the test T=T (a) for some a chosen using the data.*

This implies that data-snooping bias occurs when the data for other research are reused (Sullivan et al., 1999; White, 2000; Hsu and Kuan, 2005). In other words, the data-snooping bias can be caused by unconscious (or conscious) misuse of data (Hsu and Kuan, 2005) and by using secondary data. As most data used in financial research are secondary data, researchers are never free of data-snooping bias. In order to avoid this kind of bias, Hsu and Kuan (2005) suggest using comparable data sets rather than using the same data sets, and using sub-samples of a large data set. However, Sullivan et al. (1999) argue that selecting samples from the large population can also lead to selection bias. Similarly, Foster et al. (1997) suggest, by citing Lo and MacKinlay (1990), that grouping also brings about data-snooping bias. This implies that researchers could modify the results by selecting samples in their own way. Data-snooping is dangerous, but it is sometimes inevitable. For example, researchers can be interested in only one particular time period within the time-series data (White, 2000). This implies that without data-snooping bias, it is not possible to control specific research purposes. Therefore, data-snooping is nowadays called "data mining," a term which has positive connotations because, this method brings "*a means of extracting valuable relationships from masses of data* (White, 2000, p.1098)."

3.4.2 Country

The sample is collected from eleven countries and three different institutional environments. The eleven countries are Austria, Australia, Canada, France, Germany, Italy, the UK, the US, Japan, Korea and Taiwan, and the three different economies are Anglo-Saxon, European Continental, and the East Asia economies. The different economies and their characteristics are described below.

According to Hall and Soskice (2001), there are several ways to categorise capitalism, such as the modernisation approach, neo-corporatism, and the social systems of the production approach which are related to: (1) liberal market economies and co-ordinated market economies; (2) the role of institutions and organisations; and (3) the role of culture, informal rules, history, and others. The thesis follows Bradley et al. (2003) and Bergh (2006) when it comes to categorising the Western economies. They categorise Western industrialised countries into three different groups, i.e. Scandinavian, Central-European and Anglo-Saxon economies, although we use Anglo-Saxon and European-Continental economies in terms of the Western countries. This thesis also follows Schwartz (2010), Kim (2000) and Whitley (2000) to categorise the Eastern economy. These authors categorise the East Asian economy into Korea, Taiwan and Japan.

The Anglo-Saxon and Continental economies are Western countries unlike Japan, Korea and Taiwan. While the Anglo-Saxon model incorporates liberal [free-market] capitalism, the European model is considered to be a welfare model (Pontusson, 1997; Coffey and Thornley, 2009). In other words, the policies in the Anglo-Saxon economy are more pro-capitalism and use the financial markets more than does the Continental economy, whose policy is more pro-labour and uses more financial intermediaries. As there is a close relationship between Germany and Austria, historically, legally, and culturally (Siems, 2004), the thesis includes Austria. Following Hall and Soskice’s (2001) suggestion, the thesis excludes Spain, which is ambiguous in terms of its capitalism due to its history of economic development.

Whitley (2000) points out that Taiwan and Korea were subject to industrial influences during and after the Japanese occupation. East Asian economies share a Confucian culture and have developed under state leadership (Kim, 2000; Moon and Rhyu, 2000). China, Malaysia and Thailand have not been included in our data set because they have different economic circumstances compared with those three countries. For example, China is still a communist country and its industry is based on cheap labour (Schwartz, 2010); and as Malaysia and Thailand are second generations economies which are emerging in this region, they are still at different stages in their economic development compared with those three countries (Robison et al, 2000).

Additionally, the Korean and Taiwanese economies are still developing compared with the other sample countries. However, according to Booths et al. (2001) and the World economy and Financial Surveys (2007) of the IMF, the industrialised levels of these two countries are already far more advanced than that of other developing countries. In the sample period, Korea and Taiwan have changed their industrial structure faster than the rest of the sample countries. This factor may bring a different capital structure to these two economies, compared with other developed countries. The country factor also implies that macro-economic indicators, such as Gross Domestic Product (GDP), inflation, the growth of GDP and interest rates, are required to understand 'capital structure adjustment modes.'

3.4.3 Industry

Jong et al. (2008) use the ICB industry group to classify industry levels. Lougharan and Ritter (2004) categorise firms into two groups; technology and Internet-related firms (SIC codes 2000-3999), and old-economy manufacturing firms. This thesis collects sample companies from 27 industries based on the ICB (sub-sector) industry code. We try to select firms as widely as possible, in order to investigate the difference in capital structure based on the different industries they are part of. Our criteria of selection of different industries are firms' asset tangibility, new and old industries, the different technology required and the level of impact of the business cycle. We excluded firms from utility and financial industries because they are generally regulated across countries (Huang and Ritter, 2009). For example, banks' financial structures are affected by very different factors compared with firms from other industries. In addition, the details of ICB and ICB sub-sectors of samples are described in Section 1.1 in Appendix 1.

3.4.4 A firm's size

The present thesis categorises firms into four groups (quartiles) based on their total assets. Bates et al. (2009) also divide firms into four groups by size, to assess the relationship between firm size and cash holding.

Firm size is generally defined by three criteria; market capitalisation (market cap), total assets and total sales. Wald (1999) uses market capitalisation as a proxy of firm size. Market capitalisation reflects the market values of firms and often shows the future expectations of market participants (Frank and Goyal, 2009). Market capitalisation has two weak points, however. First, the great volatility of stock price changes (instability) makes for a very wide range of firm values, and there are no clear criteria for choosing the most representative price. Second, there is the matter of market efficiency. We often define bubble or abnormal market performances when we observe an unreasonable increase or decrease in prices: In fact, investors' irrationality and excess volatility have increased since the stock market crash of October 1987 (Stern and Chew Jr., 1992). Additionally, Walter (2003, p.5) mentions that "*…the paradigm [of market efficiency] also refers to a probabilistic representation of the behaviour of stock market prices.*" This means that stock price is just one possible aspect of intrinsic value.

The second way to decide a firm's size is by the total assets on balance sheets. Under the assumption of 'a going concern,' firms have been operating for several decades without asset revaluation. The book value, therefore, cannot reflect a firm's present value. Even though the criterion, based on book value, cannot represent the present value exactly, this is much more stable compared with the stock price decided by the financial markets, and this partially reflects a firm's value by including operating incomes and losses. Banerjee et al. (2008), Baker and Wurgler (2002), Leary and

Roberts (2005), Frank and Goyal (2009) and others use total assets as a variable with regard to the size of a firm.

Total sales are also used to measure a firm's size. In fact, the amount of sales and the total assets of a firm are very closely correlated. Rajan and Zingales (1995), Ozkan (2001), Brounen et al. (2006) and others use sales as a variable with regard to a firm's size.

3.4.5 A firm's age

Lougharan and Ritter (2004) differentiate between young firms (0 to 7 years) and old firms (8 years or more) based on the date of the IPO. Giannetti (2003) also classifies a firm's age using IPO date. Fama and French (2002) use the size of a firm as a proxy of the firm's age, because they assume that bigger firms were probably founded some time ago compared with smaller firms. In this study, based on the Thomson One Banker, we assume that the age is counted from the year in which firms are included in the dat-base, as it is not possible to obtain the year in which the firms were founded using our data-base.

This thesis categorises the data by stating that old firms are defined as having at least 18 years data across a twenty-year sample period, and that young firms are defined as having more than 8 years of data from the second decade sample period. In order to remove the effects caused by macro-economic factors that change over time, this thesis only uses data taken from the second time period for firms with a longer history, when they are compared to younger firms. Namely, with regard to both young and old firms, we only use data from the second period (from 1999 to 2008). Therefore, those two groups have operated under the same macro-economic conditions.

3.4.5.1 Survivorship and new listing bias

As Sullivan et al. (1999) suggest, survivorship bias can lead to data-snooping bias (see Section 3.4.1.1 for details of data-snooping). This survivorship bias has been considered, especially in the study of mutual funds (Brown et al., 1992; Horst et al.,

2001) and stock price performances (Brown et al., 1995; Lo and Mackinlay, 1990). Reasonably, there is a very high possibility of existing survivorship bias, though Brown et al. (1995) and Horst et al. (2001) fail to show significant survivorship bias in equity premiums. This survivorship bias can be presented as a look-ahead bias. This is because, as Brown et al. (1992, p.553) mentioned, "*…past performance does not guarantee future performance.*" New listing bias was considered by Lyon et al. (1999), who believed that new listing and rebalancing in portfolios affects the return of portfolios. This implies that the number of newly listed firms in the sample, or the number of old firms can bring a difference to the sample average. Dionysiou (2010) suggests two ways for dealing with this method; first, replace the data of firms with similarities such as size or industry; or second, delete data on newlly listed firms (namely, only use old data sets).

Research using secondary data sets, also has the same problem. Fiscal reports used in this research were collected from firms that are listed or that have survived. Otherwise, the firms are delisted from the data-base. It is not possible to control this matter using second-hand data sets. A firm with great performance, size, or profits can survive longer. Having a reputation for long survival could affect debt ratios and this, as Brown et al. (1992) mention, might lead to a look-ahead bias. There could be a survivorship bias in our sample because, as we have seen in Chapter 2, firms with longer histories have different capital structures. The thesis has tested the existence of a survivorship bias in debt ratios by using the T test. If there is a survivorship bias, there are differences in averages between samples (see Section 7.3). Therefore, as White (2000) mentions, the potential for bias is inevitable. Furthermore, part of this research is to group our sample by firm characteristics and, of itself, this can lead to bias.

3.4.6 Time period

Since time trends are observed in the alteration of debt ratios, it can be presumed that capital structures change over time. This study attempts to show that capital structure is affected by time trends. To doing so, the present thesis uses a time dummy variable to observe how debt ratios have changed over a 20 year period. This study also divides the sample into two groups of 10 years each, and observes how the two groups show different relationships between debt ratios and their determinants. There may be a difference in capital structure changing speeds or debt levels.

3.4.7 Bankruptcy probability

Since the Z-score model was made for US firms, the Z"-score model for non-US firms, and the EMS (Emerging Market Score) model for firms in emerging markets, this study uses different models in line with the origin of firms in countries when measuring bankruptcy probability. Korean firms, for example, use the EMS model, and non-US industrialised firms use the Z"-score model. For comparisons of accounting-based and market-based models in Chapter 7, the Expected Default Frequency (EDF) model is also used (see Appendix 1, Section 1.2.2.1.6 for details of the model).

3.5 Conclusion

In this chapter, we discuss the research methods, which we use in later chapters. We introduce the data sources from which we collected our data. In Section 3.3, we likewise indicate static and dynamic statistical methods, which we use in Chapters 5, 6 and 7 for statistical analyses. In this section, we explain how the partial adjustment method is related to capital structure theories and how it is used to test them. Since we use cluster analyses to obtain more clear evidence of capital structure theories, we also indicate why firms' classification, based on firms' characteristics, is important in our research and how this is not related to the problem of data mining. In Section 3.4, we also explained the importance of firms' characteristics, and why the classification of firms, based on these characteristics, is pertinent in our research.

Chapter IV The differences in leverage level over time, between countries and between industries

4.1 Introduction

This chapter examines Modigliani and Miller's irrelevance theory (1958) by testing whether there are systematic-capital-structure patterns grounded in firms' industries and countries, and different time periods. If there are systematic patterns in leverage levels based on these three different criteria, it challenges the irrelevance theory because, as Stonehill and Stitzel (1969)[10] suggest, the patterns in capital structure can prove that debt ratios are not randomly distributed. If this is the case, the systematic similarity in debt ratio can be seen as evidence for the existence of an optimal capital structure. This also implies that there are some factors that affect the choice of capital structure. Thus, this chapter is a starting point for the next three chapters, which test debt and equity choices and their important determinants based on three major capital structure theories.

The idea provides us with three testable hypotheses which are as follows:

H4.a: Capital structures are the same between countries.
H4.b: Capital structures are the same between industries.
H4.c: Capital structures are the same across time.

The findings in this chapter are first, that there are some systematic similarities in capital structure based on industry and country, and second, leverage levels have generally reduced in the second period (1999-2008).

The remainder of the chapter is divided into three sections. Section 4.2 is about data and methodology. In this section, we discuss the measurement of debt ratios, and the

[10] Stonehill and Stitzel (1969, p.91) make the point that "…*similarity of financial structures of firms in the same industry suggests that they act as if there is an optimal financial structure for an industry.*"

method for dealing with outliers. Section 4.3 presents the differences in capital structures across industries, countries and time. The chapter ends with a conclusion and the contribution of the research in Section 4.4.

4.2 Data and methodology

4.2.1 Data

The data consist of 4,598 listed firms taken from 27 industries, based on an 'ICB (Industry Classification Benchmark) subsector' classification, in the three different economies (Anglo-Saxon, European Continental, and the East Asia economies) over a twenty-year period (1989-2008) (see Section 1.1 in Appendix 1 for details). The financial statement data were collected from Thomson One Banker. There are two criteria for choosing economies (countries) and industries: (1) each economy has historical and cultural differences in terms of economic development; and (2) each industry has different characteristics (see Sections 2.3.1, 2.3.2, 2.3.5, 3.4.2 and 3.4.3 in which full details are described).

4.2.2 Measures of debt ratios

We cannot obtain a perfect debt ratio which represents a firm's exact leverage level, because there are some problems with having the right debt ratio: and the problems lead to a difficulty for researchers when it comes to choosing reliable debt ratios for study. Firstly, there are some 'financial statement items' that are unclear as to whether they are debt or equity. For example, hybrid securities such as preference shares, redeemable preferred stocks, convertible bonds and bonds with warrants. Even though these hybrid securities have a huge impact on the value of firms and capital structures, it is still not clear where they belong.

Secondly, there is no clear criterion between using market- and book-based debt ratios, although this chapter uses only a 'book-based debt ratio' following Collins and Sekely (1983), Remmers et al. (1974), Wald (1999) and others. In capital structure studies, both market- and book-based debt ratios are generally used, and both of them have strong and weak points.

Wald (1999, p.166) suggests some of the weak points when using 'book-based debt to asset ratios,' (1) countries have different accounting standards[11], "*…which potentially undercuts the comparability of cross-country results*; (2) *a linear specification may not be consistent with a particular theory of optimal capital structure*; and (3) *the variables chosen may be arbitrary or lack some essential determining factor*." Furthermore, book-based leverages reflect backward information, while market-based leverages reflect forward expectations (Barclay et al., 2006). In other words, book values are decided when stocks and bonds are issued; and these may be subsequently very different from their market value. Thus, book-value-based leverage levels are, in general, over-leveraged due to the conservative accounting principle (Hillegeist et al., 2004). Welch (2004) also suggests the problem of using book-value-based measures to be in that small firms' book values are particularly less correlated with market values.

Therefore, some researchers use market-based debt ratios, because book value cannot represent the present value of firms (Modigliani and Miller, 1958). However, there are also two problems created by using market prices. Firstly, debt ratios change dramatically over time as stock prices change in the market. It is also difficult to decide the true firm value, or to decide which value to use due to this high volatility of stock prices. According to Titman and Wessels (1988), many firms use book-value-based target ratios rather than market-value-based leverage levels. This argument implies that managements think that the financial market is generally over reacting or is less rational. Secondly, stock prices on the market are often much lower than the liquidation value when a firm is under financial stress. As a result, the market value may not represent the intrinsic value of a firm, either when it is in a good financial condition, or when it is under financial stress.

4.2.3 Outliers

The data show that some companies in the sample have suspiciously unusual leverage levels compared with other firms. For example, some firms have negative debt ratios. These outliers, or influential observations, will seriously misrepresent the

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[11] For example, the definition of long-term debt is one over one year for most countries, but is one over four years in Germany (Wald, 1999).

population. Therefore, these outliers have been removed from the analysis to avoid distorting the results.

As Grubbs (1950) and Cameron (2005) mention, there is no rule for removing outliers. In addition, there are no criteria for identifying an appropriate leverage level as we have discussed. However, a company's leverage level should not be negative; nor can it be excessively high compared to other company's gearing levels. Leverage level can be negative when a firm has lost all of its total assets so that its total asset value will be negative. This would not be normal in general circumstances. Furthermore, capital structures cannot be excessive because a high leverage level raises bankruptcy probability.

For these reasons, a debt ratio that is too high or a negative value should be removed from the sample. Kayhan and Titman (2007) restrict the values of target debt ratio between 0.00 and 1; and Baker and Wurgler (2002) define that firms with debt levels greater than 10.0 are outliers. This thesis uses book- (and, in later chapters, market-) based debt ratios only between 0 and 2.0 (≈ 99 percentile). This is similar to Lemmon et al. (2008).

4.2.4 Analysis of variance test

This chapter uses the Analysis of Variance (ANOVA) test after removing outliers. The ANOVA test is used to decide whether a particular data classification is meaningful (statistically significant) (Kennedy, 2003). Thus, the ANOVA test will indicate the meaningful differences in leverage levels between different industries, countries and time periods. If there is no significant difference between classified groups, we could not argue the existence of systemic differences in leverage levels between them.

The F statistic can be calculated as follows:

$$F = \left(\sum_{i=1}^{k} n_i (\bar{x}_i - \bar{x})^2 / (k-1)\right) \Big/ \left(\sum_{i=1}^{k} \sum_{j=1}^{ni} (x_{ij} - \bar{x}_i)^2 / (n-k)\right) \qquad (4.1)$$

where, n: total number of observation from sample, n_i: number of observation from group i, k: number of groups, x_i: a group i, x_{ij}: j_{th} observation of variable i, $\bar{x}_i$: mean of group i, and $\bar{x}$: mean of total sample.

4.3 Capital structure differences between groups

The most important objective in capital structure study is to find an optimal gearing level. If there is no optimal capital structure, then debt levels would be randomly distributed as a result of companies' business operations and managers would have no intention of changing them. This section investigates the differences and similarities between debt ratios, based on different time periods, industries and countries, and demonstrates the probability of the existence of optimal gearing levels.

4.3.1 Capital structure and time period

Fama and French (2002) and Leary and Roberts (2005) and others find that companies adjust (or change) their capital structures over time. Graham (2000, p.1935) insists that "*…firms use debt more aggressively now (2000) then they did in the 1980s.*" Daskalakis and Psillaki (2008), however, show that French companies' debt ratios gradually decreased during the sample period (from 1997 to 2002). Kim et al. (2006) also argue that Korean companies show that 'capital structure adjustment speed' and leverage levels have been affected by the Asian financial crisis. All these studies indicate that firms change their capital structures over time.

Table 4.1 shows the difference in debt ratios between the periods (1989-1998 and 1999-2008). The ANOVA test in Table 4.1 uses the whole sample of companies from eleven countries and shows that there are statistically significant differences in debt levels between the two periods. This implies that companies have changed their debt ratios across the sample period.

Table 4.1 ANOVA test between two different time periods

This table compares the difference of means in debt levels between period one (1989-1998) and period two (1999-2008) using all companies. This table shows that there are significant differences between the two periods.
Note, SS: sum of squares, DF: degree of freedom, MS: mean square, F: F statistic, Prob: p-value, *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	SS	DF	MS	F	Prob > F
Model	7.7288	1	7.7288	130.52***	0.0000
Residual	3104.0649	52418	.0592		
Total	3111.7937	52419	.0593		

Table 4.2 shows the differences in the average value of debt ratios over time between economies, and countries. Generally speaking, companies in all economies have changed their leverage levels across the two periods. The p-values of countries' comparison shows that they have all significantly changed in terms of leverage levels between the periods, with the exception of Austrian and Italian companies. The F statistic indicates that firms in the East-Asian economy have changed their debt ratios more than firms in the Anglo-Saxon economy or the Continental economy. The F statistic also shows the same results with the country level data. Overall, Tables 4.1 and 4.2 show that there are significant differences in debt ratios between the two periods across economies and countries. Thus, we can conclude that firms change their capital structures over time.

Table 4.2 ANOVA test between two periods in terms of country and economy levels

This table compares the difference of means between period one (1989-1998) and period two (1999-2008) using the economy and country levels data.
Note, F: F statistic, Prob: p-value, *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level.

	F statistic	Prob > F
Anglo-Saxon economy	8.51**	0.0035
Continental economy	12.03***	0.0005
East-Asian economy	628.18***	0.0000
Australia	18.25***	0.0000
Austria	1.31	0.2525
Canada	22.70***	0.0000
Germany	8.51**	0.0036
France	14.22***	0.0002
Great Britain	4.14**	0.0420
Italy	3.55*	0.0600
Japan	258.03***	0.0000
Korea	626.42***	0.0000
Taiwan	31.07***	0.0000
USA	33.25***	0.0000

4.3.2 Capital structure and country

The country in which a firm has been founded, and in which it operates is an important matter in analysing the financial structure of a company, because all countries in the world have different tax policies, cultures, industrialisation levels, economic situations and histories. Previous studies show that capital structure is heavily affected by country factors (Sekely and Collins, 1988; Stonehill and Stitzel, 1969), particularly by legal systems, such as bankruptcy law, stock market regulation (Bancel and Mitoo, 2004), and by culture (Grinblatt and Keloharju, 2001; Chui et al., 2002).

Capital structure differences can be explained by the location of the headquarter country (Stonehill and Stitzel, 1969; Errunza, 1979). Collins and Sekely (1983) state that capital structure differences are caused by differences in financial institutions, in national attitudes toward risk and in cultural differences. They particularly argue that capital structures are more influenced by ‘cultural characteristics’ rather than ‘industrial factors.’ For example, the sensitivity of default risk is different from country to country. Stonehill and Stitzel (1969) and Wald (1999), for instance, confirm that US firms are more sensitive to default risk than Japanese ones.

Generally speaking, the current research also finds that companies in Korea, Japan and Taiwan have higher debt ratios compared to those in the Western countries. (The differences between countries and economies are explained in Sections 2.3.1 and 3.4.2).

Rajan and Zingales (1995) find that capital structure determinants function in the same way in different countries. Booth et al. (2001) discover, however, that capital structures have systemic differences due to country factors, such as GDP growth rates, inflation rates, and capital market development. In addition, Dore (2000) suggests that the different corporate governance environments of countries lead to differences in capital structures. They suggest that firms in Germany, Italy and France hold more debt. These countries have strong family ownership with regard to firms. (see Section 2.3.1 which describes the ownership in the European Continental economy)

Table 4.3 ANOVA test results between three different economies

F statistics and p-values indicate that there are differences in debt ratios between economies in both periods (1989-1998 and 1999-2008).
Note, SS: sum of squares, DF: degree of freedom, MS: mean square, F: F statistics, Prob: p-value, *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level.

		SS	DF	MS	F	Prob >F
Period one (89-98)	Model	25.1051	2	12.5525	274.43***	0.0000
	Residual	588.3587	12863	.0457		
	Total	613.4638	12865	.0476		
Period two (99-08)	Model	3.6407	2	1.8203	28.95***	0.0000
	Residual	2486.9602	39551	.0628		
	Total	2490.601	39553	.0629		

Table 4.3 shows that there are clear differences in debt ratio between economies. In both periods one and two, the three economies have statistically different debt ratios. Table 4.4 shows the average debt ratio for each economy. The Asian economy shows the highest debt ratios, and firms in the European and Anglo-Saxon economies show similar debt ratios in the first period. In the second period, firms in the Anglo-Saxon economy are in the highest debt level position, but firms in the Asian economy are still high compared to European companies. It has also been noticed that the differences between debt ratios are smaller in the second period than in the first period. Table 4.4 with Tables 4.5 and 4.6, implies that the capital structures are

becoming increasingly similar between countries, as well as between economies in the second period. One noticeable factor is that firms in the Anglo-Saxon economy have increased debt ratios while other economies decline.

Table 4.4 Average debt ratios between economies.

The table presents the average debt ratio for each economy. Average debt ratios are without square brackets, and the values of median debt ratios are in square brackets.

	Anglo-Saxon economy	European economy	Asian economy
Period one (89-98)	.2114 [.1476]	.2130 [.1826]	.3023 [.285]
Period two (99-08)	.2235 [.1126]	.1937 [.1474]	.2213 [.1882]

Table 4.5 illustrates the results of the ANOVA test between countries and shows that there are significant differences in terms of means of debt ratios between countries in both the first and second period.

Table 4.5 ANOVA test between countries

This table shows the average difference between countries across the first (1989-1998) and second periods (1999-2008). The F statistics indicate that there are significant differences in debt ratios between countries.

Note, SS: sum of squares, DF: degree of freedom, MS: mean square, F: F statistic, Prob: p-value, *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level.

		SS	DF	MS	F	Prob
Period one (89-98)	Model	43.2371	10	4.3237	97.47***	0.0000
	Residual	570.2267	12855	.0443		
	Total	613.4638	12865	.0476		
Period two (99-08)	Model	26.1571	10	2.6157	41.97***	0.0000
	Residual	2464.4439	39543	.0623		
	Total	2490.601	39553	.0629		

Table 4.6 shows the debt ratios in terms of the average and the median and their changes based on countries. The table also shows that average debt ratios have declined in the second period across countries, with the exception of Austria, Britain, Italy and the USA. The debt ratios of the three Eastern countries, Japan, Korea and Taiwan, are higher compared with the Western countries' debt ratios in the first period and show a high debt ratio reduction in the second period. The median debt ratio changes tell a similar story. With the exception of Italy, all the sample countries reduced debt ratios in median. The table also shows that across all the sample

countries, the standard deviation has increased, with the exception of Korea and Germany.

Table 4.6 'Total debt to total asset ratio' in mean and median level changes based on countries

The table shows that average debt ratios have generally declined in the second period, across countries. Note, SD: standard deviation.

Countries	Periods	Mean	Mean change	Median	Median change	SD	SD change
Australia (AUS)	89 ~ 98	.2298	-0.0688	.2416	-0.1753	.1553	0.0709
	99 ~ 08	.1610		.0663		.2262	
Austria (AUT)	89 ~ 98	.1607	0.0253	.1835	-0.0251	.1239	0.0534
	99 ~ 08	.1860		.1584		.1773	
Canada (CAN)	89 ~ 98	.2554	-0.0643	.2434	-0.1277	.2249	0.0124
	99 ~ 08	.1911		.1157		.2373	
Germany (DEU)	89 ~ 98	.2064	-0.0263	.1547	-0.0328	.2182	-0.0086
	99 ~ 08	.1801		.1219		.2096	
France (FRA)	89 ~ 98	.2267	-0.0303	.2017	-0.0501	.1717	0.0167
	99 ~ 08	.1964		.1516		.1884	
GBR	89 ~ 98	.1630	0.0185	.1268	-0.0305	.1711	0.0749
	99 ~ 08	.1815		.0963		.2460	
Italy (ITA)	89 ~ 98	.2067	0.0324	.1843	0.0542	.1691	0.0079
	99 ~ 08	.2391		.2385		.1770	
Japan (JPN)	89 ~ 98	.2864	-0.0604	.2681	-0.0828	.1924	0.0162
	99 ~ 08	.2260		.1853		.2086	
Korea (KOR)	89 ~ 98	.4749	-0.2476	.4720	-0.2656	.2022	-0.01
	99 ~ 08	.2273		.2064		.1922	
Taiwan (TWN)	89 ~ 98	.2672	-0.061	.2551	-0.0742	.1562	0.0237
	99 ~ 08	.2062		.1809		.1799	
USA	89 ~ 98	.2158	0.0294	.1420	-0.0176	.2410	0.0786
	99 ~ 08	.2452		.1244		.3196	
Total	89 ~ 98	.2471	-0.0282	.2104	-0.0604	.2183	0.0326
	99 ~ 08	.2189		.1500		.2509	

Table 4.7 shows the ranking of debt levels between countries. It shows that, in general, in terms of average values, the firms in the Anglo-Saxon countries and the Continental countries have similar debt ratios while the firms in the Eastern countries generally maintain higher debt ratios. The high debt ratio of Asian firms is persistent across the two decades. In terms of median values, Anglo-Saxon firms generally have a lower debt ratio than European Continental firms.

Table 4.7 Ranking in average and median of debt ratios between countries

The table shows the ranking of debt levels between countries and indicates that firms in the Asian economy hold more debt across the time periods.

Rank	Debt Ratio in Average		Debt Ratio in Median		Standard Deviation	
	89 ~ 98	99 ~ 08	89 ~ 98	99 ~ 08	89 ~ 98	99 ~ 08
1	0.1607 (AUT)	0.161 (AUS)	0.1268 (GBR)	0.0663 (AUS)	0.1239 (AUT)	0.177 (ITA)
2	0.163 (GBR)	0.1801 (DEU)	0.142 (USA)	0.0963 (GBR)	0.1553 (AUS)	0.1773 (AUT)
3	0.2046 (DEU)	0.1815 (GBR)	0.1547 (DEU)	0.1157 (CAN)	0.1562 (TWN)	0.1799 (TWN)
4	0.2067 (ITA)	0.186 (AUT)	0.1835 (AUT)	0.1219 (DEU)	0.1691 (TIA)	0.1884 (FRA)
5	0.2158 (USA)	0.1911 (CAN)	0.1843 (ITA)	0.1244 (USA)	0.1711 (GBR)	0.1922 (KOR)
6	0.2267 (FRA)	0.1964 (FRA)	0.2017 (FRA)	0.1516 (FRA)	0.1717 (FRA)	0.2086 (JPN)
7	0.2298 (AUS)	0.2062 (TWN)	0.2416 (AUS)	0.1584 (AUT)	0.1924 (JPN)	0.2096 (DEU)
8	0.2554 (CAN)	0.226 (JPN)	0.2434 (CAN)	0.1809 (TWN)	0.2022 (KOR)	0.2262 (AUS)
9	0.2672 (TWN)	0.2273 (KOR)	0.2551 (TWN)	0.1853 (JPN)	0.2182 (DEU)	0.2373 (CAN)
10	0.2864 (JPN)	0.2391 (ITA)	0.2681 (JPN)	0.2064 (KOR)	0.2249 (CAN)	0.246 (GBR)
11	.4749 (KOR)	0.2452 (USA)	0.472 (KOR)	0.2385 (ITA)	0.241 (USA)	0.3196 (USA)

4.3.3 Capital structure with different industries

Traditionally, it is believed that capital structures are significantly affected by industry (Emery and Finnerty, 1998; Kester, 1986; Bowen et al., 1982). Schwartz and Aronson (1967), Scott (1972) and Scott and Martin (1975) also show that there are more differences between industries than within industries. In addition, Masulis (1983) argues that when a company's debt ratio is close to the average leverage level of the industry to which the firm belong, its value increases in the financial market.

It is presumed that different industries have different assets and operating risks to support debt capability (Emery and Finnerty, 1998), whereas firms in the same industry have the same business risk (Remmers et al., 1974). Therefore, firms within the same industry have similar financial structures. Firms with large amounts of tangible assets generally have more debts than firms with intangible assets (Binsbergen et al., 2011; Frank and Goyal, 2009). Firms in the hotel industry, for instance, have higher debt ratios than companies that are in the software industry. Table 4.8 shows that there are significant differences in the debt ratios of the twenty-seven industries.

Table 4.8 ANOVA test with different industries

The table shows the F statistics that indicate significant differences in debt ratio between industries in both time periods.
Note, SS: sum of squares, DF: degree of freedom, MS: mean square, F: F statistic, Prob: p-value, *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level.

	Source	SS	DF	MS	F	Prob
Period 1 (89-98)	Model	85.5553	26	3.2905	80.03***	0.0000
	Residual	527.9085	12839	.0411		
	Total	613.4638	12865	.0476		
Period 2 (99-08)	Model	191.0816	26	7.3492	126.33***	0.0000
	Residual	2299.5193	39527	.05817		
	Total	2490.601	39553	.0629		

Table 4.9 indicates that 17 industries decrease and 10 industries increase leverage levels in terms of average value. The table tells a similar story based on median values. As we discussed earlier, this implies that the decreasing debt ratio might have been the trend for the last 20 years. It also shows that while average debt ratios decrease, the overall standard deviations have increased.

Table 4.10 arranges debt ratios in ascending order in respect of industry average leverage levels. We can observe that most industries are in a similar order in both of the sample periods. For example, in each of the periods, hotel, airlines, and fixed line telecommunication companies have high debt ratios, while companies in biotechnology, software, and computer services have low debt ratios. This result may have two implications. Companies have smaller debt ratios, (1) if they do not have sufficient tangible assets (Myers, 2003) or (2) if they have high operating earnings' volatility (Ozkan, 2001; Bongini et al., 2000).

Table 4.9 Mean, median and SD of debt ratio with different industries

The table shows the changes in mean, median and standard deviation of debt ratio between two different time periods. Note, SD: Standard Deviation

Industry	Periods	Mean	Mean change	Median	Median change	SD	SD change
Airlines	89 ~ 98	.3504	0.0439	.3306	0.0522	.1997	0.0468
	99 ~ 08	.3943		.3828		.2465	
Aluminium	89 ~ 98	.3343	0.0216	.3241	0.0419	.1859	0.0346
	99 ~ 08	.3559		.366		.2205	
Automobiles	89 ~ 98	.3227	0.0032	.3099	0.0084	.1789	0.0129
	99 ~ 08	.3259		.3183		.1918	
Biotechnology	89 ~ 98	.1355	0.0335	.0393	-0.0146	.2346	0.0648
	99 ~ 08	.1690		.0247		.2994	
Broad-line retailers	89 ~ 98	.3004	-0.0242	.3002	-0.0266	.1631	0.0191
	99 ~ 08	.2762		.2736		.1822	
Brewers	89 ~ 98	.2371	-0.0256	.2348	-0.0379	.1810	0.0195
	99 ~ 08	.2115		.1969		.2005	
Broadcasting and entertainment	89 ~ 98	.3301	-0.0285	.2778	-0.0405	.2919	0.0132
	99 ~ 08	.3016		.2373		.3051	
Computer hardware	89 ~ 98	.1727	0.0023	.1350	-0.0059	.1565	0.0309
	99 ~ 08	.1750		.1291		.1874	
Computer services	89 ~ 98	.1733	-0.0201	.1155	-0.0395	.1931	0.019
	99 ~ 08	.1532		.0760		.2121	
Delivery services	89 ~ 98	.2363	-0.0229	.2376	-0.0713	.1821	0.0135
	99 ~ 08	.2134		.1663		.1956	
Distillers and vintners	89 ~ 98	.2641	0.0347	.2616	0.0413	.1716	0.0338
	99 ~ 08	.2988		.3029		.2054	
Drug retailers	89 ~ 98	.1918	0.0284	.1712	-0.0012	.1453	0.0792
	99 ~ 08	.2202		.1700		.2245	
Fixed line telecommunications	89 ~ 98	.3530	0.005	.3459	-0.0457	.2301	0.1067
	99 ~ 08	.3580		.3002		.3368	
Food products	89 ~ 98	.2512	-0.0023	.2268	-0.0139	.1841	0.0411
	99 ~ 08	.2489		.2129		.2252	
Gambling	89 ~ 98	.3182	-0.0077	.2331	0.0092	.3038	0.0021
	99 ~ 08	.3105		.2423		.3059	
Health care providers	89 ~ 98	.2785	0.0113	.2678	-0.0381	.2405	0.0574
	99 ~ 08	.2898		.2297		.2979	
Heavy construction	89 ~ 98	.2157	-0.015	.1789	-0.0191	.1762	0.007
	99 ~ 08	.2007		.1598		.1832	
Home construction	89 ~ 98	.3062	-0.0145	.2810	0.0075	.2236	-0.0094
	99 ~ 08	.2917		.2885		.2142	
Hotels	89 ~ 98	.4141	-0.0634	.4068	-0.0649	.2109	0.0465
	99 ~ 08	.3507		.3419		.2574	
Internet	89 ~ 98	.2166	-0.0535	.0913	-0.0561	.3049	-0.0365
	99 ~ 08	.1631		.0352		.2684	
Marine transportation	89 ~ 98	.4467	-0.0651	.4845	-0.104	.2335	-0.0252
	99 ~ 08	.3816		.3805		.2083	
Mobile telecommunications	89 ~ 98	.3448	-0.1069	.3305	-0.1569	.2487	0.0214
	99 ~ 08	.2379		.1736		.2701	
Semiconductors	89 ~ 98	.1577	-0.0004	.1064	-0.014	.1695	0.0161
	99 ~ 08	.1573		.0924		.1856	
Soft drinks	89 ~ 98	.2332	-0.0165	.2391	-0.0921	.1904	0.0642
	99 ~ 08	.2167		.1470		.2546	
Software	89 ~ 98	.1373	0.0088	.0443	-0.0206	.2104	0.0537
	99 ~ 08	.1461		.0237		.2641	
Steel	89 ~ 98	.3006	-0.0155	.2853	-0.0108	.1918	0.0142
	99 ~ 08	.2851		.2745		.206	
Travel and tourism	89 ~ 98	.4319	-0.0989	.4868	-0.1641	.2228	0.0633
	99 ~ 08	.3330		.3227		.2861	
Total	89 ~ 98	.2471	-0.0282	.2104	-0.0604	.2183	0.0326
	99 ~ 08	.2189		.1500		.2509	

Table 4.10 Ranking (ascending order) in debt ratio in terms of mean, median and standard deviation

The table shows debt ratios in ascending order. We can observe that most industries are in a similar order in both of the sample periods. Full industry names are described in Appendix 1.

	Mean Debt Ratio		Median Debt Ratio		Standard Deviation	
Order	89-98	99-08	89-98	99-08	89-98	99-08
1	0.1355 (bio tech)	0.1461 (software)	0.0393 (bio tech)	0.0237 (software)	0.1453 (drug retail)	0.1822 (bro retail)
2	0.1373 (software)	0.1532 (com ser)	0.0443 (software)	0.0247 (bio tech)	0.1565 (com hard)	0.1832 (heavy con)
3	0.1577 (semi con)	0.1573 (semi con)	0.0913 (internet)	0.0352 (internet)	0.1631 (bro retail)	0.1856 (semi con)
4	0.1727 (com hard)	0.1631 (internet)	0.1064 (semi con)	0.076 (com ser)	0.1695 (semi con)	0.1874 (com hard)
5	0.1733 (com ser)	0.169 (bio tech)	0.1155 (com ser)	0.0924 (semi con)	0.1716 (dist & vint)	0.1918 (auto mobil)
6	0.1918 (drug retail)	0.175 (com hard)	0.135 (com hard)	0.1291 (com hard)	0.1762 (heavy con)	0.1956 (deliv serv)
7	0.2157 (heavy con)	0.2007 (heavy con)	0.1712 (drug retail)	0.147 (soft drink)	0.1789 (auto mobil)	0.2005 (brewer)
8	0.2166 (internet)	0.2115 (brewer)	0.1789 (heavy con)	0.1598 (heavy con)	0.181 (brewer)	0.2054 (dist & vint)
9	0.2332 (soft drink)	0.2134 (deliv serv)	0.2268 (food prod)	0.1663 (deliv serv)	0.1821 (deliv serv)	0.206 (steel)
10	0.2363 (deliv serv)	0.2167 (soft drink)	0.2331 (gambling)	0.17 (drug retail)	0.1841 (food prod)	0.2083 (marine tra)
11	0.2371 (brewer)	0.2202 (drug retail)	0.2348 (brewer)	0.1736 (mobile tel)	0.1859 (aluminium)	0.2121 (com ser)
12	0.2512 (food prod)	0.2379 (mobile tel)	0.2376 (deliv serv)	0.1969 (brewer)	0.1904 (soft drink)	0.2142 (home cons)
13	0.2641 (dist & vint)	0.2489 (food prod)	0.2391 (soft drink)	0.2129 (food prod)	0.1918 (steel)	0.2205 (aluminium)
14	0.2785 (health pro)	0.2762 (bro retail)	0.2616 (dist & vint)	0.2297 (health pro)	0.1931 (com ser)	0.2245 (drug retail)
15	0.3004 (bro retail)	0.2851 (steel)	0.2678 (health pro)	0.2373 (bro&enter)	0.1997 (airlines)	0.2252 (food prod)
16	0.3006 (steel)	0.2898 (health pro)	0.2778 (bro&enter)	0.2423 (gambling)	0.2104 (software)	0.2465 (airlines)
17	0.3062 (home cons)	0.2917 (home cons)	0.281 (home cons)	0.2736 (bro retail)	0.2109 (hotel)	0.2546 (soft drink)
18	0.3182 (gambling)	0.2988 (dist & vint)	0.2853 (steel)	0.2745 (steel)	0.2228 (travel&tou)	0.2574 (hotel)
19	0.3227 (auto mobil)	0.3016 (bro&enter)	0.3002 (bro retail)	0.2885 (home cons)	0.2236 (home cons)	0.2641 (software)
20	0.3301 (bro&enter)	0.3105 (gambling)	0.3099 (auto mobil)	0.3002 (fixed tel)	0.2301 (fixed tel)	0.2684 (internet)
21	0.3343 (aluminium)	0.3259 (auto mobil)	0.3241 (aluminium)	0.3029 (dist & vint)	0.2335 (marine tra)	0.2701 (mobile tel)
22	0.3448 (mobile tel)	0.333 (travel&tou)	0.3305 (mobile tel)	0.3183 (auto mobil)	0.2346 (bio tech)	0.2861 (travel&tou)
23	0.3504 (airlines)	0.3507 (hotel)	0.3306 (airlines)	0.3227 (travel&tou)	0.2405 (health pro)	0.2979 (health pro)
24	0.353 (fixed tel)	0.3559 (aluminium)	0.3459 (fixed tel)	0.3419 (hotel)	0.2487 (mobile tel)	0.2994 (bio tech)
25	0.4141 (hotel)	0.358 (fixed tel)	0.4068 (hotel)	0.366 (aluminium)	0.2919 (bro&enter)	0.3051 (bro&enter)
26	0.4319 (travel&tou)	0.3816 (marine tra)	0.4845 (marine tra)	0.3805 (marine tra)	0.3038 (gambling)	0.3059 (gambling)
27	0.4467 (marine tra)	0.3943 (airlines)	0.4868 (travel&tou)	0.3828 (airlines)	0.3049 (internet)	0.3368 (fixed tel)

4.3.4 Capital structure within different industries and different countries

Our results reveal three facts in this section. Firstly, over two decades and across eleven countries, most industries' leverage levels generally show stability, but also a gradual reduction. Secondly, firms related to new technologies have lower debt ratios compared to firms in traditional industries. For example, firms in biotechnology and computer service industries have low debt levels throughout the two decades and across countries (see Tables A.4.3 and A.4.4 in Appendix 4). Finally, an average debt ratio of an industry in a particular country is not the same as that in another country, but it is ranked in a similar place among different industries in each country. For example, the observed leverage levels of airlines and steel firms are very varied across countries, but most of the airlines companies' debt ratios are ranked higher than steel companies across countries. This implies that debt ratios are jointly related to industry and country factors (see Tables 4.9 and 4.10; and Tables A.4.3 and A.4.4 in Appendix 4).

4.3.4.1 Different leverage levels in terms of similarity and persistency

Our results indicate that firms have different leverage levels in line with industries, time periods and countries. The results also show persistency in terms of leverage levels. Namely, firms with high debt levels in the first period retain their high gearing levels over time, whereas firms with low debt levels in the first period retain their low gearing levels over time.

4.3.4.1.1 Similarities and differences in debt ratios

There are similarities and differences in debt ratios across industries and countries. For example, most debt ratios are between 15% (AUT) and 28% (USA) in the food product industry, with the exception of some countries (see Table A.4.2 in Appendix 4 for details). Firms in computer services, broadcasting and entertainment, drug retailing, automobiles and computer hardware industries also generally clearly show regular patterns in leverage levels. For instance, computer service firms generally have low debt levels across the two decades in most of the sample countries. In addition, health care providers, in general, have debt levels between 25% and 35% and heavy construction firms have between 15% and 25%, but there are many exceptions to this. For example, semiconductor firms in Korea in the first term show 46% while other firms are lower than 30%.

Overall, there are some similarities in terms of debt ratios in industry averages across countries and wide diversities at the same time (see Tables A.4.3 and A.4.4 in Appendix 4). The phenomenon that leverage levels in terms of industrial averages are in a similar order across time and countries, implies the existence of important 'capital-structure-decision determinants.' However, at the same time, the phenomenon that debt levels in terms of industrial averages are widely spread across countries, might imply the existence of country effects in leverage level decisions.

4.3.4.1.2 Persistency in debt ratios

The most noticeable observation is the persistency of leverage levels in terms of industry averages, over time. Across the twenty-year period, industry average leverage levels have changed but to a limited extent. Therefore, in terms of the order of debt ratios in industry averages between the two periods, they have not changed much (Table 4.10). In addition, aluminium companies, health care providers, travel and tourism companies, and broadcasting and entertainment companies show widely spread debt levels across countries. In particular, their debt ratios in terms of industry averages do not show a clear pattern across countries. However, their leverage levels show stable changes through the two periods of time in each country. This is strong evidence of capital structure persistency. This implies that these firms probably have reasons to maintain the same leverage level over time, without taking into accout their industry mean debt ratios.

4.3.4.2 New industries

High technology industries have only recently begun business when compared with traditional industries. Approximately 900 companies in our sample (about 25% of the total sample of firms) are newly listed in the second period within the high technology industries (ICB code 9000 series). Biotechnology firms have also doubled in number (an increase of 174 companies). Together, these two industries, comprising of about 1,074 companies show an increase in the number of firms in the high technology industries. From Table 4.9, software, biotechnology, and computer hardware firms have increased their debt ratios in the second period based on the average value. Based on the median value, however, this has decreased during the same period. Only companies in traditional industries, e.g. airlines, aluminium and automobiles, have increased their in terms of both mean and median debt levels.

Internet firms, for instance, had about a 25% debt level in the first period, though only four countries had Internet companies. In the second period, ten countries have Internet companies, with the exception of Austria, and most of their debt ratios are between 3% and 15%, with the exception of Germany, Canada and the USA. All computer hardware companies in the Anglo-Saxon economy have higher debt ratios than those in the Continental and the Far Eastern economies. Companies in high technology industries generally have a low debt level. Even though some of them increased their debt levels in the second period, it is still low; and the increase in the number of such companies in these industries in the second period, might lead to an overall decrease in leverage levels on average. This is consistent with Bates et al. (2009).

4.4 Conclusion and contribution

From earlier times, e.g. Donaldson (1961), Solomon (1963) and Stonehill and Stitzel (1969), it has been thought to be important to know the existence of optimal capital structure. If this is the case, why would it be so? The chapter has investigated only the debt ratio differences between industries and between countries by using time series data. The idea is simple. If there are target debt ratios, companies would try to achieve those targets, and if they were successful, then their debt ratios would be near the optimal capital structure: and we could then observe systematic patterns in leverage levels based particular industries.

Our results show that both country and industry factors together affect debt levels. For example, our results show that the average debt level of each industry is different as between countries but the average debt ratios of industries are ranked in a similar order across countries (see Table 4.11; and Tables A.4.3 and A.4.4 in Appendix 4).

In other words, the average debt levels of some industries are always higher than that of others, across countries, whereas the average debt levels of the industries vary in different countries. There are some exceptions, of course.

Our results also show that firms in Eastern countries have higher debt levels compared with Western countries, and there is a trend in terms of capital structure change. For example, debt levels have generally reduced in all the sample countries, over the two decades. The overall conclusion in this chapter implies that there are some common factors in capital structure decisions.

4.4.1 Contribution

Since Stonehill and Stitzel (1969), only a few papers have been published which compare debt ratios based on company characteristics. Our results indicate two aspects: first, that capital structures are not randomly distributed, unlike Modigliani and Miller's (1958) irrelevance theory implies; and second, the differences in capital structure based upon company characteristics (mainly, industry, country and time period in this chapter) imply that there may be a unique optimal debt ratio for each individual firm in respect of their different situations as DeAngelo and Masulis (1980) suggest (see Section 2.2.4 in Appendix 2 for details). In other words, debt ratios can be affected by a firm's unique characteristics and situation, including different taxes, countries and industrial factors.

4.4.2 Implication

This is the most important chapter in this thesis. The results of this chapter underpin the rest of the thesis and require further study. This is because, in this chapter, we have observed that there is a high probability that firms have their optimal capital structure. If there is an optimal capital structure, then we need to know which is the optimal one, what are the important determinants to achieve the optimal gearing level, and how firms come close to their target. Since, we have observed the probability of the existence of an optimal capital structure, we are further motivated to undertake further research about firms' changing behaviours in terms of their capital structure.

Chapter V Three major capital structure theories and debt level determinants

5.1 Introduction

In Chapter 4, we saw that there are various differences in leverage levels in industries and countries over a period of time. In this chapter, as each hypothesis in Chapter 2 is related to a capital structure theory (or theories), we can investigate: (1) what the most appropriate capital structure theory is amongst them; and (2) what the most important debt ratio determinants are by testing our hypotheses.

As discussed in Chapter 2, various researchers have attempted to suggest the important capital structure determinants, such as bankruptcy probability and tax shields for the static trade-off theory, and stock prices and asymmetric information for the pecking order and market timing theories (Myers, 1984; Baker and Wurgler, 2002). In this chapter, we will examine these theories by testing previously suggested research methods. For example, whether a 'financial deficit' would be positively associated with debt issue in terms of the pecking order theory. This method is suggested by Flannery and Rangan (2006) and others. Our results indicate that no one theory dominates the others. Although all three major theories partially explain a firm's financial policy, the trade-off theory is the best amongst them. Our results show that cash holding, firm size, bankruptcy probability, asset tangibility, market-to-book ratio, capital expenditure and stock return all play important roles in 'capital structure decision making procedures'. Our results also indicate that firms have reduced their leverage levels by issuing equity over the last twenty years, and that many firms in our sample have issued equity and debt at the same time. This may imply that asymmetric information is not as great as Myers (1984) thought.

This chapter is structured as follows. Section 5.2 shows the predicted signs of different capital structure theories. Section 5.3 defines the variables that are used in this chapter. Section 5.4 describes different methodologies associated with different capital structure theories. Section 5.5 presents the results from three static models. The chapter closes with a summary and conclusion of the results in Section 5.6.

5.2 Predicted signs and capital structure theories

The predicted sign table was originally provided in Chapter 2. For convenience, it is repeated here.

Table 5.1 Summary of predicted signs associated with capital structure theories

The table shows the differences and similarities of predicted signs associated with different capital structure theories. In general, the predicted signs are similar between theories. As Myers (2001) mentions, this might be seen as evidence for the correlation between capital structure theories. Flannery and Rangan (2006) also conclude that the pecking order theory is a part of the trade-off theory, rather than a unique leverage determinant, because the variable 'financial deficit' does not change the other variables' signs and significant levels. All variables are defined in Section 5.3.

	Static trade-off theory	Dynamic trade-off theory	Simple pecking order theory	Complex pecking order theory	Market timing theory
Market-to-book	-	-	-	-	-
Financial slack					
Firm size	+		+/-	+	
Asset tangibility	+		+/-		
Capital expenditure	+/-		+	-	
Tax rate	+				
Earnings volatility	-	-		-	
R&D expense/ asset	+/-		+	-	
ROA(profitability)	+	-	-	-	
Bankruptcy probability	-	-	-	-	

5.3 The definition of variables

In order to understand the relationship between capital structure and its determinants, this thesis has divided the independent variables into five categories: taxes, financial distress, the costs of capital, growth, and some nominal variables. This classification has already been used in many previous studies.

5.3.1 Choice and definition of debt ratios

There is no clear criterion for using debt ratio which represents a firm's correct capital structure in a capital structure study (see Section 4.2.2 where full details of debt ratio measures are provided).

In addition, Bowman (1980) argues that as there is a strong correlation between book value and market value, mis-specification owing to using book-value measures is very small. Frank and Goyal (2009) however, find that book-value-based debt ratio and market-value-based debt ratio do not show the same results. They confirm that industry median leverage, asset tangibility and profitability are statistically significant when market-based leverages are used; and that the variables of market-to-book ratio, firm size and expected inflation lose their reliability.

Therefore, much previous research has used both book- and market-based debt ratios together, such as Leary and Roberts (2005), Huizinga et al. (2008), and Antoniou et al. (2008). Chapters 6 and 7 also generally use market- and book-based debt ratios together, although book-based debt ratio takes a more important role. The definitions of the two variables used in this thesis are as follows:

Book-based debt ratio=(short term debt and current portion of long-term debt+long-term debt)/(book value debt+book value equity)
Market-based debt ratio=(short term debt and current portion of long-term debt+long-term debt)/(book value debt-book value equity+market value equity).

Figures 5.1 and 5.2 show the trends of book-based debt ratios over the twenty-year period. The figures show that debt ratios have decreased across all countries and economies. In particular, the debt ratios of Korean and Asian firms have shifted more than have been the case in other countries and economies.

Figure 5.1 World debt ratio trends over a 20 year period

The figure shows that all the economies have decreased their debt ratios over the sample time period. The Asian firms have reduced their debt ratios most rapidly. Note, debt ratios are based on the book-based debt ratios as defined by Antoniou et al. (2008) and data are collected from Thomson One Banker. Book-based debt ratio = (short term debt and current portion of long-term debt+long-term debt)/(book value debt+book value equity).

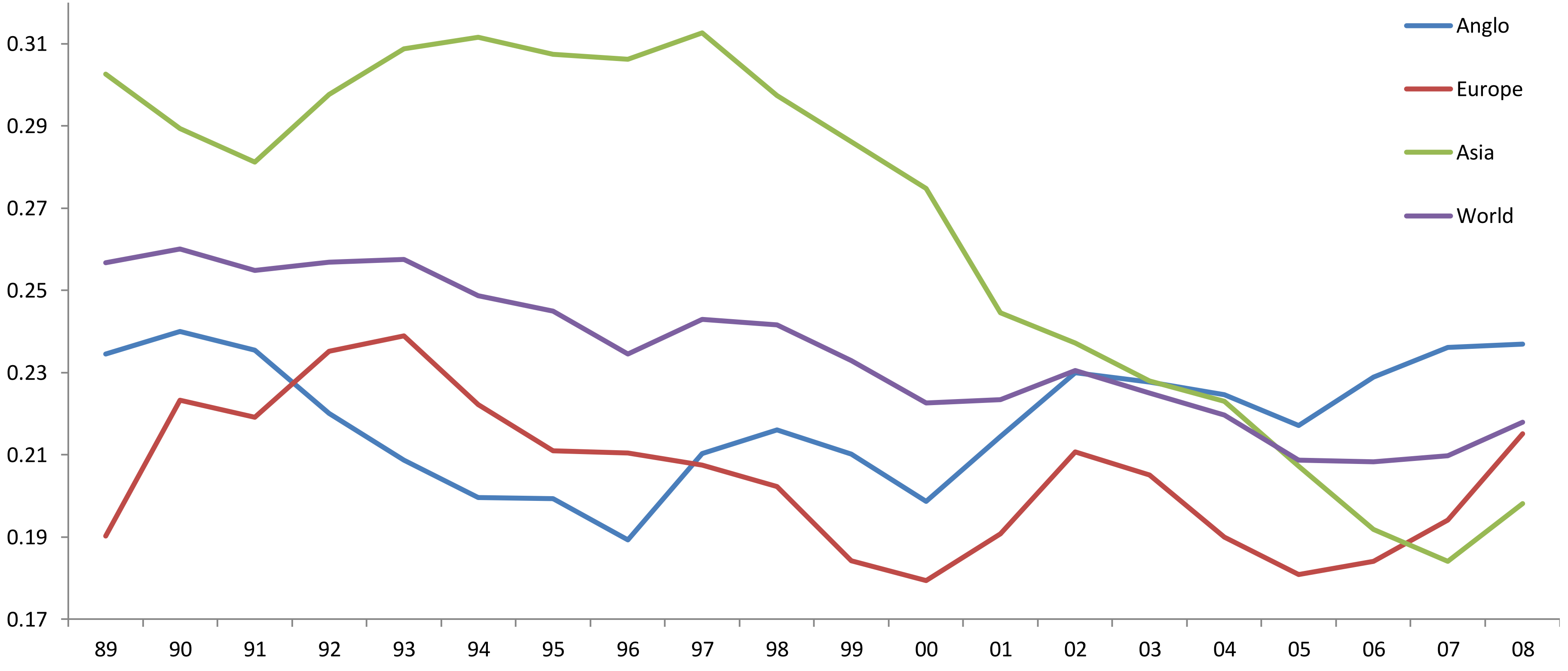
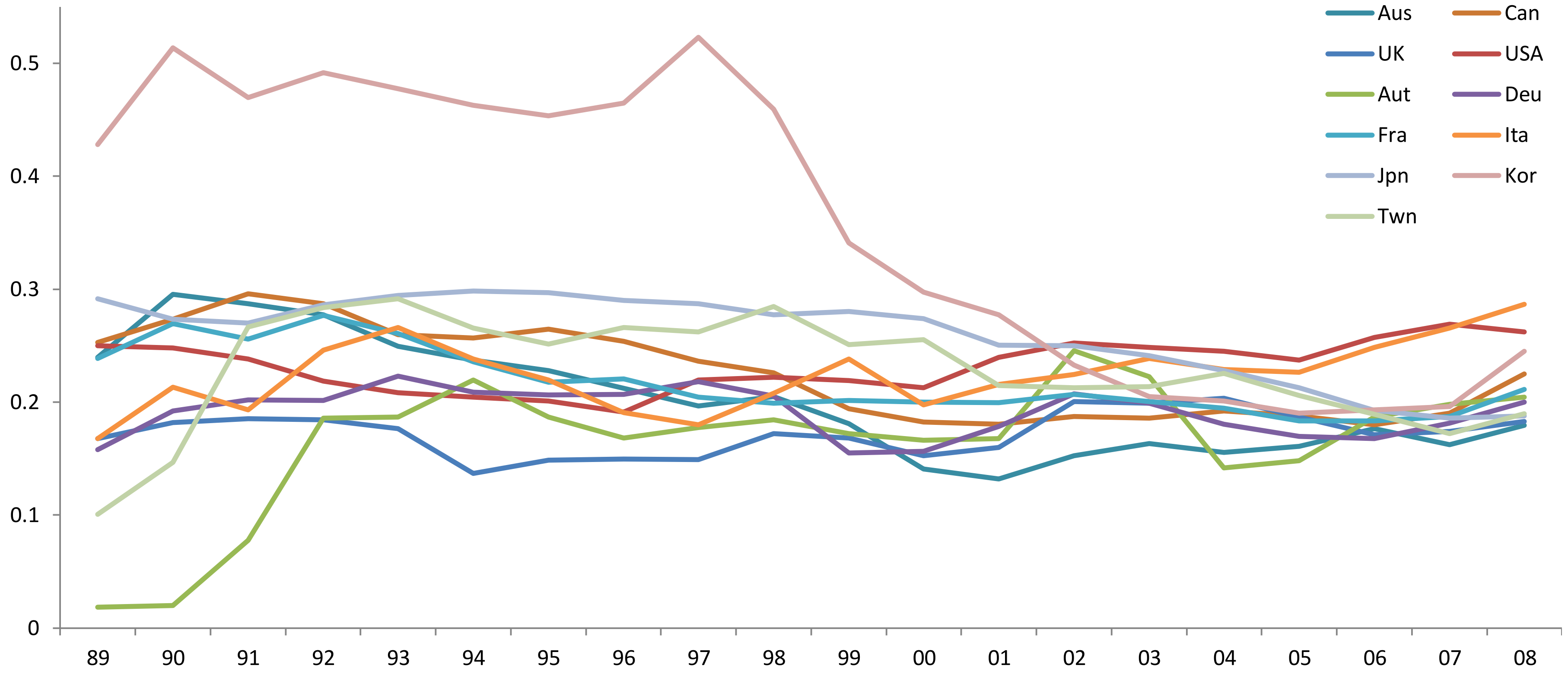


Figure 5.2 Debt ratio trends by countries over a 20 year period

The figure shows the same story as revealed in Figure 5.1. All firms decrease debt ratios during the sample time period. The figure also shows that Asian firms, such as Korean, Japanese and Taiwanese firms have reduced their debt ratios more rapidly. Note, debt ratios are based on the book-based debt ratios as defined by Antoniou et al. (2008) and data are collected from Thomson One Banker. Book-based debt ratio = (short term debt and current portion of long-term debt+long-term debt)/(book value debt+book value equity).



5.3.2 Choice and definitions of independent variables

Full details of the theoretical backgrounds of each independent variable selection are provided in Section 1.2 in Appendix 1.

5.3.2.1 Taxes

In the static trade-off theory, debt increases a firm's value as a result of the associated tax shields. Therefore, tax should be positively associated with the debt ratio. However, there are some weaknesses when using tax rates because all countries have different tax rates (see Table A.1.4 in Appendix 1), and some industries have different tax rates on their revenue, e.g. charities pay less or no tax (Brealey et al., 2008). These differences would affect a firm's capital structure. Various authors use different tax rates as tax indicators. Desai et al. (2004), for example, follow Modigliani and Miller (1963) in that they use corporate income tax rates. Byoun (2008) uses a marginal tax rate that is equal to the statutory income tax rate. Huizinga (2008) uses a statutory tax rate on dividends as a proxy of tax rate.

The definition of the tax rate used in this thesis is as follows:
Tax rate = (income tax / pre-tax income)

5.3.2.2 Financial distress

Fama and French (2005) and Hovakimian et al. (2004) argue that the trade-off theory is more related to risk than to tax advantage. In addition, Brounen et al. (2006), using a questionnaire, find that financial stability is the most important matter of concern for CFOs; followed by credit ratings and earnings volatility. They also suggest that this conclusion is inconsistent with the pecking order theory, and corroborates the assertions of Graham and Harvey (2001) that financial flexibility (or financial stability) is generally considered to be consistent with the pecking order theory, but also relates to some non-pecking order problems, such as transaction costs (for capital structure adjustment), liquidity (for bankruptcy probability control) and new investment opportunities.

In this thesis, the variables, profitability, firm size, financial slack (net cash holding), asset tangibility and earnings volatility are considered as financial distress cost representatives. These variables are related to firms' financial stability (or flexibility), collateral value, and ability to control financial matters. We can presume that big firms, for example, have a better ability to manage financial matters.

5.3.2.2.1 Profitability

Profitable firms can have high tax shields as a result of using more debt. Cheng and Shiu (2007) and Huizinga et al. (2008) use 'return on assets' and Baker and Wurgler (2002) use 'operating income before depreciation' divided by assets, as a proxy of profitability. This thesis follows their lead by using (EBIT-tax)/$Asset_{t-1}$ as a proxy of profitability.

ROA (return on asset): (Net Income before Preferred Dividends + ((Interest Expense on Debt-Interest Capitalized) × (1-Tax Rate))) / Last Year's Total Assets

Note, ROA is defined by Cheng and Shiu (2007).

5.3.2.2.2 Firm size

There are many different types of measure for a firm's size, such as the 'year end market cap' (Shumway, 2001), the 'book value of debt plus the market value of equity' (Kurshev and Strevulaev, 2006), the 'total sales' (Antoniou et al., 2008; Flannery and Rangan, 2006), the 'ln(real sales)' (Baker and Wurgler, 2002; Graham, 2000) and the 'net assets (total asset-current liability)' (Frank and Goyal, 2003). This thesis uses the 'logarithm of assets' as a proxy, following Brav (2009) and Byoun (2008).

LNASSET: log(total asset)

5.3.2.2.3 Financial slack (net cash ratio)

This thesis follows Leary and Roberts' (2005) definition for a proxy of financial slack (net cash ratio).

Financial Slack (net cash ratio) = (cash + marketable securities) / net assets
where, net assets=total asset – 'cash and marketable securities'

5.3.2.2.4 Asset tangibility

Rajan and Zingales (1995) and Antoniou et al. (2008) use the ratio of 'net tangible asset to total asset.'

Asset tangibility = Net Tangible Assets/Total Assets

5.3.2.2.5 Earnings volatility

Earnings volatility is defined as a five-year-moving-standard-deviation of the ratio of 'operating income to total assets'. We therefore have data for it from 1995.

5.3.2.2.6 Bankruptcy probability

Previous research uses returns on assets (Castanias, 1983), total assets (Welch, 2004) and current ratios (Zmijewski, 1984) as proxies of bankruptcy probability. Following Leary and Roberts (2005), Purnanandam (2008) and Binsbergen et al. (2010), we use the series of Z-score models such as Z-score, Z''-score and EMS. In other words, the thesis uses a 'combined Z-score model' as a proxy of bankruptcy probability that uses different types of Z-score models based on a firm's characteristics. We named this 'combined pb-area.' The Z'-score model is used for US firms, the Z''-Score model for non-US firms, and the EMS model for firms in the emerging markets, following Altman's suggestion. Good, gray and bad areas indicate financial conditions based on this 'bankruptcy decision model series.' EDF models are also used for the comparison of bankruptcy probability in Section 7.4 (see Section 1.2.2 in Appendix 1 where full details of bankruptcy probability measures are provided).

Figure 5.3 World net cash ratio trends for a 20 year period

The figure shows that net cash ratios have gradually increased across the world over the last 20 years. The figure indicates that firms increase their cash-holdings across the sample period of time. The Anglo-Saxon economy increases it most, followed by the European and Asian economies. Note that net cash ratios are defined by Leary and Roberts (2005) and data are collected from Thomson One Banker. Net cash ratio = (cash + marketable securities) / net assets, where, net assets=total asset – 'cash and marketable securities'.

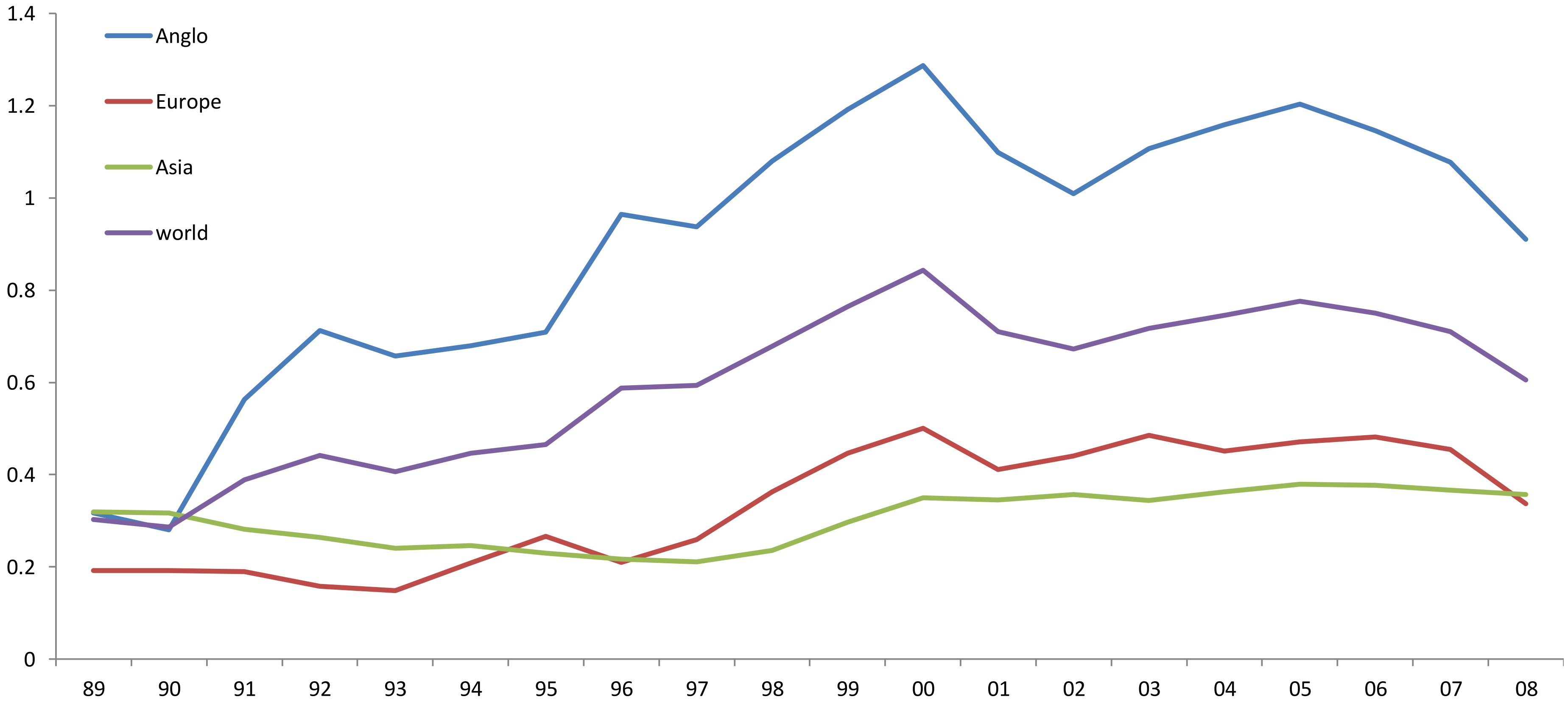
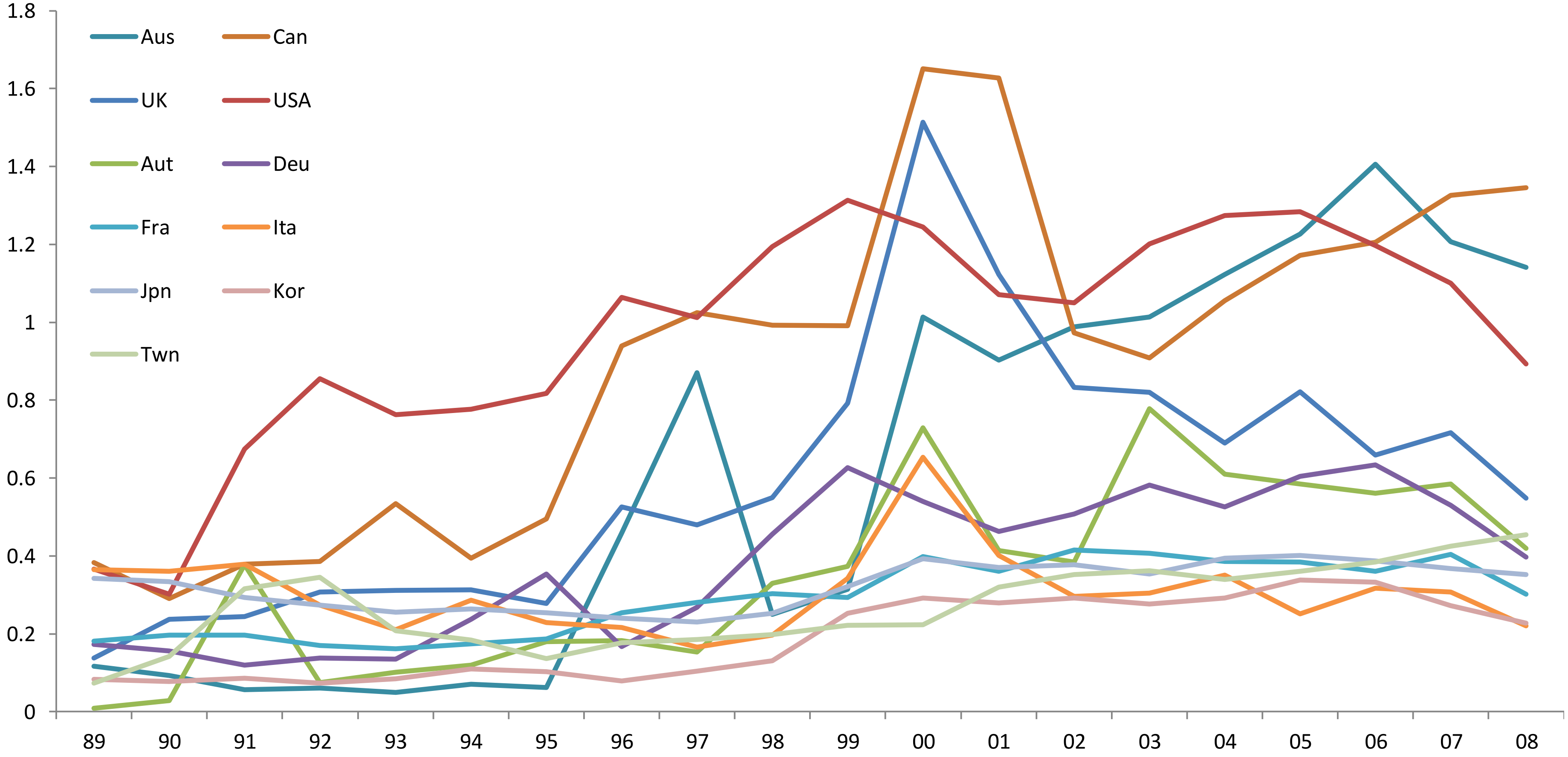


Figure 5.4 Net cash ratio trend by country for a 20 year period

The figure shows 'net cash ratio' changes based on country level data. The figure indicates that firms in the US have generally increased their cash ratio continuously. Note that net cash ratios are defined by Leary and Roberts (2005) and data are collected from Thomson One Banker. Net cash ratio = (cash + marketable securities) / net assets, where, net assets=total asset – 'cash and marketable securities'.



5.3.2.3 Financial costs

5.3.2.3.1 Inflation

Cheng and Shiu (2007) suggest the Ln_inflation.

INF: GDP deflator

5.3.2.3.2 Market-to-book ratio

Market-to-book ratio = ((total asset–book equity+market equity)/total asset)

5.3.2.3.3 Stock return

$$SR_{t-1,t} = \ln(1 + (P_t - P_{t-1})/P_{t-1})$$

where, $SR_{t-1,t}$: stock return at t, P_t: stock price at t.

5.3.2.4 Growth and investment

Goyal et al. (2002) suggest five variables as proxies of growth opportunities, including market-to-book ratio (as a proxy of Tobin's Q) (used by Cheng and Shiu, 2007), annual growth rate of sales (Huizinga et al., 2008), advertising and R&D expenditure (Long and Malitz, 1983; Bradley et al., 1984). This thesis uses 'capital expenditure' and 'research and development expenses' together as proxies of new investment and growth opportunity. R&D expenses generally involve investment in intangible assets, whereas capital expenditure involves investment in tangible assets (Amir et al., 2007; Coles et al., 2006).

5.3.2.4.1 Capital expenditure

CAPEX: Capital expenditure = (capital expenditure/total asset)

5.3.2.4.2 R&D expenses

R&D expenses = research and development expenses/total asset

5.3.2.5 Nominal variables

Our data also include various nominal variables such as time periods, industries, countries and economies. It includes a number of dummy variables. There is a potential problem with these in that an OLS equation will run out of degrees of freedom when it does not include sufficient number of observations. The use of time trend dummy variables can solve this problem (Cameron, 2005) because they can show debt ratio trends throughout the sample period without having dummy variables for each individual time period. The differences in terms of this time trend dummy variable compared with a traditional dummy variable are that: (1) the time trend dummies show the whole trend in terms of changes of dependent variables, while the traditional method shows changes for each individual year; and (2) the time trend dummy can be a proxy of unmeasured variables. Therefore, it can be a superior measurement (Cameron, 2005). This method also allows the use of other nominal variables, including countries and industries.

This thesis has some nominal data, time trends, different countries and industries, and economies. The defined dummy variables are described in Appendix 1.1.

5.3.2.6 Pure issuance

In this thesis, we use new variables in the form of the pure issuance of equity and debt, and which clearly indicate the firms' real choice between debt and equity. The reason for the new variables is because, as Hovakimian et al. (2004) mention, about 65% of firms issue equity and debt simultaneously. Therefore, the previous variables of net equity issue and net debt issue, cannot be good indicators for explaining firms' debt ratio change. In other words, in using the regression models, there is always a certain level of relationship between debt ratio change and 'net equity issue, and net debt issue'. Without considering which dependent and independent variables are used, the regressand is always associated with the regressor at a certain level. Therefore, debt ratio changes always show some level of association with the independent variables, net equity issue and net debt issue, at the same time, particularly when firms issue equity and debt together. This fact indicates that using the previous variables, net equity issue or net debt issue, we cannot clearly point out whether firms choose equity or debt to change their gearing levels. Therefore, in order to address the weakness of the previous research involving these two previous variables, we use two new variables, pure equity issue and pure debt issue. These new variables clearly indicate the firms' real choice between equity and debt. In addition, since they show the firms' real choice between equity and debt, the positive value of 'pure equity issue' indicates the negative value of 'pure debt issue', (pure equity issue = -1 ×pure debt issue). The definitions of the variables are as follows:

Net stock issuance=(sale stock-repurchase stock)/total asset

Net long-term debt issuance = ('long-term debt issue'-'long-term debt retirement')/total asset

Pure equity issuance = ((net stock issue-net bond issue)/total asset) = ((sale stock-repurchase stock) - ('long-term debt issue'-'long-term debt retirement'))/total asset.

Pure debt issuance = ((net bond issue-net stock issue)/total asset) = (('long-term debt issue'-'long-term debt retirement') - (sale stock-repurchase stock))/total asset.

where, sale stock refers to the sale or issue of common and preferred stock. This item, sale stock, indicates the cash flows received from issuing common and preferred stock. It includes the conversion of debentures or preferred stock into common stock, the sale of treasury shares, shares issued for acquisitions and proceeds from stock options. It does not include warrant issuance, share issuance costs and the stocks of subsidiary firms (see the definitions of Thomson One Banker and Compustat). Repurchase stock refers to redemptions, retirement or the conversion of common or preferred stock. It indicates cash flows which are used to buy outstanding common and prepared equity. This includes the purchase of treasury shares, the repurchase of stock, the exchange of common stock for preferred stock or debentures, and the retirement of preferred stock. It does not include warrant purchase, reductions in the stock of a subsidiary, and share purchase when reported separately (see the definitions of Thomson One Banker and Compustat). Long-term debt issue refers to the amount of money received by firms from the issuance of long-term debt, including convertible bonds, capitalised lease obligations and debt acquired from acquisitions. Long-term debt retirement refers to the amount of such borrowings reduced by firms as a result of reducing long-term debt, including capitalised lease obligations and the conversion of debentures into common stock.

5.4 Methodology

5.4.1 Data

The detail of the data was described in Section 3.2. For convenience, some important figures are duplicated here. The data consist of 4,598 companies from 27 industries in 11 countries and from 3 different economies (see Appendix 1.1 for details). The industry classification is based on the 'Industry Classification Benchmark (ICB) sector and sub-sector.' Its sample period is between 1989 and 2008. Macro-economic variables (GDP deflator (inflation) and market capitalisation) have been collected from the International Monetary Fund, and the World Economic Outlook Database. GDP growth has been collected from the OECD Factbook, with the exception of the Taiwanese data as that is from the IMF.

The data has been cleaned up by removing outliers to avoid potential errors as a result of using an inappropriate data set, and in order to minimise their influence. The thesis drops the values of debt ratio, both book- and market-based, if the values are greater than 2.00. This is about 99 percentile of the data set. The thesis also drops negative debt ratios as outliers. In the case of other variables, we likewise drop outliers if the values of variables are greater than three standard deviations from the variables' means.

5.4.1.1 Missing values

There are some missing values in the data set. The thesis uses generally accepted methods to replace these missing values with a minimal effect on the statistical outcomes.

As the missing values of tax rates are correlated to net loss, the thesis replaces the missing values after comparing them with the data of net income. If firms have negative net income, they do not report the tax rates. The thesis, therefore, replaces the missing data with zero tax rates if firms have negative net incomes.

Both the data for ‘long-term debt reduction and repurchase,’ and for ‘common equity and preferred stock repurchase and sales,’ also have missing values. After comparing the behaviour of other sample companies, the thesis presumes that these companies did not issue or repurchase long-term debt or equity if there are no data.

As for the rest of the data, if there are any missing values between time t_0 and t_2, (at t_1), the value of t_1, V_{t1}, is replaced by the mean value between time t_0 and t_2 ($(V_{t2}+V_{t0})/2$); and, if the missing spaces are continued for more than two years, the spaces have been left as missing data.

5.4.2 Panel data

The models in this thesis are based on panel data that include three different elements, debt ratio determinants, company, and time. The model also includes some dummy variables or classifications, viz. countries, industries and time trends.

$$Y_{i,t} = \alpha + \sum_{i=1}^{n}\sum_{k=1}^{n}\sum_{t=1}^{n}\beta_{i,t}X_{i,t,k} + u_{i,t} \quad (5.1)$$

where, i: debt ratio determinants, k: company, t: year, $u_{i,t}$: error term.

Panel data often does not conform to the requirement that it is independent identically distributed (i.i.d) and the best linear unbiased estimator (BLUE), because idiosyncratic error (time-varying error), heteroskedasticity and correlation over time can often occur in panel data. When these problems are present, OLS assumptions cannot be fulfilled. Therefore, it is arguable as to whether OLS is the most appropriate method when using panel data. Pooled OLS, GLS (with fixed effect and random effect), and Instrument Variables (IV) estimators (2SLS, 3SLS, or GMM) are used. If there is no heteroskedasticity problem in OLS regression, the GLS fixed, first and random effect models can be used, and Instrument Variable (IV or 2SLS) and the GMM estimator suggest identical conclusions. If there is a heteroskedasticity problem, however, the GMM estimator leads to a better estimate (Baum et al., 2003).

We also use the two-step GMM estimator that uses residuals produced by the first stage regression to make an 'asymptotically optimal weighting matrix' (see Appendix 3.2 in which full details have been provided). Antoniou et al. (2006, p.175) mentioned that a two-step GMM is a superior estimator "*…when the disturbances are expected to show heteroskedasticity in the large sample data with a relatively long time span. This can control the correlation of errors overtime, heteroskedasticity across firms, simultaneity and measurement errors due to the utilisation of the orthogonality conditions on the variance-covariance matrix.*"

Verbeek (2008) compares statistical models to decide the best estimator by employing similar variables to those of Flanery and Rangan (2006). Verbeek models are of 'partial capital structure adjustments' using OLS, OLS with 'fixed effect and first-difference' and GMM estimators. He concludes that none of the models explains capital structure entirely convincingly. The differences in coefficients among the OLS, OLS with 'fixed effect and first-difference' are substantial (Verbeek, 2008). OLS, in general, overestimates the coefficients (particularly the speed of adjustment, λ) while fixed effect underestimates the coefficients. The coefficients of the first-difference model also substantially underestimate the true value, particularly when λ is large. The results from the GMM one-step and two-step estimators (using the methods of Anderson and Hasio, 1981; and Arellano and Bond, 1991) also indicate an unrealistically weak instrument problem. This implies that we may analyse a model with various methodologies before coming to a conclusion, and trying to find the finest instruments.

In addition, much previous research such as that of Ozkan (2001) and Marsh (1982) suggests that capital structure is affected by many categorical variables, e.g. industry, country and economy. The thesis, therefore, analyses gearing ratios using several different classifications based on a firm's characteristics in Chapter 7.

5.4.2.1 Instruments

As Davidson and Mackinnon (2004) state, in general, there are endogeneity problems in the panel data when a variable is not orthogonal with the error term. A solution for the endogeneity problem is using first differences or fixed effects. These methods, however, raise a problem that they omit variables which are constant over time. This problem can be solved by using estimators such as IV or GMM which use instruments. Instruments are required to make sure that the error term is not correlated to endogenous independent variables; otherwise the OLS outcomes will be biased[12].

Theoretically, any variables can be instruments if they are highly correlated with independent variables and uncorrelated with the error term (see Sections 3.1.1 and 3.2.3 in Appendix 3 which provide a full description of the endogeneity problem). However, it is difficult to find suitable instruments. Therefore, one- or two-period-lagged independent variables are generally used as instruments. Lemmon and Zender (2008) and Ozkan (2001) use a one-period-lagged independent variable for all their analyses. Drobetz and Wanzenried (2006) use GMM models with two-period-lagged independent variables as instruments[13]. In Chapters 6 and 7, we also use one- or two-period-lagged variables as instruments (Mackay and Phillips, 2005; see Section 3.1.2 in Appendix 3 which provides full details of the instruments used).

This thesis decides endogeneity in variables by using C-statistic (also called difference-in-Sargan C test (Roodman, 2006) or J-statistic). The C-statistic provides the orthogonality condition of (sub-instrumental) variables (Baum, 2006). Its null hypothesis is the exogeneity of variables. However, Roodman (2006) mentions by citing Sargan (1958) that the error in the Sargan test is proportionate as it increases

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[12] Let us assume a regression model A, $y_1=\alpha_0+\beta_1x+\beta_2y_2+\mu$, where y_2 is an endogenous variable, μ is an error term. To solve this problem, z_1 and z_2 are used as instruments for y_2, $\hat{y}_2=\pi_0+\pi_1z_1+\pi_2z_2+\pi_3x+\nu$, where, ν is an error term. Then $\Sigma\hat{y}_2(y_1-\hat{\beta}_0-\hat{\beta}_1y_2+\hat{\beta}_2x)=0$. This equation is used to solve the regression model A. Since this method goes through two stages, it is called the two-stage least square (2SLS) method.

[13] Most researchers use from one to four-period lagged or differenced explanatory variables (Nishioka, 2004; Benito, 2003). Flannery and Rangan (2006) use lagged market-based debt ratios for lagged book-based debt ratios as instruments.

the number of instruments and, by citing Ruud (2000), we do not know the reasonable number of instruments.

5.4.3 Statistical descriptions

Table 5.2 presents descriptive statistics, and Table 5.3 presents a correlation matrix for the sample data. There are some high correlations with the size of the firm, profit, earnings volatility, research and development expenses in Table 5.3. Table 5.4 also presents the correlation matrix with differenced data and shows a high correlation with the size of the firm, research and development expenses and profit. Table 5.5 shows the VIF (variance inflation factors) test and indicates that there is no multi-collinearity between independent variables (see Section 3.2.1.2. in Appendix 3 in which full details of the VIF test are provided). Therefore, even though there are relatively high correlations between some variables as Tables 5.2 and 5.3 indicate, all variables can be used together for analysis.

Table 5.2 Descriptive statistics of dependent and independent variables for the whole sample period between 1989 and 2008

BDR: book value based debt ratio=book value debt/book value asset, MDR: market-based debt ratio=book value of debt/(book value of asset–book value of equity+market equity), NLTD: Net long term debt issuance=(‘long-term debt issue’-‘long-term debt retirement’)/total asset, NE: Net stock issuance =(sale stock-repurchase stock)/total asset, Netcash=cash and short-term investment/(total asset-cash and short-term investment), Lnasset=log(total asset), Tang (asset tangibility)=net property, plant and equipment/total asset, Tax=income taxes/pre-tax income, the thesis removes the negative value of taxes. Capex (Capital expenditure)=capital expenditure/total asset, the thesis removes the negative value of capital expenditure. R&D=research and development expenses/asset, the thesis removes the negative value of R&D. M/B (Market-to-book ratio)=(asset-book equity+market equity)/asset, this thesis removes the observations that are greater than 10 and smaller than zero. Profit (Profitability)=operating income before tax/asset, Vol (earnings volatility)=5 year moving average standard deviation of the ratio of ‘operating income’ to ‘total asset’, DEF1=(dividend+investment+working capital change-cash-flow after interest and tax)/total asset, DEF2=(DEF1+long- term debt)/total asset.

Stats	BDR	MDR	ΔBDR	ΔMDR	NLTD	NE	DEF1	DEF2	Netcash	Lnasset	Tang	Tax	Capex	R&D	M/B	Profit	Vol
Mean	.226	.167	0	007	.01	.062	.163	.284	.673	4.95	.242	.329	.056	.076	1.84	-.036	.082
Min	0.00	0.00	-1.842	-.722	-.6	-.866	-3.515	-3.516	0.00	-4.61	-.008	0	0	0	.043	-3	.000
p25	.019	.01	-.029	-.021	-.013	0	-.021	.044	.068	3.44	.063	.025	.011	.002	.99	-.022	.016
P50	.166	.111	0	0	0	0	.051	.186	.174	4.98	.183	.306	.031	.018	1.31	.040	.037
p75	.354	.276	.025	.032	.014	.02	.217	.412	.466	6.54	.376	.431	.07	.09	2.1	.093	.093
p99	1.1	.662	.459	.289	.387	.912	1.818	1.866	10.12	10.70	.826	2.16	.39	.74	8.13	.376	.574
Max	1.91	.729	1.857	.709	.643	1.091	4.563	4.845	33.67	13.04	.913	13.25	.62	1.43	9.99	2.43	.673
Sd	.244	.176	.146	.088	.094	.186	.396	.411	2.03	2.50	.212	.564	.076	.142	1.47	.347	.115
Skewness	1.84	1.02	-.326	.180	1.238	2.961	3.341	2.695	7.88	-.220	.91	10.60	3.05	4.00	2.58	-3.98	2.60
Kurtosis	8.89	3.17	34.276	10.693	13.847	13.02	22.75	17.917	81.62	3.60	3.00	165.84	15.25	24.73	10.61	25.6	10.2

Table 5.3 A correlation matrix for the whole sample period between 1989 and 2008

Netcash=cash and short-term investment/(total asset-cash and short-term investment), Lnasset=log(total asset), Tang (asset tangibility)=net property, plant and equipment/total asset, Tax=income taxes/pre-tax income, Capex (Capital expenditure)=capital expenditure/total asset, R&D=research and development expenses/asset, M/B (Market-to-book ratio)=(asset-book equity+market equity)/asset, the thesis drops the observations that are greater than 10, Profit (Profitability)=operating income before tax/asset, Vol (earnings volatility)=5 year moving average standard deviation of the ration of 'operating income' to 'total asset,' BP=bankruptcy areas from Z-, Z'- and EM- Score areas, 1=good, 2=gray, and 3=bad areas of the bankruptcy score. The table shows that lnasset has correlation relationships to R&D, profit, and vol, tang to capex, R&D to M/B, profit, Vol and lnasset, M/V to Vol, and profit to Vol, Lnasset and R&D. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level.

	Netcash	Lnasset	Tang	Tax	Capex	R&D	M/B	Profit	Vol	BP
Netcash	1.00									
Lnasset	-0.19***	1.00								
Tang	-0.24***	0.28***	1.00							
Tax	-0.1***	0.2***	0.05***	1.00						
Capex	-0.06***	0.09***	0.36***	-0.01*	1.00					
R&D	0.25***	-0.33***	-0.21***	-0.15***	-0.03***	1.00				
M/B	0.23***	-0.27***	-0.21***	-0.12***	0.09***	0.33***	1.00			
Profit	-0.20***	0.42***	0.11***	0.16***	0.06***	-0.50***	-0.22***	1.00		
Vol	0.27***	-0.51***	-0.27***	-0.18***	-0.02***	0.46***	0.36***	-0.55***	1.00	
BP	-0.09***	-0.05***	0.20***	-0.03***	-0.02***	0.12***	-0.08***	-0.29***	0.14***	1.00

Table 5.4 A correlation matrix for the whole sample period with differenced variables between 1989 and 2008

DEF1=(dividend+investment+working capital change-cash-flow after interest and tax)/total asset, DEF2=(DEF1+long- term debt)/total asset. The table shows the correlation between variables. The table indicates that there is generally no significant correlation except between ΔR&D and ΔLnasset, between Δprofit and ΔLn asset, and between Δprofit and ΔR&D. All variables are defined in Section 5.3. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	ΔNetcash	ΔLnasset	ΔTang	ΔTax	ΔCapex	ΔR&D	ΔM/B	ΔProfit	ΔVol	ΔBP	DEF1	DEF2
ΔNetcash	1.00											
ΔLnasset	0.15***	1.00										
ΔTang	-0.19***	-0.14***	1.00									
ΔTax	0.00	0.02***	-0.01**	1.00								
ΔCapex	0.01*	0.17***	0.12***	0.01	1.00							
ΔR&D	-0.25***	-0.35***	0.19***	-0.01	-0.05***	1.00						
ΔM/B	0.03***	-0.21***	-0.03***	-0.01*	0.01**	0.5***	1.00					
ΔProfit	0.14***	0.35***	-0.16***	0.02***	0.06***	-0.45***	-0.04***	1.00				
ΔVol	-0.02***	-0.08***	0.02***	-0.02***	-0.01	0.11***	0.03***	-0.23***	1.00			
ΔBP	0.09***	-0.12***	0.15***	-0.02***	-0.01**	0.12***	-0.11***	-0.22***	0.06***	1.00		
DEF1	0.01	0.19***	0.09***	0.00	0.18***	-0.05***	-0.03***	0.01	0.01*	0.02***	1.00	
DEF2	0.01*	0.19***	0.06***	0.01	0.14***	-0.05***	-0.04***	0.01**	0.01	0.02***	0.99***	1.00

Table 5.5 VIF test results

The table indicates that there is no multi-collinearity between independent variables. All variables are defined in Section 5.3.

Variable	Regressands: BDR, MDR, ΔBDR, ΔMDR
Netcash	1.19
Lnasset	1.37
Tang	1.48
Tax	1.04
Capex	1.30
R&D	1.67
M/B	1.33
Profit	2.03
Vol	1.91
BP	1.29
Mean VIF	1.46

5.5 Testing static models

To test the static models, we mainly use three dependent variables, leverage level, change in gearing level, and issuances of securities. The leverages are measured by book- and market-based equity values. Fama and French (2002) mention that the expected signs can be changed, based on book- or market-based asset valuing. In other words, the analysed results are changeable according to the dependent variables' definition.

5.5.1 Composition in debt ratio change

Baker and Wurgler (2002) decompose the change of debt ratio into three parts, net equity issue (-(e/A)), newly retained earnings (-(ΔRE/A)), and the residual change in leverage ($-(E_{t-1}(1/A_t-1/A_{t-1}))$ as shown in Equation (5.2). The residual change in leverage indicates the growth of assets, which includes equity and debt issues and newly retained earnings (Baker and Wurgler, 2002).

$$\left(\frac{D}{A}\right)_t-\left(\frac{D}{A}\right)_{t-1}=-\left[\left(\frac{E}{A}\right)_t-\left(\frac{E}{A}\right)_{t-1}\right]=-\left(\frac{e}{A}\right)_t-\left(\frac{\Delta RE}{A}\right)_t-\left[E_{t-1}\left(\frac{1}{A_t}-\frac{1}{A_{t-1}}\right)\right] \quad (5.2)$$

According to Baker and Wurgler (2002), capital structure changes are mostly related to equity issues. They conclude that the market-to-book ratio affects leverage alteration through net equity issues. In addition, retained earnings are 'earning-subtracts-dividend' (Gitman, 2006) and are related to financing costs. The cost of holding the retained earnings is, at least, the same as equity financing costs or less. If the equity financing cost is smaller than using retained earnings, then the firm dividends all retained earnings, and finances using equity issuance. In fact, the cost of retained earnings should be smaller than the cost of any external financing, including debt issuance in the pecking order theory. Thus, increasing retained earnings indicate that external financing is costly. Increased retained earnings are added to equity assets and are negatively associated with a leverage level. From this point of view, we can assume that retained earnings are closely related to the pecking order theory.

Alti (2006) also decomposes the debt level change in a similar way, as shown below:

$$\left(\frac{D}{A}\right)_t - \left(\frac{D}{A}\right)_{t-1} = -\left(\frac{e}{A}\right)_t - \left(\frac{\Delta RE}{A}\right)_t + \left[\left(\frac{E}{A}\right)_{t-1} \times \left(\frac{\Delta \text{cash} + \Delta \text{other assets}}{A}\right)_t\right] \quad (5.3)$$

Using Equations (5.2) and (5.3), we can find important factors in leverage level change as follows (Baker and Wurgler, 2002).

From Table 5.6, both Baker and Wurgler's (2002) and Alti's (2006) models show similar results. Changes in debt ratio are more likely to be related to stock issue rather than to the retained earnings and the residual asset growth of firms. However, both models show that cash-flows generated by retained earnings and residual asset growth are not trivial in terms of debt ratio changes. This result implies that firms are performing more actively in the change capital structure by using the financial market, but that the importance of accumulating internal funds should also be considered as important. This result is consistent with the market timing theory and contradicts Welch's (2004) managerial inertia theory. Welch argues (2004) that firms issue neither equities nor bonds by depending upon the financial market situation.

Table 5.6 Debt ratio changes with regard to the Baker and Wurgler (2002) and Alti (2006) models

The table shows that changes in debt ratio are more likely to be related to external financing rather than to the operating income of firms. Particularly, stock issue is the most important matter. A: total asset, RE: retained earnings, e: equity, -(e/A): equity issue, -(ΔRE/A): increased retained earnings, -(E_{t-1}(1/A_t-1/A_{t-1}): the residual change in leverage, BDR: book-based debt ratio, MDR: market-based debt ratio. ***: significance at 0.01 level, **: significance at 0.01 level, *: significance at 0.01 level.

OLS	Baker and Wurgler (2002)		Alti (2006)	
	ΔBDR	ΔMDR	ΔBDR	ΔMDR
Cons	-.0009 (-1.21)	.0043 (8.20)***	.004 (3.04)***	0092 (9.07)***
$-\left(\frac{e}{A}\right)_t$	.2238 (47.88)***	.0729 (20.82)***	.2171 (39.88)***	.0987 (26.84)***
$-\left(\frac{\Delta RE}{A}\right)_t$	.1376 (60.21)***	.0385 (25.33)***	.1202 (46.82)***	.0547 (32.90)***
$-\left[E_{t-1}\left(\frac{1}{A_t}-\frac{1}{A_{t-1}}\right)\right]$	.1493 (44.93)***	.0435 (19.8)***		
$\left(\frac{E}{A}\right)_{t-1}$			-.0074 (-3.05)***	-.0130 (-7.86)***
$\left(\frac{\Delta cash+\Delta other\ assets}{A}\right)_t$			-.0519 (-18.46)***	-.0563 (-29.65)***
Obs	31025	28939	26959	26449
Adj-R^2	0.1322	0.0291	0.0906	0.0542

Table 5.7 shows the relationships between the ‘debt ratio change elements’ defined by Baker and Wurgler (2002) and Alti (2006) and the important ‘capital structure determinants’ that we will use in Chapters 6 and 7. From Table 5.7, equity issue is positively related to cash holdings, market-to-book ratio (M/B) and earnings volatility, and it is negatively related to profit and asset tangibility. This table shows the importance of profit. In particular, M/B indicates that a firm issues equities with high M/B. This is consistent with Banker and Wurgler (2002). This implies that equity issuances generally follow the trade-off and market timing theories together, and also the pecking order theory, in broad terms. The last column is inconsistent with Baker and Wurgler (2002) and Alti (2006) who assert that firms issue stock when the market condition is good. Our results suggest that firms issue equity regardless of the market situation. The results also show the importance of

profitability and asset tangibility across all regressands. The table does not tell the same story as Baker and Wurgler (2002). They suggest that M/B is the most important factor.

Table 5.7 Regressions between decomposed elements in debt ratio changes with full independent variables

The table shows the relationships between the 'debt ratio change elements' defined by Baker and Wurgler (2002) and Alti (2006) and the important 'capital structure determinants' that we will use in Chapters 5, 6 and 7. The negative signs of the first three dependent variables imply that firms increase their debt ratios (Alti, 2006). The last variable ((Δ $cash_t$+ Δ other $asset_t$)/A_t) indicates the growth in assets and decreases debt ratio by increasing equity and other assets. This implies that firms issue equity more than they need to if it shows a positive sign. A: total asset, RE: retained earnings, e: equity. All variables are defined in Section 5.3. ***: significance at 0.01% level, **: significance at 0.5% level, and *: significance at 0.1% level.

OLS fixed effect	$-\left(\frac{e}{A}\right)_t$	$-\left(\frac{\Delta RE}{A}\right)_t$	$-E_{t-1}\left(\frac{1}{A_t}-\frac{1}{A_{t-1}}\right)$	$\frac{\Delta cash_t + \Delta other\ assets_t}{A_t}$
Cons	-.0781 (-4.83)***	.0155 (0.62)	-.1671 (-7.45)***	.3706 (13.03)***
$Netcash_t$	-.0244 (-20.78)***	-.0002 (-0.09)	.0078 (4.52)***	-.0181 (-8.29)***
$Lnasset_t$	.0082 (3.65)***	-.0096 (-2.61)***	.0356 (10.81)***	-.0785 (-18.79)***
$Tang_t$	.1155 (6.78)***	.0012 (0.04)	-.1993 (-8.18)***	.3673 (11.87)***
Tax_t	.00002 (0.01)	.0013 (0.43)	-.0010 (-0.38)	.0007 (0.22)
$Capex_t$	-.3731 (-17.)***	-.1019 (-2.93)***	.6701 (21.61)***	-1.399 (-35.78)***
$R\&D_t$	.3072 (13.17)***	.0089 (0.23)	-.1898 (-5.71)***	.5168 (12.08)***
M/B_t	-.0196 (-17.55)***	.0103 (5.71)***	.0236 (14.71)***	-.0301 (-14.84)***
$Profit_t$	.1630 (16.07)***	-.9516 (-57.8)***	.2929 (20.12)***	-.5457 (-29.12)***
Vol_t	-.0616 (-2.85)***	.0320 (0.9)	-.1260 (-4.00)***	-.1338 (-3.35)***
BP_t	.0133 (5.91)***	.0507 (14.2)***	-.0147 (-4.64)***	.0328 (8.17)***
Obs	12133	15219	15345	15302
Adj-R^2	0.2541	0.5365	0.1133	0.1622

5.5.2 Trade-off theory

Frank and Goyal (2003) mention that the static trade-off theory attempts to explain leverage levels, but that the pecking order theory tries to explain debt ratio changes.

The thesis, therefore, uses non-differenced variables for testing the trade-off theory and uses differenced variables for testing the pecking order theory. In this section, we test the trade-off theory by comparing our results with those of the predicted signs given in Table 5.1. Table 5.8 generally supports the static trade-off theory.

Net cash holdings are negatively associated with debt ratios, consistent with Bates et al. (2009). They suggest that firms kept increasing their free cash-flows between 1980 and 2006 as operating risks have been increasing in the market (see Figures 5.3 and 5.4). They also imply that firms with stable cash-flows can have low cash levels. This idea is supported by Section 7.9 when we consider profitability. The results of this section suggest that firms with high profitability hold less cash. One more important matter to note with regard to cash-holding is that, as we can see from Figures 5.1 to 5.4, debt ratio and cash holding are negatively associated simultaneously. That is to say, firms decrease debt levels while increasing cash levels. The overall suggestion of this result is that firms which increase debt capability would not need to increase cash holding if they have stable profitability.

Bankruptcy probability, BP, is positively associated with debt levels. This is consistent with previous research, such as that of Harris and Raviv (1991), John (1993), Sanz (2006) and others. This result implies that firms with a high debt ratio have high bankruptcy probability. We predict a negative sign because high bankruptcy probability leads to equity issuance. Therefore, although the predicted signs show an opposite direction in Table 5.8 compared with our prediction, it gives the same signal as we predicted.

Table 5.8 Regression to test the static trade-off theory

$$DR_t=\alpha_t+\beta_1 \cdot Netcash_t+\beta_2 \cdot Lnasset_t+\beta_3 \cdot tang_t +\beta_4 \cdot Tax_t+\beta_5 \cdot Capex_t+\beta_6 \cdot Rnd_t +\beta_7 \cdot M/B_t+\beta_8 \cdot Profit_t+\beta_9 \cdot Vol_t+\beta_{10} \cdot BP_t+\beta_{11} \cdot Year_t \quad \beta_{12} \cdot Counrty_t+\beta_{13} \cdot Industry_t+ \varepsilon_t \quad (5.4)$$

The table shows the results of analyses using the GMM estimator. The predicted signs indicate that debt ratios generally follow the static trade-off theory. BDR: book-based debt ratio, MDR: market-based debt ratio. All variables are defined in Section 5.3. t statistics are in parenthesis; *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level; this analysis uses ICB level of criteria; L1, L2: one- and two-period-lagged variables; the null hypothesis of J statistic is that over-identifying restrictions are valid. The values in the square brackets are the significant levels of J statistic (Hansen p-value); Instrumented variables in Column (1): logasset, asset tangibility, capital expenditure to asset, research and development, profitability, earnings volatility and bankruptcy probability; Instrumented variables in Column (2): netcash, capex, M/B and R&D; Instrumented variables in Column (3): profitability, MB, netcash and tax rate; Instrumented variables in Column (4): tax.

		BDR_t		*MDR_t*	
		(1)	*(2)*	*(3)*	*(4)*
Variables	predicted sign	*GMM*	*GMM fixed*	*GMM*	*GMM fixed*
Cons		-.0635 (-4.71)***	-.0051 (-3.52)***	.0541 (4.53)***	-.0045 (-5.46)***
$Netcash_t$		-.0086 (-4.60)***	-.0158 (-4.59)***	-.0067 (-5.39)***	-.0011 (-1.67)*
Tax_t	+	-.0007 (-0.31)	.0037 (2.19)**	.0033 (0.21)	-.0226 (-1.53)
BP_t	-	.1694 (44.29)***	.1004 (31.65)***	.1035 (52.62)***	.0745 (39.97)***
$Tang_t$	+	.1599 (9.42)***	.1238 (3.28)***	.1274 (14.04)***	.1458 (10.56)***
$Capex_t$	+/-	.0646 (0.89)	-.0456 (-0.31)	-.0455 (-2.05)**	-.0699 (-3.94)***
M/B_t	-	.0131 (6.04)***	.0062 (0.97)	-.0238 (-14.58)***	-.0160 (-21.39)***
$R\&D_t$	+/-	-.1046 (-2.41)**	.0593 (0.55)	-.0673 (-3.52)***	-.0348 (-2.01)**
$Profit_t$	+	-.0064 (-0.21)	-.0720 (-2.60)***	.0036 (0.21)	-.0259 (-3.25)***
Vol_t	-	-.0899 (-1.90)*	.0782 (1.80)*	-.0521 (-2.19)**	-.0171 (-1.05)
$Lnasset_t$	+	.0061 (6.20)***	.0208 (5.85)***	.0051 (8.28)***	.0208 (13.78)***
Year		-.0029 (-5.75)***		-.0034 (-10.83)***	
Country		-.0043 (-7.02)***		.0013 (2.91)***	
Industry		-.0017 (-1.91)*		-.0049 (-7.41)***	
Instruments		L1, L2	L1, L2	L1, L2	L1, L2
Hansen [p-value]		9.958 [0.1909]	3.135 [0.5354]	2.582 [0.6299]	0.704 [0.4013]
Observation		10719	11291	10592	11752

The negative signs of profitability indicate that firms accumulate profits. This supports the pecking order theory. However, judging by Section 7.9 on profitability, the situation is mixed with the pecking order and trade-off theories. From Table 7.39, as profitability increases, debt issue is more heavily associated with debt change.

Asset tangibility and a firm's size indicate positive signs, as we expected. This might suggest the importance of bankruptcy probability. R&D expenses and capital expenditure show a negative relationship to debt ratio, in general. This indicates that companies use more equity and internal funds for new investments purposes. This is inconsistent with the pecking order theory.

Market-to-book ratio (M/B) is negatively related to market-based debt ratios while being positively related to book-based debt ratios. This implies that stock price affects the 'market-value-based debt ratio' more directly. There will be two interpretations of the negative relationship between them with regard to the market-based debt ratio. High stock prices encourage firms to issue equity in the market timing theory, and increase the size of total asset which decreases the debt ratio. The negative relationship between them can also be considered in terms of the trade-off and pecking order theories together, because a high M/B lowers the cost of equity capital.

Overall, the results indicate that bankruptcy probability, asset tangibility, profits, firm size, cash holdings and market-to-book ratios are the most important factors in capital structure decision making. Interestingly, these five factors, with the exception of asset tangibility, are directly related to the elements of Altman's Z'-score measurement. This indirectly implies the importance of bankruptcy probability rather than the matter of asymmetric information and tax shield. This result also suggests that market- and book-based debt ratios show some differences. Table 5.8 also indicates that capital structure is closely related to the factors of country, industry and time. Firms decrease debt ratios over time, and East-Asian countries and high-technology industries decrease debt ratio more severely.

5.5.3 Pecking order theory

As discussed before, pecking order theory tries to explain debt ratio changes by issuing equity or debt (Frank and Goyal, 2003). Thus, the change in (book-based) debt ratio is a better regressand for testing the pecking order theory (Kayhan and Titman, 2007). We use it as a major regressand in this section including the issuance of equity and debt.

From the viewpoint of the (simple) pecking order theory, firms should issue debt when they need capital. The required capital for firms is evaluated by 'financial deficit' as defined by Frank and Goyal (2003), and Shyam-Sunder and Myers (1999), as below:

$$DEF1_t = DIV_t + I_t + \Delta WC_t - C_t = D_t + E_t \quad (5.5)$$

$$DEF2_t = DIV_t + I_t + \Delta WC_t - C_t + LTDR_t \quad (5.6)$$

where, DEF1: 'financial deficit' defined by Frank and Goyal (2003), DEF2: 'financial deficit' defined by Shyam-Sunder and Myers (1999), DIV: dividend, I: investment (capital expenditure), WC: net working capital (=total current assets-total current liabilities=operating working capital+cash and cash equivalents+current debt), C: cash-flow after interest and taxes (=internal cash-flow or net income+depreciation), LTDR: long-term debt ratio, D: net debt issue, E: net equity issue. All items are scaled by 'total asset.'

Shyam-Sunder and Myers (1999) add long-term debt ratios (LTDR) for defining 'financial deficit' in Equation (5.6) because their pecking order prediction is related to 'long-term debt issuance.' However, according to Frank and Goyal (2003), their unreported results show that the long-term debt ratio is not important with regard to their regression in the definition of 'financial deficit.' They, therefore, use the 'financial deficit' without a long-term debt ratio.

Positive 'financial deficit' indicates that firms invest cash more than their internally generated capital. On the other hand, a negative 'financial deficit' indicates less investment than internally generated funds and increased 'internal cash-flows' in firms (Kayham and Titman, 2007). Frank and Goyal (2003) show that 'financial deficit' leads to debt financing for large firms. This is consistent with the pecking order theory. They state, however, that debt financing does not dominate equity financing.

As the 'financial deficit' is composed by these four (or five) items, it is possible to investigate the most influential item among them with regard to debt ratio change. The item of utmost importance can be found by using the equations below, which are suggested by Frank and Goyal (2003).

$$\Delta DR_t=\alpha_t+DIV_t+I_t+\Delta WC_t-C_t+\varepsilon_t \quad (5.7)$$
$$\Delta DR_t=\alpha_t+DIV_t+I_t+\Delta WC_t-C_t+LTDR_t+\varepsilon_t \quad (5.8)$$

where, ΔDR_t: debt ratio change.

From DEF1 and DEF2 in Equations (5.5) and (5.6), the next analyses are also executed.

$$\text{Net D or Net E}=\alpha_t+DIV_t+I_t+\Delta WC_t-C_t+\varepsilon_t \quad (5.9)$$
$$\text{Net D or Net E}=\alpha_t+DIV_t+I_t+\Delta WC_t-C_t+LTDR_t+\varepsilon_t \quad (5.10)$$

where, net D: net long-term debt issue, net E: net equity issue

Based on predicted signs, Panels A and B in Table 5.9, generally follow the pecking order theory. The pecking order theory predicts a positive sign with regard to both investment and 'working capital' (Frank and Goyal, 2003). The positive relationship between 'debt ratio change' and investment indicates that firms use debt for new investment, consistent with both the pecking order and the trade-off theories. As investment (capital expenditure/asset) is generally about tangible investment, investing in tangible assets increases collateral and future debt capacity (Frank and Goyal, 2003). The table also indicates that a change in 'net working capital' is negatively associated with a leverage level. This implies that firms supply 'working capital' with equity issue or operating incomes. Similarly, 'internal cash-flow' (C=net income+depreciation) suggests a pro-pecking order theory, with negative signs, which indicates that firms accumulate cash for future investment. The dividends also show a positive association with debt level change but, as Frank and Goyal suggest, trade-off theory also expects a positive relationship between them. As we discussed earlier, although our results in Panels A and B generally follow the predicted signs, since the pecking order and trade-off theories have similar predictions, it is not clear whether our results are consistent with the pecking order theory.

In Panels C and D, net long-term debt issuance is positively related to dividend, but dividend is negatively related to equity issuance. This result is more consistent with the static trade-off theory, rather than with the pecking order theory, because this implies that firms try to change their leverage levels. The results also tell us that, when firms consider using external financing sources, both debt and equity issuances are affected by similar factors. In other words, with the exception of dividends, all variables have the same relationship with debt and equity issue. In terms of 'explanatory powers (R^2)', equity issuance shows higher 'explanatory powers' in Panel D than bond issuance in Panel C. Frank and Goyal (2003) also show that equity financing has a better 'explanatory power' and debt financing does not dominate equity financing.

Using Frank and Goyal (2003) and Shyam-Sunder and Myers (1999), we test the following equation.

$$\Delta DR_t = \alpha_t + DEF_t + \varepsilon_t \qquad (5.11)$$
$$\Delta DR_t = \alpha_t + \Delta DEF_t + \varepsilon_t \qquad (5.12)$$

Equations (5.11) and (5.12) are the simplest way of testing the pecking order theory. These equations are too simple without any restrictions (control variables), but the method has one advantage. Researchers do not lose observations that occur when increasing control variables (Frank and Goyal, 2003). As firms issue debt when they require capital, if the capital structure follows the pecking order theory without considering control variables, then the coefficient of 'DEF' will be unity (Shyam-Sunder and Myers, 1999). This is because, in the pecking order model, firms only issue safer security when they need new capital. This is consistent with our argument that firms issue equity when managers are less optimistic or when the issuing costs are low.

Tables 5.10 and 5.11 indicate that debt ratio is generally negatively related to ‘financial deficits’ and that the values of ‘coefficient’ and ‘explanatory power’ are very low. From Panel B in both tables, it is clear that ‘financial deficits’ relate more to equity issue. The tables also show that ‘financial deficits’ (DEF) are similarly related (the same coefficient signs) to equity and debt issuance. This result suggests that the pecking order theory may not play an important role in increasing finance, or that asymmetric information costs may not be as great as Myers (1984) previously suggested. We also test ‘DEF’ with control variables. The results are shown in Table 5.14.

Table 5.9 Debt ratio changes and financial deficits

Based on predicted signs, Panels A and B in this table generally follow the pecking order theory. The pecking order theory predicts a positive sign in both investment and 'working capital' (Frank and Goyal, 2003). In Panels C and D, net long-term debt issuance is positively related to dividend, but dividend is negatively related to equity issuance. This result is more consistent with the static trade-off theory, rather than with the pecking order theory, because this implies that firms try to change their leverage levels. $DEF1=\alpha_t+DIV_t+I_t+\Delta WC_t-C_t$, $DEF2=\alpha_t+DIV_t+I_t+\Delta WC_t-C_t+LTDR_t$, ΔBDR: book-based debt ratio change, ΔMDR: market-based debt ratio change, DEF1: financial deficit defined by Frank and Goyal, DEF2: Shyam-Sunder and Myers (1999) also define financial deficits (DEF2), DIV: dividend, I: investment (capital expenditure), WC: working capital, C: cash-flow after interest and taxes (=internal cash-flow or net income+depreciation), LTDR: long-term debt ratio. All items are scaled by total asset. t statistics are in parenthesis; *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

		Panel A: ΔBDR_t				Panel B: ΔMDR_t			
	Predicted signs	$DEF1_t$		$DEF2_t$		$DEF1_t$		$DEF2_t$	
		OLS	OLS fixed	OLS	OLS fixed	OLS	OLS fixed	OLS	OLS fixed
Cons		-.0075 (-8.17)***	-.0109 (-10.14)***	-.0249 (-25.48)***	-.0594 (-46.86)***	-.0063 (-10.20)***	-.0109 (-14.52)***	-.0157 (-22.94)***	-.0374 (-39.43)***
DIV_t	+	.0161 (3.83)***	.0297 (4.25)***	.0314 (7.89)***	.04 (6.27)***	.0095 (3.40)***	.0256 (5.14)***	.0181 (6.56)***	.0307 (6.4)***
I_t	+	. 0889 (9.67)***	.1199 (9.75)***	.0503 (5.79)***	.1342 (12.11)***	.1610 (24.73)***	.2271 (24.84)***	.1323 (20.37)***	.2266 (25.63)***
ΔWC_t	+	-.1569 (-49.37)***	-.1509 (-43.57)***	-.1565 (-52.18)***	-.1619 (-51.37)***	-.0577 (-26.26)***	-.0583 (-23.81)***	-.0595 (-27.05)***	-.0668 (-27.62)***
C_t	-	-.0223 (-10.69)***	-.0520 (-16.10)***	-.0109 (-5.48)***	-.0220 (-7.42)***	-.0090 (-6.71)***	-.0089 (-4.18)***	-.0068 (-5.02)***	.0035 (1.62)
$LTDR_t$				.1351 (34.05)***	.3659 (57.08)***			.0835 (28.90)***	.2121 (43.47)***
Obs		38129	38129	37878	37878	34712	34712	34450	34450
Adj-R^2		0.0782	0.0748	0.1059	0.0851	0.0411	0.0393	0.0627	0.0539

Table 5.9 Continued

	Panel C: net long-term debt issue/asset$_t$				Panel D: net equity issue/asset$_t$			
	DEF1		DEF2		DEF1		DEF2	
	OLS	OLS fixed	OLS	OLS fixed	OLS	OLS fixed	OLS	OLS fixed
Cons	-.0059 (-8.66)***	-.0085 (-10.97)***	-.0201 (-27.08)***	-.04 (-41.47)***	.0323 (28.95)***	.0275 (23.93)***	.05 (37.78)***	.0583 (32.47)***
DIV$_t$	.0031 (0.80)	.0105 (1.73)*	.0169 (4.62)***	.0192 (3.39)***	-.0301 (-4.81)***	-.0152 (-1.70)*	-.04 (-6.77)***	-.0198 (-2.26)**
I$_t$	.2286 (33.83)***	.2691 (30.65)***	.1924 (29.47)***	.2735 (32.93)***	.2487 (22.21)***	.3687 (27.82)***	.30 (27.15)***	.3713 (28.51)***
ΔWC_t	.0077 (3.45)***	.0064 (2.68)***	.0092 (4.25)***	-.0002 (-0.07)	.318 (82.57)***	.2919 (78.41)***	.34 (87.45)***	.3092 (82.58)***
C$_t$	-.0226 (-15.77)***	-.0186 (-8.57)***	-.0208 (-14.7)***	-.0079 (-3.72)***	-.2675 (-101.91)***	-.1599 (-46.11)***	-.29 (-107.01)***	-.1836 (-51.05)***
LTDR$_t$			.1137 (39.68)***	.2293 (49.20)***			-.12 (-25.59)***	-.1554 (-21.86)***
Obs	30097	30097	29809	29809	29852	29852	29525	29525
Adj-R^2	0.0419	0.0412	0.0882	0.0826	0.3034	0.2609	0.34	0.3026

Table 5.10 Debt ratio change and financial deficit with Frank and Goyal's (2003) model

This table use Frank and Goyal's (2003) model from Equation (5.11), $\Delta(D/A)_t=\alpha_t+DEF_t+\varepsilon_t$. The table shows that debt ratio change has a stronger relationship with equity issue rather than debt issue. $DEF1=DIV_t+I_t+\Delta WC_t-C_t$, $DEF2=DIV_t+I_t+\Delta WC_t-C_t+LTDR_t$, ΔBDR: book-based debt ratio change, ΔMDR: market-based debt ratio change, DEF1: financial deficit defined by Frank and Goyal, DEF2: Shyam-Sunder and Myers (1999) also define financial deficits (DEF2), DIV: dividend, I: investment (capital expenditure), WC: working capital, C: cash-flow after interest and taxes (=internal cash-flow or net income+depreciation), LTDR: long-term debt ratio. All items are scaled by total asset. t statistics are in parenthesis; *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	Panel A							
	ΔBDR_t		ΔMDR_t		ΔBDR_t		ΔMDR_t	
	OLS				OLS fixed			
Cons	-.0006 (-0.79)	-.059 (-7.02)***	.0031 (6.17)***	-.0006 (-1.05)	.0013 (1.56)	-.0079 (-8.38)***	.0039 (7.20)***	-.0014 (-2.10)**
$DEF1_t$	-.0128 (-6.71)***		.0012 (0.97)		-.025 (-9.55)***		-.0043 (-2.41)**	
$DEF2_t$		.0043 (2.54)***		.0133 (11.31)***		.0116 (4.99)***		.0162 (9.64)***
Ajd R-squared	0.0012	0.0001	0.0000	0.0037	0.0012	0.0002	0.0000	0.0037
Observation	38129	37878	34712	34450	38129	37878	34712	34450
	Panel B							
	Net Long-term debt issue/$asset_t$		Net equity issue/$asset_t$		Net Long-term debt issue/$asset_t$		Net equity issue/$asset_t$	
	OLS				OLS fixed			
Cons	.0052 (9.33)***	-.0028 (-4.61)***	.0212 (22.69)***	.0044 (3.98)***	.0049 (8.75)***	-.0046 (-6.80)***	.0265 (30.67)***	.0099 (9.30)***
$DEF1_t$	.0241 (18.12)***		.2459 (99.09)***		.0254 (14.35)***		.2068 (71.40)***	
$DEF2_t$		.0393 (32.12)***		.1861 (76.69)***		.0456 (27.99)***		.1653 (59.82)***
Ajd R-squared	0.0108	0.0334	0.2475	0.1661	0.0108	0.0335	0.2427	0.1661
Observation	30097	29809	29852	29525	30097	29809	29852	29525

Table 5.11 Debt ratio change and financial deficit with Shyam-Sunder and Myers' (1999) model

The table shows that debt ratio change has a stronger relationship with equity issue rather than debt issue. This table uses Shyam-Sunder and Myers' (1999) model, Equation (5.12): $\Delta(D/A)_t=\alpha+\Delta DEF_t+\varepsilon_t$. $DEF1=DIV_t+I_t+\Delta WC_t-C_t$, $DEF2=DIV_t+I_t+\Delta WC_t-C_t+LTDR_t$, ΔBDR: book-based debt ratio change, ΔMDR: market-based debt ratio change, DEF1: financial deficit defined by Frank and Goyal, DEF2: Shyam-Sunder and Myers (1999) also define financial deficits (DEF2), DIV: dividend, I: investment (capital expenditure), WC: working capital, C: cash-flow after interest and taxes (=internal cash-flow or net income+depreciation), LTDR: long-term debt ratio. All items are scaled by total asset. t statistics are in parenthesis; *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level.

	Panel A				Panel B			
OLS	ΔBDR_t		ΔMDR_t		Net Long-term debt issue/$asset_t$		Net equity issue/$asset_t$	
Cons	-.0008 (-1.13)	-.0005 (-0.72)	.0032 (6.54)***	.0035 (7.28)***	.0084 (15.50)***	.0081 (15.47)***	.0484 (47.7)***	.0472 (46.54)***
$\Delta DEF1_t$	-.0072 (-3.69)***		-.0051 (-3.74)***		.0108 (7.43)***		.0537 (19.54)***	
$\Delta DEF2_t$		.0372 (22.38)***		.0191 (14.75)***		.0352 (26.15)***		.0391 (14.87)***
Ajd R-squared	0.0004	0.0153	0.0004	0.0071	0.0021	0.0257	0.0144	0.0085
Observation	32543	32238	30758	30456	26264	25935	26134	25778

Frank and Goyal (2003) suggest that during the 1980s and 1990s, American firms used more equity than debt for external financing. Our findings also come to the same conclusion. This is inconsistent with the pecking order theory and consistent with Figures 5.1 and 5.2 and Tables 5.9 to 5.11. Column (1) in Table 5.12 shows that the number of observations (each firm has a maximum of 20 observations during the sample period) which 'issue more net equity than net debt issuance' is twice greater than the observations that 'issue more net debt than net equity issuance'. The average of increasing equity (14%) in terms of 'pure issuance of equity' ('equity issue'-'equity repurchase'-'debt issue'-'debt retirement') is also greater than increasing 'pure issuance of debt' (8%) ('debt issue'-'debt retirement'-'equity issue'-'equity repurchase'). This table is also inconsistent with the inertia theory. Only 2,635 sample observations out of 35,311 did nothing. That is just under 7.5% of the total sample. This implies that most firms actively issue equity or debt in order to change their leverage levels.

Table 5.12 Descriptive statistics of number of observations who issue equity or debt

Note, net equity issue: equity issue-equity repurchase, net debt issue: debt issue-debt retirement (debt recall), Column (1) indicates that net equity issue minus net debt issue is positive. Column (2) indicates that net equity issue minus net debt issue is negative. Column (3) indicates that net equity issue minus net debt issue is zero. Obs: observation numbers, Mean: (net equity issue-net debt issue)/total asset in Column (1), (net equity issue-net debt issue)/total asset in Column (2), and other values are described in the same way.

	(1)	(2)	(3)
	Net equity issue > net debt issue	Net equity issue < net debt issue	Net equity issue = net debt issue
Obs	20,289	12,387	2,635
Mean	.1396	.0832	0
Min	2.85e-06	2.03e-06	0
p25	.0116	.0164	0
P50	.0383	.0466	0
p75	.1505	.1084	0
p99	.9999	.5067	0
Max	1.4751	.9773	0
Sd	.2243	.1044	0
Skewness	2.2845	2.5578	-
Kurtosis	7.8651	11.81161	-

Table 5.13 is a summary of the number of observations that issue equity and debt. Panel A (net long-term debt issue) shows that more firms (observation: 16,141) reduced debt during the sample period, and that more firms (observation: 18,057) increased equity in Panel B (net equity issue). Panel C (pure debt issuance) indicates

that, during the sample period, more firms (observation: 20,289) decreased their debt ratio then increased debt (observation: 12,387). This means that almost twice as many firms reduced their debt ratios. Tables 5.12 and 5.13 are seriously inconsistent with the pecking order theory.

Table 5.13 Number of observations who issue equity or debt

The table is a summary of the number of observations which issue equity and debt.
Note, Panel A: Net long-term debt issuance/total asset, panel B: Net equity issuance/total asset, and panel C: 'pure issuance of debt,' (Net long-term debt issuance/total asset)-(Net equity issuance/total asset). Mean and median: mean and median value of pure debt increase.

	Panel A			Panel B		
	Increase (>0)	Decrease (<0)	Unchanged (=0)	Increase (>0)	Decrease (<0)	Unchanged (=0)
Mean [median]	.0889 [.0499]	-.0420 [-.0182]	0 [0]	.1399 [.0204]	-.0365 [-.0107]	0 [0]
Number of obs	11796 (31.2%)	16141 (43.6%)	9049 (24.5%)	18057 (49.6%)	7717 (21.2%)	10615 (29.2%)

	Panel C			
	overall	Increase (>0)	Decrease (<0)	Unchanged (=0)
Mean [median]	-.0510 [-.0047]	.0833 [.0467]	-.1397 [-.0384]	0 [0]
Number of obs	35311	12387 (35.1%)	20289 (57.5%)	2635 (7.5%)

Finally, applying Frank and Goyal (2003), the thesis analyses the pecking order theory by testing 'financial deficit' (DEF) with control variables.

$$\Delta DR_t=\alpha_t+\beta_1 DEF_t+\beta_2\Delta Netcash_t+\beta_3\Delta Lnasset_t+\beta_4\Delta tang_t+\beta_5\Delta Tax_t +\beta_6\Delta Capex_t+\beta_7\Delta Rnd_t+\beta_8\Delta M/B_t+\beta_9\Delta Profit_t+\beta_{10}\Delta Vol_t+\beta_{11}\Delta BP_t+\varepsilon_t \quad (5.13)$$

where, DEF_t : $DEF1_t$, $DEF2_t$. All variables are defined in Section 5.3.

The 'financial deficits' are considered with control variables in Table 5.14. The results show that the pecking order theory works, as debt increasing is associated with positive 'financial deficits' (DEF1, DEF2) and with negative profitability. Our results imply a similar meaning with those of Frank and Goyal (2003) model. Their model indicates that the change of debt ratio shows negative signs with M/B, profits and previous debt ratios, and positive signs with asset tangibility and sales.

Table 5.14 Test the pecking order theory with full control variables

The table tests Equation (5.13) which includes all control variables. The results show that the pecking order theory works as debt increasing is associated with positive financial deficits (DEF1, DEF2) and with negative profitability.

Note, $DEF1=DIV_t+I_t+\Delta WC_t-C_t$, $DEF2=DIV_t+I_t+\Delta WC_t-C_t+LTDR_t$, DEF1: 'financial deficit' defined by Frank and Goyal, DEF2: 'financial deficit' defined by Shyam-Sunder and Myers (1999), DIV: dividend, I: investment (capital expenditure), WC: net working capital (=total current assets-total current liabilities=operating working capital+cash and cash equivalents+current debt), C: cash-flow after interest and taxes (=internal cash-flow or net income+depreciation), LTDR: long-term debt ratio. Tang: net tangible asset/total asset, M/B: ((total asset-book equity+market equity)/total asset), profit: ROA (return on asset)=((Net Income before Preferred Dividends+((Interest Expense on Debt-Interest Capitalized)×(1-Tax Rate)))/Last Year's Total Assets), netcash: (Cash+Marketable Securities)/Total Assets, Lnasset: log(total asset), Tax: income taxes/pre-tax income, Capex: capital expenditure/total asset, R&D: research and development expense/total asset, Vol: five-year moving standard deviation of the ratio of operating income to total asset, BP: bankruptcy probability, mixed Z-score models, BDR: Book-based debt ratio=(short term debt & current portion of long-term debt+long-term debt)/(book value debt+book value equity), MDR: market-based debt ratio=(short term debt & current portion of long-term debt+long-term debt)/(book value debt-book value equity+market value equity), t statistics are in parenthesis, *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level. The null hypothesis of J statistic (Hansen p-value) is that over-identifying restrictions are valid; The values in the square brackets are the significant levels of J statistic (Hansen p-value); L1: one-period-lagged variable; Instruments in Column (1): tax, capex and M/B; Instruments in Column (2): tax, M/B and Vol; Instruments in Column (3): Vol and M/B; Instruments in Column (4): tax.

GMM		Δ BDR		Δ MDR	
Variables	predicted sign	(1)	(2)	(3)	(4)
Cons		-.0051 (-3.32)***	-.0159 (-7.75)***	-.0065 (-6.49)***	-.0095 (-9.31)***
$DEF1_t$	+	.0273 (2.68)***		.011 (2.23)**	
$DEF2_t$	+		.0506 (6.29)***		.0256 (6.03)***
Δ Tang	+/-	.1704 (3.90)***	.1761 (4.11)***	.1837 (7.40)***	.1621 (7.10)***
Δ M/B	+/-	.0146 (1.80)*	.0120 (1.66)*	-.0076 (-2.37)**	-.0162 (-17.64)***
Δ Profit	-	-.1354 (-3.74)***	-.1299 (-2.90)***	-.0556 (-3.34)***	-.0318 (-2.83)***
Δ Netcash		-.0019 (-.071)	-.0031 (-1.23)	-.0011 (-1.07)	-.001 (-1.16)
Δ Lnasset	+/-	.0350 (3.58)***	.037 (3.46)***	.0544 (8.34)***	.0438 (9.40)***
Δ Tax		-.0012 (-0.57)	-.0003 (-0.16)	.0016 (1.15)	-.0004 (-0.15)
Δ Capex	+	.0544 (0.89)	.0118 (0.39)	-.0391 (-1.61)	-.0275 (-1.25)
Δ R&D	+	.0130 (0.18)	-.0368 (-0.45)	-.0046 (-0.14)	.0122 (0.55)
Δ Vol	-	-.0351 (-0.48)	-.3541 (-0.70)***	.0216 (0.08)	-.0328 (-1.17)
Δ BP	-	.057 (11.87)***	.0576 (12.36)***	.0492 (20.86)***	.0435 (21.60)***
Instruments		L1, L2	L1, L2	L1, L2	L1, L2
Hansen [p-value]		3.184 [0.3642]	2.884 [0.4099]	3.974 [0.1371]	0.473 [0.4917]
Observation		6572	6379	8043	7640

One interesting fact in this table is that the effects on the debt ratio change from control variables are greater than the effect from the financial deficits. This indicates that the 'financial deficit' is significantly associated with debt ratios, but that the strength of the effect is much weaker than conventional variables such as bankruptcy probability, market-to-book ratios, or profitability.

These results are mostly consistent with Frank and Goyal (2003) who also show that 'financial deficit' is more closely related to 'net equity issuances,' rather than 'debt issuances', and that 'financing deficit' is less important to explain debt issuances over time. This conclusion goes against the results of Shyam-Sunder and Myers (1999). They show that 'debt issuance' dominates external funding.

5.5.4 Market timing

The idea of a relationship between stock price and equity issuance is not new. Myer (1984) already considers stock price as relating to issuance costs; and Baker and Wurgler (2002) show equity issuance as having a high market-to-book ratio period. According to Alti's (2006) research, firms' investments and equity issuance in a hot-market are not very relevant. He presumes that firms may issue equity for investment purposes because firms' growth expectance is higher for hot-market but their results indicate that the investment rate is lower in the hot-market. This implies that firms issue equity only after overvalued stock-prices. This phenomenon also supports the pecking order theory, in terms of issuing costs and increasing debt capacity (see Section 2.2.5 in which the relationship between the pecking order theory and market timing theory is fully described). However, Welch (2004) suggests in his 'inertia theory' that market-based debt ratio is mainly decided by stock prices rather than by new overvalued equity issuance. Therefore, firms do not put an effort into changing their capital structure. Namely, debt ratio becomes low with high stock prices and high with low stock prices. Welch (2004) also shows that there is no evidence of targeting.

Both Kayhan and Titman (2007) and Flannery and Rangan (2006) use the 'share price effect' (SPE), which is obtained by subtracting the 'actual debt ratio' (ADR) from an ‘Implied Debt Ratio’ (IDR). The IDR is defined by Welch (2004). Since market timing is related to stock price, Welch (2004) uses the IDR as a proxy of the market situation in his inertia theory.

Welch (2004) suggests the extent to which stock prices affect the market-based debt ratio. The next equation can easily explain the suggestion. If a firm’s gearing ratio at time t+1 is perfectly associated only with stock returns between time t and t+1, issuing neither equity nor debt[14], then the ‘market based debt ratio’ (MDR_{t+1}) at t+1 will be the same as the $IDR_{t,t+1}$.

$$IDR_{t,t+1}=\left(\frac{D_t}{E_{t+1}+D_t}\equiv\frac{D_t}{E_t\cdot(1+\text{stock return}_{t,t+1})+D_t}\right) \qquad (5.14)$$

where, IDR: implied debt ratio, D: total debt, E: total market valued equity, stock $\text{return}_{t,t+1}=((P_{t+1}-P_t)/P_t)$: stock return, P_t: stock price at t.

Using a dynamic adjustment method, he hypothesises the next equation. If a firm adjusts its debt ratio perfectly, $\alpha_2=1$, $\alpha_3=0$; and, if it never adjusts its leverage level, then $\alpha_2=0$, $\alpha_3=1$.

$$MDR_t=\alpha_1+\alpha_2\cdot MDR_{t-1}+\alpha_3\cdot IDR_{t-1,t}+\varepsilon_t \qquad (5.15)$$

Equation (5.15) implies that market-based debt ratio at time t equals the sum of the previous year debt ratio and stock price effects. The α_2 implies ‘capital structure adjustment speed.’ The unity of α_3, therefore, indicates that the debt ratio is decided only by stock price changes.

If Equation (5.15) changes with a restriction that the coefficients of variables add up to one, as follows: $MDR_t=\alpha_1+\lambda_1\cdot IDR_{t-1,t}+(1-\lambda_1)MDR_{t-1}+\varepsilon_t$, then it will be $MDR_t-MDR_{t-1}=\alpha_1+\lambda_1\cdot(IDR_{t-1,t}-MDR_{t-1})$, where $IDR_{t-1,t}-MDR_{t-1}$ is SPE (Stock Price Effect) (Welch, 2004). Since Equation 5.15 is based on the ‘dynamic adjustment method’

[14] Welch (2004) ignores dividends because they are not seen as a great problem in capital structure.

and SPE, which is obtained by subtracting MDR from IDR, the SPE term has a similar effect to adjustment speeds if firms issue neither equity nor debt, as follows:

$$MDR_t - MDR_{t-1} = \lambda \cdot SPE_{t-1,t} \quad (5.16)$$

If equity is fully affected by the stock price, then $IDR_{t-1,t}$ and MDR_t will be the same, and the coefficient of $SPE_{t-1,t}$, λ, becomes unity.

Flannery and Rangan (2006) adjust Welch's regression in the next regression.

$$\Delta MDR_{t,\,t-1} = \lambda_1(\text{target } MDR_t - MDR_{t-1}) + (1-\lambda_2)SPE_{t-1,t} + \varepsilon_t \quad (5.17)$$

where, λ_1: adjustment speed, $1-\lambda_2$: stock price effect.

This equation expresses the view that a change in debt ratio equals the sum of 'partial debt ratio adjustment' plus 'stock price effect.' The coefficient ($1-\lambda_2$) of SPE can be interpreted as debt ratio changes affected by the share price (Flannery and Rangan, 2006).

This thesis also uses the variable of stock returns, SR=log(1+annual stock return), to test the association between stock returns and debt ratio changes and stock issuances, following Kayhan and Titman (2007). Following the suggestion of Alti (2006), the thesis does not use the 'weighted market-to-book ratio.'

From Table 5.15, in Welch's (2004) model, using his interpretation, In column (1), the implied debt ratio ($IDR_{t-1,t}$) indicates that about 23% of the debt ratio (MDR_t) is affected by the stock price only, but MDR_{t-1} is close to 41% (1-0.59) of the current debt ratio (MDR_t or target). This indicates that a big proportion of the debt ratio change is decided by financing and internal capital increases. Column (1) shows that MDR_{t-1} is a more important factor than IDR. This result is inconsistent with Welch (ibid.). Column (2) shows that the 'stock price effect' and the 'partial adjustment speed' have a similar effect to the current debt ratio.

Table 5.15 Debt ratio change and the stock price effect

The table shows that there is a strong stock price effect on debt ratio change.
Note, MDR_{t-1}: market-based debt ratio at time t-1, BDR: book-based debt ratio, Net equity issuance =(sale stock-repurchase stock)/total asset, IDR: Implied debt ratio, $IDR_{t-1,t} \equiv D_{t-1}/(E_{t-1}$ (1+stock $return_{t-1,t}$)+D_{t-1}), SR: stock return, log(1+annual stock return). $SPE_{t-1,t}=IDR_{t-1,t}-MDR_{t-1}$, $Speed2_t$: $target2_t-MDR_{t-1}$, target2: 'market-based target debt ratio' calculated by OLS. In Column (5), the thesis splits the stock return into quartiles and uses only the 3rd and 4th quartiles' data (1st quart:-.427, 2nd quart: -.046, 3rd quart: .254). *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	(1)	(2)	(3)	(4)	(5)
OLS	MDR_t	ΔMDR_t	ΔMDR_t	ΔBDR_t	Net equity issue/asset
Cons	.0178 (32.44)***	.0008 (1.01)	.0007 (1.68)*	-.0001 (-0.10)	.0083 (1.88)*
MDR_{t-1}	.5904 (118.06)***				
$IDR_{t-1,t}$	.2273 (67.95)***				
Speed2		.2269 (48.19)***			
$SPE_{t-1,t}$		.2345 (44.88)***			
$SR_{t-1,t}$			-.0483 (-79.04)***	-.0234 (-23.21)***	.0831 (11.39)***
Adj-R^2	0.7883	0.1723	0.1287	0.0123	0.0145
Obs	42337	15121	42293	43026	8717

Columns (3) and (4), using stock return (SR), indicate that the debt ratio is negatively associated with stock return. This raises three possible conclusions: (1) that firms issue equity, or (2) that the stock price itself decreases debt ratios, or (3) both (1) and (2) together. Column (5) shows that stock price is positively associated with net equity issuances. In Column (5), stock return ($SR_{t-1,t}$) with 'net stock issue to asset' is regressed with the 3rd and 4th quartile data of stock earnings. When the first and second quartile data are included, it shows a negative sign with regard to equity issuance. This indicates that firms start to issue equity when the stock price is significantly overvalued or highly priced. This also indicates that firms issue equity with low stock prices, because low stock prices probably indicate a high probability of bankruptcy with an unusual loss of a firm's value or that judging by the given trend during the sample period, firms' general behaviour is to increase equity. The overall conclusion is that stock prices affect capital structure decisions, but the importance is not as great as market timing and inertia theories suggest. Therefore, it is still not clear as to its critical importance. This result also indicates that equity issues could be associated with high stock prices and high bankruptcy probabilities.

In Table 5.15, the thesis tests the stock price effect on debt ratio in a simple way. Table 5.16 includes control variables that are considered as key debt ratio determinants in major capital structure theories. Applying Welch's variables (2004), and the method of Flannery ansd Rangan (2006), Table 5.16 shows the market timing effect and the stock price effect.

$$MDR_t=\alpha+\lambda_1\sum\beta X_{t-1}+(1-\lambda_1)MDR_{t-1}+(1-\lambda_2)SPE_{t-1,t}+\varepsilon_t \quad (5.18)$$

$$MDR_t=\alpha+\lambda_1\sum\beta X_{t-1}+(1-\lambda_1)IDR_{t-1,t}+\varepsilon_t \quad (5.19)$$

$$\Delta(DR)_t=\alpha+\sum\beta\Delta X_t+\lambda SR_{t-1,t}+\varepsilon_t \quad (5.20)$$

where, X: control variables that are defined in Section 5.3.

Equations (5.18) and (5.19) use the idea of 'dynamic capital structure adjustment.' The coefficient of MDR_{t-1} would be zero when firms adjust their debt ratios perfectly in respect to stock price changes and other control variables. Equation (5.18) assumes that the leverage level is decided upon by the 'capital structure adjustment,' the 'stock price effect' (SPE) and other control variables. Since $SPE_{t-1,t}=IDR_{t-1,t}-MDR_{t-1}$, Equation (5.18) can be rewritten as Equation (5.19), which indicates the effect on debt ratios from stock returns. Similar to the partial adjustment interpretation with MDR_{t-1} in Equation (5.18), the coefficient of $IDR_{t-1,t}$ will be zero if the debt ratio is fully decided only by the 'partial capital structure determinants' in Equation (5.19). The λ_1 (= 1-coefficient) of IDR indicates the stock price effect in Equation (5.19). Equation (5.19) is derived from Equation (5.15), $MDR_t=MDR_{t-1}+IDR_{t,t+1}+\varepsilon_t$, where MDR_{t-1} is decided by the capital structure decision factors. The variables, X_{t-1} indicate the debt ratio determinants[15] (As described in Section 6.3).

[15] This section assumes that all ten major variables are associated with capital structure decisions, since this section is more focussed on the market timing test rather than 'dynamic capital structure.' However, the next section is consistent with previous research and chooses seven variables as the most important capital structure determinants.

Table 5.16 Market timing and capital structure with control variables

The table presents the strong market timing effect on leverage level change by showing significant relationships between debt ratio and variables that are related to the market timing effect, such as SPE, IDR, and SR. Control variables in Equations (5.19) and (5.20) are one period lagged (Columns (2) and (3)) and first differenced (Columns (4), (5) and (6)) respectively. Fixed effect is not used for Equation (5.20) (Columns (4), (5) and (6)) because they use first differenced data, which have similar results to fixed effects. Column (6) only uses the 4th quartile in stock return (SR).
Note, MDR: market-based debt ratio, BDR: book-based debt ratio, Net equity issuance =(sale stock-repurchase stock)/total asset, IDR: Implied debt ratio, $IDR_{t-1,t} \equiv D_{t-1}/(E_{t-1}(1+\text{stock return}_{t-1,t})+D_{t-1})$, SR: stock return, log(1+annual stock return). $SPE_{t-1,t}=IDR_{t-1,t}-MDR_{t-1}$, SR: stock return, $SR_{t,t+1}=\ln(1+(p_{t+1}-p_t)/p_t)$, p: stock price. All variables are defined in Section 5.3. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level. The null hypothesis of J statistic (Hansen p-value) is that over-identifying restrictions are valid; The values in the square brackets are the significant levels of J statistic (Hansen p-value); MDR_{t-2} and MDR_{t-3} are instrumented for the xtabond2 command, using options of robust, small and two-step, sub-options of eq(level), lag(1 2) and collapse for gmm style and of eq(level) for iv-style for Column (1); Columns (2) and (6) use ivreg2 command. R&D, vol, tax and are instrumented for Column (2); R&D and profit are for Column (3); Vol for Column (4); tax for Columns (5) and (6).

		MDR				Δ MDR	Δ BDR	Net equity issue/asset
		System GMM	GMM	GMM fixed		GMM	GMM	GMM
Variables	predicted sign	(1)	(2)	(3)	Variables	(4)	(5)	(6)
Cons		.0035 (1.05)	-.0108 (-3.45)***	-.0027 (-4.46)***	Cons	-.0087 (-11.16)***	-.0030 (-2.27)	-.0205 (-2.67)***
MDR_{t-1}	+	.7448 (19.70)***						
$SPE_{t,t+1}$	+	.2886 (18.02)***						
$IDR_{t,t+1}$	+		.5456 (106.43)***	.4513 (63.60)***				
SR_t	-				SR_t	-.0539 (-23.15)***	-.0183 (-4.75)***	.0198 (1.27)
$Tang_{t-1}$		.0259 (2.72)***	.0755 (13.52)***	.0131 (1.11)	Δ $Tang_t$	.1593 (7.22)***	.1594 (3.74)***	-.3130 (-4.53)***
M/B_{t-1}	-	.0021 (2.69)***	-.0000 (-0.07)	-.001 (-1.90)**	Δ M/B_t	-.0025 (-2.00)**	.0067 (2.81)***	.0209 (4.21)***

Table 5.16 Continued

$Profit_{t-1}$		.0018 (0.33)	.0506 (5.60)***	-.0044 (-0.32)	Δ $Profit_t$	-.0333 (-2.13)**	-.1343 (-4.37)***	-.0299 (-0.65)
$Netcash_{t-1}$		-.0006 (-1.76)*	.0005 (1.40)	-.0007 (-1.50)	Δ $Netcash_t$	.0004 (0.42)	-.0006 (-0.29)	.0309 (4.69)***
$Lnasset_{t-1}$		.0013 (2.85)***	.0014 (3.78)***	.0139 (10.09)***	Δ $Lnasset_t$	.0779 (15.08)***	.0394 (4.44)***	.1176 (5.79)***
Tax_{t-1}		.0008 (0.59)	.0006 (0.47)	.0037 (2.98)***	Δ Tax_t	.0009 (0.89)	-.0014 (-0.85)	-.0041 (-0.87)
$Capex_{t-1}$		.1226 (8.25)***	.1232 (8.76)***	.0788 (5.06)***	Δ $Capex_t$	-.041 (-1.92)*	-.0131 (-0.34)	.1414 (1.80)*
$R\&D_{t-1}$		-.0097 (-0.87)	.0383 (3.44)***	.0472 (1.69)*	Δ $R\&D_t$	.0285 (1.17)*	-.0228 (-0.34)	-.1781 (-1.14)
Vol_{t-1}		-.0187 (-1.75)*	.0112 (0.91)	-.0284 (-1.96)**	Δ Vol_t	-.1187 (-0.56)	.0102 (0.17)	-.1315 (-1.32)
BP_{t-1}		-.0036 (-1.08)	.0024 (1.87)*	-.0015 (-0.95)	Δ BP_t	.0393 (21.01)***	.0533 (13.68)***	-.0285 (-3.61)***
AR(1)		-12.52***						
AR(2)		0.47						
Inst No		14						
Instruments		L1, L2	L1, L2	L1, L2	Instruments	L1, L2	L1, L2	L1, L2,L3
Hansen [p-value]		1.35 [0.245]	1.805 [0.4054]	2.512 [0.2848]	Hansen [p-value]	0.140 [0.7083]	0.484 [0.4865]	1.430 [0.4892]
Observation		13277	11312	11104	Observation	9320	8467	1515

Column (1) describes Equation (5.18) and is tested by System GMM because this model includes a lagged dependent variable (MDR_{t-1}) as an independent variable. In other words, Column (1) has a dynamic model form (see Section 6.3.2.1 and Section 3.1.2.1.3 in Appendix 3 which describe the System GMM in detail). In Column (1), the coefficient of MDR_{t-1} and SPE indicates that partial adjustment (0.2552=1-.7748) and stock price effect (0.7114=1-.2886) play a major role in debt ratio decisions. Columns (2) and (3) describe Equation (5.19) and show that the coefficient for $IDR_{t,t+1}$ is (1-0.5456 or 1-0.4513). This indicates that the current debt ratio is 45.4% or 54.87% affected by the stock price, depending on the model. This implies that the stock price has a significant effect on the debt ratio. Columns (4) and (5) show that annual stock returns (SR) are negatively associated with debt ratios. The market-based debt ratio is more strongly associated with stock returns than the book-based debt ratio. The last column indicates that stock returns (SR) and M/B are positively associated with equity issuances although SR is not significant.

Overall, according to the results, the variables of stock return, SPE, IDR and SR, are significantly important in terms of the market-based debt ratio change, although Column (6) indicates that SR is not seriously associated with equity issuance.

5.6 Summary and conclusions

Our results show that debt ratios are mainly affected by the previous year's debt ratio, cash holdings, firm size, bankruptcy probability, asset tangibility, market-to-book ratio (including stock return) and macro-economic environmental factors. Table 5.17 shows that no theory clearly dominates the others, and that the key variables of each theory suggest that these theories can partially explain leverage level changes.

Table 5.17 Summary of results

Note, PS: predicted signs, RE: results. If there are differences in results based on different methods, we report the most representative signs regarding significant levels. The sign of '+/-' indicates that it is difficult to decide on representative signs. All variables are defined in Section 5.3.

	Static trade-off theory		Simple pecking order theory		Market timing theory	
	PS	RE	PS	RE	PS	RE
Stock price effect					+	+
Implied debt ratio					+	+
Annual stock return					-	-
DR_{t-1}						
Speed						
Financial deficit			+	+		
Market-to-book	-	+/-	-	+/-	-	-
Financial slack		-		-		+/-
Firm size	+	+	+/-	+		+
Asset tangibility	+	+	+/-	+		+
Capital expenditure	+/-	-	+	+/-		+/-
Tax rate	+	+/-		-		+
Earnings volatility	-	-		-		+/-
R&D expense	+/-	-	+	+/-		+/-
ROA(profitability)	+	-	-	-		-
Bankruptcy probability	-	+	-	+		+

5.6.1 The most appropriate capital structure determinants

5.6.1.1 Tax

Brounen et al. (2006) argue that tax is the fourth most important factor after financial flexibility, credit ratings and earnings volatility. However, our results show that tax rate is a less important factor in debt ratio choice decisions. This is inconsistent with Modigliani and Miller's (1963) and consistent with a number of previous studies such as those of Myers (2001), Bebczuk (2003) and Shefrin (2007).

5.6.1.2 Financial distress costs

In our results, we find that the variables, bankruptcy probability, which measure the degree of financial distress indicate that financially secure firms, not subject to significant financial distress issue less debt than other firms.

5.6.1.2.1 Cash holdings

Net cash holding shows a significantly negative relationship with debt levels across the analyses. This implies that firms which are financially less secure, hold more cash and less debt ratio, consistent with Opler et al. (1999) and John (1993) who assert that small firms and firms engaged in more risky activities, hold more cash. Graham and Harvey (2001) and Brounen et al. (2006) also argue that financial stability, particularly cash-holding, is more likely to be related to the static trade-off theory, rather than the pecking order theory.

In line with Opler et al.’s (1999) research, cash-holdings have gradually reduced between 1950 and 1994. Bates et al. (2009) and Duchin (2010) indicate, as in Figures 5.3 and 5.4, that cash-holdings started to increase from the mid-1990s. This implies that cash-holdings are affected by macro-economic factors such as a shift in the prosperity of various industries or due to the technological revolution. Judging by Figures 5.1 and 5.2 in which debt ratios continuously decrease, it is possible to assume that the debt ratio has also gradually changed due to the same factors. Therefore, Figures 5.3 and 5.4 show a strong relationship between debt ratios and cash-holdings.

5.6.1.2.2 Firm size

Our results show that firm size is positively associated with leverage levels. This result is consistent with that of Ozkan (2001), and Mackay and Phillips (2005). This supports both the static trade-off theory and the pecking order theory, because large firms spend less on transaction costs (Titman and Wessels, 1988) in terms of the trade-off theory, and they have low asymmetric information costs in terms of the pecking order theory. Firm size can also be considered as a bankruptcy probability indicator, because large firms are assumed to have less earnings volatility and better ‘financial managing ability.’ As Kurshev and Strevulaev (2006) suggest, our results also indicate that firm size is the most important determinant.

5.6.1.2.3 Profitability

From the results, profitability (ROA, return on asset) is negatively associated with debt ratio. This result is consistent with the finding of Mitton (2007) and Antoniou et al. (2008). They argue that profitable firms borrow less because they have accumulated sufficient internal funds to meet their needs. This implies that profitable firms decrease their debt ratio. Fama and French (2002) explain that this is evidence of how capital structure follows the (complex) pecking order theory.

However, based on both trade-off and the pecking order theories (with low asymmetric information), firms should issue debt, particularly profitable firms. According to Myers and Majluf (1984), debt is a risk-free asset for a profitable firm. This implies that profitable firms use more debt to obtain more tax benefits in terms of trade-off theory; and this expectation has been confirmed by a large body of previous research, such as that of Frank and Goyal (2003) and Ross (1977). Hovakimian et al. (2001) also find that firms with ‘high returns on assets’ are more likely to issue debt because profits reduce leverage levels which distance their debt ratios from their leverage targets. Our results in Section 7.9 also show that firms with high profitability are more likely to issue debt. Our results therefore imply that debt ratio in respect of profitability is jointly connected to the pecking order theory and the trade-off theory.

5.6.1.2.4 Asset tangibility

Our results indicate that asset tangibility is positively related to debt ratio, consistent with Braun and Larranin (2005), Lemmon et al. (2008) and Brav (2009). This is because tangible assets have collateral value (Frank and Goyal, 2003) although liquidity costs depend on an alternative use of the tangible assets rather than asset tangibility itself (Lee et al., 2000; Alderson and Betker, 1995). Frank and Goyal (2003) suggest that as high asset tangibility reduces firms’ asymmetric information costs, firms can issue more debt. After all, asset tangibility can be related to both the pecking order and trade-off theories; and our results are supported by those two theories together.

5.6.1.3 Investment

The results show that, in general, growth opportunities (R&D expenses and capital expenditure) do not generally give a clear indication of the relationship between debt ratios and investment factors across analyses. However, capital expenditure shows a more positive association with debt ratios and R&D expenses show a more negative association. It would be closer to trade-off theory because capital expenditure has higher asset tangibility which allows firms to increase their debt levels.

5.6.2 The most appropriate capital structure

Our results cannot suggest a dominant capital structure theory that can explain all 'firms' leverage level changing behaviours,' over others. However, trade-off theory might be the best among them, because our results indicate that firm size, asset tangibility, profits, cash holding, market-to-book ratio and bankruptcy probability are the most important leverage level determinants, and that all these variables are generally closely related to trade-off theory. All of these determinants, excluding asset tangibility and firm size, are directly related to the Z'-score model which, of course, is an indicator of bankruptcy likelihood.

Our results indicate that firms issued equity and reduced debt ratios during the sample period of time. They also occasionally issued equity and debt simultaneously. This is consistent with Hovakimian et al. (2004). They find that about 61.5% of firms issue stocks and bonds together. Flannery and Rangan (2006) and others suggest that 'financial deficit' will be positively associated with debt issue in terms of the pecking order theory. Our results (Table 5.11) show that the 'financial deficit' is more associated with equity issue rather than with debt issue. This implies that the pecking order theory cannot explain firms' gearing modes during the sample period.

Chapter VI Testing Dynamic Capital Structure Adjustment Theories

6.1 Introduction

In Chapter 5, we investigated three important capital structure theories by using static models and predicted signs (Table 5.1) which are related to these capital structure theories. In this chapter we focus on dynamic models. This means this chapter tests both the trade-off and the complex pecking order theories. In terms of the trade-off theory, we test whether firms change their capital structure over time. The trade-off theory argues that firms will change their debt ratios in order to move to their optimal (or target) capital structure.

As Myers (1984), and Fama and French (2002) mentioned, the complex pecking order theory implies that firms reduce their debt ratios when firms have net profits as there are adverse selection costs which increase firms' issuing costs. In other words, firms accumulate their profits in order to increase their debt capacity for their future need for cash (e.g. new positive NPV projects). This implies that firms change their gearing levels while they accumulate cash in terms of the notion of the pecking order theory. This likewise implies that debt ratios are negatively associated with firms' profits. Furthermore, as there is a high level of adverse selection costs due to high asymmetric information, firms cannot issue equity at fair value. This also implies that, as the market timing theory asserts, firms will issue equity when stock prices are above their fair value. Therefore, we can test the complex pecking order theory by observing whether or not firms change their capital structure or whether their profits are negatively associated with debt ratios.

In order to compare different optimal capital structures, in this chapter we estimated the optimal capital structure using both the Tobit model and normal OLS models after carefully studying previous research. Our results indicate that there is no significant difference in estimated target debt ratios between the Tobit model-based method and the OLS model-based method. Results from descriptive statistics and capital structure adjustment speeds show that both methods suggest similar conclusions, in terms of the average target debt ratio and the speed of the adjustment in the debt ratio.

Our results show that: (1) firms adjust their capital structures in a fashion consistent with the views of Leary and Robert (2005) and Hovakimian et al. (2004); (2) stock prices are negatively associated with the debt ratio, which implies that firms issue equity when stock is overpriced. This is consistent with the views of Fama and French (2002) and Baker and Wurgler (2002). Our results likewise indicate negative associations between debt ratios and firms' profits. This is consistent with Myers (1984) and Bevan and Danbolt (2002). This implies that firms accumulate their operating income. According to the complex pecking order theory, this can be interpreted as firms accumulating cash in order to increase their debt capacity for financing future projects. This is a cheaper way for firms to increase their cash in the world with high asymmetric information costs. In this chapter, therefore we can observe that debt ratio adjustment can be explained by both the trade-off and complex pecking order theories. Both theories assume that firms have their own target debt ratios.

This chapter is structured as follows. Section 6.2 describes methods. In this section, we describe how the target capital structure for each firm is decided upon, and how we observe whether firms adjust their debt ratio. Section 6.3 tests dynamic models in terms of both the trade-off and the complex pecking order theories. Section 6.4 closes the chapter by offering conclusions and identifying the limitations of the research.

6.2 Method

In this chapter, we use the same variables that were used in Chapter 5. The differences in this chapter are that we use dynamic models and test dynamic versions of the trade-off and pecking order theories. We also explain in Section 6.3.1 how we can estimate optimal capital structures for each firm. In this section, we show how we decided on the important capital structure determinants in order to obtain target debt ratios, by presenting the details of previous research and their determinants.

We also briefly introduce the dynamic trade-off theory and complex pecking order theory, and how they are connected to our methods in Section 6.3. In Section 6.3.2.1, Difference- and System-GMM are explained as we use panel data. It is necessary to understand how and why a dynamic model involving panel data causes serial correlation and heteroskedasticity in error terms. Finally, we mention that this chapter applies Flannery and Rangan's (2006) method. In other words, while we test the dynamic models, we also test asymmetric information based on capital structure theories by using the variables which are closely related to market timing and stock prices. Of course, in this chapter, we continuously use the viewpoints of dynamic models when we interpret our statistical results in order to bring out the main purposes of this chapter.

6.3 Testing dynamic models

The dynamic models attempt to test the existence of a target debt ratio that is changed over time in respect of the market (or economic) situation. Frank and Goyal (2003), for example, conclude that leverage levels move differently, and that financing patterns change over time. Fama and French (2002) show that the adjustment speed toward targets is slow; and Graham and Harvey (2001) mention that achieving targets might not be a primary aim of firms, even though they all have their targets. These phenomena may lead to less meaningful statistical results for leverage level rebalance tests. For example, firms may issue equity in a bull market in order to obtain extra cash, although they may have a low debt ratio than their target (see Section 6.3.3 for more examples).

6.3.1 Dynamic trade-off model and partial adjustment model

If there is an optimal debt ratio, firms attempt to stay at the optimal leverage level, or to change their debt ratios towards the optimal level; and, if they do, it will prove the trade-off theory. From the formula of 'partial adjustment process,' $Y_t - Y_{t-1} = \lambda(Y_t^* - Y_{t-1})$, λ will be 1 if firms change their debt ratios immediately; and λ will be 0 if firms do not change their gearing ratios or the changing speed is extremely (infinitely) slow (see Section 3.3.1.3.3, which describes the partial adjustment in full detail). Unless λ is 0, we assume that firms change their debt ratios toward their targets, and that the values of λ are generally between zero and unity. Namely, firms partially change their debt ratios. We generally believe that firms change their capital structures slowly because there are transaction costs (or adjustment costs) that interrupt immediate capital structure adjustment. This implies that λ would be close to unity in an efficient capital market. Therefore, many firms change their capital structure in a 'lumpy' way (Fischer et al. 1989; Hovakimian et al., 2004; Leary and Roberts, 2005).

This partial adjustment method can be used to test the trade-off theory as well as the simple pecking order theory. In the simple pecking order theory, as it does not have target debt levels, λ will be 0 and will be insignificant (Fama and French, 2002).

6.3.1.1 Target leverage level

Since target leverage levels are invisible, we need to calculate them. Several ways have been developed in order to obtain target debt ratios. In the current thesis, we use the partial adjustment method in two different ways, Tobit and regression models (see Sections 3.3.1.3.1 and 3.3.1.3.2 which describe the target debt ratios in detail).

The target leverage levels for the 'partial adjustment approach' have to be measured with 'year-by-year cross-sectional regression.' This is because firms may change their target debt ratios every year, based on a firm's and the macro-economic situation. Table 6.1 shows capital structure determinants from previous research.

Table 6.1 Previous research into target leverage ratio estimation

Note, earnings and ROA: earnings to asset, plant: capital expenditure, R&D: research and development expenses, PPE, FIXTA: asset tangibility, SE: selling expense, Dp: depreciation, TP: target payout, STD: standard deviation, Ln(A): log(total asset); all variables are scaled by total asset.

Authors	Variables	method
Shyam-Sunder and Myers (1999)	$DR_t=\alpha_0+plant_t+R\&D_t+tax_t+eaning_t+\varepsilon_t$	regression
Shyam-Sunder and Myers (1999)	$\Delta DR_t=\alpha_0+\Delta plant_t+\Delta R\&D_t+\Delta tax_t+\Delta eaning_t+\varepsilon_t$	regression
Hovakimian et al. (2001)	$DR_t=\alpha_0+R\&D/sales_t$ + selling-expensive$_t$/sale$_t$ + tangible asset ratio$_t$ +firm size$_t$ $+\varepsilon_t$	Tobit
Fama and French (2002)	$DR_t=\alpha_0+V_{t-1}/A_{t-1}+EBIT_{t-1}/A_{t-1}+Dp_{t-1}/A_{t-1}+R\&Ddummy_{t-1}+R\&D_{t-1}/A_{t-1}+\ln(A_{t-1})+TP_{t-1}+\varepsilon_t$	regression
Kayhan and Titman (2007)	$DR_t=\alpha_0+M/B_{t-1}+PPE_{t-1}+EBIT_{t-1}+R\&D_{t-1}+SE_{t-1}+R\&Ddummy_{t-1}+SIZE_{t-1}+industrydummy_{t-1}+\varepsilon_t$	Tobit
Nguyen and Shekhar (2007)	$DR_t=\alpha_0+M/B_{t-1}+FIXTA_{t-1}+ROA_{t-1}+STD\_ROA_{t-1}+\varepsilon_t$	regression

To obtain target leverage ratios, after considering the previous research, we have chosen seven determinants which mostly affect capital structure. When we decide on the 'standard time' for target leverage ratios and adjustment speeds, we followed French and Fama's approach. That is that the last-year-fiscal-situation creates the present debt ratio. As there are not many empirical studies using differenced data (Shyam-Sunder and Myers, 1999), the thesis also uses only indifferenced data.

$$DR_t=\alpha_0+\beta_1 Netcash_{t-1}+\beta_2 Lnasset_{t-1}+\beta_3 tang_{t-1}+\beta_4 Capex_{t-1}+\beta_5 Rnd_{t-1}+\beta_6 M/B_{t-1}+\beta_7 Profit_{t-1}+\varepsilon_t \quad (6.1)$$

where, All variables are defined in Section 5.3.

Using Equation (6.1), we calculated target debt ratios for each firm. We undertook three stages in order to obtain the target capital structures.

Firstly, We chose these variables as important capital structure determinants after carefully studying previous research as shown in Table 6.1. These seven variables are considered important in most capital structure research and relate to the three major capital structure theories. Furthermore, as we can see from Table 6.1, with the exception of the dummy variables, we include more determinants in our estimating model than previous research. In addition, our variables do not overlap in capital structure determinants, such as R&D expenses and R&D dummy. We believe this fact leads us to be better able to estimate firms' target debt ratios than those from previous studies.

In the second stage, as can be seen from Table 6.2, we regressed Equation (6.1) in order to obtain associations (coefficients) between dependent variables and covariates. For example, the coefficients in Table 6.2 are computed with regard to the entire sample period. However, we have regressed the model (Equation 6.1) year by year, using annual data. This method allows us to obtain new target debt ratios for each year. In other words, every year there are different coefficients. It is necessary to calculate the coefficients every year because firms face different business environments each year. As their business environment changes, firms' target debt ratios will also need to change year-on-year. For instance, if a firm suffers a big loss or faces an economic recession in a particular year, it might reduce its debt ratio in the coming year otherwise its default risk might be unacceptably increased.

Table 6.2 Coefficients for target debt ratios using OLS and Tobit regressions

The table shows four different target decision models using Tobit and OLS regression models, and using book- and market-based debt ratios and observations in all years. Note, the thesis, generally, uses OLS based target rather than Tobit based target. MDR: market-based debt ratio, BDR: book-based debt ratio. All variables are defined in Section 5.3. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level.

	By OLS regression		By Tobit regression	
	BDR	MDR	BDR	MDR
Intercept	.0641 (12.65)***	.0827 (23.18)***	.0015 (0.24)	.0443 (10.31)***
M/B_{t-1}	.0005 (0.59)	-.0189 (-26.68)***	-.003 (-2.41)**	-.024 (-27.10)***
$Profit_{t-1}$	-.2058 (-30.94)***	-.1015 (-22.20)***	-.2515 (-31.23)***	-.1334 (-24.03)***
$Netcash_{t-1}$	-.0107 (-12.43)***	-.0061 (-10.11)***	-.0196 (-16.44)***	-.0127 (-15.07)***
$Lnasset_{t-1}$	.0156 (21.54)***	.0126 (24.67)***	.0217 (25.10)***	.0168 (27.75)***
$Tang_{t-1}$	.2977 (33.12)***	.2543 (39.90)***	.3495 (32.93)***	.2881 (38.55)***
$Capex_{t-1}$	-.0307 (-1.33)	-.0925 (-5.66)***	.0148 (0.55)	-.0536 (-2.80)***
$R\&D_{t-1}$	-.2166 (-13.76)***	-.1911 (-17.51)***	-.2704 (-14.00)***	-.2360 (-17.51)***
R square	0.1542	0.2588		
Observation	20553	20488	20553	20488

Thirdly, and finally, we obtained each firm's target debt ratio by multiplying the values of the determinants by the coefficients which we gained from the second stage. In other words, using Equation (6.1), we can estimate the coefficients of important capital structure determinants, and then multiply them by the value of each independent variable for each year. The sum of multiplying the estimated coefficients by a firm's actual capital structure determinants' values becomes a target debt ratio for each firm in a specific year. As we mentioned earlier, since we have estimated coefficients every year, we can obtain new target debt ratios every year for each individual firm.

Following previous research as shown in Table 6.1, we calculated target debt ratios using both normal regression and the Tobit model. We find that there is not much difference between the methods in terms of descriptive statistics as shown in Table 6.3 and the capital structure adjusting speeds as shown in Table 6.4. Although we calculate target debt ratios in two different ways, there is no significant difference between them. Therefore, we only used the target debt ratios, calculated by using the normal regression model rather than using the Tobit model for our analyses.

Table 6.3 Descriptive statistics of target and actual debt ratios

The values are removed from the estimated target debt ratios if they are negative or greater than 1, and from the actual debt ratios if they are negative or greater than 2.
Note, MDR: market-based debt ratio, BDR: book-based debt ratio

	Target by regression		Target by Tobit		Actual debt ratio	
Stats	BDR	MDR	BDR	MDR	BDR	MDR
Mean	.1382	.0936	.1713	.1149	.2258	.1671
Min	0	0	0	0	0	0
p25	.0759	.0408	.0939	.0537	.0191	.0096
P50	.1265	.0835	.1593	.1043	.166	.1109
P75	.188	.1353	.2343	.1648	.3539	.2755
P99	.3616	.2684	.4411	.3172	1.1	.6615
Max	.8577	.3756	.8696	.4717	1.9144	.729
sd	.0825	.0644	.1017	.0758	.2436	.176
Skewness	.8885	.7127	.7739	.6592	1.8421	1.0186
Kurtosis	4.668	3.0533	4.1149	3.042	8.8937	3.1664
obs	19051	15675	18618	15423	52420	48182

Tables 6.2 and 6.3 compare two different methods to estimate target debt ratios: the Tobit model and the simple OLS. Following Hovakimian et al. (2001), we measured

target debt ratios by using book- and market-based debt ratios because there is always ambiguity when using book- and market-based values (Fama and French, 2002). To prevent the distortion of the analysed results, we removed outliers, including negative debt ratios, from both real debt ratios and target debt ratios.

6.3.2 The dynamic trade-off theory

The simplest model for investigating 'capital structure adjustment speed' toward targets is the equation below, used by Shyam-Sunder and Myers (1999).

$$\Delta DR_{i,t}=\alpha+\lambda(target_{i,t}-DR_{i,t-1})+\varepsilon_t \qquad (6.2)$$

where, λ: adjustment speed toward target, ΔDR: debt ratio change and target: target debt ratio.

The positive λ indicates that debt ratio moves toward the targets; and, if $\lambda > 1$, this implies that there is no adjustment costs (Antoniou et al., 2008). Namely, a higher λ indicates a fast adjustment speed.

Flannery and Rangan (2006) suggest that DR_{t-1} can also be a tool to measure adjustment speed when the model includes full capital structure determinants (see Section 3.3.1.3 and Flannery and Rangan, 2006).

$$DR_{i,t}= \alpha+(1- \lambda)DR_{i,t-1}+ \lambda\sum_j \beta_j X_{j,i,t-1}+\varepsilon_{i,t}+ \xi_i \qquad (6.3)$$

In this equation, when λ is zero, the coefficient of DR_{t-1} will be unity when there is no capital structure adjustment. This implies that a smaller coefficient and a greater λ, implies a higher speed of adjustment. In Equation (6.3), the 'one-period-lagged dependent variable,' DR_{t-1}, as a regressor, is endogenous to error terms (Ozkan, 2001). Arellano and Bond (1991) indicate that the endogeneity can be removed by using instrument variables with GMM estimations. We therefore use the instruments of DR_{t-1}, one period or more lagged DR (see Flannery and Rangan, 2006; Ozkan, 2001).

6.3.2.1 Difference GMM and System GMM

Using dynamic (auto-regressive) panel data, the assumption of serial uncorrelation and homoskedasity in error terms ($u_{i,t}$) can be easily violated. If this is the case, the individual effect is related to error terms; and the fixed effect or random effect estimator cannot solve this problem in the regression with dynamic panel data, because the correlation remains between the lagged regressors and disturbances (error terms) (Wawro, 2002). Arellano and Bond (1991) suggest that regressors with a predetermined ($E(u_t|X_t)=0$ rather than $E(u|X)=0$), use 'lagged values' as instruments in 'first differences' in dynamic models. This 'Difference GMM' becomes less informative with two conditions (Blundell and Bond, 1998). First, the variables are close to a random walk (Roodman, 2009); namely, λ in Equation (6.3) is close to 1 (weak correlation); and second, the 'unobservable fixed effects' (ξ_i) increases. If this is the case, the instrument y_{i1} is weakly correlated with the regressand (Δy_{i2}). This weak instrument problem leads to a 'downward bias' (Wawro, 2002). If data consist of a highly persistent time series however, we can solve this problem (Wawro, 2002; Eicher and Schreiber, 2010). In the System GMM, Arellano and Bover (1995) and Blundell and Bond (1998) use the first differenced values as well as lagged values as instruments (see Appendix 3.1.2.1 for details) in order to solve this problem.

There are two different estimators to calculate coefficients in Difference- and System GMM based on the moment conditions, to minimise the quadratic distance that is the 'average covariance matrix' of $Z_i^{'}\bar{\varepsilon}_i$. The one-step estimator is $(\sum_i Z_i^{'}Z_i)^{-1}$ and the two-step estimator is $(\sum_i Z_i^{'}\bar{\varepsilon}_i\bar{\varepsilon}_i^{'}Z_i)^{-1}$ (Arellano and Bover, 1995; Blundell and Bond, 1998). The one-step estimator is more reliable with small samples. If the disturbances of residuals are heteroskedastic, however, then the two-step estimator is more reliable (Wawro, 2002; Arellano and Bond, 1991; Blundell and Bond, 1998). In this dynamic analysis, we use the System GMM with the two-step estimator to solve this correlation problem owing to using an autoregressive panel data model. We use the 'xtabond2' command for estimating System GMM; and following Roodman's

(2009) suggestion, we report all options used for the estimation and number of instruments.

Table 6.4 Capital structure adjustment speed comparison between different measures

The table shows firms' debt ratio changes across time.
Note, MDR: market-based debt ratio, BDR: book-based debt ratio, speed1=target1$_t$-BDR$_{t-1}$, speed2=target2$_t$-MDR$_{t-1}$, speed3=target3$_t$-BDR$_{t-1}$, and speed4=target4$_t$-MDR$_{t-1}$. Target1: book-based target debt ratios calculated by OLS, target2: market-based target debt ratios calculated by OLS, target3: book-based target debt ratios calculated by Tobit regression, and target4: market-based target debt ratios calculated by Tobit regression. The coefficient values are λ (capital structure adjustment speed). The coefficient values of Blundell and Bond's (1998) method are (1-λ). Thus, the adjustment speed λ is (1-coefficient). The values in the square brackets are the significant levels of J statistic (Hansen p-value); C test value suggests the endogenous variables. For System GMM with BDR and MDR, we use only BDR$_{t-2}$ (for regressand BDR) MDR$_{t-2}$ and R&D asset$_{t-2}$ (for regressand MDR) as endogenous variables and use options (or suboptions) of equation(level) laglimits(1 2) collapse for gmm-style and of equation(level) for iv-style and of small two-step and robust for the 'xtabond2' command itself. All variables are defined in Section 5.3. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level.

	Shyam-Sunder and Myers (1999): Pooled OLS				Blundell and Bond (1998): System GMM	
	ΔBDR_t	ΔMBR_t	ΔBDR_t	ΔMBR_t	BDR_t	MBR_t
Cons	.0125 (13.72)***	.0152 (19.07)***	.0076 (8.59)***	.0126 (16.47)***	.0128 (3.07)***	.0041 (0.86)
Speed1$_t$	.1523 (35.24)***					
Speed2$_t$		.1498 (32.49)***				
Speed3$_t$			.1504 (34.86)***			
Speed4$_t$				.1531 (32.80)***		
BDR$_{t-1}$					.7787 (21.18)***	
MDR$_{t-1}$						.7583 (29.24)***
Adj-R^2	0.0616	0.0639	0.0616	0.0661		
AR(1)					-9.30***	-15.52***
AR(2)					1.34	1.63
Hansen [p-value]					1.15 [0.28]	3.58 [0.167]
inst					L1, L2	L1, L2
Inst No					10	19
obs	18912	15443	18482	15189	20541	20429

From Table 6.4, the 'Blundell and Bond method' includes the 'target capital structure determinants' that we used for estimating the 'target debt ratio,' although we do not report them here because the purpose of this equation is to test the 'capital structure adjustment speed' rather than to investigate their effect. By using different targets, Table 6.4 indicates that it is clear that firms move their debt levels towards optimal leverage ratios. One noticeable matter is that the values of λ are similar across the coefficients that are estimated by using different target debt ratios and regression methods.

Finally, applying Flannery and Rangan (2006) and including other control variables, we test the following equation;

$$DR_t=\alpha+(1-\lambda)DR_{t-1}+ \lambda(SR_{t-1,t}+DEF1_t)+\sum\beta X_{t-1}+Z_t+\varepsilon_t \qquad (6.4)$$

where, λ: adjustment speed toward target, X: variables used to obtain target debt ratios, Z: extra control variables include tax, earnings volatility and bankruptcy probability, $speed_t$ = $target_t$ debt ratio-DR_{t-1}, $\sum X_{t-1}$: M/B_{t-1}, $profitability_{t-1}$, net $cash_{t-1}$, $size_{t-1}$, asset $tangibility_{t-1}$, $capex_{t-1}$ and $R\&D_{t-1}$.

Table 6.5 also suggests the existence of a target debt ratio. These results support the trade-off theory rather than the pecking order theory. The ‘capital structure adjustment speeds’ are still highly significant when including all other capital structure determinants. Furthermore, ‘stock returns’ indicate a negatively significant association with debt ratio, but ‘financial deficits’ do not show the significance with the regressand, although it generally indicates a positive relationship to it. This indicates that market timing theory is more acceptable than pecking order theory in our results. This of course is related to the phenomenon of equity issuing during the period of time under consideration.

While we interpret the target debt ratios and the speeds of capital structure adjustment, it is important to remember the argument put forward by Graham and Harvey (2001). They find that firms generally have a target debt ratio, but achieving this target is not the most important factor in operating firms. It is therefore not difficult to imagine that there are various ranges in the speed of adjustment. Therefore, we analyse the speed of capital structure adjustment based on firms’ characteristics in Chapter 7.

Table 6.5 Dynamic capital structure models with control variables

Applying Flannery and Rangan (2006) and including other control variables, we test Equation 6.4. The table shows that firms change their leverage levels toward targets.

Note, MDR: market-based debt ratio, BDR: book-based debt ratio. All variables are defined in Section 5.3. The values in the square brackets are the significant levels of J statistic (Hansen p-value); C test value suggests the endogenous variables. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level. Instruments are DR, BP and vol in Columns (1), and (2); DR, SR and R&D in Columns (3), and (4); DR, BP and R&D in Columns (5), and (6); DR, BP, R&D and capital expenditure in Columns (7), and (8). Options for xtabond2 syntax are small, twostep and robust; and the suboptions for gmm-style are equation(level), laglimits(1 2), collapse and for iv-style is equation(level).

System GMM	Predicted signs	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		BDR	MDR	BDR	MDR	BDR	MDR	BDR	MDR
Cons		.0349 (1.98)**	.0497 (4.46)***	-.0251 (-2.94)***	-.0091 (-2.02)**	.0475 (2.97)***	.0471 (4.86)***	.0455 (2.86)***	.039 (4.29)***
DR_{t-1}		.8228 (17.64)***	.8142 (20.59)***	.7768 (16.49)***	.8113 (20.87)***	.8371 (19.96)***	.8135 (20.36)***	.8420 (19.62)***	.8409 (22.40)***
$SR_{t,t+1}$	-			-.1396 (-4.90)***	-.1297 (-7.34)***			-.0259 (-9.38)***	-.0538 (-28.23)***
$DEF1_t$	+					.0034 (0.36)	.0007 (0.18)	.0017 (0.17)	-.0057 (-1.33)
$Netcash_{t-1}$		-.0041 (-3.84)***	-.0036 (-6.02)***	-.0027 (-1.84)*	-.0017 (-2.09)**	-.0042 (-3.20)***	-.0037 (-5.01)***	-.0039 (-2.88)***	-.0031 (-4.27)***
$Tang_{t-1}$		.0575 (3.42)***	.0346 (2.90)***	.0701 (4.54)***	.0459 (4.41)***	.0561 (3.39)***	.0350 (2.87)***	.0266 (0.78)	.0017 (0.08)
$Capex_{t-1}$		.0716 (2.56)**	.0781 (4.08)***	.0579 (2.11)**	.0594 (3.40)***	.0613 (2.49)**	.0723 (3.91)****	.2647 (1.48)	.2962 (2.51)**
M/B_{t-1}		-.0017 (-1.13)	-.0007 (-0.63)	-.0074 (-2.85)***	-.0072 (-4.46)***	-.0028 (-1.46)	-.0009 (-0.69)	-.0058 (-2.36)**	-.0052 (-3.27)***
$R\&D_{t-1}$		-.0191 (-0.71)	-.0542 (-3.59)***	.2311 (2.15)**	.1191 (1.93)*	.0962 (0.99)	-.0221 (-0.42)	.1168 (1.18)	.0326 (0.69)
$Profit_{t-1}$		-.0853 (-3.71)***	-.0666 (-4.57)***	.0409 (1.57)	.0541 (3.51)***	-.0749 (-2.93)***	-.0597 (-3.76)***	-.0667 (-2.61)***	-.0327 (-2.26)**

Table 6.5 Continued

$Lnasset_{t-1}$		.0051 (4.19)***	.0039 (4.76)***	.0031 (3.87)***	.0026 (5.50)***	.0036 (3.76)***	.0034 (5.18)***	.0028 (2.84)***	.0023 (3.62)***
Tax_{t-1}		.0012 (0.82)	.0017 (1.15)	.0024 (1.40)	.0033 (2.27)**	-.0016 (-0.90)	.0003 (0.18)	-.0003 (-0.17)	.0018 (1.09)
BP_{t-1}	-	-.0278 (-2.48)**	-.0288 (-3.89)***	.0175 (2.73)***	.0067 (1.69)*	-.0309 (-2.69)***	-.0282 (-3.79)***	-.0274 (-2.32)**	-.0221 (-2.93)***
Vol_{t-1}	-	.0879 (1.19)	.0009 (0.02)	-.0888 (-3.52)***	-.0598 (-4.22)***	-.0184 (-0.84)	-.0003 (-0.02)	-.0477 (-1.74)*	-.0377 (-2.17)**
AR(1)		-6.17***	-11.49***	-7.55***	-12.46***	-7.09***	-11.09***	-7.06***	-11.27***
AR(2)		1.47	-0.81	1.28	-0.03	1.10	-0.32	1.45	1.27
Hansen [p-value]		5.08 [0.166]	0.96 [0.811]	6.89 [0.075]	1.70 [0.636]	6.63 [0.085]	0.98 [0.805]	7.39 [0.117]	0.24 [0.993]
Inst		L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2
Inst No		15	15	16	16	16	16	18	18
Obs		13619	13553	13327	13267	12127	12050	11884	11813

6.3.3 Complex pecking order model

In the conclusion to his article, Myers (1984) suggests a new idea of capital structure that jointly considers the static trade-off theory and the pecking order theory (see Section 2.2.4.1, which describes details of the complex pecking order theory). He suggests that a low stock price prevents investment in a positive NPV project; and thus that firms attempt to remain within safe debt levels (it might be short-term targets), e.g. near a default-risk-free zone, in order to (1) reduce financial distress costs and (2) prepare the firm's borrowing power for future debt issue, namely, for future debt capability.

Since firms have [short-term] target debt ratios for increasing debt capacity, there would be a negative relationship between debt levels and investment opportunities (capital expenditure) in the complex pecking order theory (Fama and French, 2002). However, from Table 6.5, coefficient signs of capital expenditure and R&D expenses show positive relations that are more likely to follow the simple pecking order and trade-off theories.

Firm size and the volatility of cash-flows (or earnings) are positively and negatively associated with debt ratio respectively in the complex pecking order theory and trade-off theory, because large firm size and low volatility increase debt capability in the complex pecking order theory (Fama and French, 2002) and reduce the bankruptcy risk in the trade-off theory. Our results are consistent with their predictions. In addition, firms like to accumulate cash for future projects when the adverse selection cost is low (Bessler et al., 2011). Our results indicate that debt ratios are negatively associated with market-to-book ratios. Overall, the coefficient signs in Table 6.5 generally support the complex pecking order theory (see Table 5.1, which shows the full details of the predicted signs).

6.4 Conclusions and limitations

Table 6.6 shows that firms adjust their capital structure across time as the adjustment speeds are greater than zero. The predicted signs of complex pecking order theory also indicate that our results are consistent with this theory. One important point we can make is that our results support both the trade-off theory and the complex pecking order theory.

Table 6.6 Summary of results

Note, PS: predicted signs, RE: results. If there are differences in results based on different methods, we report the most representative signs regarding significant levels. The sign of '+/-' indicates that it is difficult to decide on representative signs. All variables are defined in Section 5.3.

	Dynamic trade-off theory		Complex pecking order theory	
	PS	RE	PS	RE
Stock price effect				
DR_{t-1}	+	+		
Speed	+	+		
Financial deficit				
Market-to-book	-	-	-	-
Financial slack		-		-
Firm size		+	+	+
Asset tangibility		+		+
Capital expenditure		+	-	+
Tax rate		+		+
Earnings volatility	-	-	-	-
R&D expense		+/-	-	+/-
ROA(profitability)	-	-	-	-
Bankruptcy probability	-	-	-	-

6.4.1 Conclusion

In this chapter, we tested capital structure theories using dynamic methods. The dynamic models indicate that firms change their capital structures in order to achieve their targets. We estimated each individual firm's target debt ratio by using Tobit and OLS models. Our results show that both methods suggest similar target debt ratios and capital structure adjustment speeds.

Our results show that firms adjust their capital structures, which indicates that firms aim to achieve their target debt ratios in order to maximise their value. This, of course, supports the trade-off theory. In terms of the complex pecking order theory, firms' capital structure adjustment can be interpreted as firms changing their capital structures in order to increase their debt capacity for future positive NPV projects. As the complex pecking order theory suggests, firms have short-term target debt ratios rather than long-term optimal capital structures.

Our results also indicate that stock prices and market-to-book ratios are negatively associated with debt ratios. This supports both the pecking order and the market timing theories. Debt ratios which are negatively associated with volatility of earnings, and which are positively associated with firm size, similarly support both the trade-off theory and the asymmetric information based theories.

Similar to what has been demonstrated in Chapter 5, using dynamic methods still does not clearly indicate the most appropriate capital structure theory which we can use to explain firms' general gearing ratio adjusting behaviours. This chapter therefore also indicates the probability that both the trade-off theory and asymmetric information-based theories can partially explain firms' capital structure adjustment behaviour.

6.4.2 Limitation

There are some limitations with regard to this chapter. These limitations are related to the dynamic model. We used Tobit and normal OLS models to estimate firms' optimal capital structures. There are, however, many other ways to obtain optimal capital structures. This implies that there is no one correct way to estimate true target debt ratios which accurately indicate firms' targets. For example, Emery and Finnerty (1997) consider an industry's average as a target gearing level. Furthermore, as we can see from Table 6.1, there are no clear determinants for estimating target debt ratios since different researchers use different variables for their research. This implies that likewise we cannot assert that our method is the best one, although we consider that this is the best method compared to others. That is because, as was mentioned earlier, (1) we use more capital structure determinants, (2) there is no duplication in determinants and (3) we renew the target debt ratio every year, as firms' business environments change. In addition, we estimate target debt ratios using a normal OLS based model. This is because there is a censorship associated with using a Tobit model, and therefore we will lose some information because of this censoring. Since there is no lost data, as with a Tobit model, our OLS model based estimation include more data than a corresponding Tobit model based estimation.

6.4.3 Implication

In Chapters 5 and 6, we investigate the most important capital structure determinants and the appropriate theory. Our results indicate that all capital structure theories partially explain firms' debt ratio changes and that there is no dominant one, although our results imply that the trade-off theory is the most appropriate. Our results in this chapter likewise imply that capital structure determinants, which are related to bankruptcy probability, are continuously important.

In Chapter 7, we use cluster analysis for the same purpose as in Chapters 5 and 6. The advantage of this is that we can more clearly observe the most important capital structure changing factors and theories. In other words, using only regression models as in Chapters 5 and 6, we observe only the overall association between the dependent and independent variables. However, if we use cluster analysis, we can discover how the association changes as the segments of firms' characteristics change. In Chapter 7, therefore, we observe different and clearer evidence in terms of firms' debt ratio changing behaviours in line with the segments of firms' characteristics.

Chapter VII Debt ratio and a firm's characteristics

7.1 Introduction and motivation

In this chapter, we test three major important capital structure theories, the trade-off theory, the market timing theory, and the pecking order theory, by using cluster analysis. The purpose of this chapter is the same as Chapters 5 and 6, which investigate the most appropriate capital structure theory and search for important leverage level determinants. In other words, this chapter is an extension of Chapters 5 and 6. The methods we use in this chapter are also the same methods which we used in Chapters 5 and 6. The difference is that we use these methods based on different segments of firms' characteristics (e.g. the first quartile of firms' size, old aged firms, and so on).

An important motivation for using cluster analyses is that this method can show clearer evidence of firms' debt ratio changing behaviours than the methods in Chapters 5 and 6. This clearer evidence of course helps us to investigate important capital structure determinants and theories. In other words, by using the methods introduced in Chapters 5 and 6, we can simply observe the overall association between independent variable and covariates. However, if we use cluster analysis, we can observe how the associations between them change, as the segments of firms' characteristics change. That is, for example, firms in the first quartile segment in terms of firm size would have different behaviours compared to firms in the other segments when they adjust their capital structures, because firms in different segments face different financial and market conditions. Therefore, we can obtain different and clearer evidence in terms of firms' debt ratio changing behaviours in line with the different segments of firms' characteristics.

For example, as we mentioned earlier, the methods in Chapters 5 and 6 simply indicate a positive association between firms' size and debt ratios. However, cluster analysis indicates that there is a positive association between firms' size and debt ratios in the third and fourth quartile segments of firms' size and that there is a negative association between them in the first and second quartiles. Furthermore, issuing equity is more likely for small firms than for large firms, a difference that was not observed in Chapters 5 and 6.

In addition, in Chapter 6, we only observe the phenomenon that firms adjust their capital structures. This is, of course, evidence of the trade-off theory. However, in this chapter, we can observe firms' different capital structure adjustment speeds based on the segments of firms' characteristics. From Table 7.40, for example, firms in the first and fourth quartiles with regard to firms' profits, have high capital structure adjustment speeds, while in the second and third quartiles, they have low adjustment speeds. This phenomenon supports both the trade-off theory and the pecking order theory. This is because firms in the first quartile (in a net loss area) need to issue equity rapidly to improve their financial stability. On the other hand, firms in the fourth quartile have high stock prices due to high profits, such as having extra cash by issuing over-priced stocks. This example implies that, compared to the previous method, cluster analysis can support the other capital structure theory, or suggest a better explanation in respect of the segments of firms' characteristics, because we can observe in more detail firms' debt ratio changing behaviours compared to Chapters 5 and 6.

In this chapter, firms have been divided into quartiles (four segments) in terms of certain characteristics, including firm size and asset tangibility, and they have also been divided by country, industry and other aspects. Eleven different characteristics are tested in this chapter. Classifying data in terms of certain specific characteristics can lead to data snooping bias. However, as White (2000) argues, studying the bias itself can be a reason for research (see Section 3.4 in which the cluster effect and bias are fully described). In this chapter, we can observe the different debt and equity choices of firms, and the different 'capital structure adjusting speeds' in line with the different segments of firms' characteristics. Since we have analysed many different characteristics using different methods, we do not report all the results as this would be tedious. Therefore, we use some of the important results to better support our argument. However, we report the full results in Appendix 5.

There are four hypotheses considered in this chapter:

H7.a: A firm's specific characteristics segment affects its capital structure.

H7.b: A firm's specific characteristics segment affects its equity and debt issue choice.

H7.c: There are differences in capital structure adjusting speed in respect of the firms' characteristics segment.

H7.d: Macroeconomic factors affect both a firm's leverage level and its debt and equity choices.

Our important findings in this chapter are that firms behave differently in order to adjust their debt ratios, and that the different behaviours are explained by different capital structure theories in line with the different segments associated with firms' characteristics. In other words, firms in financially less secure segments in respect of their characteristics, operate in accordance with the trade-off theory. For example, firms within the segments associated with small size, net loss, low tangible asset, high earnings volatility, extremely high debt ratio, and low tangible asset, issue equity. This behaviour follows the trade-off theory. On the other hand, firms with high profits and stock returns operate in accordance with both the market timing theory and the pecking order theory. That is, firms within the segments associated with high profits or high stock returns, issue more equity. However, our results likewise deny the pecking order theory because we observe that firms with high asymmetric information costs, issue equity. For example, small, young or high-technology firms mainly issue equity, although they have high levels of asymmetric information. In addition, firms associated with financially less secure segment areas (e.g. high bankruptcy, short histories, and over-leveraged firms) have faster 'capital structure adjustment speeds.' The results of this chapter indicate stronger evidence of the trade-off theory than those of Chapters 5 and 6.

As we expected earlier, we find that cluster analyses show more details of firms' debt ratio changing behaviours. Our results also provide clearer evidence that capital structure is significantly affected by the segments of a firm's characteristics. Furthermore, our results similarly show that firms generally follow the trade-off theory and try to use opportunities to issue debt or equity when asymmetric information costs are low. Finally, and importantly, our results indicate that macro-economic factors such as inflation, time, industry and country, all relate to a firm's leverage debt-and-equity choice modes and speed of adjustment.

The chapter is structured as follows. From Section 7.2 to Section 7.12, data are divided and analysed based on the firm's characteristics. A firm's characteristics are its size (Section 7.2), age (Section 7.3), bankruptcy probability (Section 7.4), leveraged level (Section 7.5), period of time under consideration (Section 7.6), stock return (Section 7.7), growth (Section 7.8), profitability (Section 7.9), asset tangibility (Section 7.10), country (Section 7.11) and industry (Section 7.12). The chapter closes with a summary and conclusion of the results in Section 7.13.

7.2 Firms' Size

Table 7.1 shows that bigger firms have higher debt levels. This implies that smaller firms issue more equity and larger firms are more likely to follow the pecking order theory, which is consistent with Frank and Goyal (2003) and Helwege and Liang (1996). The table also indicates that big firms hold less cash, have more tangible assets, make higher profits, pay more taxes, have smaller research and development expenses; and are less volatile in terms of income than small firms. Table 7.1 indicates that, in general, large firms are more secure financially than small ones in terms of earnings volatility, asset tangibility and profitability. Judging from the R&D expenses, they might be more likely to relate to old and traditional industries.

Table 7.1 Descriptive characteristics, based on firms' size

The univariate comparison of means and medians of measures of firms' characteristics based on their size between 1989 and 2008; median values are in square brackets.
Note, -4.6052< 1st quartile < 3.4366, 3.4366 ≤ 2nd quartile < 4.9822, 4.9822 ≤ 3rd quartile < 6.5403 and 6.54 ≤4th quartile <13.044 in Log(total asset). All variables are defined in Section 5.3.

Variables	Fist quartile	Second quartile	Third quartile	Fourth quartile
BDR	.1899 [.0543]	.1759 [.1051]	.2405 [.1983]	.2952 [.2817]
MDR	.0924 [.0221]	.1403 [.0689]	.1938 [.1496]	.2291 [.2008]
Netcash	1.2122 [.3357]	.8693 [.2257]	.4248 [.1551]	.2147 [.1123]
Tax	.1361 [0]	.3361 [.2963]	.4063 [.3752]	.4295 [.3690]
Tang	.1564 [.0796]	.2184 [.1603]	.2762 [.2326]	.3175 [.2892]
R&D	.1537 [.0643]	.0813 [.0342]	.0432 [.0082]	.0284 [.0078]
Profit	-.2787 [-.0777]	.0112 [.0419]	.0459 [.048]	.0612 [.0522]
Vol	.187 [.1326]	.0837 [.0489]	.0473 [.027]	.0306 [.0189]
Obs	13326	13321	13327	13324

Adverse selection problems cause small firms to issue more debt according to the pecking order theory (Frank and Goyal, 2003), as they have greater asymmetric information problems. Frank and Goyal (2009) also extend this argument, in a manner similar to that for market timing theory, that firms can issue equity if there are fewer less asymmetric costs. Since a larger firm has less asymmetric information compared with a smaller one, it can issue more equity than the smaller firm. Table 7.2, however, shows that firms in the first quartile rely relatively more on equity issue than firms in the second quartile. It likewise indicates that firms in the third and fourth quartiles issue more equity compared with the firms in the first and second quartiles. Higher equity issue in the first quartile than the second quartile can be explained by the trade-off theory because such firms have higher bankruptcy probability than the others. Therefore, they need to issue equity. Firms using more equity in the third and fourth quartile can be explained by the pecking order theory (c.f. Frank and Goyal, 2009). However, according to traditional pecking order theory, although there is low asymmetric information for larger firms, they should issue debt because equity issue is still costly. The results in Table 7.2 are consistent with both the pecking order theory (in terms of Frank and Goyal's argument) and the trade-off theory. The market timing theory might explain this because there are more chances of the over-valuation of stock prices for larger firms. Furthermore, if the traditional pecking order theory is correct, small firms should issue debt because equity issue is too expensive for them.

Table 7.2 Debt ratio changes based on firms' size, using the Baker and Wurgler model (2002)

The table shows that small firms relatively use more equity, whereas large firms use more external financing, and all firms generally rely more on equity across quartiles.
Note, BDR: book-based debt ratio, A: total asset, e: equity, RE: retained earnings, -(e/A): equity issue, -(RE/A): increased retained earnings, -(E_{t-1}(1/A_t-1/A_{t-1})): the residual change in leverage. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	ΔBDR			
OLS	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0003 (0.10)	-.0019 (-1.28)	-.0038 (-2.99)***	-.0043 (-4.97)***
$-\left(\frac{e}{A}\right)_t$	.2089 (19.41)***	.1668 (21.66)***	.3702 (35.01)***	.3591 (27.37)***
$-\left(\frac{\Delta RE}{A}\right)_t$	.1152 (26.44)***	.1267 (23.14)***	.3049 (41.97)***	.2635 (37.07)***
$-\left[E_{t-1}\left(\frac{1}{A_t}-\frac{1}{A_{t-1}}\right)\right]$	.1153 (17.24)***	.1272 (18.96)***	.3196 (38.34)***	.2775 (35.50)***
Obs	6210	6606	8031	10178
Adj-R^2	0.1246	0.1058	0.2420	0.1813

Panel A in Table 7.3 shows the different associations between debt ratio change and financial deficit elements, based on firms' sizes. Firms in the 4th quartile use more debt for dividends and new investment (capital expenditure) and less for ‘working capital change’ than small ones. This might be because smaller firms are financially more vulnerable. In Panel A, ‘internal cash and net income’ (C) has a great negative effect on the debt ratio of larger firms. This might imply that large firms have higher profitability. Panels B and C also show that large firms use more debt for new investments, while small firms use more equity; and working capital also relates less positively to equity issue for large firms. This table also shows that investment is the most important element in terms of issuing new capital.

Table 7.3 Debt ratio changes and financial deficit components, based on firms' size

The table shows the different associations between debt ratio change and financial deficit elements, based on firm size and shows that large firms use more debt for new investments, while small firms use more equity.

Note, ΔBDR: book-based debt ratio change, Net stock issuance/asset =(sale stock-repurchase stock)/total asset, Net long-term debt issuance/asset=('long-term debt issue'-'long-term debt retirement')/total asset, DEF1=$DIV_t+I_t+\Delta WC_t-C_t$, DEF1: financial deficit defined by Frank and Goyal (2003), DIV: dividend, I: investment (capital expenditure), WC: working capital, C: cash-flow after interest and taxes (=internal cash-flow or net income+depreciation). All items are scaled by total asset. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	Panel A: ΔBDR_t			
OLS	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	-.0128 (-4.23)***	-.0115 (-7.43)***	-.0042 (-2.63)***	.0007 (0.50)
DIV_t	.0277 (1.81)*	.0162 (3.67)***	.0385 (3.15)***	.2067 (3.66)***
I_t	-.0521 (-1.80)*	.1465 (9.83)***	.1513 (9.89)***	.1524 (11.83)***
ΔWC_t	-.1715 (-26.14)	-.1304 (-24.00)***	-.1273 (-16.76)***	-.1132 (-13.48)***
C_t	-.0199 (-4.94)	-.0366 (-6.80)***	-.1061 (-14.21)***	-.1484 (-16.60)***
Obs	8104	9899	9819	10310
Adj-R^2	0.1023	0.0806	0.0645	0.06
	Panel B: Net long-term debt issue / $asset_t$			
OLS	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	-.0089 (-4.87)***	-.0101 (-7.50)***	-.0063 (-4.39)***	-.0029 (-2.33)**
DIV_t	-.0007 (-0.06)	.0133 (3.02)***	.0311 (2.62)***	.0301 (0.59)
I_t	.1509 (8.65)***	.2002 (15.26)***	.2528 (18.85)***	.301 (27.05)***
ΔWC_t	-.0063 (-1.69)*	.0053 (1.21)	.0530 (8.30)***	.0981 (13.45)***
C_t	-.0227 (-10.17)***	-.0313 (-7.40)***	-.0512 (-8.36)***	-.0724 (-9.50)***
Obs	6144	6600	7775	9578
Adj-R^2	0.0314	0.0388	0.0536	0.0846
	Panel C: Net equity issue / $asset_t$			
OLS	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0825 (21.75)***	.0476 (17.96)***	.0203 (11.57)***	-.0018 (-1.69)*
DIV_t	-.092 (-3.93)***	-.0347 (-3.98)***	-.0739 (-5.09)***	.1114 (2.66)***
I_t	.3356 (8.92)***	.3363 (12.92)***	.2715 (16.48)***	.1745 (19.09)***
ΔWC_t	.2864 (35.46)***	.4063 (46.82)***	.3225 (41.22)***	.1552 (26.00)***
C_t	-.2139 (-41.00)***	-.3528 (-42.00)***	-.2149 (-28.49)***	-.1512 (-24.09)***
Obs	5954	6569	7771	9558
Adj-R^2	0.2680	0.3360	0.2371	0.1146

Frank and Goyal (2003) show that ‘financial deficit’ is related less to debt issuance, which implies that the pecking order theory does not explain capital structure change. They do, however, show that larger firms are more likely to follow pecking order behaviours than smaller firms. Table 7.4 is generally consistent with Frank and Goyal’s suggestions (2003). Large firms rely more upon debt for their financial deficit (DEF1), although the explanatory power and coefficients are not great. In particular, firms in the 4th quartile issue much greater debt than firms in the 1st quartile. The same conclusion is shown by Panels B and C. This shows more debt issue on the part of large firms, and strong equity issue on the part of small firms. One more important result from Panel C is that the observed explanatory powers of regressions and the coefficients of ‘financial deficit’ are much greater than is indicated in Panels A and B. This implies that firms generally use equity for external finance.

Table 7.4 Debt ratio changes and financial deficits (DEF1), based on firms' size

The table shows that large firms use more upon debt for their financial deficit (DEF1), although the explanatory power and coefficients are not great.
Note, ΔBDR: book-based debt ratio change, Net equity issuance/asset =(sale stock-repurchase stock)/total asset, Net long-term debt issuance/asset=('long-term debt issue'-'long-term debt retirement')/total asset, $DEF1=DIV_t+I_t+\Delta WC_t-C_t$, ΔBDR: book-based debt ratio change, DEF1: financial deficit defined by Frank and Goyal (2003), DIV: dividend, I: investment (capital expenditure), WC: working capital, C: cash-flow after interest and taxes (=internal cash-flow or net income+depreciation). All items are scaled by total asset. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	Panel A: ΔBDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0009 (0.30)	-.001 (-0.72)	-.0024 (-1.88)*	-.0001 (-0.06)
$DEF1_t$	-.0157 (-3.96)***	-.0179 (-5.12)***	.0067 (1.20)	.0269 (4.12)***
Adj-R^2	0.0018	0.0025	0.0001	0.0015
Obs	8104	9899	9819	10307
	Panel B: Net long-term debt issuance/ $asset_t$			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	-.0008 (-0.47)	-.0018 (-1.35)	.0035 (3.22)***	.0117 (14.41)***
$DEF1_t$	.0198 (9.32)***	.0239 (7.97)***	.0688 (14.71)***	.1248 (22.47)***
Adj-R^2	0.0138	0.0094	0.0269	0.05
Obs	6144	6600	7775	9578
	Panel C: Net equity issuance/ $asset_t$			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0763 (22.48)***	.0294 (11.51)***	.0099 (7.28)***	-.0006 (-0.89)
$DEF1_t$	.2188 (42.74)***	.2325 (35.19)***	.2377 (40.54)***	.1572 (35.12)***
Adj-R^2	0.2348	0.1586	0.1745	0.1142
Obs	5954	6569	7771	9558

In Table 7.5, larger firms' 'capital structure adjustment speeds' are slower than those of smaller firms. This result is consistent with Antoniou et al. (2008) who suggest that smaller firms change leverage levels more rapidly. This might imply that 'capital structure adjustment speed' depends on internal cash-flow as well as financing, because if firms' capital structure adjustment relies entirely on external financing, then large firms would change gearing levels quickly with low transaction costs (Flannery and Rangan, 2006). Therefore, our result is inconsistent with the financing cost hypothesis. This can be explained better by financial security. As smaller firms are financially in less secure positions than large ones, it is a more important matter for smaller firms to stay out of an unsecured (high) debt level. Panel B uses System GMM, and we have not reported the capital structure determinants, since the purpose of this regression is to test the 'capital structure adjustment speed' rather than to investigate the effects from them.

Table 7.5 Capital structure adjustment speed comparison between different measures, based on the size of firms

The table shows that 'capital structure adjustment speeds' are increased for smaller firms. Panel B uses System GMM. We do not report the capital structure determinants since the purpose of this regression is to test the 'capital structure adjustment speed' rather than to investigate their effects. Note, BDR: book-based debt ratio, speed1= $target1_t-BDR_{t-1}$, target1: book-based target debt ratio is calculated by OLS. The coefficient values are λ (capital structure adjustment speed) in Panel A. The coefficient values of 'capital structure adjustment speed' in Panel B are (1-λ). Thus, the adjustment speed λ is (1-coefficient). In calculating Panel B, we use all 7 capital structure determinants although we do not report those coefficients here. BDR_{t-1} is instrumented and the 7 variables are assumed exogenous in Panel B used by the System GMM. The values in the square brackets are the significant levels of J statistic (Hansen p-value); C test value suggests the endogenous variables. Options for xtabond2 syntax are small, twostep, and robust; and the sub-options for gmm-style are equation(level), laglimits(1 2), collapse and for iv-style is equation(level). *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level.

OLS	Panel A: ΔBDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0228 (6.36)***	.0075 (4.70)***	.0076 (5.36)***	.0114 (9.48)***
Speed1	.2401 (17.50)***	.1461 (16.60)***	.1028 (15.49)***	.1184 (19.44)***
Adj-R^2	0.0877	0.0672	0.0438	0.0592
Obs	3176	4527	5217	5992
Sys-GMM	Panel B: BDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0503 (2.67)***	.0207 (1.15)	.0146 (0.73)	.028 (2.49)**
BDR_{t-1}	.6254 (6.93)***	.8141 (15.50)***	.903 (22.81)	.8274 (15.29)***
AR(1)	-3.91***	-7.52***	-4.18***	-6.75***
AR(2)	-0.09	-0.40	1.72*	0.45
Hansen [P-value]	1.22 [0.27]	0.26 [0.613]	1.26 [0.261]	0.03 [0.874]
Inst	L1, L2	L1, L2	L1, L2	L1, L2
Inst No	10	10	10	10
Obs	3730	5145	5557	6109

7.2.1 Conclusion with regard to debt ratio and firms' size

In Chapters 5 and 6, we observe that firms' size is positively related to debt ratios. This is consistent with both the trade-off and the pecking order theories, because large firms have low bankruptcy probability and asymmetric information costs. In this section, Table 7.3 similarly shows that small firms use more equity and less debt in their new investments. In addition, Table 7.4 indicates a strong positive association between debt ratio and financial deficits as the size of firm increases.

Finally, capital structure adjustment speeds decrease as firms' size increases. The overall conclusion is that firms' capital structure adjustment behaviours based on firms' size, in general, follows the trade-off theory and particularly, small firms' behaviours can be explained only by the trade-off theory (see, Tables 7.3 and 7.4). It is not possible to explain this under the pecking order theory because small firms cannot issue equity due to high asymmetric information.

7.3 A firm's age

In Sections 2.3.4 (firm history) and 3.4.5 (firm age), we have already discussed the probability that a firm's age can affect its debt ratio changing behaviour. In this section, we investigate whether firms' age can affect their gearing ratio adjusting patterns in line with their different ages by using cluster analysis.

In order to test our hypothesis, we divide our sample into two groups based on firm age. The literature survey indicates that various studies use different methods in order to decide the proxies for firms' ages, as it is difficult to know for sure when firms were actually founded. For example, Lougharan and Ritter (2004) and Giannetti (2003) use the date of IPOs of their sample firms. Furthermore, Fama and French (2002) use the size of the firms. As we can see from these examples, there is no clear criterion. This is because most databases, including Thomson One Banker, do not provide the year when the firms in their database were founded.

In this thesis, we estimate the firms' age based on when our sample firms first appear in our database (Thomson One Banker). For example if a firm's fiscal data was first shown in the year 1989, we presume that the firm was founded in 1989 or before, because our sample started in 1989. Furthermore, if a firm's data first appeared in the year 1990, we then presume that the firm was founded in 1990. This implies that old firms are firms which are shown as having a longer period on the database. For example, we assume that firms which do not have data in the first ten-year period (from 1989 to 1998), and have more than 8 years of data in the second ten-year-period (from 1999 to 2008) are short history (young) firms, and those which have more than 18 years of data in the total twenty-year period as being long history (old) firms. We use only the second ten-year period data from both old and young firms for analysis, because we take account of macro-economic changes between the two different time periods, which might have affected the firms' capital structures. In other words, we compare the two different age groups under the same macro-economic conditions (see Section 3.4.5 in which more details with regard to decisions about a firm's age are described).

Table 7.6 shows a T test result. There is a significant difference in terms of book-based debt ratios between the groups. This may suggest the existence of a survivorship bias between the two groups. However, it also shows that there is a significant difference in debt ratio between an old age group and a young age group. Furthermore, as White (2000) mentions, the purpose of this classification is to investigate the differences in firms' debt ratio changing behaviours between the two groups.

Table 7.6 T test between long and short history firms in terms of book-based debt ratios

The t statistic indicates the significant differences in book-based debt ratio between two groups. *** significance at 0.01 level

	Obs	Mean	Std. Error	Std. Deviation
Long history	8806	.2494	.0023	.2117
Short history	25294	.2096	.0016	.2556
Difference	34100	.0398	.0013	.2456
	t statistic= 13.12, ***, probability =0.000			

Hall et al. (2004) presume that older firms have more chance of accumulating funds than younger ones, and consequently they have less need to borrow. However, younger firms have fewer opportunities to accumulate funds, and therefore have to borrow. They did, however, find the opposite result. Giannetti (2003) also shows the positive relationship between debt levels and a firm's age. From Table 7.7, firms with a long history have higher debt levels, are of a greater size, and tend to hold more tangible assets as well as less cash. The table also shows that earnings volatility is lower for older firms. This implies that older firms are better placed when using external financial resources, and have a better business performance, in general. One particularly noticeable point is that there is a significant difference in cash holding between old and young firms, and older firms hold high debt, as well as, lower cash. This implies that the firm's age is a very significant factor for the debt ratio decision.

Table 7.7 Descriptive characteristics by firms' age

Univariate comparison of means and medians of measures of a firm's characteristics based on its age between 1989 and 2008. Median values are in square brackets. All variables are defined in Section 5.3.

Variables	Long history	Short history
BDR	.2493 [.2222]	.2096 [.1293]
MDR	.2087 [.1723]	.1513 [.0802]
Tang	.296 [.2707]	.2129 [.1344]
Netcash	.2936 [.1175]	.812 [.2099]
Tax	.4111 [.3662]	.2768 [.2093]
Profit	.04149 [.0437]	-.0789 [.0302]
Vol	.03699 [.0196]	.1048 [.0531]
Lnasset	6.9338 [6.8314]	4.285 [4.3976]
Obs	8810	25722

Table 7.8 shows the number of observations of firms which increase their debt, in terms of 'pure debt issue' ((Net long-term debt issuance/total asset)-(Net equity issuance/total asset)). Generally, firms with both young and old histories issue equity more than debt. In terms of old firms' observations, 45% issue more debt, while 31% of young firms issue more debt. Overall, 60% of firms are observed to issue more equity during the last ten year period. This implies that between 1999 and 2008, firms with a long history used more debt than those with a short history.

Table 7.8 Number of observations that indicate an increased debt ratio, based on the firms' age

The table shows that in general both young and old firms issue equity more than debt.
Note, number of observations of pure debt increase is (Net long-term debt issuance/total asset)-(Net equity issuance/total asset). Mean and median: mean and median value of pure debt increase

	Panel A (long history firms)			Panel B (short history firms)		
	Increase (>0)	Decrease (<0)	Unchanged (=0)	Increase (>0)	Decrease (<0)	Unchanged (=0)
Mean [median]	.0604 [.034]	-.0564 [-.0225]	0 [0]	.094 [.0521]	-.1551 [-.0444]	0 [0]
Number of obs	3228 (45%)	3675 (52%)	266 (3.7%)	5370 (31%)	10499 (60%)	1537 (8.8%)

Table 7.9 indicates that old firms are more associated with equity issue than are younger ones. This implies that firms with a long history have less asymmetric information costs in terms of the pecking order theory.

Table 7.9 Debt ratio changes based on the age of firms, using the Baker and Wurgler models model (2002)

The table shows that old companies are associated more with external financing rather than young companies.
Note, BDR: book-based debt ratio, long: long history firms, short: short history firms, A: total asset, RE: retained earnings, e: equity, -(e/A): equity issue, -(RE/A): increased retained earnings, -(E_{t-1}(1/A_t-1/A_{t-1}): the residual change in leverage. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

OLS		Cons	$-\left(\frac{e}{A}\right)_t$	$-\left(\frac{\Delta RE}{A}\right)_t$	$-\left[E_{t-1}\left(\frac{1}{A_t}-\frac{1}{A_{t-1}}\right)\right]$	Obs	Adj-R^2
ΔBDR	long	-.005 (-5.22)***	.2815 (22.05)***	.1846 (30.97)***	.1705 (21.83)***	7198	0.1406
	short	-.0004 (-0.31)	.2022 (31.38)***	.1255 (41.55)***	.1348 (29.97)***	15936	0.1202

Table 7.10 shows that a financial deficit (DEF1) is a negatively related debt ratio for both groups in Panel A. This implies that companies with both long and short histories use more equity, and this is inconsistent with the pecking order theory. As we have seen from Figure 5.1, there is a time serial trend in terms of debt ratio. Namely, debt ratio has been reducing continuously over the last twenty years. However, Panels B and C in the table indicate that companies with a long history are more associated with long-term debt issuance and less associated with equity issue, than firms with a short history. In addition, Table 7.11 indicates that firms with a short history adjust their debt ratios more quickly. Together, Tables 7.10 and 7.11 imply that young firms consider their financial security to a greater extent and therefore swiftly adjust their debt ratios. This probably supports the trade-off theory.

Table 7.10 Debt ratio changes and financial deficits (DEF1) based on the firms' age

The table implies that companies with both long and short histories use more equity but old firms use relatively less equity and more debt than young ones.

Note, ΔBDR: book-based debt ratio change, Net equity issuance/asset =(sale stock-repurchase stock)/total asset, Net long-term debt issuance/asset=('long-term debt issue'-'long-term debt retirement')/total asset, DEF1=$DIV_t+I_t+\Delta WC_t-C_t$, DEF1: financial deficit as defined by Frank and Goyal (2003), DIV: dividend, I: investment (capital expenditure), WC: working capital, C: cash-flow after interest and taxes (=internal cash-flow or net income+depreciation). All items are scaled by total asset. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	Panel A: ΔBDR_t		Panel B: Net long-term debt issue/ $asset_t$		Panel C: Net equity issue/ $asset_t$	
	long	short	long	short	long	short
Cons	-.0055 (-5.23)***	.0001 (0.04)	-.0001 (-0.07)	.0039 (4.74)***	-.0046 (-4.80)***	.0298 (20.10)***
$DEF1_t$	-.0004 (-0.07)	-.0061 (-2.37)**	.0352 (7.90)***	.0212 (12.28)***	.2009 (40.85)***	.2443 (69.94)***
Adj-R^2	0.00	0.0002	0.0095	0.0094	0.2065	0.2383
Obs	7412	20560	6423	15808	6410	15637

Table 7.11 Comparison of 'capital structure adjustment speed,' based on the firms' age

The table indicates that old firms adjust their debt ratios slowly.
Note, MDR: market-based debt ratio, BDR: book-based debt ratio. The coefficient values of Panels C and D are (1-λ). Thus, the adjusting speed λ is (1-coefficient) in Panels A and B. In calculating Panels C and D, we use all 7 capital structure determinants though we do not report these coefficients here. BDR_{t-1} and MDR_{t-1} are used as instruments in Panels C and D respectively. The values in the square brackets are the significant levels of J statistic (Hansen p-value); C test value suggests the endogenous variables. For the syntax of xtabond2, eq(level) lag(1 2) and collapse options are used for gmm-style and eq(level) option is used for iv-style. All variables are defined in Section 5.3. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	Panel A: ΔBDR_t		Panel B: ΔMDR_t	
	long	short	long	short
Cons	.0022 (1.81) *	.0128 (9.61) ***	.0069 (5.94) ***	.0167 (14.25) ***
Speed1	.1064 (16.12) ***	.1724 (27.59) ***		
Speed2			.1222 (17.70) ***	.1869 (26.44) ***
Adj-R^2	0.0521	0.0675	0.0673	0.0791
Obs	4708	10506	4329	8127
	Panel C: BDR_t		Panel D: MDR_t	
	long	short	long	short
Cons	-.0024 (-0.37)	.0088 (1.48)	.0077 (1.24)	.0057 (1.40)
BDR_{t-1}	.8718 (15.82)***	.7509 (16.74)***		
MDR_{t-1}			.7846 (16.56)***	.7451 (23.65)***
AR(1)	-6.37***	-7.39***	-9.19***	-12.08***
AR(2)	0.21	0.91	1.15	1.54
Hansen [P-value]	0.03 [0.863]	2.83 [0.092]	0.92 [0.337]	0.93 [0.334]
Inst	L1. L2	L1. L2	L1. L2	L1. L2
Inst No	10	10	10	10
Obs	4787	11201	4754	11167

7.3.1 Conclusion with regard to debt ratio and with firms' age

This section strongly supports the trade-off theory because our results show that firms with a short history use more equity and have lower debt ratio. Table 7.11 also indicates that firms with a short history show high capital structure adjustment speeds. This implies that, as firms with a short history tend to be in financially unstable situations, they issue equity to increase their financial stability. The high capital structure adjustment speeds of short history firms also indicate that they need to change their debt ratios as soon as possible in order to escape from a situation of instability. This section likewise indicates that firms with a long history also issue more equity than debt, just as in the case of short history firms. Compared with other chapters and sections of our analyses, this is a situation for all firms in our sample data. That is, firms, irrespective of the length of their histories, use more equity. This is thoroughly against the pecking order theory, and implies that there is a big shift in debt ratio change across our entire sample, for the time under consideration. This phenomenon is consistent with Bates et al. (2009) who suggest that the increasing amount of intangible assets held by firms creates costly financial distress and hence firms hold less debt and have more equity and lower debt ratios.

7.4 Bankruptcy Probability

This thesis uses the 'combined pb-area.' That is, we use a series of the Z'-score models as a proxy of financial distress (see Section 5.3.2.2.6 in which the details of Z-score models are described). In Section 7.4.1, we compare our proxy of bankruptcy probability, combined bp-area, to Z-score and EDF models to test its reliability (see Section 1.2.2 in Appendix 1 in which full details of bankruptcy probability measures are described).

7.4.1 The comparison between market-based and accounting-based bankruptcy prediction models

According to Hillegeist et al. (2004), 'accounting-based credit scoring models' (Z- or O-scores) could not properly represent bankruptcy probability because Z- and O-score models can be biased, caused by the sample selection process. For example, there are a limited number of firms who go bankrupt. Since 1% of firms generally go bankrupt in the US, 5% of bankruptcy probability cannot be tested with this low bankruptcy level. In other words, while a relatively small number of firms become bankrupt, the majority of firms survive. As there is a problem due to small sample size, there can be a bias in bankruptcy estimation. To solve this problem, Shumway (2001) asserts that a hazard model (probability model) is more accurate and relatively unbiased for forecasting bankruptcy.

Since 'accounting-based bankruptcy prediction models,' such as Z- and O-score models are formed as a prediction score based on a 'multiple discriminate analysis' (MDA) and 'market-based bankruptcy prediction models' are formed as a probability, it is difficult to make a comparison between them. Thus, they have to be transformed into the same formation to make comparisons possible. In other words, Z-score transforms into probability like the Black-Sholes-Metron (BSM) model, and vice versa. We can transform them by using the 'discrete hazard model' (Ohlshon, 1980; Shumway, 2001; Hillegeist et al., 2004).

For example, we can transform the probabilistic results from market-based models, such as the EDF model, can be turned into a score to allow comparison with accounting-based models. Hillegeist et al. (2004) suggest the following method:

$$score = \ln\left(pb/(1-pb)\right) \tag{7.1}$$

where, pb: actual probability of bankruptcy

In the same way, the 'scoring models' can also be turned into 'logistic functional models' to compare the probability model by reversing the previous formula, using the following method:

$$pb_{i,t} = e^{\alpha_t + x_{i,t}\beta} \big/ (1 + e^{\alpha_t + x_{i,t}\beta}) = e^{Z-score} \big/ (1 + e^{Z-score}) \tag{7.2}$$

where, $pb_{i,t}$: actual probability of bankruptcy, α : constant, x : a vector of explanatory variables, β : coefficient vector. Since Z- score models do not report the constant, we presume that the constant is zero in order to calculate the probability of bankruptcy. O-score models, however, report the contents.

As this is a 'log transformation function' from Equation (7.1), the score tends to infinity when the pb is one or zero. The pb value should be winsorised because the value of infinity could distort results. By following Hillegeist et al. (2004), we restrict the value of the pb to between 0.00001 (minimum) and 0.99999 (maximum), then the score will be between -11.51292 and +11.51292: to make a comparison, the scores of accounting-based models should be winsorised between -11.51292 and +11.51292.

Hillegist et al. (2004) conclude that the market-based BSM model contains more information, and thus the BSM model is a better proxy of bankruptcy probability than accounting-based models. Agawal and Taffler (2008) however, conclude that there is no significant difference between market-based and accounting-based models in terms of a failure prediction. Shumway (2001) also suggests using both methods for more accuracy.

Table 7.12 shows the relationship between debt ratios and bankruptcy probabilities at time t. The low value of Z- and the BP-area and the high value of Z-bp (Z-score model based bankruptcy probability) and EDF indicate financial stability (see Section 1.2.2 in Appendix 1). This table tells us the same story that bankruptcy probability and debt ratios are positively associated. Specificially, firms with high debt ratios expose a high level of bankruptcy probability. In terms of the explanatory power, Z-area, Z-bp and Bp-area are the most reliable indicators of bankruptcy probability. The coefficients of the probability model such as EDF and Z-bp also have high and statistically significant values. As they show similar results, it is appropriate to use both methods.

Table 7.12 Comparison between book-based and market-based bankruptcy prediction models

The table shows that there is clear correlation between market- and book-based bankruptcy prediction models.
Note, BDR: book-based debt ratio. Z-score and EDF-score are winsorised between -11.51292 and 11.51292, and Z-bp and EDF are winsorised between 0.00001 and 0.99999. Z-area and bp-area are defined 1= good area, 2=gray area, 3=bad area, where a good area indicates a high score in terms of z-score values and a bad area indicates a low score. Since, a high EDF probability indicates a long distance to default, a high value indicates a secure financial state. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	BDR_t					
Cons	-.0307 (-14.53)***	-.0132 (-5.96)***	.4451 (300.88)***	.149 (48.06)***	.7452 (172.82)***	.2389 (168.90)***
$Z\text{-area}_t$	.1781 (158.98)***					
$Bp\text{-area}_t$		.1459 (129.27)***				
$Zscore_t$			-.0386 (-115.42)***			
$EDFscore_t$				-.0169 (-28.06)***		
$Z\text{-bp}_t$					-.4944 (-101.15)***	
EDF_t						-.2969 (-12.70)***
Adj-R^2	0.4030	0.2759	0.3184	0.0198	0.2640	0.0041
Obs	37437	43859	28523	38994	28523	39026

Table 7.12 Continued

Note, MDR: market-based debt ratio. The Z-score and the EDF-score are winsorised between -11.51292 and 11.51292, and Z-bp and EDF are winsorised between 0.00001 and 0.99999. Z-area and bp-area are defined 1= good area, 2=gray area, 3=bad area, where the good area indicates a high score in terms of the z-score value and the bad area indicates a low score. Since a high EDF probability indicates a long distance to default, a high value indicates a secure financial state. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	MDR_t					
Cons	-.0402 (-28.29)***	.0013 (0.80)	.3486 (303.67)***	.1152 (49.76)***	.4972 (136.12)***	.1875 (176.68)***
$Z\text{-area}_t$	.1416 (188.92)***					
$Bp\text{-area}_t$		.1019 (119.77)***				
$Zscore_t$			-.0298 (-115.35)***			
$EDFscore_t$				-.0127 (-28.09)***		
$Z\text{-bp}_t$					-.2843 (-68.93)***	
EDF_t						-.3782 (-21.96)***
Adj-R^2	0.4873	0.2575	0.3205	0.0198	0.1441	0.0122
Obs	37547	41368	28203	38981	28203	39013

7.4.2 Debt ratio and bankruptcy probability

Table 7.13 shows that the bankruptcy probability is mostly related to debt ratio, cash holdings and profit, and increases as debt ratios increase, while firms with a low bankruptcy probability hold high net cash. An important fact is that firms in bad areas show deep negative profits. The combined-bp area and Z'-score areas show the same result.

Table 7.13 Descriptive characteristics, based on bp-area

A univariate comparison of the means and medians of measures of firm characteristics are based on the bankruptcy probability between 1989 and 2008.
Note, median values are in square brackets. The combined pb-area is defined by a series of z'-score based models (see Section 5.3.2.2.6 in which the details of Z-score models are described). All variables are defined in Section 5.3.

Variables	Combined bp area			Z' score area		
	Good area	Gray area	Bad area	Good area	Gray area	Bad area
BDR	.1302 [.0886]	.293 [.2927]	.4201 [.3977]	.1465 [.1132]	.3314 [.3234]	.5018 [.4601]
MDR	.0953 [.0532]	.2507 [.2403]	.2925 [.2877]	.0947 [.069]	.2875 [.2779]	.3698 [.3801]
Netcash	.6768 [.2476]	.1907 [.1108]	.4145 [.1011]	.5296 [.1946]	.1751 [.1091]	.2961 [.0907]
Profit	.0439 [.069]	.0312 [.0407]	-.1826 [.0043]	.0234 [.0632]	.026 [.038]	-.1531 [.0093]
Obs	23137	8049	13189	21358	6456	10114

We regress the Z'-score decision factors with debt ratios to investigate the effect on leverage level decision from those bankruptcy probability decision factors.

$$(\Delta)DR_t=(WC/TA)_t+(RE/TA)_t+(EBIT/TA)_t+(ME/BD)_t+(SALE/TA)_t+\varepsilon_t \qquad (7.3)$$

where WC: Working Capital, TA: Total Asset, RE: Retained Earnings, ME: Market Value Equity, EBIT: Earnings before Interest and Taxes, BD: Book Value of Total Debt, SALE: sale.

From Table 7.14, most factors from the Z'-score model are negatively related to debt ratios. This implies that high debt ratios increase the probability of bankruptcy. It is, therefore, not surprising that all variables in the Z-score model are considered as important factors when analysing capital structure theories from previous research.

‘Working capital to asset’ is the most important factor, followed by profit related items (EBIT, retained earnings and sales).

Table 7.14 Debt ratio and the component of the Z’-score model

The table shows that most factors from the Z’-score model are negatively related to debt ratios. This implies that high debt ratios increase the probability of bankruptcy. BDR: book-based debt ratio, MDR: market-based debt ratio, *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

OLS	BDR	MDR		ΔBDR	ΔMDR
Cons	.4522 (224.23)***	.3802 (256.50)***	Cons	-.0034 (-6.36)***	.004 (8.05)***
$\frac{WC}{TA}$	-.1713 (-37.79)***	-.1053 (-31.65)***	$\Delta\frac{WC}{TA}$	-.1453 (-29.13)***	-.0926 (-19.90)***
$\frac{RE}{TA}$	-.0569 (-42.15)***	.0017 (1.74)*	$\Delta\frac{RE}{TA}$	-.0588 (-32.16)***	.0016 (0.98)
$\frac{EBIT}{TA}$	.0946 (13.38)***	-.0066 (-1.28)	$\Delta\frac{EBIT}{TA}$	-.0802 (-17.72)***	-.0789 (-18.82)***
$\frac{ME}{BD}$	-.0171 (-93.93)***	-.0188 (-142.72)***	$\Delta\frac{ME}{BD}$	-.0088 (-62.80)***	-.011 (-85.56)***
$\frac{SALE}{TA}$	-.049 (-32.56)***	-.0338 (-30.77)***	$\Delta\frac{SALE}{TA}$	-.0401 (-16.76)***	-.0421 (-19.30)***
Adj-R^2	0.3798	0.5028	Adj-R^2	0.2828	0.3103
No of Obs	29163	28847	No of Obs	24383	23984

Table 7.15 indicates that firms with a high level of bankruptcy probability (in a bad area) at time t-1, increase their equity issue to reduce the debt ratio at time t. This is strong evidence for supporting the static trade-off theory. The differences are more noticeable in the Z’-score area than with a combined bp-area, although they show a similar relationship.

Table 7.15 Debt ratio changes based on the bp-area, using the Baker and Wurgler models (2002)

The table indicates that firms with a high level of bankruptcy probability (in a bad area) at time t-1 increase equity issue to reduce debt ratio at time t.
Note, ΔBDR: book-based debt ratio change, the combined pb-area is defined by a series of z'-score based models (see Section 5.3.2.2.6 in which the details of Z-score models are described). A: total asset, e: equity, RE: retained earnings, -(e/A): equity issue, -(RE/A): increased retained earnings, $-(E_{t-1}(1/A_t-1/A_{t-1})$: the residual change in leverage. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

OLS	Panel A: ΔBDR_t					
	Combined pb-area			Z'-score area		
BP condition at t-1	Good $area_{t-1}$	Gray $area_{t-1}$	Bad $area_{t-1}$	Good $area_{t-1}$	Gray $area_{t-1}$	Bad $area_{t-1}$
Cons	.0014 (1.80)*	-.005 (-3.91)***	-.0085 (-3.56)***	.0029 (3.55)***	-.0071 (-5.05)***	-.0137 (-5.09)***
$-\left(\frac{e}{A}\right)_t$	.2315 (37.68)***	.4851 (33.80)***	.3026 (24.5)***	.23 (37.15)***	.5847 (30.26)***	.4772 (26.64)***
$-\left(\frac{\Delta RE}{A}\right)_t$	.164 (48.37)***	.2959 (34.45)***	.1334 (28.52)***	.1549 (47.35)***	.236 (26.93)***	.1726 (29.97)***
$-\left[E_{t-1}\left(\frac{1}{A_t}-\frac{1}{A_{t-1}}\right)\right]$	.1846 (42.39)***	.2379 (20.77)***	.132 (15.48)***	.1833 (39.98)***	.1357 (10.29)***	.1282 (12.94)***
Adj-R^2	0.1630	0.2845	0.1362	0.1598	0.2654	0.1821
Obs	14460	4653	7381	14242	3657	5822

From Table 7.16, Panels A and B show that the 'financial deficit' is negatively associated with debt increasing when firms are in a bad area at t-1. This implies that they use equity for 'financial deficits' when they are in financially unstable conditions. This is consistent with Fitzpatrick and Ogden's findings (2011) that 55% of firms experiencing financial distress issue equity. They imply that the asymmetric information cost is not as great as the pecking order theory argues, or that the bankruptcy costs are greater than were previously thought.

Table 7.16 Debt ratio changes and financial deficits (DEF1), based on the bp-area

The table shows that firms use equity for financial deficits when they are in financially unstable conditions.
Note, the combined pb-area is defined by a series of z'-score based models (see Section 5.3.2.2.6 in which the details of Z-score models are described). $DEF1=DIV_t+I_t+\Delta WC_t-C_t$, ΔMDR: market-based debt ratio change, ΔBDR: book-based debt ratio change, Net equity issuance/asset =(sale stock-repurchase stock)/total asset, Net long-term debt issuance/asset=('long-term debt issue'-'long-term debt retirement')/total asset, DEF1: financial deficit defined by Frank and Goyal (2003), DIV: dividend, I: investment (capital expenditure), WC: working capital, C: cash-flow after interest and taxes (=internal cash-flow or net income+depreciation). All items are scaled by total asset. This table is based by combined bankruptcy probability rather than z'-score area. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	Panel A: ΔBDR_t			Panel B: ΔMDR_t		
Bp area	$Good_{t-1}$	$gray_{t-1}$	bad_{t-1}	$good_{t-1}$	$gray_{t-1}$	Bad_{t-1}
Cons	.0033 (4.01)***	-.0123 (-8.70)***	-.014 (-5.96)***	.0095 (15.45)***	-.0046 (-3.31)***	-.0138 (-10.25)***
$DEF1_t$	.0172 (7.05)***	.018 (3.15)***	-.0405 (-9.19)***	.011 (5.93)***	.0222 (3.83)***	-.0039 (-1.68)*
Adj-R^2	0.0028	0.0016	0.0091	0.0021	0.0026	0.0002
Obs	17361	5680	9096	16363	5292	8282
	Panel C: Net long-term debt $issue_t/asset_t$			Panel D: Net equity $issue_t/asset_t$		
Bp area	$Good_{t-1}$	$gray_{t-1}$	bad_{t-1}	$good_{t-1}$	$gray_{t-1}$	Bad_{t-1}
Cons	.0086 (11.91)***	.0007 (0.48)	-.0051 (-3.44)***	.0077 (6.66)***	.0130 (9.31)***	.0395 (17.82)***
$DEF1_t$	.0331 (14.68)***	.0654 (10.28)***	.0263 (10.09)***	.2518 (66.41)***	.1492 (24.01)***	.2174 (48.86)***
Adj-R^2	0.0159	0.0244	0.0139	0.2491	0.1216	0.2549
Obs	13278	4185	7129	13294	4156	6976

From Table 7.17, capital structure adjustment speeds generally reduce as bankruptcy probability declines. This implies that firms in a bad area need more financial stability and, as a consequence, they change leverage levels more rapidly.

Table 7.17 Capital structure adjustment speed comparison, based on the bp-area

The table shows that 'capital structure adjustment speeds' generally reduce as bankruptcy probability declines.

Note, BDR: book-based debt ratio, MDR: market-based debt ratio. The combined pb-area is defined by a series of z'-score based models (see Section 5.3.2.2.6 in which the details of Z-score models are described). The coefficient values are λ (capital structure adjustment speed) in Panels A and B. The coefficient values of 'capital structure adjustment speeds' in Panels C and D are (1-λ). Thus, the adjustment speed λ is (1-coefficient). In calculating Panels C and D, we use all 7 capital structure determinants, although we do not report on these coefficients here. BDR and capital expenditure is instrumented in Panel C. MDR and capital expenditure are used as instruments in Panel D. The values in the square brackets are the significant levels of J statistic (Hansen p-value); C test value suggests the endogenous variables. xtabond2 uses eq(level) lag(1 2) collapsed for gmm-style, and eq(level) for iv-style. All variables are defined in Section 5.3. This table is based by combined bankruptcy probability rather than z'-score area. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	Panel A: ΔBDR_t			Panel B: ΔMDR_t		
Bp area	good $_{t-1}$	gray $_{t-1}$	bad $_{t-1}$	good $_{t-1}$	gray $_{t-1}$	Bad $_{t-1}$
Cons	.0077 (8.64)***	.0106 (4.73)***	.0309 (7.96)***	.0128 (14.66)***	.0232 (8.77)***	.0196 (6.79)***
$Speed1_t$	.1243 (18.95)***	.1426 (13.38)***	.1967 (17.74)***			
$Speed2_t$				.1145 (14.66)***	.1719 (13.19)***	.1954 (17.23)***
Adj-R^2	0.0363	0.0619	0.0741	0.0268	0.0629	0.0820
Obs	9503	2698	3924	7724	2579	3315
	Panel C: BDR_t			Panel D: MDR_t		
Bp area	good $_{t-1}$	gray $_{t-1}$	bad $_{t-1}$	good $_{t-1}$	gray $_{t-1}$	Bad $_{t-1}$
Cons	.0254 (4.48)***	-.0197 (-1.10)	.0280 (1.53)	.032 (4.53)***	.0187 (0.72)	-.0077 (-0.71)
BDR_{t-1}	.6602 (10.62)***	.9553 (9.70)***	.7674 (11.21)			
MDR_{t-1}				.7328 (10.35)***	.8129 (9.52)***	.7595 (15.36)***
AR(1)	-8.99***	-1.97**	-4.63***	-7.00***	-5.34***	-7.43***
AR(2)	3.13***	1.00	2.15**	3.50***	2.44**	1.99**
Hansen [P-value]	1.09 [0.581]	3.86 [0.145]	1.91 [0.384]	3.71 [0.156]	2.01 [0.366]	0.61 [0.736]
Inst	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2
Inst No	11	11	11	11	11	11
Obs	10456	2725	4037	10450	2703	3967

Table 7.18 shows the number of observations of 'pure debt issue' in respect of the financial conditions at time t-1. The table indicates that by not regarding bankruptcy probability areas, firms generally decrease the debt ratio by issuing more equity. The table further shows that as bankruptcy probability increase, firms issue more equity, from 54% of the total security issue in good areas to 63% in bad areas.

Table 7.18 Number of observations that increase debt, based on the bp-area

The table indicates that by not regarding bankruptcy probability areas, firms generally decrease the debt ratio by issuing more equity. However, it also shows that firms issue more equity as the bankruptcy probability increases.
Note, number of observations of 'pure debt increase,' (Net long-term debt issuance/total asset)-(Net equity issuance/total asset). Mean and median: mean and median value of pure debt increase. This table is based by combined bankruptcy probability rather than z'-score area. The combined pb-area is defined by a series of z'-score based models (see Section 5.3.2.2.6 in which the details of Z-score models are described).

	Good $area_{t-1}$		Gray $area_{t-1}$		Bad $area_{t-1}$	
	Increase (>0)	Decrease (<0)	Increase (>0)	Decrease (<0)	Increase (>0)	Decrease (<0)
Mean [median]	.0794 [.0442]	-.0966 [-.0257]	.0665 [.0421]	-.0783 [-.0343]	.0887 [.047]	-.1652 [-.0588]
Number of obs	5,433 (38%)	7,847 (54%)	1,883 (41%)	2,546 (55.5%)	2,352 (30%)	4,855 (63.8%)

The results in this section indicate that financially distressed firms reorganise debt ratios more actively than those in a good area. This indication is not consistent with Gilson (1997), who asserts that as financial costs are too severe for financially distressed firms, they cannot issue new securities. The results in this section also imply that bankruptcy costs are greater than transaction costs.

7.4.3 Conclusion with regard to debt ratio and firms' bankruptcy probability

Tables 7.15 and 7.16 show that firms issue more equity and less debt when they are in a bad area in terms of Z-score model at time t-1. This shows that firms issue equity when their financial security is unstable at time t-1. This is strong evidence that firms (particularly firms in bad areas at time t-1) adjust their capital structure structures. Table 7.17 also indicates that firms in a bad area at time t-1 adjust their capital structures more rapidly than those firms in the other areas. Furthermore, from Table 7.18 we also observe that without considering firms' financial states at time t-1, more firms from the entire range of financial states issue more equity, and firms in bad areas issue relatively more equity than those in the other areas. The results from Tables 7.15, 7.16 and 7.17 support the trade-off theory. As we have seen in Section 7.3.1, we can also observe a trend in Table 7.18. That is, the trend of increasing equity without regarding firms' financial states also indicates that there is a big shift in terms of firms' capital structure change. This can be explained only by the trade-off theory, because it is difficult to believe that all firms are over-priced or that asymmetric information is reduced across time if we accept the market timing theory or the pecking order theory respectively as explanations of this phenomenon.

7.5 Over-leveraged and under-leveraged firms

If capital structure follows the trade-off theory, over-leveraged (under-leveraged) firms attempt to reduce (increase) leverage levels. In particular, over-leveraged firms have to reduce debt in both the trade-off theory and the pecking order theory because they face great credit problems. However, Flannery and Rangan (2006) and Lemmon and Zender (2008) argue that both theories suggest opposite solutions for under-leveraged firms. The trade-off theory expects that under-leveraged firms issue debt or repurchase equity, while the pecking order theory expects firms to reduce their debt ratios to increase their debt capability by retiring outstanding debt.

In order to decide whether firms' leverage levels are over- or under-leveraged, we compare them to target debt ratios, (TDR_t-DR_t, where, TDR is target debt ratio and DR is actual debt ratio). If the actual debt ratio is higher than the target debt ratio, then it is over-leveraged and vice versa. Using these over- or under-leveraged debt ratios, we expect to observe different 'firms' debt ratio changing behaviours'. Firms would like to change their debt ratios towards moderate levels if there is a target debt ratio.

$$\text{Over- or under-leveraged leverage level}_t = \text{Target debt ratio}_t - \text{actual debt ratio}_t \quad (7.4)$$

When classifying leverage levels into two groups (those of over-leveraged and under-leveraged firms), we compare debt ratios with four different target leverage levels (book- and market based and tobit- and regression based target debt ratios; see Table A.5.20 in Appendix 5). The four different target debt ratios lead to similar results. To reach a clearer conclusion of the effect of over- and under-leveraged debt ratios, we use firms which are only extremely over- and under-leveraged, similar to those considered by Kurshev and Strebulaev (2006) (the fourth or first quartile for under- and over-leveraged firms, respectively). For example, if the value (of TDR_t-DR_t) is greater than 0.113, or smaller than -0.275, for under- and over-leveraged firms, respectively (see Table A.5.20 in Appendix 5); we use the target debt ratios computed by regression with book-based debt ratios.

The basic statistic in Table 7.19 indicates that the statistical values are similar between OLS regressed target debt ratios and the Tobit regressed target debt ratio. This implies that it matters little whether we are using OLS- or Tobit-based target debt ratios. The table shows that there are significant differences in cash holding, asset tangibility, and bankruptcy probability between the two groups. Namely, under-leveraged firms hold more cash and tangible assets and have a low bankruptcy probability in general.

Table 7.19 Descriptive characteristics, based on leverage levels

Univariate comparison of means and medians of measures of firms' characteristics, based on leverage levels between 1989 and 2008.
Note, median values are in square brackets. OLS Regressed target: target debt ratio is computed by OLS. Tobit regressed target: target debt ratio is computed using the Tobit model. BDR-target: book based target debt ratio, MDR-target: market based target debt ratio. All variables are defined in Section 5.3. Extremely over- and under-leveraged firms are defined as firms are in the fourth quartile among the under-leveraged firms, and in the first quartile among the over-leveraged firms respectively. For example, the value (of target debt ratio-actual debt ratio) is greater than 0.113 and smaller than -0.275 with book-based debt ratios (see, Table A.5.20 in Appendix 5).

	OLS regressed target				Tobit regressed target			
	BDR-target		MDR-target		BDR-target		MDR-target	
Variables	Extreme -under	Extreme -over	Extreme -under	Extreme -over	Extreme -under	Extreme -over	Extreme -under	Extreme -over
BDR	.0266 [.0044]	.6091 [.5465]	.0448 [.0103]	.5098 [.4765]	.0505 [.0127]	.5882 [.5232]	.0682 [.0234]	.5213 [.4789]
MDR	.0228 [.0026]	.3982 [.4053]	.0274 [.0087]	.4782 [.4687]	.042 [.0082]	.4086 [.4099]	.0536 [.0137]	.4777 [.4664]
Netcash	.6097 [.2886]	.3783 [.0936]	.3599 [.2182]	.1727 [.0832]	.6977 [.2688]	.2419 [.0793]	.6398 [.2702]	.156 [.0767]
Tang	.2865 [.2688]	.2532 [.1923]	.3613 [.3479]	.3011 [.2642]	.254 [.2248]	.3017 [.2586]	.2471 [.2043]	.3431 [.3359]
BP	1.35 [1]	2.461 [3]	1.239 [1]	2.425 [3]	1.42 [1]	2.496 [3]	1.348 [1]	2.4733 [3]
Obs	2219	2517	1450	2432	1247	1938	2278	1689

Table 7.20 Debt ratio changes based on leverage levels, using the Baker and Wurgler model (2002)

The table supports the trade-off theory by showing, that extremely over-leverage firms at time t-1 issue equity more.

Note, ΔBDR: book-based debt ratio change, ΔMDR: market-based debt ratio change. Extremely over- and under-leveraged firms are defined as firms are in the fourth quartile among the under-leveraged firms, and in the first quartile among the over-leveraged firms respectively. For example, the value (of target debt ratio-actual debt ratio) is greater than 0.113 and smaller than -0.275 with book-based debt ratios (see, Table A.5.20 in Appendix 5). Independent variables with ΔMDR are based on market-based target debt ratios for the decision of level of debt ratio criteria, and the independent variables with ΔBDR are based on book based target debt ratio. A: total asset, e: equity, RE: retained earnings, -(e/A): equity issue, -(RE/A): increased retained earnings, $-(E_{t-1}(1/A_t-1/A_{t-1})$: the residual change in leverage. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	Panel A: ΔBDR_t		Panel B: ΔMDR_t	
Leverage level	Ex-over $_{t-1}$	Ex-under $_{t-1}$	Ex-over $_{t-1}$	Ex-under $_{t-1}$
Cons	-.0372 (-7.54)***	.0130 (4.80)***	-.0358 (-10.94)***	.0096 (5.24)***
$-\left(\frac{e}{A}\right)_t$	.6211 (17.67)***	.0467 (2.89)***	.4111 (9.59)***	.0756 (3.82)***
$-\left(\frac{\Delta RE}{A}\right)_t$	.2342 (16.89)***	.0741 (9.02)***	.0524 (4.43)***	.0639 (6.87)***
$-\left[E_{t-1}\left(\frac{1}{A_t}-\frac{1}{A_{t-1}}\right)\right]$	.0842 (3.69)***	.0810 (6.77)***	.1369 (6.23)***	.0308 (2.85)***
Adj-R^2	0.2181	0.0623	0.0873	0.0464
Obs	1742	1356	1415	919

Table 7.20 clearly shows that extremely over-leveraged firms at time t-1, issue more equity in the next term than under-leveraged firms. This supports the trade-off theory.

As was discussed earlier, Flannery and Rangan (2006) suggest that the pecking order theory and the trade-off theory expect different behaviours on the part of firms when they are under-leveraged. They show, in general, that firms follow the trade-off theory rather than the pecking order theory. Following their idea, we test it with extremely over- and under-leveraged firms.

Table 7.21 Debt ratio changes and financial deficits (DEF1) using Flannery and Rangan's (2006) model, based on leverage levels

The table implies that extremely over-leveraged firms at time t-1 use equity at time t, while extremely under-leveraged firms use debt for new investment.
Note, ΔBDR: book-based debt ratio change, ΔMDR: market-based debt ratio change. Extremely over- and under-leveraged firms are defined as firms are in the fourth quartile among the under-leveraged firms, and in the first quartile among the over-leveraged firms respectively (see, Table A.5.20 in Appendix 5). $DEF1_t=DIV_t+I_t+\Delta WC_t-C_t$, ΔBDR: book-based debt ratio change, ΔMDR: market-based debt ratio change, DEF1: financial deficit defined by Frank and Goyal (2003), DIV: dividend, I: investment (capital expenditure), WC: working capital, C: cash-flow after interest and taxes (=internal cash-flow or net income+depreciation). All items are scaled by total asset. DEF1 levels indicate the levels of financial deficit for only firms who are extremely over-leveraged or under-leveraged at time t-1. The regression with ΔBDR uses book based OLS regressed-target debt ratio and with ΔMDR uses market-based OLS regressed-target debt ratio. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

Leverage level	Panel A : Extremely over-leveraged at time t-1			
	ΔBDR_t		ΔMDR_t	
DEF1 level at t	$DEF1_t>0$	$DEF1_t<0$	$DEF1_t>0$	$DEF1_t<0$
Cons	-.0133 (-1.49)	-.0411 (-5.37)***	-.0352 (-7.39)***	-.0311 (-5.90)***
$DEF1_t$	-.1342 (-6.13)***	.0491 (1.57)	-.0811 (-5.30)***	.1592 (5.05)***
Adj-R^2	0.0293	0.002	0.0256	0.0367
Obs	1214	732	1031	645
Leverage level	Panel B : Extremely under-leveraged at time t-1			
	ΔBDR_t		ΔMDR_t	
DEF1 level at t	$DEF1_t>0$	$DEF1_t<0$	$DEF1_t>0$	$DEF1_t<0$
Cons	.0119 (2.68)***	.018 (0.68)	.0116 (4.35)***	.0006 (0.21)
$DEF1_t$	.0652 (6.96)***	-.0495 (-2.43)**	.0129 (2.14)**	-.0744 (-3.03)***
Adj-R^2	0.0422	0.0105	0.005	0.0224
Obs	1078	464	719	359

From Panels A and B in Table 7.21, the extremely over- and under-leveraged firms at time t-1 decrease or increase debt at time t, respectively, when 'financial deficit' is greater than zero (DEF1 > 0). This implies that over-leveraged firms use equity and under-leveraged firms use debt for new investment. On the other hand, over- and under-leveraged firms are positively and negatively associated with 'financial deficit (DEF1),' respectively, when DEF1 < 0. This implies that accumulated earnings reduce the debt ratio for firms which are extremely over-leveraged; and debt levels increase while retained earnings is increased for extremely under-leveraged firms. Therefore, our results also support the trade-off theory.

Table 7.22 Debt ratio changes and financial deficits (DEF1), based on leverage levels

The table implies from Panels A and B, that firms generally follow the trade-off theory.
Noter, extremely over- and under-leveraged firms are defined as firms are in the fourth quartile among the under-leveraged firms, and in the first quartile among the over-leveraged firms respectively (see, Table A.5.20 in Appendix 5). ΔMDR: market-based debt ratio change, ΔBDR: book-based debt ratio change, Net equity issuance/asset =(sale stock-repurchase stock)/total asset, Net long-term debt issuance/asset=('long-term debt issue'-'long-term debt retirement')/total asset, $DEF1=DIV_t+I_t+\Delta WC_t-C_t$, DEF1: financial deficit defined by Frank and Goyal (2003), DIV: dividend, I: investment (capital expenditure), WC: working capital, C: cash-flow after interest and taxes (=internal cash-flow or net income+depreciation). All items are scaled by total asset. The leverage level is based on time t-1. All regressions in this table are based on book based target ratio except the models with the independent variable of ΔMDR. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	Panel A: ΔBDR_t		Panel B: ΔMDR_t	
Leverage level	Ex-over_{t-1}	Ex-under_{t-1}	Ex-over_{t-1}	Ex-under_{t-1}
Cons	-.0399 (-7.55)***	.012 (4.17)***	-.0456 (-14.78)***	.0099 (5.40)***
$DEF1_t$	-.0675 (-4.54)	.0628 (8.75)***	-.0352 (-3.02)***	.0131 (2.62)***
Adj-R^2	0.01	0.0467	0.0048	0.0054
Obs	1946	1543	1676	1078
	Panel C: Net long-term debt issue / asset_t		Panel D: Net equity issue / asset_t	
Leverage level	Ex-over_{t-1}	Ex-under_{t-1}	Ex-over_{t-1}	Ex-under_{t-1}
Cons	-.0093 (-2.85)***	.0069 (3.49)***	.02 (7.48)***	-.0006 (-0.13)
$DEF1_t$	.0989 (10.63)***	.0326 (6.65)***	.19 (20.75)***	.4099 (34.24)***
Adj-R^2	0.0623	0.0316	0.20	0.4702
Obs	1686	1323	1701	1321

Table 7.22 shows that extremely over- or under-leveraged firms' debt ratios at time t-1 are negatively and positively associated with 'financial deficits' at time t. Namely, an extremely over-leveraged firm uses equity for a financial deficit, and vice versa. Panels A and B support the static trade-off theory. Panels C and D do not tell the same story and it might show a behavioural persistency. Extremely over-leveraged firms are more associated with debt issuance while extremely under-leveraged firms are more associated with equity issuance. These behaviours do not belong to any capital structure theory.

Table 7.23 A comparison of ‘capital structure adjustment speeds’, based on leverage levels

The table indicates that extremely over-leveraged firms change their debt ratios first, followed by extremely under-leveraged firms.
Note, $over_{t-1}$ and $under_{t-1}$ indicate that over- and under-leveraged firms at time t-1 and ex-un and ex-ov are extremely under-leveraged and over-leveraged. Extremely over- and under-leveraged firms are defined as firms which are in the fourth quartile among the under-leveraged firms, and in the first quartile among the over-leveraged firms respectively (see, Table A.5.20 in Appendix 5). BDR: book-based debt ratio, MDR: market-based debt ratio, Speed1= $target1_t$ – BDR_{t-1}, speed2= $target2_t$-MDR_{t-1}, target1: book based target debt ratio calculated by OLS, target2: market-based target debt ratio calculated by OLS. The coefficient values are λ (capital structure adjustment speed) in Panels A and B. The coefficient values of ‘capital structure adjustment speed’ in Panels C and D are (1-λ). Thus, the adjustment speed λ is (1-coefficient). Independent variables with (Δ)MDR are based on market-based target debt ratios for the decision of level of debt ratio criteria, and the independent variables with (Δ)BDR are based on book based target debt ratio. BDR_{t-1} is instrumental for Panel C, MDR_{t-1} and profitability are instrumental for Panel D. Panels C and D use System GMM with options for small robust and twostep, with sub-options of eq(level) and lag(1 2) collapsed for gmm-style, and of eq(level) for iv-style. The values in the square brackets are the significant levels of J statistic (Hansen p-value); C test value suggests the endogenous variables. All variables are defined in Section 5.3. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	Panel A: ΔBDR_t				Panel B: ΔMDR_t			
	$Over_{t-1}$	$under_{t-1}$	$Ex\text{-}ov_{t-1}$	$Ex\text{-}un_{t-1}$	$over_{t-1}$	$under_{t-1}$	$Ex\text{-}ov_{t-1}$	$Ex\text{-}un_{t-1}$
Cons	.0168 (8.45)***	.0061 (3.72)***	.0797 (7.78)***	-.0202 (-3.23)***	.0277 (16.04)***	.0069 (5.43)***	.073 (6.56)***	.0001 (0.02)
$Speed1_t$	.1629 (21.83)***	.1422 (8.81)***	.2773 (12.97)***	.2845 (7.25)***				
$Speed2_t$					.1984 (24.16)***	.1192 (6.33)***	.3139 (10.27)***	.1140 (2.85)***
Ajd R^2	0.0541	0.0109	0.0764	0.0311	0.0702	0.0089	0.0537	0.0063
Obs	8311	6959	2022	1606	7725	4337	1842	1132
	Panel C: BDR_t				Panel D: MDR_t			
	$Over_{t-1}$	$under_{t-1}$	$Ex\text{-}ov_{t-1}$	$Ex\text{-}un_{t-1}$	$over_{t-1}$	$under_{t-1}$	$Ex\text{-}ov_{t-1}$	$Ex\text{-}un_{t-1}$
Cons	.0165 (1.50)	.0150 (2.13)**	.0535 (0.83)	.0059 (0.37)	-.0832 (-2.04)**	.0029 (0.70)	.0954 (1.71)*	-.0073 (-0.48)
BDR_{t-1}	.8178 (15.95)***	.9593 (5.00)***	.7744 (5.51)***	.6045 (2.19)**				
MDR_{t-1}					.7164 (12.02)***	.5527 (4.04)***	.4983 (3.53)***	.6961 (3.19)***
AR(1)	-7.04***	-1.09	-3.70***	0.60	-6.74***	-1.11	-2.55**	0.84
AR(2)	2.28**	5.03***	2.47**	2.34**	-0.87	4.25***	1.87*	2.31**
Hansen [P-value]	29.75 [0.581]	23.14 [0.874]	27.11 [0.713]	21.58 [0.869]	5.74 [0.125]	60.06 [0.617]	69.52 [0.297]	62.65 [0.453]
Inst	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2
Inst No	41	41	41	39	12	73	73	71
Obs	8483	7179	2059	1621	8030	4794	1872	1155

Table 7.23 shows the ‘different capital adjustment speeds’ based on debt levels at time t-1. The table generally shows that over-leveraged firms change their debt ratios faster than do under-leveraged firms; and extremely over- or under-leveraged firms also change their gearing levels faster than the less extremely leveraged firms. This implies that bankruptcy costs are greater than ‘capital structure adjustment costs’ for

(extremely) over-leveraged firms. This is consistent with Korteweg (2010), who finds that over-leveraged firms are more likely rebalance their leverage levels. This table might also support the hypothesis of 'capital structure adjustment costs' by showing that extremely under-leveraged firms' 'capital structure adjustment speed' is faster than that of others, because their adjustment costs might be lower due to a low bankruptcy probability.

Table 7.24 Number of observations of 'pure debt issue' with book-based leverage level at t-1

The table shows that firms generally decrease debt ratios, regardless of debt levels. It shows arguable evidence however that (extremely) over-leveraged firms issue equity more than do others.
Note, extremely over- and under-leveraged firms are defined as firms are in the fourth quartile among the under-leveraged firms, and in the first quartile among the over-leveraged firms, respectively (see, Table A.5.20 in Appendix 5). Number of observations of 'pure debt increase,' (Net long-term debt issuance/total asset)-(Net equity issuance/total asset). Mean and median: mean and median values of pure debt increase. This tabe is based on book-based debt ratio.

	Under-leveraged$_{t-1}$			Over-leveraged$_{t-1}$		
	Increase$_t$ (>0)	Decrease$_t$ (<0)	Unchanged$_t$ (=0)	Increase$_t$ (>0)	Decrease$_t$ (<0)	Unchanged$_t$ (=0)
Mean [median]	.0726 [.0335]	-.0869 [-.0182]	0 [0]	.0781 [.0478]	-.0959 [-.0386]	0 [0]
Number of obs	2400 (39%)	3252 (53%)	517 (8.4%)	2933 (41%)	4138 (57%)	169 (2.3%)
	Extremely under-leveraged$_{t-1}$			Extremely over-leveraged$_{t-1}$		
	Increase$_t$ (>0)	Decrease$_t$ (<0)	Unchanged$_t$ (=0)	Increase$_t$ (>0)	Decrease$_t$ (<0)	Unchanged$_t$ (=0)
Mean [median]	.0619 [0206]	-.1313 [-.0201]	0 [0]	.1027 [.0649]	-.1319 [-.0572]	0 [0]
Number of obs	559 (40%)	699 (50%)	134 (9.6%)	699 (38%)	1090 (60%)	40 (2.2%)

Table 7.24 shows that firms generally decrease debt ratios regardless of debt levels. It shows arguable evidence however that (extremely) over-leveraged firms issue more equity than the others. One other noticeable point is that there are fewer over-leveraged firms who do nothing (neither issue equity nor debt) compared to under-leveraged firms. In other words, firms behave more actively when they are over-leveraged.

7.5.1 Conclusion with regard to debt ratio and firms' leverage levels

This section tests the trade-off theory because we investigate firms' capital structure adjusting behaviours in line with firms' leverage levels. In other words, the trade-off theory argues the existence of optimal capital structure. This argument implies that firms try to increase and reduce their debt ratios if they have too low or too high debt ratios respectively in order to approach the optimal capital structure. Table 7.20 indicates that extremely over-leveraged firms issue more equity than extremely under-leveraged firms. Furthermore, Table 7.22 also shows a negative association between debt ratio change and financial deficits for extremely over-leveraged firms and shows a positive association between them for extremely under-leveraged firms. Table 7.23 shows that extremely over- and under-leveraged firms adjust their capital structure faster than other groups of firms. All our results, particularly, for the extremely over- and under-leveraged firms, follow the trade-off theory.

7.6 Different time periods

This section is similar to Chapter 4 in that firms in different time periods have different debt ratios. Figure 5.1 indicates that firms use less debt than they did before, consistent with Graham (2000). He asserts that firms used debt more aggressively in the 1980s. Table 7.25 shows that firms used less debt in the second period. It also shows that a firm's size, tangible assets and capital expenditure decrease and earnings volatility increases. This might imply that the firm's capital structure is affected by macro-economic factors. In fact, during these two recent decades, many high technology and internet firms have been founded. This section might also be related to the firm's age as indicated in Section 7.3. Namely, most old firms were at the first period in our sample but this was not the case for many young firms.

Table 7.25 Descriptive characteristics between two periods

The table shows that firms use less debt in the second period, and a firm's size, tangible assets and capital expenditure decrease and earnings volatility increases. All variables are defined in Section 5.3. 1995 is the first year in this table because the variable of 'Vol' is a 5 year standard deviation of earnings.

	1995-2001		2002-2008	
	Mean	Median	Mean	Median
BDR	.23	.18	.22	.15
MDR	.18	.12	.16	.10
Netcash	.69	.16	.71	.19
Lnasset	5.05	5.11	4.69	4.69
Tang	.26	.21	.22	.15
Tax	.35	.34	.30	.26
Capex	.07	.04	.05	.02
Vol	.07	.03	.09	.04
Obs	17003		30318	

Table 7.26 Debt ratio changes between two periods, using the Baker and Wurgler model (2002)

Note, ΔBDR: book-based debt ratio change, ΔMDR: market-based debt ratio change, A: total asset, RE: retained earnings, e: equity, -(e/A): equity issue, -(RE/A): increased retained earnings, $-(E_{t-1}(1/A_t-1/A_{t-1})$: the residual change in leverage. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	Panel A: ΔBDR_t		Panel B: ΔMDR_t	
OLS	1995-2001	2002-2008	1995-2001	2002-2008
Cons	.0011 (0.76)	-.002 (-1.94)**	.0059 (5.90)***	.0041 (6.18)***
$-\left(\frac{e}{A}\right)_t$	.2368 (32.47)***	.2219 (34.40)***	.0788 (12.47)***	.0721 (16.18)***
$-\left(\frac{\Delta RE}{A}\right)_t$	.1842 (39.24)***	.1237 (45.00)***	.0576 (16.38)***	.0338 (19.47)***
$-\left[E_{t-1}\left(\frac{1}{A_t}-\frac{1}{A_{t-1}}\right)\right]$	.1976 (31.03)***	.1365 (32.75)***	.0753 (16.62)***	.0315 (12.14)***
Obs	9236	19499	8371	18398
Adj-R^2	0.1772	0.1178	0.0427	0.0259

Table 7.26 shows that although firms rely slightly more upon equity issuance for debt ratio change in the first period, there is no significant difference between them in their equity issuing behaviours.

From Table 7.27, 'capital structure adjustment speed' is greater in the second period. Panel A, particularly, using the System GMM, shows that the 'capital structure adjustment speed' has greatly increased in the second period. The results using market-based debt ratio (Table A.5.33 in Appendix 5) also show the same results.

Table 7.27 Capital structure adjustment speed comparison between two periods

The table indicates that 'capital structure adjustment speed' is increased in the second period although it is arguable with OLS.

Note, ΔBDR: book-based debt ratio change, ΔMDR: market-based debt ratio change, speed1= $target1_t-BDR_{t-1}$, target1: book based target debt ratio calculated using OLS. The coefficient values are λ (capital structure adjustment speed) in Panel B. The coefficient values of Panel A are (1-λ). Thus, the adjustment speed λ is (1-coefficient). Panel A uses System GMM and BDR_{t-1} is instrumented. The command xtabond2 uses options of robust small and twosteps, and eq(level) lag(1 2) collapsed as sub-options for gmm-style and eq(level) for iv-style. The values in the square brackets are the significant levels of J statistic (Hansen p-value); C test value suggests the endogenous variables. All variables are defined in Section 5.3. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	Panel A: BDR_t			Panel B: ΔBDR_t	
	1995-2001	2002-2008		1995-2001	2002-2008
Cons	.0077 (0.91)	.0128 (2.68)***	Cons	.0189 (9.17)***	.0102 (9.68)***
BDR_{t-1}	.9051 (15.28)***	.7466 (16.86)***	$Speed1_t$	.1524 (15.89)***	.1579 (30.75)***
AR(1)	-4.50***	-9.08***	Adj-R^2	0.0623	0.0625
AR(2)	0.63	0.67	Obs	3785	14178
Hansen [P-value]	1.43 [0.232]	0.39 [0.535]			
Inst	L1, L2	L1, L2			
Inst No	10	10			
Obs	4536	14692			

7.6.1 Conclusion with regard to debt ratio and different time periods

As we have seen from previous sections, firms gradually decrease their debt ratios by issuing equity without regard to their size, age, or bankruptcy probability. In this section, we have also observed that firms' average debt ratios reduce in the second period compared to the first period, but this is trivial. We cannot find any big difference in this section. Both the results from Chapter 4 and from this section indicate a decrease in debt ratios, but we cannot find any significant differences from other tests, such as equity issue and capital structure adjustment speeds.

7.7 Stock returns

Firms can reduce debt levels when stock returns are high by issuing high priced equity or increasing the asset value if market timing and the pecking order theory are correct. In addition, the stock price effect (increasing (or decreasing) asset value as stock price increases (or decreases)) would be high in terms of debt ratio change, without actually issuing equity or debt if the inertia theory is correct.

From Table 7.28, a basic statistical descriptive table, there is a negative relationship between stock return and debt ratio, even though the differences in debt ratio between groups are not great. This table also indicates that profitability increases, and cash holding and earnings volatility decrease as stock returns increase. This table also shows one particular factor that cash holdings decrease with the exception of the 4th quartile as debt ratios decrease. This is inconsistent with a general trend between debt ratio and cash holding in our sample. The exception of the 4th quartile might imply the market timing effect by equity issuing with high stock price.

Table 7.28 Descriptive characteristics by stock return

Univariate comparison of means and medians of measures of firm characteristics is based on stock returns between 1989 and 2008. Median values are in square brackets. We segregate data based on log(stock return), 1Q<-.43, -.43≤2Q<-.046, -.046≤3Q <.25 and .25≤ 4Q. All variables are defined in Section 5.3.

Variables	Fist quartile	Second quartile	Third quartile	Fourth quartile
SR	-1.0356 [-.8346]	-.2181 [-.207]	.0954 [.0925]	.5481 [.4809]
BDR	.244 [.1732]	.2272 [.1812]	.2214 [.1758]	.2139 [.1539]
MDR	.1859 [.1259]	.1801 [.1353]	.1698 [.1229]	.1472 [.0851]
Netcash	.7661 [.1936]	.5388 [.1581]	.4825 [.1527]	.6531 [.1773]
Profit	-.154 [.0045]	-.0099 [.0373]	.0146 [.279]	.0064 [.0543]
Vol	.1167 [.0625]	.0636 [.0286]	.0592 [.0258]	.0809 [.0391]
Obs	10877	11355	12158	11502

Table 7.29 shows that there is no clear evidence that stock returns trigger equity issue, although there is a steady increase in equity issue from the second quartile. Firms in the first quartile issue equity moderately more than firms in the second quartile,

because they are financially less secure with low stock prices and low profits. Table 7.28 reveals the severe loss in net income for firms in the first quartile. It is therefore necessary to issue equity to increase their financial stability. In the 4th quartile, we can see more clear evidence of increasing equity issue.

Table 7.29 Debt ratio changes based on stock returns, using the Baker and Wurgler model (2002)

The table shows little evidence of that stock returns trigger equity issue.
Note, ΔBDR: book-based debt ratio change, A: total asset, RE: retained earnings, e: equity, -(e/A): equity issue, -(RE/A): increased retained earnings, $-(E_{t-1}(1/A_t-1/A_{t-1})$: the residual change in leverage. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	ΔBDR_t			
OLS	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0166 (7.95)***	.0032 (2.70)***	-.0059 (-4.56)***	-.0164 (-12.03)***
$-\left(\frac{e}{A}\right)_t$	.2222 (19.96)***	.2132 (22.88)***	.222 (21.9)***	.2597 (29.85)***
$-\left(\frac{\Delta RE}{A}\right)_t$	.1217 (28.2)***	.1281 (28.00)***	.1219 (23.96)***	.1480 (31.03)***
$-\left[E_{t-1}\left(\frac{1}{A_t}-\frac{1}{A_{t-1}}\right)\right]$	.1089 (17.15)***	.1448 (22.23)***	.1515 (20.56)***	.2467 (36.11)***
Adj-R^2	0.1198	0.1313	0.1081	0.1847
Obs	6687	6863	7199	8053

Table 7.30 indicates the positive relationship between both net debt and equity issuance, and financial deficit. This might be related to issuance costs as we discussed already (Bolton and Freixas, 2000). Panel B in Table 7.30 shows a noticeable increase in equity issue in the 4th quartile. This might be related to the overvalued stock price effect. (see Table A.5.36 in Appendix 5 for more details about debt ratio change and financial deficit).

Table 7.30 Debt ratio changes and financial deficits (DEF1), based on stock returns

The table indicates the positive relationship between both 'net debt and equity issuance' and financial deficit. Panel B in the table shows a noticeable increase in equity issue in the 4th quartile.
Note, Net equity issuance/asset =(sale stock-repurchase stock)/total asset, Net long-term debt issuance/asset=('long-term debt issue'-'long-term debt retirement')/total asset, $DEF1=DIV_t+I_t+\Delta WC_t-C_t$, DEF1: financial deficit defined by Frank and Goyal (2003), DIV: dividend, I: investment (capital expenditure), WC: working capital, C: cash-flow after interest and taxes (=internal cash-flow or net income+depreciation). All items are scaled by total asset. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	Panel A: Net long-term debt issuance/ $asset_t$			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0081 (6.09)***	.0069 (6.40)***	.0042 (4.01)***	.0024 (2.24)**
$DEF1_t$	.0213 (8.52)***	.0276 (8.76)***	.03335 (10.74)***	.0271 (9.56)***
Adj-R^2	0.0110	0.0115	0.02	0.0113
Obs	6459	6487	6918	7929
	Panel B: Net equity issuance/ $asset_t$			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0305 (13.55)***	.0071 (4.50)***	.0055 (3.65)***	.0172 (10.40)***
$DEF1_t$	.2028 (42.33)***	.2482 (48.46)***	.2493 (50.07)***	.2969 (60.01)***
Adj-R^2	0.2191	0.2673	0.2669	0.3137
Obs	6383	6435	6883	7879

Table 7.31 Net equity issue and stock return

The table shows that firms which are extremely over-valued (in the 4th quartile) are likely to issue equity. SR: stock return, log(1+annual stock return). Net equity issuance/asset =(sale stock-repurchase stock)/total asset, *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

OLS	Net equity $issue_t$ / $asset_t$			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0350 (8.50)***	.0251 (6.78)***	.0344 (14.01)***	.0084 (1.91)*
$SR_{t,t+1}$	-.0326 (-9.75)***	-.0378 (-2.49)**	-.0255 (-1.34)	0.831 (11.49)***
Adj-R^2	0.0119	0.0007	0.0001	0.0147
Obs	7795	7503	7787	8797

Table 7.31 shows clear evidence that firms which are extremely over-valued (in the 4th quartile) are likely to issue equity. The full description in Appendix 5 (Table A.5.38), however, indicates little supporting evidence of the relationship between debt ratio change and stock return.

Table 7.32 Capital structure adjustment speed comparison based on stock return

The table shows that a firm's 'capital structure adjustment speed' increases as stock returns increase. Note, BDR: book-based debt ratio, MDR: market-based debt ratio. The coefficient values of 'capital structure adjustment speeds' in Panels A and B are (1-λ). Thus, the adjustment speed λ is (1-coefficient). In calculating Panels A and B, we use all 7 capital structure determinants, though we do not report these coefficients here. BDR_{t-1} and MDR_{t-1} are used as instruments for Panels A and B, respectively. Panels A and B use System GMM and use options of small, robust and twosteps for options of xtabond2, the suboptions of eq(level) lag(1 2) collapsed for gmm-style and of eq(level) for iv-style. The values in the square brackets are the significant levels of J statistic (Hansen p-value); C test value suggests the endogenous variables. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	Panel A: BDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0356 (3.75)***	.0102 (2.01)**	.0011 (0.17)	.0007 (0.10)
BDR_{t-1}	.8186 (10.99)***	.8459 (15.65)***	.6411 (7.51)***	.7922 (16.48)***
AR(1)	-3.03***	-5.92***	-4.40***	-3.06***
AR(2)	-0.74	-0.05	-0.15	1.21
Hansen [P-value]	0.09 [0.762]	5.17 [0.023]	0.29 [0.591]	2.77 [0.096]
Inst	L1, L2	L1, L2	L1, L2	L1, L2
Inst No	10	10	10	10
Obs	4868	4917	4856	5447
	Panel B: MDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0362 (5.22)***	.0124 (2.62)***	.0094 (1.79)*	-.0066 (-1.31)
MDR_{t-1}	.9585 (16.55)***	.8630 (19.75)***	.7137 (16.15)***	.6354 (16.55)***
AR(1)	-3.85***	-6.38***	-6.26***	-4.83***
AR(2)	4.77***	1.64	0.70	3.86***
Hansen [P-value]	2.02 [0.155]	2.69 [0.101]	2.16 [0.141]	0.30 [0.584]
Inst	L1, L2	L1, L2	L1, L2	L1, L2
Inst No	10	10	10	10
Obs	4819	4898	4850	5419

Table 7.32 shows that in general, a firm's 'capital structure adjustment speed' increases as stock returns increase. The speed increases more noticeably with 'market-based debt ratios.' This implies that the market timing theory is related to 'financing (transaction) costs': or stock price changes itself mainly affect the market based debt ratio. These results also suggest the feasibility of the pecking order theory argument.

7.7.1 Conclusion with regard to debt ratio and firms' stock returns

This section is closely related to the theories that are based on asymmetric information, such as the pecking order and the market timing theories. Tables 7.29 and 7.30 indicate that firms issue more equity as well as more debt as stock prices increase. This is consistent with Bolton and Freixas (2000) who assert that firms can issue debt if they can issue equity because asymmetric information costs on debt are lower than those on equity. The capital structure adjustment speed increases with increasing stock returns as is shown in Table 7.32. This section offers clear evidence that the stock price is closely related to equity issue, and hence the pecking order and the market timing theories.

7.8 Growth opportunities

Several measures are used for a firm's growing capability, such as stock prices, Tobin's' Q, market-to-book ratio, growth of assets (see Section 1.2.3 in Appendix 1 in which full details of growth measures are described). In this section, we use capital expenditure and Research and Development (R&D) expenses.

According to Frank and Goyal (2003), a high growth level can lead to adverse selection problems, because high growing firms have high asymmetric information; and they should issue debt as in the pecking order theory. The results in this thesis do not show clear evidence of this. From the statistical description in Table 7.33, we can observe that the debt ratio gradually increases as capital expenditure increases, but decreases as R&D expenses increase. Asset tangibility (Tang) shows a significant relationship between capital expenditure and R&D expenses in the table. Asset tangibility increases as capital expenditure increases, while it decreases as R&D expenses increase. This might be because, capital expenditures are based on physical investments which are tangible assets, but R&D expenses are based on intangible assets (see Section 5.7.1.2.4 in which asset tangibility is mentioned). Therefore, R&D expenses and capital expenditure are related, not only to growth, but to asset tangibility and probably to collateral values, bankruptcy costs and asymmetric information cost.

In Table 7.33, firm size and profitability have positive relationships with capital expenditure, but not R&D expenses; and earnings volatility (Vol) has a negative relationship with capital expenditure, but a positive relationship with R&D expenses. Both capital and R&D expenditure are positively related to a firm's market value (M/B). The cash holding figure is consistent with Opler et al. (1999), in that R&D expense (capital expenditure) is positively (negatively) associated with increasing cash holding. This reminds us that in the complex pecking order theory, firms increase debt capability for future investments. Low debt levels and high cash holdings with high investment opportunities, support the complex pecking order theory. Therefore, Table 7.33 indicates that R&D expenditure follows the pecking order theory, but capital expenditure is more closely linked to trade-off theory.

Table 7.33 Descriptive characteristics with growth opportunities

The univariate comparison of the means and medians of measures of a firm's characteristics is based on capital expenditure and R&D expenses between 1989 and 2008.
Note, median values are in square brackets. The criteria of capital expenditure and R&D expenses are as follows: 1Q<0.011, 0.011≤ 2Q<0.031, 0.031≤3Q<0.07, 0.07≤4Q in capital expenditure to asset; 1Q<0.0017, 0.0017≤2Q<0.018, 0.018≤3Q<0.092, 0.092≤4Q in R&D to asset. All variables are defined in Section 5.3.

	Capital expenditure/asset$_t$				R&D/asset$_t$			
	1st Q	2nd Q	3rd Q	4th Q	1st Q	2nd Q	3rd Q	4th Q
Capex	.0045 [.0041]	.0201 [.0196]	.0477 [.0464]	.1535 [.1181]	.0562 [.0298]	.053 [.0308]	.0581 [.0344]	.0517 [.0292]
R&D	.0817 [.0121]	.083 [.0276]	.072 [.0207]	.0688 [.0187]	.0002 [0]	.0077 [.0066]	.04811 [.0445]	.2463 [.174]
BDR	.2150 [.121]	.2009 [.1275]	.2264 [.181]	.2513 [.2122]	.2768 [.2332]	.2319 [.2054]	.1604 [.0971]	.1304 [.0222]
MDR	.1602 [.0855]	.1565 [.0873]	.1727 [.1261]	.1763 [.1295]	.2064 [.1634]	.1962 [.1639]	.1155 [.0572]	.0589 [.007]
Netcash	1.039 [.2061]	.6964 [.1977]	.5079 [.1549]	.4396 [.1342]	.3839 [.1099]	.3006 [.1448]	.7309 [.2711]	1.54 [.627]
Tang	.1323 [.0566]	.1875 [.1163]	.2684 [.2313]	.3726 [.3607]	.2721 [.2157]	.2863 [.2721]	.1968 [.1478]	.1353 [.0949]
M/B	1.7341 [1.152]	1.771 [1.276]	1.8447 [1.319]	2.0521 [1.478]	1.686 [1.219]	1.41 [1.123]	2.0309 [1.485]	2.853 [2.264]
Profit	-.1238 [.0161]	-.0302 [.0377]	.0041 [.0489]	.0095 [.0606]	-.0189 [.0503]	.04442 [.0478]	.026 [.0527]	-.2081 [-.063]
Vol	.1048 [.0458]	.0843 [.0415]	.0714 [.0339]	.0764 [.0380]	.0728 [.0301]	.0414 [.0217]	.0829 [.0505]	.1674 [.1148]
Lnasset	4.0022 [4.177]	5.012 [4.959]	5.6329 [5.539]	5.5407 [5.461]	5.0929 [5.469]	6.0108 [5.841]	5.2518 [4.888]	3.9107 [3.802]
Obs	11285	11384	11294	11329	7004	7097	7028	7035

Table 7.34 shows that equity issue increases as capital expenditure increases and decreases as R&D expenses increase. Panel A indicates that capital expenditure increases with increasing newly retained earnings and increasing residual leverage, which includes the growth resulting from combining equity, debt and retained earnings together. This implies that while capital expenditure increases, firms use more external financing sources. Panel B, which examines R&D expenses, reveals the opposite phenomenon, that firms use fewer external financing sources while R&D expenses increase.

Table 7.34 Debt ratio changes based on growth opportunities, using the Baker and Wurgler model (2002)

The table shows that equity issue increases as capital expenditure increases and decreases as R&D expense increases.
Note, ΔBDR: book-based debt ratio change, A: total asset, RE: retained earnings, e: equity, -(e/A): equity issue, -(RE/A): increased retained earnings, $-(E_{t-1}(1/A_t-1/A_{t-1})$: the residual change in leverage.
*** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	ΔBDR_t			
	Panel A: Capital expenditure / asset			
OLS	1st Q	2nd Q	3rd Q	4th Q
Cons	-.0034 (-1.65)*	-.0064 (-4.66)***	-.0044 (-3.36)***	.0047 (2.98)***
$-\left(\frac{e}{A}\right)_t$	.1746 (15.46)***	.1953 (21.76)***	.2396 (26.03)***	.2939 (33.91)***
$-\left(\frac{\Delta RE}{A}\right)_t$	.1085 (25.74)***	.1389 (31.68)***	.1612 (31.74)***	.1847 (32.22)***
$-\left[E_{t-1}\left(\frac{1}{A_t}-\frac{1}{A_{t-1}}\right)\right]$	.0952 (14.69)***	.1265 (19.85)***	.1844 (24.80)***	.2182 (29.94)***
Obs	6634	7986	8128	7837
Adj-R^2	0.0972	0.1232	0.1418	0.1981
	Panel B: R&D / asset			
OLS	1st Q	2nd Q	3rd Q	4th Q
Cons	-.0014 (-0.64)	-.0061 (-3.94)***	-.0029 (-1.68)*	-.0023 (-1.00)
$-\left(\frac{e}{A}\right)_t$	.2972 (16.73)***	.3808 (23.41)***	.2328 (23.23)***	.1651 (18.27)***
$-\left(\frac{\Delta RE}{A}\right)_t$	.1359 (21.22)***	.1387 (16.93)***	.1333 (21.78)***	.1218 (25.02)***
$-\left[E_{t-1}\left(\frac{1}{A_t}-\frac{1}{A_{t-1}}\right)\right]$	.1566 (16.55)***	.199 (18.78)***	.1662 (20.76)***	.1113 (15.61)***
Obs	4737	4060	4700	5269
Adj-R^2	0.1276	0.1673	0.1571	0.1189

This indicates the clear differences between capital expenditure and R&D expenses, whilst both variables are used as a firm's future growth indicators. This table also implies that these phenomena might be related to both bankruptcy probability and asymmetric information, because these two variables are closely related to the new investment.

Table 7.35 shows that the stock price effect on debt ratio increases as capital expenditure and R&D expense increase. This implies that stock prices increase with capital expenditure and R&D expense increases.

Table 7.35 Debt ratio changes and stock price effects with the growth factors of firms

The table indicates that 'stock prices effect ($IDR_{t,t+1}$)' on debt ratios increase as capital expenditure and R&D expense increases. MDR: market-based debt ratio, IDR: implied debt ratio, $IDR_{t-1,t} \equiv D_{t-1}/(E_{t-1}(1+\text{stock return}_{t-1,t})+D_{t-1})$, D: total debt, E: total equity. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

OLS	MDR_t			
	Panel A: Capital expenditure /asset			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0147 (11.59)***	.0109 (11.07)***	.0154 (15.25)***	.0277 (22.82)***
MDR_{t-1}	.5662 (53.84)***	.5757 (59.32)***	.5575 (56.75)***	.4469 (38.02)***
$IDR_{t,t+1}$	.2043 (30.73)***	.2357 (36.32)***	.2611 (38.69)***	.3653 (44.08)***
Adj-R^2	0.7401	0.8269	0.8295	0.7741
Obs	9942	10117	9955	9132
	Panel B: R&D expense / asset			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.023 (12.51)***	.0186 (12.51)***	.0178 (14.94)***	.0123 (12.57)***
MDR_{t-1}	.5918 (44.87)***	.6479 (53.61)***	.3568 (23.52)***	.2791 (16.87)***
$IDR_{t,t+1}$	.2139 (24.78)***	.1807 (22.03)***	.3639 (36.90)***	.3747 (37.19)***
Adj-R^2	0.7602	0.8007	0.76	0.64
Obs	5696	6246	5782	5694

Table 7.36 indicates that 'book-based debt ratios' capital structure adjustment speeds' increase with increasing capital expenditure, whereas there is no significant difference with R&D expenses changes.

Table 7.36 Capital structure adjustment speed comparison with firm growth factors

The table indicates that 'book-based debt ratio's capital structure adjustment speeds' increase with increasing capital expenditure, whereas there is no significant difference with the R&D expense changes.
Note, BDR: book-based debt ratio. The coefficient values are (1-λ). Thus, the adjustment speed λ is (1-coefficient). In calculating Panels C and D, we use all 7 capital structure determinants, though we do not report these coefficients here. BDR_{t-1} is instrumented for Panels A and B. The values in the square brackets are the significant levels of J statistic (Hansen p-value); C test value suggests the endogenous variables. The options for xtabond2 are twosteps small robust and suboptions for gmm-style are eq(level) lag(1 2) and collapsed and for iv-style is eq(level) for Panels C and D. All variables are defined in Section 5.3. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

System GMM	BDR_t			
	Panel A: Capital Expenditure/ Asset			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0111 (1.16)	.0031 (0.42)	.0049 (0.84)	.0548 (4.72)***
BDR_{t-1}	8896 (11.95)***	.7549 (12.25)***	.7912 (15.53)***	.6121 (8.46)***
AR(1)	-3.66***	-4.26***	-6.15***	-5.02***
AR(2)	0.96	1.07	0.56	1.33
Hansen [P-value]	0.85 [0.357]	1.08 [0.299]	0.35 [0.555]	0.15 [0.702]
Inst	L1, L2	L1, L2	L1, L2	L1, L2
Inst No	10	10	10	10
Obs	4814	5790	5419	4429
	Panel B: R&D expense/ Asset			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0278 (2.02)**	.0102 (1.42)	.0107 (1.60)	.0048 (0.53)
BDR_{t-1}	.7361 (9.50)***	.7939 (14.70)***	.7957 (12.88)***	.7527 (10.10)***
AR(1)	-4.95***	-6.83***	-5.55***	-5.66***
AR(2)	0.71	-0.02	-0.30	1.20
Hansen [P-value]	0.96 [0.328]	0.46 [0.496]	0.05 [0.825]	0.86 [0.354]
Inst	L1, L2	L1, L2	L1, L2	L1, L2
Inst No	10	10	10	10
Obs	4608	5169	5219	4949

7.8.1 Conclusion with regard to debt ratio and firms' growth opportunities

Our results show that capital expenditure is positively and R&D expense is negatively associated with debt ratios. Although we consider that both capital expenditure and R&D expense are proxies of a firm's growth opportunities, these two parameters indicate opposite associations with the debt ratio as they increase. We observe that these two proxies of a firm's growth opportunity are positively associated with stock prices as firms' growth opportunities increase. These two proxies of growth opportunity are related to both the trade-off theory and the pecking order theory. For example, capital expenditure is the amount of money spent on tangible assets. Therefore, firms' expenses with regard to capital expenditure have less asymmetric information problems and greater liquidation value when they go bankrupt. On the other hand, R&D expense has more asymmetric information problems and less liquidation value. This implies that the characteristics of these two proxies are related to both the trade-off theory and the pecking order theory and our results in these two growth opportunity situations support both theories. This is because, in terms of debt ratio with growth opportunity, both proxies relate to the trade-off theory. However, at the same time, both proxies are positively associated with stock price.

7.9 Profitability

The results from the previous chapter show that debt ratios indicate a negative relationship with profitability. As we discussed earlier, this is important evidence which supports the (complex) pecking order theory (French and Fama, 2002).

In Table 7.37, profitability is positively associated with a firm's size, stock return (SR) and asset tangibility, and is negatively associated with debt ratio, bankruptcy probability, cash holding and earnings volatility. This mainly implies that profitability is closely related to financial stability. It also implies that profitability and stock returns might be closely associated[16]. In fact, 28% of observations which are in the 4th quartile of profitability are in the 4th quartile of stock return at the same time. This might be explained as being that highly profitable firms issue equity at extremely overvalued prices, or that together, the high profits and stock prices reduce the leverage level.

[16] The number of observation, based on total assets, which are in both the fourth quartile of profitability and the fourth quartile of stock return is 3,639 that is about 28% of observations in the fourth quartile of profit and 32% of observation in the fourth quartile of stock return. The sum of two variables in the fourth quartile is 29,090.

Table 7.37 Descriptive characteristics with profitability

The univariate comparison of means and medians of measures of firms' characteristics is based on profitability between 1989 and 2008. The median values are in square brackets.
Note, the criterion of segregation of profitability into quartiles is as follows: 1st Q <= -0.022, -0.022 < 2nd Q <= 0.04, 0.04 < 3rd Q <= 0.093, and 4th Q > 0.093. All variables are defined in Section 5.3.

	Profit / asset			
	1st Q	2nd Q	3rd Q	4th Q
Profit	-.4004 [-.1993]	.0164 [.0188]	.0639 [.0628]	.1755 [.1427]
BDR	.2157 [.891]	.2749 [0.2522]	.2457 [0.2213]	.1613 [.0941]
MDR	.126 [.044]	.2464 [.2252]	.1983 [.1685]	.0963 [.0441]
SR	-0.403 [-0.2613]	-0.1153 [-0.0599]	-0.0417 [0.00]	0.052 [0.0929]
Netcash	1.595 [.333]	0.3185 [.1337]	0.2751 [.1372]	.5044 [.221]
Tang	.1781 [.0968]	.2858 [.246]	.2803 [.248]	.2286 [.17]
Capex	.0487 [.0202]	.0497 [.0274]	.0572 [.0358]	.0706 [.0446]
R&D	.1637 [.0942]	.0336 [.0067]	.0311 [.0085]	.0524 [.0208]
MB	2.3242 [1.561]	1.2601 [1.0537]	1.4156 [1.2085]	2.42 [1.9126]
Vol	.1788 [.1263]	.0435 [.0213]	.0399 [.0217]	.0663 [.0394]
Lnasset	3.2577 [3.225]	5.8313 [5.7208]	5.9258 [5.7842]	5.2245 [5.0482]
Bp	2.178 [3.00]	1.9845 [2.00]	1.6534 [1.00]	1.2464 [1.00]
Obs	13034	12976	13079	13046

Table 7.38 shows that equity issue increases one and half times and the residual leverage changes and newly retained earnings likewise increase from 1st to 4th quartile firms. This might imply that firms use more external financing sources as their profits increase. This is consistent with the pecking order theory because as firms increase their profits, their issuing costs would decrease due to higher profits and lower bankruptcy probability. Therefore they can use more external finance. This is consistent with Bolton and Frexas' (2000) idea that firms can issue debt if they can issue equity. From the next table, we can also observe debt issue increasing with increasing profits, but there is no clear evidence of increasing equity issues.

Table 7.38 Debt ratio changes based on profitability, using the Baker and Wurgler model (2002)

The table imply that firms use more external financing sources as their profits increase.
Note, BDR: book-based debt ratio, A: total asset, RE: retained earnings, e: equity, -(e/A): equity issue, -(RE/A): increased retained earnings, $-(E_{t-1}(1/A_t-1/A_{t-1})$: the residual change in leverage. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	Panel A: ΔBDR_t			
OLS	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0184 (6.81)***	.0004 (0.34)	-.0084 (-8.05)***	-.0188 (-14.90)***
$-\left(\frac{e}{A}\right)_t$	.2041 (24.29)***	.2551 (17.84)***	.4153 (35.87)***	.3389 (33.43)***
$-\left(\frac{\Delta RE}{A}\right)_t$	.1086 (26.87)***	.1922 (21.68)	.2407 (28.93)***	.1952 (28.46)***
$-\left[E_{t-1}\left(\frac{1}{A_t}-\frac{1}{A_{t-1}}\right)\right]$	.1155 (19.93)***	.2112 (23.38)***	.3865 (44.96)***	.2823 (35.90)***
Adj-R^2	0.1168	0.1222	0.2779	0.2123
Obs	8197	6672	7426	8653

From Table 7.39, Panels A shows that 'net long-term debt issuance' increases while profits increase. There is not a clear sign of change in equity issue with the exception of the first quartile. Panel B indicates that the net equity issue reaches its peak in the first quartile of profitability in which the average of profits is -0.4, with this being the only negative profit area among the four quartiles. Therefore, Panels A and B together support the trade-off theory.

Table 7.39 Debt ratio changes and financial deficits (DEF1), based on profitability

The table supports the trade-off theory because firms use more debt as profits increase and use equity when their profits are negative.

Note, Net equity issuance/asset =(sale stock-repurchase stock)/total asset, Net long-term debt issuance/asset=('long-term debt issue'-'long-term debt retirement')/total asset, $DEF1=DIV_t+I_t+\Delta WC_t-C_t$, DEF1: financial deficit defined by Frank and Goyal (2003), DIV: dividend, I: investment (capital expenditure), WC: working capital, C: cash-flow after interest and taxes (=internal cash-flow or net income+depreciation). All items are scaled by total asset. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	Panel A: Net long-term debt issuance$_t$/ asset$_t$			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0055 (3.82)***	.0054 (4.95)***	.0081 (7.98)***	.00003 (0.03)
DEF1$_t$	.0199 (9.46)***	.0455 (9.24)***	.0579 (11.52)***	.0406 (10.89)***
Adj-R^2	0.0105	0.0140	0.0176	0.0137
Obs	8299	5942	7374	8393
	Panel B: Net equity issuance$_t$/ asset$_t$			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0746 (24.74)***	.0129 (10.24)***	.0092 (8.86)***	.0012 (1.05)
DEF1$_t$	.2555 (50.46)***	.1421 (25.16)***	.1465 (28.50)***	.1564 (33.09)***
Adj-R^2	0.2392	0.969	0.0998	0.1145
Obs	8098	5896	7317	8467

Both Panels A and B in Table 7.40, using OLS and Sys-GMM respectively, shows a gradual increase of 'capital structure adjustment speed,' as profits increase. One interesting factor is that firms in the first quartile have a relatively high 'capital structure adjustment speed' compared to the second quartile. This is probably the same reason why firms in the first quartile issue equity more in Panel B in Table 7.39. They are close to bankruptcy unless they change leverage levels quickly. In addition, low issuing costs with high profitability may lead to a high adjustment speed in the third and fourth quartiles.

Table 7.40 Capital structure adjustment speed comparison based on profitability

The table shows high 'capital structure adjustment speed' in the first and fourth quartiles. This implies that both transaction and bankruptcy costs work together to change firms' capital structures.
Note, BDR: book-based debt ratio. The coefficient values are (1-λ) in Panel B. Thus, the adjustment speed λ is (1-coefficient). In calculating, we use all 7 capital structure determinants though we do not report these coefficients here. BDR_{t-1} is instrumented. xtabond2 command uses options of small robust twosteps, and sub-options of eq(level) lag(1 2) collapsed for gmm-style and of eq(level) for iv-style. The values in the square brackets are the significant levels of J statistic (Hansen p-value); C test value suggests the endogenous variables. All variables are defined in Section 5.3. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level.

OLS	Panel A: ΔBDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0299 (11.32)***	.0116 (8.70)***	.0071 (5.35)***	-.0036 (-2.61)***
$Speed1_t$	.1753 (15.87)***	.1052 (16.06)***	.1397 (20.64)***	.1728 (25.24)***
Adj-R^2	0.0513	0.0522	0.0795	0.1212
Obs	4658	4669	4923	4615
Sys-GMM	Panel B: BDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0275 (2.92)***	.0004 (0.07)	.0101 (1.35)	-.0081 (-1.02)
BDR_{t-1}	.7919 (11.17)***	.8520 (18.87)***	.7287 (15.06)***	.7298 (13.33)***
AR(1)	-4.29***	-6.53***	-4.44***	-5.75***
AR(2)	0.16	0.21	0.15	0.25
Hansen [P-value]	1.14 [0.286]	0.22 [0.642]	1.21 [0.270]	0.00 [0.969]
Inst	L1, L2	L1, L2	L1, L2	L1, L2
Inst No	10	10	10	10
Obs	5190	4802	5070	5430

7.9.1 Conclusion with regard to debt ratio and firms' profitability

In this section, there is no clear evidence of dominant capital structure theory, which is mainly explained by a change in a firm's profit. Descriptive statistics indicate a negative association between both book- and market-based debt ratios and increasing profits. This is related to two ideas. On the one hand, profits reduce debt ratio by increasing a firm's total assets by adding cash generated from the firm's operations (Hovakimian et al., 2004). On the other hand, high profits lead to high stock prices, which lead to stock issue. The first idea relates to the pecking order theory, and the second idea relates to the market timing theory. According to the argument put forward by Bolton and Freixas (2000), this follows both the pecking order theory and the market timing theory. Table 7.39 also shows that firms' behaviours in using external financing sources follow both the pecking order theory and the trade-off theory. For example, inconsistent with Table 7.38, financial deficits are positively associated with long-term debt issue as profit increases. This supports the trade-off theory in that less risky firms use more debt to obtain tax benefits. The net equity issue variable likewise indicates that firms which are in the first quartile mostly issue equity. This also supports the trade-off theory. On the other hand, firms in the fourth quartile (i.e. those subject to high profits) are the second most likely to issue equity and more than the second and third quartiles. This is closely related to the market timing theory because there is high level of probability of over-valued stock prices. Therefore, we can argue that firms' debt ratio changing behaviours based on firms' profitability, support all three major capital structure theories.

7.10 Asset tangibility

The descriptive statistics in Table 7.41 show that both book- and market-based debt ratios increase with increasing asset tangibility. Tax, profits, firm size and capital expenditure show a positive relationship with asset tangibility; and R&D expenses, market-to-book ratios, net cash and earnings volatility are negatively associated. The relationship between these items and asset tangibility are similar to the relationship between debt ratio and these items. This implies that there is a strong correlation between asset tangibility and debt ratios.

Table 7.41 Descriptive characteristics with asset tangibility

The univariate comparison of means and medians of measures of firms' characteristics is based on asset tangibility levels between 1989 and 2008.
Note, median values are in square brackets. The criterion of segregation of asset tangibility into quartiles is as follows: The value of 1st Q<0.063, 0.063≤2nd Q <0.183, 0.183≤3rd Q < 0.376, 0.376 ≤4th Q in asset tangibility. All variables are defined in Section 5.3.

	Asset tangibility			
	1st Q	2nd Q	3rd Q	4th Q
Tang	.0283 [.0274]	.1168 [.1134]	.2741 [.2716]	.5508 [.5245]
BDR	.1491 [.0299]	.1878 [.1009]	.2301 [.1933]	.3418 [.3214]
MDR	.0939 [.015]	.1213 [.0581]	.1767 [.1381]	.2725 [.2545]
Netcash	1.6324 [.3875]	.6602 [.2734]	.2807 [.1654]	.1307 [.0884]
Tax	.2585 [.1704]	.3263 [.3]	.3788 [.3549]	.3622 [.3333]
Capex	.0236 [.0109]	.0435 [.0275]	.0631 [.0441]	.0972 [.0669]
R&D	.0994 [.0504]	.1039 [.0445]	.0575 [.0128]	.0291 [.0053]
MB	2.2704 [1.5929]	2.0505 [1.447]	1.644 [1.2334]	1.442 [1.175]
Profit	-.943 [.0231]	-.0546 [.0385]	.0003 [.0478]	.0115 [.0434]
Vol	.1341 [.0781]	.0929 [.0469]	.0561 [.0266]	.0448 [.0239]
Lnasset	3.769 [3.759]	4.817 [4.853]	5.432 [5.377]	5.8627 [5.8549]
Obs	13122	13143	13163	13124

Table 7.42 shows a very similar pattern to Table 7.38, in terms of the relationship between debt ratio changes and firms' profits. As asset tangibility increases, all three elements of leverage level change increase. The same explanation used with Table

7.38 can be applied, because asset tangibility is closely related to profits, bankruptcy costs as well as asymmetric information costs. However, Tables 7.43 and 7.44 indicate increasing debt issue and decreasing equity issue as asset tangibility increases. Thus, the matter is still open for debate.

Table 7.42 Debt ratio changes based on asset tangibility, using the Baker and Wurgler model (2002)

The table shows that as tangibility increases, all three elements of leverage level change increase. Note, ΔBDR: book-based debt ratio change, A: total asset, RE: retained earnings, e: equity, -(e/A): equity issue, -(RE/A): increased retained earnings, $-(E_{t-1}(1/A_t-1/A_{t-1})$: the residual change in leverage. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	Panel A: ΔBDR_t			
OLS	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0014 (0.70)	-.0045 (-3.03)***	-.0022 (-1.67)*	.0008 (0.60)
$-\left(\frac{e}{A}\right)_t$	.1661 (20.32)***	.2444 (28.52)***	.3139 (28.29)***	.3774 (27.19)***
$-\left(\frac{\Delta RE}{A}\right)_t$	.0875 (20.52)***	.1563 (38.15)***	.1821 (36.56)***	.2464 (39.66)***
$-\left[E_{t-1}\left(\frac{1}{A_t}-\frac{1}{A_{t-1}}\right)\right]$	.1285 (22.03)***	.1576 (25.84)***	.2030 (25.90)***	.2169 (22.68)***
Adj-R^2	0.0945	0.1767	0.1757	0.1952
Obs	7888	8045	7358	7530

From Panel A in Table 7.43, we can see that the debt ratio is becoming more positively associated with new investments (I_t) as asset tangibility increases. It is more negatively associated with working capital (WC_t). From Panel B, net long-term debt issuance is becoming more associated with new investments (I_t) as asset tangibility increases, and Panel C shows that the association between equity issuance and new investment is becoming less. Panel C also shows that working capital and internal cash (C_t) is becoming gradually less associated with net equity issue. The coefficients of working capital in Panel C indicate the improvement in the financial efficiency of firms as asset tangibility increases. This also implies that as a firm's asset tangibility increases, it has a more secure financial position. Together Tables 7.41, 7.42, 7.43 and 7.44 indicate that firms increase debt as well as equity as their asset tangibility increases. However, the debt increase is greater than the equity increase. Therefore, these findings support both the pecking order theory and the trade-off theory.

Table 7.43 Debt ratio changes and financial deficit components, based on asset tangibility

The table shows that firms use more debt as their asset tangibility increases.
Note, ΔBDR: book-based debt ratio change, Net equity issuance/asset =(sale stock-repurchase stock)/total asset, Net long-term debt issuance/asset=('long-term debt issue'-'long-term debt retirement')/total asset, DEF1=$DIV_t+I_t+\Delta WC_t-C_t$, DEF1: financial deficit defined by Frank and Goyal (2003), DIV: dividend, I: investment (capital expenditure), WC: working capital, C: cash-flow after interest and taxes (=internal cash-flow or net income+depreciation). All items are scaled by total asset. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	Panel A: ΔBDR_t			
OLS	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0014 (0.69)	-.0054 (-2.90)***	-.0094 (-5.62)***	-.0158 (-9.15)***
DIV_t	.0198 (1.78)*	.0164 (1.98)**	.0127 (2.04)**	.0167 (2.2)**
I_t	-.0994 (-2.72)***	.0253 (1.01)	.1288 (7.71)***	.1649 (13.84)***
ΔWC_t	-.1293 (-21.33)***	-.1718 (-27.38)***	-.1696 (-24.50)***	-.1936 (-23.72)***
C_t	-.0054 (-1.24)	-.0172 (-4.53)***	-.0224 (-5.35)***	-.0799 (-15.56)***
Adj-R^2	0.0568	0.0975	0.0858	0.1283
Obs	9674	9785	9299	9202
	Panel B: Net long-term debt $issue_t$ / $asset_t$			
OLS	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0057 (4.57)***	-.0012 (-0.88)	-.0098 (-6.97)***	-.0229 (-14.94)***
DIV_t	.0136 (1.53)	.0049 (0.66)	-.0004 (-0.06)	.0012 (0.15)
I_t	.0594 (2.58)**	.1532 (7.93)***	.2571 (18.95)***	.3449 (33.06)***
ΔWC_t	.0097 (2.78)***	.0124 (2.67)***	-.0051 (-0.92)	.02 (2.97)***
C_t	-.0167 (-6.91)***	-.0153 (-5.64)***	-.0202 (-6.27)***	-.054 (-12.5)***
Adj-R^2	0.0072	0.0128	0.0537	0.1406
Obs	7709	7996	7060	7181
	Panel C: Net equity $issue_t$ / $asset_t$			
OLS	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0548 (20.23)***	.0136 (6.03)***	.0092 (5.01)***	.0123 (8.16)***
DIV_t	-.0632 (-3.31)***	-.0319 (-2.65)***	.0011 (0.13)	-.0074 (-0.96)
I_t	.6312 (12.01)***	.7575 (23.96)**	.316 (17.67)***	.179 (17.28)***
ΔWC_t	.3464 (43.9)***	.3095 (39.16)***	.2351 (32.05)***	.1331 (19.43)***
C_t	-.2658 (-45.63)	-.2688 (-54.23)***	-.2401 (-51.92)***	-.1943 (-41.39)***
Adj-R^2	0.3121	0.3455	0.3023	0.2102
Obs	7638	7873	7009	7179

Table 7.44 Debt ratio changes and financial deficits (DEF1), based on asset tangibility

The table shows that firms use more debt for financial deficits as their asset tangibility increases. Note, $DEF1=DIV_t+I_t+\Delta WC_t-C_t$, ΔBDR: book-based debt ratio change, DEF1: financial deficit defined by Frank and Goyal (2003), DIV: dividend, I: investment (capital expenditure), WC: working capital, C: cash-flow after interest and taxes (=internal cash-flow or net income+depreciation). All items are scaled by total asset. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	ΔBDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0023 (1.19)	-.0007 (-0.47)	-.0009 (-0.76)	-.0045 (-3.37)***
$DEF1_t$	-.0349 (-9.06)***	-.0136 (-3.80)***	-.0011 (-0.31)	.0336 (7.53)***
Adj-R^2	0.0083	0.0014	0.00	0.006
Obs	9674	9785	9299	9202

The 'financial deficit' (DEF1) in Table 7.44 tells us the same story, in that firms use more debt with increasing asset tangibility, particularly those in the fourth quartile, which noticeably use more debt. The 'book-based debt ratio's capital structure adjustment speed' decreases while asset tangibility increases (in Table 7.45) with the exception of firms in the 4th quartile. On the other hand, the market-based adjustment speed has not changed much with asset tangibility differences. The results with OLS show a similar conclusion in Appendix 5, Table A.5.60.

Table 7.45 Capital structure adjustment speed comparison based on asset tangibility

The table shows that 'book-based debt ratio's capital structure adjustment speed' decreases while asset tangibility increases.
Note, BDR: book-based debt ratio. The coefficient values are (1-λ). Thus, the adjustment speed λ is (1-coefficient). We use all 7 capital structure determinants, though we do not report those coefficients here. BDR_{t-1} is used as instruments in Panels C and D. xtabond2 command uses options of twosteps robust and small and sub-options of eq(level) lag(1 2) collapsed for gmm-style and of eq(level) for iv-style. The values in the square brackets are the significant levels of J statistic (Hansen p-value); C test value suggests the endogenous variables. All variables are defined in Section 5.3. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	Panel A: BDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0228 (2.38)**	.0347 (4.00)***	.0246 (2.23)**	.0363 (2.51)**
BDR_{t-1}	.7064 (9.80)***	.8127 (12.95)***	.8659 (14.26)***	.7766 (11.79)***
AR(1)	-5.41***	-6.72***	-3.00***	-3.86***
AR(2)	-1.22	1.69*	1.79*	-0.44
Hansen [P-value]	1.22 [0.269]	0.35 [0.555]	0.00 [0.947]	0.04 [0.842]
Inst	L1, L2	L1, L2	L1, L2	L1, L2
Inst No	10	10	10	10
Obs	4812	5763	5539	4406

7.10.1 Conclusion with regard to debt ratio and firms' asset tangibility

Asset tangibility relates to the trade-off theory because firms with high tangibility have a higher collateral value when they go bankrupt (Frank and Goyal, 2003). However, some researchers (e.g. Alderson and Betker, 1995) do not agree with this view. Tangibility likewise relates to the pecking order theory because tangible assets have low asymmetric information costs (Frank and Goyal, 2009). Therefore, firms with high tangibility can use more debt. In terms of asset tangibility, both theories expect the same behaviour in firms' debt ratio changes. In other words, as highly tangible firms have a low bankruptcy probability due to a high collateral value, and less adverse selection costs due to a low asymmetric information problem, both theories expect the issue of new debt as firms' tangible assets increase. Our results also indicate that the strength of the positive association between debt ratio change and debt issue substantially increases as the asset tangibility of firms increases. In other words, our results support both the trade-off and pecking order theories.

7.11 Country

7.11.1 Inflation

There are many different arguments in the discussion of inflation. For example, Mania (2007) implies that inflation does not affect financial policy, at least in the long-term, because 'monetary neutrality' leads to inflation and does not affect productivity. However, other economists suggest that inflation affects a firm's financial policy. For instance, Frank and Goyal (2009) argue that inflation levels can be considered as a proxy of decreasing the value of investment and, at the same time, high inflation can be a trigger for new debt issuance. Myers (2001) also suggests that high inflation is positively related to tax advantages. On the other hand, Desai et al. (2004) and Huizinga et al. (2008) show that inflation is negatively related to debt ratio. Their arguments might be explained by DeAngelo and Masulis (1980) who aruge that inflation increases a firm's revenue, at least in nominal value, because it increases its incoming cash-flow.

Bierman (1981) argues that the benefits of inflation, using debt, depend on inflation rates, interest rates and 'expected increasing income.' He suggests that borrowers' real return is 'inflation (1+i) divided by nominal interest rates (1+n).' This implies that if the 'nominal interest rate' is greater than inflation, there is no benefit from borrowing. He also mentions that in a perfectly anticipated world, the issuance of debt is not worthwhile as the inflation rate is fully incorporated into the interest rate. With uncertainty surrounding the condition of future events, however, borrowers' real return depends on inflation, the nominal interest rate and a company's expected income (growth). Additionally, Gulati and Zantout (1997) assert that firms frequently adjust their capital structures in order to protect them from the effects (for example, changing the accumulation of cash holding) caused by inflation. Haas and Peeters (2006) also find that higher inflation increases the 'capital structure adjustment speed'.

7.11.2 GDP growth

The GDP growth can be a proxy for the alternative opportunity in aggregate levels. For example, Huang and Ritter (2009) use real GDP growth as a growth opportunity. They assert that firms with high real GDP growth (as a variable of a firm's current growth opportunity) are more likely to issue debt. Drobetz and Wanzenried (2004) find that the 'adjustment speed of capital structure' towards the target ratios will be faster with good economic prospects. Similarly, Haas and Peeters (2006) also find that high GDP growth increases the 'capital structure adjustment speed' in some countries, but not all.

7.11.3 Other country-related factors and debt ratios

Jong et al. (2008) show the relationship between leverage levels and bond capitalisation and GDP growth. They expect that 'bond market capitalisation' is positively related to debt levels because it gives more bond issuing opportunities to firms. They also suggest the reverse of the conclusion of 'stock market capitalisation,' because it gives more cheap-cost-stock-issuing opportunities. In Figure 2.5, 'stock market capitalisation over GDP' indicates that 'stock market capitalisation' has been reducing after it reached a peak in 1999, whereas from Figure 2.6 the overall 'bond market capitalisation' has gradually been increasing over the last twenty years.

In a similar way to Jong et al. (2008), in Panel A in Table 7.46, we regress the debt ratio with only country-related variables. We also include control variables in the second regression in Panel B to mirror more of the real world.

Hypothesis 7.10.a: Inflation is positively associated with the debt level.

Hypothesis 7.10.b: The legal system affects the debt level.

Hypothesis 7.10.c: Bond market capitalisation-to-GDP is positively associated with the debt level.

Hypothesis 7.10.d: Stock market capitalisation-to-GDP is negatively associated with the debt level

Hypothesis 7.10.e: GDP growth is positively associated with the debt level.

$$DR_{i,t} = \beta_1 \, GDP_{i,t} + \beta_2 \, law_{i,t} + \beta_3 \, bond_{i,t} + \beta_4 \, stock_{i,t} + \beta_5 \, inflation_{i,t} + \varepsilon_{i,t} \qquad (7.5)$$

where, GDP: GDP growth, inflation: GDP deflator, law: 0=common law system, 1= civil law system, bond: bond market capitalisation, stock: stock market capitalisation

Since all macro-economic variables are exogenous to debt ratio, OLS is used in Panel A: and in Panel B, the GMM is used for considering endogeneity with the control variables. In Panel B, the coefficients of control variables are not reported, as the major purpose of the table is to observe the effects on debt ratio from macro-economic factors.

Table 7.46 shows that macro-economic factors affect the capital structure significantly. It also shows that firms with common law systems rely more on equity issuance during the given sample period. Inflation is positively related to long-term debt issue, and GDP growth is positively related to equity issuance, generally. This is not entirely consistent with our assumption that GDP growth represents a new investment opportunity at the country level, and should be positively related to debt issue, because firms with new profitable opportunities finance these with debt, so as to have increasing profits and tax benefits.

Table 7.46 Debt ratio and country characteristics

The table shows that macro-economic factors affect capital structure significantly. Panel A uses OLS without including control variables and Panel B uses GMM, including control variables.
Note, BDR: book-based debt ratio, MDR: market-based debt ratio, Net equity issue/asset =(sale stock-repurchase stock)/total asset, Net debt issue/asset=('long-term debt issue'-'long-term debt retirement')/total asset. The coefficients of control variables in Panel B are not reported. The control variables are bp-area, market-to-book ratio, net cash, log(asset), asset tangibility, tax rate, capital expenditure, R&D expenses, profitability, and earnings volatility. All variables are defined in Section 5.3. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level. In Panel B, logasset, asset tangibility, capital expenditure, research and development to asset, profitability, earnings volatility and bankruptcy probability for Coiumn (1), tax rate, market-to-book ratio and earnings volatility for Coiumn (2), earnings volatility for Coiumn (3) and asset tangibility is instrumented for Coiumn (4), respectively.

		Panel A: without control variables			
OLS	Predicted signs for DR	BDR_t	MDR_t	Net LT debt issue/ $asset_t$	Net equity issue/ $asset_t$
Cons		.2669 (31.89)***	.2221 (30.53)***	.0003 (0.07)***	.1049 (12.73)***
Law_t		.0555 (11.89)**	.0848 (20.78)***	.0124 (5.49)***	-.0822 (-20.05)***
$Inflation_t$	+	.2299 (2.20)***	.2088 (2.27)**	.3400 (6.19)***	-.1731 (-1.75)*
$GDP\text{-}growth_t$	+	-.2018 (-2.74)***	-.0002 (-0.00)	.0190 (-0.46)	.4201 (5.61)***
$Bond_t$	+	-.0206 (-8.41)***	-.0176 (-8.17)***	-.0055 (-3.88)***	-.008 (-3.11)***
$Stock_t$	-	-.0639 (-13.89)***	-.0859 (-21.33)***	-.0001 (-0.05)	-.0075 (-1.75)*
Adj-R^2		0.0365	0.0939	0.0100	0.0631
Obj		21357	19627	12077	12039
		Panel B: with control variables			
GMM		BDR_t	MDR_t	Net LT debt issue/ $asset_t$	Net equity issue/ $asset_t$
		(1)	(2)	(3)	(4)
Cons	Predicted signs	-.0509 (-2.70)***	.0136 (0.53)	-.0094 (-1.05)	.0146 (1.12)
Law_t		.0467 (5.97)***	.0584 (8.15)***	.0044 (1.12)	-.0235 (-4.97)***
$Inflation_t$	+	.0678 (0.29)	.8702 (4.16)***	.3864 (4.18)***	-.1235 (-1.36)
$GDP\text{-}growth_t$	+	-.4491 (-2.69)***	.2045 (1.17)	-.0502 (-0.63)	.1574 (3.00)***
$Bond_t$	+	-.0287 (-7.21)***	-.0265 (-7.09)***	.0009 (-0.51)	.0025 (1.26)
$Stock_t$	-	-.0205 (-3.11)***	-.0512 (-7.54)**	-.0049 (-1.53)	-.0111 (-2.79)***
Instruments		L1, L2	L1, L2	L1, L2	L1, L2
J statistic		7.222 [0.4062]	2.237 [0.5247]	0.086 [0.7688]	0.948 [0.3301]
Observation		4747	4241	3768	4177

7.11.4 Capital structures and countries

Table 7.47 shows several differences between countries. European-Continental and Anglo-Saxon economies hold low levels of debt ratios compared to the East Asian economy and also, in general, hold more cash. Generally, firm size is larger and asset tangibility levels are higher for East-Asian firms. The table also shows that firms in the European-Continental economy pay higher taxes compared to others. Firms in the Anglo-Saxon economy have the highest earnings volatility, followed by European-Continental and East-Asian firms respectively. In Table 7.47, descriptive statistics indicate that Asian firms are generally in a more secure place, financially. This might lead to high debt ratios for East-Asian firms.

Table 7.47 Descriptive characteristics of different countries

The univariate comparison of means and medians of measures of firm characteristics is based on countries between 1989 and 2008. Median values are in square brackets.
Note, AUS: Australia, CAN: Canada, UK: Britain, USA: United States of America, AUT: Austria, DEU: Germany, FRA: France, ITA: Italy, JPN: Japan, KOR: Korea, TWN: Taiwan. All variables are defined in Section 5.3.

Country	BDR	MDR	netcash	Lnasset	tax	MB	profit	vol	obs
AUS	0.1676 [0.082]	0.1135 [0.048]	1.0277 [0.142]	3.3016 [2.977]	0.1811 [0.082]	2.0997 [1.524]	-0.1799 [-0.01]	0.1487 [0.083]	2178
CAN	0.2035 [0.129]	0.1409 [0.070]	1.1198 [0.198]	4.1023 [3.99]	0.2348 [0.145]	2.1099 [1.511]	-0.1533 [0.036]	0.1127 [0.057]	1973
UK	0.1177 [0.103]	0.1066 [0.058]	0.7066 [0.161]	4.3724 [4.048]	0.2553 [0.265]	2.1135 [1.554]	-0.0401 [0.057]	0.1068 [0.049]	3405
USA	0.2373 [0.130]	0.1353 [0.062]	1.0916 [0.219]	4.6063 [4.739]	0.2392 [0.161]	2.3949 [1.727]	-0.1167 [0.034]	0.1215 [0.065]	18189
AUT	0.1794 [0.167]	0.1473 [0.129]	0.4543 [0.130]	5.0425 [4.834]	0.2493 [0.183]	1.4164 [1.117]	-0.0278 [0.009]	0.0785 [0.029]	288
DEU	0.1869 [0.131]	0.1453 [0.087]	0.4709 [0.127]	4.5742 [4.151]	0.3676 [0.304]	1.6483 [1.269]	-0.0522 [0.007]	0.1016 [0.059]	2881
FRA	0.2041 [0.164]	0.1542 [0.114]	0.3371 [0.134]	4.9964 [4.597]	0.3119 [0.326]	1.6975 [1.332]	0.0218 [0.045]	0.0647 [0.036]	2766
ITA	0.233 [0.224]	0.1954 [0.165]	0.3169 [0.131]	5.7606 [5.478]	0.4817 [0.373]	1.4499 [1.199]	-0.0108 [0.013]	0.0577 [0.034]	680
JPN	0.2452 [0.215]	0.2117 [0.181]	0.3396 [0.181]	5.879 [5.750]	0.5353 [0.465]	1.353 [1.114]	0.0506 [0.042]	0.0283 [0.016]	13719
KOR	0.2644 [0.252]	0.2691 [0.257]	0.2591 [0.115]	5.4418 [5.216]	0.2699 [0.251]	1.1904 [0.967]	0.0516 [0.054]	0.0541 [0.034]	3027
TWN	0.2104 [0.189]	0.1947 [0.152]	0.3531 [0.177]	4.8865 [4.661]	0.1996 [0.137]	1.5013 [1.180]	0.0530 [0.049]	0.0544 [0.039]	4192

Table 7.48 Debt ratio changes based on different countries, using the Baker and Wurgler model (2002)

The table indicates that firms in all countries rely more upon equity issue than newly retained earnings and residual leverage changes. This implies that firms in all countries have been reducing their debt ratio.

Note, ΔBDR: book-based debt ratio change, A: total asset, RE: retained earnings, e: equity, -(e/A): equity issue, -(RE/A): increased retained earnings, $-(E_{t-1}(1/A_t-1/A_{t-1})$: the residual change in leverage. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level. AUS: Australia, CAN: Canada, UK: Britain, USA: United States of America, AUT: Austria, DEU: Germany, FRA: France, ITA: Italy, JPN: Japan, KOR: Korea, TWN: Taiwan.

	Panel A: ΔBDR										
OLS	AUS	CAN	UK	USA	AUT	DEU	FRA	ITA	JPN	KOR	TWN
	Anglo-Saxon economy				European-Continental economy				East-Asian economy		
Cons	.008 (2.10)**	.0011 (0.31)	.0069 (2.54)**	-.0019 (-1.43)	.0099 (1.12)	.0088 (2.73)***	.0015 (0.66)	.0092 (2.26)**	-.0059 (-6.84)***	-.0063 (-1.83)*	-.0041 (-2.08)**
$-\left(\frac{e}{A}\right)_t$	.1633 (9.74)***	.2019 (11.27)***	.1984 (13.98)***	.2359 (33.69)***	.2933 (4.52)***	.216 (8.20)***	.2705 (9.85)***	.1602 (5.20)***	.4059 (24.77)***	.3927 (11.06)***	.3721 (10.32)***
$-\left(\frac{\Delta RE}{A}\right)_t$	.0730 (9.81)***	.1354 (13.56)***	.1142 (15.86)***	.1519 (43.68)***	.0904 (2.49)**	.0766 (8.91)***	.0884 (7.92)***	.1487 (5.48)***	.3195 (29.80)***	.3051 (14.49)***	.1479 (11.07)***
$-\left[E_{t-1}\left(\frac{1}{A_t}-\frac{1}{A_{t-1}}\right)\right]$	.1003 (8.38)***	.1362 (8.86)***	.1508 (14.18)***	.1566 (32.07)***	.0941 (1.43)	.0785 (5.19)***	.1802 (9.39)***	.1993 (6.83)***	.2842 (24.49)***	.1803 (8.31)***	.1479 (10.96)***
Adj-R^2	0.0811	0.1445	0.1216	0.1423	0.1278	0.1044	0.1101	0.1333	0.2155	0.2327	0.1326
Obs	1624	1246	2905	14656	120	1175	1379	454	4666	1099	1701

From Table 7.48, we can observe that firms in all countries rely more upon equity issue than upon newly retained earnings and residual leverage changes. This implies that firms in all countries have been reducing their debt ratio. It also shows that there are differences between East-Asian and Western economies. Firms in the East-Asian economy issue more equity than Western firms during the sample time period. This is consistent with Figures 5.1 and 5.2. In fact, as Table 7.51 also indicates, firms in the East-Asian economy change their debt levels more rapidly.

In Table 7.49, firms in the East Asian economy rely more upon debt for new investments (I_t) compared to the Anglo-Saxon and European-Continental economies. Austria and Italy are closer to the East Asian economy, and Germany and France are closer to the Anglo-Saxon economy.

Table 7.50 shows that 'financial deficit' is not positively related to debt ratio changes with the exception of Korea, at least among the countries whose coefficient levels are statistically significant. This also implies that the pecking order theory is not consistent with this result.

Table 7.51 shows various 'capital structure adjustment speeds' across countries. The 'capital structure adjustment speeds' are similar between countries, but the table shows that firms in the European-Continental economy have a slower, and firms in the East Asian economy have a faster rate than the others, while the Anglo-Saxon countries sit between them. Firms in Korea and Taiwan, emerging economies, and Australia and the USA, show fast 'capital structure adjustment speeds.' Our overall conclusion of this section is that capital structure is connected to country characteristics as well as macro-economic trends. This particularly shows that cultural matters such as legal systems affect debt levels, but that the 'global scale of macro-economic trend shift' affects leverage ratios the most.

Table 7.49 Debt ratio changes and financial deficit components, based on different countries

The table shows that firms in the East Asian economy rely more upon debt for new investments (I_t) compared to the firms in the Anglo-Saxon and European-Continental economies.

Note, $DEF1=DIV_t+I_t+\Delta WC_t-C_t$, ΔBDR: book-based debt ratio change, DEF1: financial deficit defined by Frank and Goyal (2003), DIV: dividend, I: investment (capital expenditure), WC: working capital, C: cash-flow after interest and taxes (=internal cash-flow or net income+depreciation). All items are scaled by total asset. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level. AUS: Australia, CAN: Canada, UK: Britain, USA: United State of America, AUT: Austria, DEU: Germany, FRA: France, ITA: Italy, JPN: Japan, KOR: Korea, TWN: Taiwan.

	Panel A: ΔBDR										
OLS	AUS	CAN	UK	USA	AUT	DEU	FRA	ITA	JPN	KOR	TWN
	Anglo-Saxon economy				European-Continental economy				East-Asian economy		
Cons	-.005 (-0.93)	.0053 (-1.11)	-.003 (-0.71)	-.0035 (-1.89)*	-.0213 (-2.30)**	-.0003 (-0.06)	-.0042 (-1.51)	-.0034 (-0.65)	-.0136 (-11.70)***	-.0179 (-5.42)***	-.0093 (-4.23)***
DIV_t	.0279 (1.45)	.0465 (1.55)	.0132 (0.92)	.01169 (0.68)	.0295 (1.03)	.0061 (0.35)	.0301 (2.73)***	.0123 (0.43)	.0235 (5.73)***	.0452 (2.95)***	.0186 (2.51)**
I_t	.0421 (0.95)	.0067 (0.15)	-.0322 (-0.82)	.0737 (4.00)***	.2087 (2.63)***	.0308 (0.92)	.1189 (4.40)***	.0559 (0.97)	.1574 (9.37)***	.2712 (8.86)***	.1469 (7.18)***
ΔWC_t	-.0979 (-7.33)***	-.1244 (-9.94)***	-.2129 (-16.4)***	-.1617 (-30.25)***	-.1951 (-6.18)***	-.1479 (-11.24)***	-.0871 (-6.67)***	-.2791 (-12.3)***	-.155 (-21.7)***	-.1374 (-9.3)***	-.1293 (-10.65)***
C_t	-.0278 (-3.44)***	-.0437 (-5.38)***	.0154 (1.62)	-.0172 (-5.32)***	.0314 (1.05)	-.0422 (-3.29)***	0.1009 (-7.13)***	.1176 (4.40)***	-.0829 (-9.85)***	-.1288 (-9.11)***	-.0109 (-0.88)
Adj-R^2	0.0541	-.1074	0.0976	0.0757	0.1816	0.0802	0.0737	0.236	0.0983	0.1154	0.0593
Obs	1524	1479	2530	14322	198	2008	2132	488	7940	2343	3165

Table 7.50 Debt ratio changes and financial deficits (DEF1), based on different countries

The table shows that financial deficit is not positively related to debt ratio changes with the exception of Korea.
Note, $DEF1=DIV_t+I_t+\Delta WC_t-C_t$, ΔBDR: book-based debt ratio change, DEF1: financial deficit defined by Frank and Goyal (2003), DIV: dividend, I: investment (capital expenditure), WC: working capital, C: cash-flow after interest and taxes (=internal cash-flow or net income+depreciation). All items are scaled by total asset. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level. AUS: Australia, CAN: Canada, UK: Britain, USA: United States of America, AUT: Austria, DEU: Germany, FRA: France, ITA: Italy, JPN: Japan, KOR: Korea, TWN: Taiwan.

	Panel A: ΔBDR										
OLS	AUS	CAN	UK	USA	AUT	DEU	FRA	ITA	JPN	KOR	TWN
	Anglo-Saxon economy				European-Continental economy				East-Asian economy		
Cons	.0044 (0.94)	-.0001 (-0.03)	.0065 (1.78) *	.0045 (2.90) ***	.0023 (0.32)	.0058 (1.73) *	-.0029 (-1.29)	.0121 (2.56) **	-.0118 (-12.35) ***	-.0093 (-3.37) ***	-.0027 (-1.35)
$DEF1_t$	.0058 (0.74)	.0065 (0.82)	-.0612 (-7.68) ***	-.0134 (-4.22) ***	-.0419 (-2.00) **	-.0401 (-4.31) ***	.0092 (1.11)	-.1346 (-7.90) ***	-.0054 (-1.43)	.0292 (2.84) ***	-.0075 (-1.16)
Adj-R^2	0.00	0.00	0.0224	0.0012	0.0151	0.0087	0.0001	0.112	0.0001	0.003	0.0001
Obs	1524	1479	2530	14322	198	2008	2132	488	7940	2343	3165

Table 7.51 Capital structure adjustment speed comparison, based on different countries

The table shows that firms in the European-Continental economy have a slower 'capital structure adjustment speed,' and firms in the East Asian economy have a faster rate than the others.

Note, BDR: book-based debt ratio. The coefficient values are (1-λ). Thus, the adjustment speed λ is (1-coefficient). We use all 7 capital structure determinants though we do not report those coefficients here. BDR_{t-1} is used as instrument. The System GMM and use options of small, robust and twosteps for options of xtabond2, the suboptions of eq(level) lag(1 2) collapsed for gmm-style and eq(level) for iv-style. The values in the square brackets are the significant levels of J statistic (Hansen p-value); C test value suggests the endogenous variables. All variables are defined in Section 5.3. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level. AUS: Australia, CAN: Canada, UK: Britain, USA: United States of America, AUT: Austria, DEU: Germany, FRA: France, ITA: Italy, JPN: Japan, KOR: Korea, TWN: Taiwan.

	BDR_t										
OLS	AUS	CAN	UK	USA	AUT	DEU	FRA	ITA	JPN	KOR	TWN
	Anglo-Saxon economy				European-Continental economy				East-Asian economy		
Cons	.0256 (1.61)	.0238 (0.85)	.0075 (0.75)	.0217 (2.42)**	-.0512 (-1.01)	.0148 (1.23)	.0057 (0.37)	.0560 (1.95)*	.0041 (0.80)	.0393 (2.13)**	.0446 (3.05)***
BDR_{t-1}	.6959 (4.32)***	.8647 (6.84)***	.8655 (6.21)***	.7304 (13.60)***	1.1616 (1.54)	.8250 (4.54)***	.8998 (7.36)***	.9479 (7.90)***	.8866 (20.32)***	.7966 (6.15)***	.7995 (14.24)***
AR(1)	-2.23***	-3.06***	-2.40**	-6.18***	-0.28	-3.01***	-3.08***	-2.35***	-6.26***	-3.43***	-7.24***
AR(2)	0.06	1.43	1.42	0.81	-1.79	0.50	-0.81	0.38	0.59	-0.28	0.59
Hansen (P-value)	0.05 [0.829]	1.40 [0.236]	0.10 [0.752]	0.35 [0.555]	0.00 [1.00]	1.99 [0.159]	2.22 [0.137]	0.85 [0.358]	1.07 [0.301]	0.28 [0.599]	0.48 [0.490]
Inst	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2
Inst No	10	10	10	10	10	10	10	10	10	10	10
Obs	586	652	996	8685	57	616	478	109	4710	1566	2086

7.11.5 Conclusion with regard to debt ratio and different countries

We have observed that macroeconomic factors significantly affect capital structure and firms' debt and equity choices. This implies that country factors affect firms' capital structures because macro-economic factors are closely related to changes in the debt ratio. Our descriptive characteristics indicate that Asian countries such as, Japan, Korea and Taiwan have high debt ratios compared to Western countries particularly Anglo Saxon firms. The debt ratios of European firms fall between these two countries. Table 7.47, descriptive characteristics, generally indicates four differences between those two different groups of countries for firms in our sample: (1) The Asian countries have large firm sizes and (2) more profitability and (3) have lower earnings volatility and (4) market-to-book ratios. These imply, namely, that firms in the Asian countries are in a financially stable condition, compared to firms in Western countries. Therefore, they can have higher debt levels compared to others. We can likewise observe in Table 7.49 that firms in the Asian countries use more debt for their new investments compared with firms in Western countries. Furthermore, firms in Anglo-Saxon countries have the highest capital structure adjustment speeds, followed by firms in Asian and European countries. From the results shown in the previous sections, financially less secure firms adjust their capital structure more rapidly. As western firms, particularly Anglo-Saxon ones, are financially in a less secure position, our results showing a fast adjustment speed for Anglo-Saxon firms are consistent with previous sections. This implies that, based on country characteristics, firms' debt ratio changing behaviours, generally follows the trade-off theory. In other words, financially secure firms like those in Asia countries use more debt and do not feel the need to adjust their capital structure, but less secure firms in Anglo-Saxon countries use more equity and rapidly adjust debt ratios. In addition, Asian firms have the second fastest speed of adjustment. With regard to the previous sections, this might be interpreted that these relatively high adjustment speeds by financially secure Asian firms are the result of low transaction costs due to a low probability of bankruptcy.

7.12 Industry

This section is closely related to several previous sections because different industries have different tangible assets and capital expenditure, earnings volatility, and R&D expenses; and as we have already discussed, these factors significantly affect debt levels. The descriptive statistics in Table 7.52 indicate that debt levels vary across industries. Firms with ICB code 5000 series (Consumer services) have a relatively high debt level and, with ICB code 9000 series (Technology) have a relatively low debt level. The table also indicates that debt ratio is generally positively associated with firm size (log asset) and asset tangibility and are negatively associated with cash holding and R&D expenses.

Table 7.53 suggests that firms finance themselves in very different ways across industries. In general, industries with high debt levels, asset tangibility and large size (such as, firms in the steel, marine transportation, hotel and fixed- and mobile-telecommunication industries) are more associated with newly retained earnings and residual leverage changes. The table also indicates that the change of debt level generally relies upon equity issuance across industries.

Table 7.54 shows debt level change is mainly affected by 'new investments' (I_t) and 'working capital changes' ($\triangle WC_t$). They are closely related to industry characteristics and consider economics and industrial situations. There are some noticeable industries which show different behaviours between industries in terms of debt ratio changes. For example, internet, software and biotechnology firms use less debt for new investments, and steel, hotel and marine transportation firms generally use more debt (See Panels C and D in Table A.5.69 in Appendix 5 for details).

Table 7.55 presents a variety of relationships between 'debt ratio change' and 'financial deficits.' However, this table also shows similar results to Table 7.54. Firms in steel and marine transportation are positively associated with 'debt ratio changes,' and those in internet or software industries are negatively associated.

Table 7.52 Descriptive characteristics by industry

Univariate comparison of means and medians of measures of firm characteristics based on industry between 1989 and 2008.
Note, median values are in square brackets. All variables are defined in Section 5.3. Icbsub: the codes of ICB industry subsector classification are defined in Table A.1.1 in Appendix 1.

Icbsub	BDR	MDR	netcash	logasset	tang	capex	R&D	Obs
1753	0.3485 [0.3453]	0.3112 [0.2925]	0.1779 [0.0499]	6.1401 [6.2032]	0.4127 [0.4406]	0.0581 [0.0384]	0.0047 [0.0036]	319
1757	0.2905 [0.2777]	0.2717 [0.2519]	0.2876 [0.0821]	6.046 [6.0551]	0.3761 [0.3821]	0.0545 [0.0361]	0.0054 [0.0032]	2535
2357	0.2061 [0.1678]	0.1914 [0.1531]	0.2374 [0.1601]	6.0144 [6.0273]	0.1991 [0.1779]	0.0292 [0.0139]	0.0042 [0.0022]	4917
2771	0.2193 [0.1792]	0.1832 [0.1387]	0.1758 [0.1513]	6.0235 [5.8268]	0.3728 [0.3617]	0.0936 [0.0668]	0.0002 [0.00]	319
2773	0.4053 [0.4088]	0.3487 [0.3457]	0.1700 [0.1075]	6.0429 [6.0592]	0.5576 [0.5883]	0.0877 [0.0594]	0.0013 [0.00]	849
3353	0.3246 [0.3148]	0.2824 [0.2795]	0.1566 [0.1167]	8.7005 [8.9925]	0.3319 [0.3284]	0.0842 [0.0723]	0.0360 [0.0309]	688
3533	0.2216 [0.2100]	0.1758 [0.1384]	0.1631 [0.0637]	5.4754 [5.0433]	0.3881 [0.3648]	0.0892 [0.0522]	0.0069 [0.0060]	468
3535	0.2892 [0.2872]	0.2343 [0.2300]	0.2588 [0.0473]	5.1185 [5.0901]	0.2071 [0.1910]	0.0366 [0.0261]	0.0051 [0.0010]	602
3537	0.2214 [0.1607]	0.1399 [0.0751]	0.2274 [0.1056]	5.0406 [5.1923]	0.3445 [0.3420]	0.0613 [0.0491]	0.0128 [0.0022]	672
3577	0.2497 [0.2201]	0.2056 [0.1709]	0.2561 [0.1141]	5.3380 [5.4165]	0.3392 [0.3427]	0.0552 [0.0412]	0.0194 [0.0064]	5357
3728	0.2961 [0.2883]	0.2606 [0.2348]	0.225 [0.1032]	6.0277 [6.1251]	0.1527 [0.0886]	0.0198 [0.0072]	0.0027 [00]	1200
4533	0.2872 [0.2406]	0.1836 [0.1281]	0.5144 [0.1067]	4.7234 [4.7446]	0.258 [0.1728]	0.0693 [0.0452]	0.0135 [00]	2125
4573	0.1634 [0.0290]	0.0619 [0.0078]	3.6736 [1.5258]	3.2204 [3.3548]	0.1329 [0.0792]	0.0428 [0.0193]	0.2648 [0.1965]	3384
5333	0.2132 [0.1712]	0.1342 [0.0833]	0.3094 [0.1121]	5.7548 [5.7815]	0.2049 [0.1922]	0.0540 [0.0368]	0.0073 [0.00]	489
5373	0.2842 [0.2861]	0.2396 [0.2224]	0.1542 [0.0881]	6.6922 [6.3327]	0.3705 [0.3533]	0.0678 [0.0509]	0.0006 [0.00]	1432
5553	0.3078 [0.2447]	0.1986 [0.1658]	0.3221 [0.0863]	4.8614 [5.1242]	0.2174 [0.1467]	0.0581 [0.0248]	0.0227 [0.00]	2637
5751	0.3788 [0.3527]	0.3017 [0.2968]	0.2809 [0.1471]	7.4187 [8.1441]	0.5557 [0.6093]	0.1229 [0.0986]	0.0002 [0.00]	495
5752	0.3121 [0.2415]	0.1911 [0.1332]	0.5008 [0.1660]	4.6897 [5.0573]	0.3523 [0.2851]	0.0806 [0.0437]	0.0344 [0.0127]	1142
5753	0.3687 [0.3644]	0.2921 [0.2803]	0.1514 [0.0676]	5.6723 [5.5626]	0.5171 [0.5492]	0.0620 [0.0378]	0.0053 [0.00]	839
5759	0.3650 [0.4087]	0.2904 [0.2892]	0.5180 [0.1024]	6.3836 [6.6354]	0.4655 [0.5739]	0.0700 [0.0501]	0.0177 [0.00]	1069
6535	0.3570 [0.3180]	0.2109 [0.1750]	0.4021 [0.0792]	5.9825 [6.5062]	0.3912 [0.4257]	0.0943 [0.0790]	0.0187 [0.0008]	1018
6575	0.2574 [0.1970]	0.1536 [0.1094]	0.4034 [0.1479]	5.3342 [5.2746]	0.2896 [0.2604]	0.0989 [0.0719]	0.0316 [0.0040]	634
9533	0.1563 [0.0810]	0.1030 [0.0494]	0.5003 [0.2052]	3.8899 [3.8516]	0.1209 [0.0698]	0.0459 [0.0210]	0.0443 [0.0122]	3493
9535	0.1668 [0.0400]	0.0845 [0.0198]	1.1511 [0.4889]	3.1387 [3.2581]	0.1397 [0.0702]	0.0619 [0.0297]	0.0726 [0.0230]	1555
9537	0.1447 [0.0723]	0.0749 [0.0103]	0.9992 [0.4287]	3.3772 [3.4345]	0.1083 [0.0637]	0.0435 [0.0204]	0.1427 [0.0942]	6734
9572	0.1746 [0.1304]	0.1372 [0.0856]	0.4617 [0.2131]	4.9051 [4.6995]	0.1825 [0.1406]	0.0511 [0.0286]	0.0693 [0.0469]	3382
9576	0.1574 [0.0965]	0.1186 [0.0547]	0.6473 [0.3230]	5.0860 [4.9711]	0.2299 [0.1759]	0.0758 [0.0416]	0.0947 [0.0702]	4944

Table 7.56 indicates significant differences in the ‘capital structure adjustment speed’ between industries. The ‘capital structure adjustment speed’ is high for travel, telecommunication, marine-transportation, steel, bio-technology, drug retailing and technology industries, while, aluminium, food production, health provider, broad line retailing, soft-drink and the hotel industries adjust their capital structures slowly.

Even though there are significant differences in ‘capital structure adjustment speed’ with regard to different industries, it is still difficult to find the right explanation before we understand the situation of industries in the given sample period. This is because capital structure might rely on the combined effect of industry, macro-economic trends and a firm’s own characteristics as has been discussed in this chapter.

Table 7.53 Debt ratio changes based on different industries, using the Baker and Wurgler model (2002)

The table suggests that in general, industries with high debt levels, tangibility and size use more external finance, viz. firms in the steel, marine transportation, hotel and fixed- and mobile-telecommunication industries.

Note, ΔBDR: book-based debt ratio change, A: total asset, RE: retained earnings, e: equity, -(e/A): equity issue, -(RE/A): increased retained earnings, $-(E_{t-1}(1/A_t-1/A_{t-1})$: the residual change in leverage. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level. The full industry names are defined in Table A.1.1 in Appendix 1.

	ΔBDR_t								
OLS	Aluminium	Steel	Heavy-cons	Delivery	M-transport	Auto	Brewers	Distil & vin	So-drink
Cons	.0026 (0.32)	-.0057 (-2.25)**	-.0029 (-1.88)*	-.0104 (-1.76)*	-.0105 (-2.76)***	.0054 (1.52)	-.0019 (-0.34)	-.0025 (-0.5)	-.0066 (-1.40)
$-\left(\frac{e}{A}\right)_t$	-.0221 (-0.17)	.3554 (13.04)***	.5285 (19.12)***	.4667 (5.47)***	.6639 (10.22)***	.6387 (7.11)***	.3074 (2.89)***	.4937 (9.16)***	.4999 (9.91)***
$-\left(\frac{\Delta RE}{A}\right)_t$	-.0301 (-0.39)	.3114 (18.91)***	.1884 (17.15)***	.4105 (5.61)***	.4387 (8.99)***	.4619 (10.63)***	.3523 (10.39)***	.3379 (13.08)***	.1881 (8.79)***
$-\left[E_{t-1}\left(\frac{1}{A_t}-\frac{1}{A_{t-1}}\right)\right]$	.0712 (1.77)*	.3186 (14.06)***	.1819 (12.05)***	.41 (5.48)***	.6247 (13.33)***	.2724 (7.16)***	.2017 (3.16)***	.3687 (9.60)***	.3607 (8.64)***
Adj-R^2	0.0083	0.2686	0.2011	0.1968	0.3541	0.2567	0.3027	0.3432	0.2779
Obs	167	1251	2315	206	385	452	246	371	402

Table 7.53 Continued

	ΔBDR_t								
	Food prod	Home-cons	Health	Biotech	Drug retail	BR-retail	Bro & Ent	Airlines	Gamble
Cons	-.0038 (-1.74)*	-.0011 (-0.32)	-.0117 (-2.88)***	.0111 (2.04)**	.0078 (1.02)	-.0039 (-1.49)	.01337 (3.46)***	.0175 (2.63)***	.0041 (0.59)
$-\left(\frac{e}{A}\right)_t$	.3358 (15.59)***	.3477 (6.46)***	.3233 (10.88)***	.1806 (13.64)***	1.0272 (12.11)***	.3445 (9.37)***	.2949 (12.24)***	.3462 (5.07)***	.2914 (5.86)***
$-\left(\frac{\Delta RE}{A}\right)_t$	.1405 (14.23)***	.1701 (8.25)***	.2642 (19.31)***	.1296 (16.01)***	.2429 (7.54)***	.2878 (11.19)***	.1182 (12.97)***	.2415 (9.02)**	.1024 (5.14)***
$-\left[E_{t-1}\left(\frac{1}{A_t}-\frac{1}{A_{t-1}}\right)\right]$	.1363 (11.01)***	.1387 (5.59)***	.3287 (14.86)***	.1377 (12.08)***	.32961 (6.20)***	.2917 (11.43)***	.1227 (9.61)***	-.1401 (-2.05)***	.2007 (5.93)***
Adj-R^2	0.1245	0.1257	0.2249	0.1302	0.3201	0.1899	0.1363	0.1853	0.0599
Obs	2626	800	1592	2252	313	891	1692	399	869

	ΔBDR_t								
	Hotels	Travel	Fixed tel	Mobil tel	Com-serv	Internet	Software	Com-hard	Semicon
Cons	-.0012 (-0.28)	-.0066 (-1.89)*	.0079 (1.24)	-.0024 (-0.24)	.0022 (0.68)	.0001 (0.01)	-.0004 (-0.15)	-.0021 (-0.87)	-.0058 (-3.29)***
$-\left(\frac{e}{A}\right)_t$	.4424 (8.79)***	.2244 (6.05)***	.2964 (7.53)***	.4091 (7.28)***	.2523 (12.29)***	.2018 (7.10)***	.1994 (16.81)***	.1788 (9.61)***	.2192 (15.35)***
$-\left(\frac{\Delta RE}{A}\right)_t$	.1175 (4.34)***	.1342 (7.96)***	.1357 (10.85)***	.2005 (7.66)***	.1297 (16.94)***	.1327 (10.41)***	.1123 (20.43)***	.0843 (9.92)***	.1588 (17.91)***
$-\left[E_{t-1}\left(\frac{1}{A_t}-\frac{1}{A_{t-1}}\right)\right]$	.2969 (7.81)***	.2982 (11.40)***	.1329 (6.13)***	.2702 (7.16)***	.1565 (13.03)***	.1503 (7.88)***	.1300 (16.70)***	.0573 (5.18)***	.1367 (13.45)***
Adj-R^2	0.1799	0.2133	0.1710	0.1909	0.18	0.1507	0.1351	0.0655	0.1254
Obs	520	541	757	408	1904	768	3852	2026	3020

Table 7.54 Debt ratio changes and financial deficit components, based on different industries

The table shows that there are some noticeable industries which show different behaviours with regard to debt ratio change. For example, internet, software and biotechnology firms use less debt for new investments (I_t), and steel, hotel and marine transportation firms generally use more debt.

Note, ΔBDR: book-based debt ratio change, DEF1=$DIV_t+I_t+\Delta WC_t-C_t$, DEF1: financial deficit defined by Frank and Goyal (2003), DIV: dividend, I: investment (capital expenditure), WC: working capital, C: cash-flow after interest and taxes (=internal cash-flow or net income+depreciation). All items are scaled by total asset. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level. The full industry names are defined in Table A.1.1 in Appendix 1.

	ΔBDR_t								
OLS	Aluminium	Steel	Heavy-cons	Delivery	M-transport	Auto	Brewers	Distil & vin	So-drink
Cons	-.0191 (-2.22)**	-.0155 (-4.58)***	-.0127 (-6.78)***	-.0056 (-0.62)	-.0022 (-0.37)	.001 (0.16)	.0013 (0.26)	-.0091 (-1.23)	-.0118 (-1.23)
DIV_t	.0134 (0.25)	.0555 (2.93)***	.0159 (2.10)**	.0255 (1.02)	.0283 (1.54)	.1044 (3.41)***	.0089 (0.35)	.0286 (1.26)	.0264 (0.89)
I_t	.2249 (2.46)**	.3063 (8.68)***	.2207 (6.65)***	.0852 (1.26)	.2623 (6.78)***	.3057 (4.94)***	.2077 (4.36)***	.3727 (2.84)***	-.0449 (-0.38)
ΔWC_t	-.1389 (-3.26)***	-.1265 (-6.68)***	-.1408 (-11.56)***	-.1307 (-2.48)**	-.046 (-1.09)	-.2413 (-6.33)***	-.0951 (-3.08)***	-.1754 (-5.38)***	-.3316 (-8.85)***
C_t	.0465 (1.74)*	-.1747 (-11.04)***	-.0513 (-4.19)***	-.1228 (-2.42)**	-.3357 (-6.44)***	-.3227 (-8.17)***	-.2574 (-6.40)***	-.0766 (-3.36)***	.0348 (1.51)
Adj-R^2	0.0612	0.1400	0.0700	0.0677	0.1348	0.2603	0.1891	0.0969	0.1486
Obs	230	1682	3058	261	548	504	319	464	449
	ΔBDR_t								
	Food prod	Home-cons	Health	Biotech	Drug retail	BR-retail	Bro & Ent	Airlines	Gamble
Cons	-.0071 (-2.69)***	-.0045 (-1.04)	-.0131 (-2.27)**	-.0046 (-0.80)	-.0046 (-0.44)	-.0108 (-2.37)**	.0015 (0.34)	-.0099 (-1.01)	-.0007 (-0.08)
DIV_t	.0046 (0.45)	.0128 (0.53)	.036 (1.13)	-.0318 (-0.37)	.0181 (0.41)	.0492 (3.12)***	.0084 (0.26)	.0044 (0.08)	-.0079 (-0.13)
I_t	.0957 (3.23)***	.1537 (1.18)	.1767 (3.24)***	.0533 (0.86)	.055 (0.46)	.2808 (6.89)***	.0014 (0.04)	.1314 (2.15)**	.0692 (1.04)
ΔWC_t	-.2537 (-19.38)***	-.0673 (-3.14)***	-.2455 (-12.93)***	-.1266 (-12.82)***	-.2557 (-6.58)***	-.0628 (-2.47)**	-.2267 (-14.03)***	-.2428 (-6.88)***	-.2044 (-6.70)***
C_t	-.0062 (-0.73)	-.0406 (-2.30)**	-.0281 (-2.1)**	-.0159 (-2.07)**	-.0420 (-1.96)**	-.2275 (-5.49)***	.0011 (0.11)	-.0882 (-3.65)***	-.0196 (-1.00)
Adj-R^2	0.1055	0.019	0.1226	0.0725	0.1364	0.0723	0.015	0.1552	0.0548
Obs	3532	890	1544	2654	378	1020	1915	375	854

Table 7.54 Continued

	ΔBDR_t								
	Hotels	Travel	Fixed tel	Mobil tel	Com-serv	Internet	Software	Com-hard	Semicon
Cons	-.0043 (-0.76)	-.0097 (-2.19)**	.004 (0.35)	-.0059 (-0.48)	-.0047 (-1.37)	-.0049 (-0.68)	-.0014 (-0.50)	-.0119 (-4.17)***	-.0099 (-4.35)***
DIV_t	.0041 (0.21)	.0286 (1.43)	.0467 (1.07)	.0111 (0.18)	.0119 (0.93)	.0554 (1.39)	.0049 (0.40)	.0133 (1.15)	.0221 (2.18)**
I_t	.1753 (3.19)***	.0744 (1.95)*	-.0977 (-1.19)	.0101 (0.12)	.0753 (2.01)**	.0369 (0.61)	-.0622 (-1.78)*	.1688 (5.40)***	.1225 (6.82)***
ΔWC_t	-.1213 (-3.65)***	-.1141 (-5.61)***	-.2531 (-9.35)***	-.2074 (-6.23)***	-.175 (-13.93)***	-.1551 (-9.98)***	-.1267 (-15.47)***	-.1468 (-12.03)***	-.1017 (-10.72)***
C_t	-.1486 (-3.17)***	-.0055 (-0.44)	-.0529 (-3.19)***	-.0259 (-1.08)	-.0404 (-4.41)***	-.0146 (-1.23)	-.0214 (-4.46)***	-.0046 (-0.52)	-.0306 (-3.84)***
Adj-R^2	0.0569	0.0508	0.1729	0.0827	0.0985	0.0866	0.0694	0.0697	0.0540
Obs	564	665	710	481	2537	1088	4925	2607	3875

Table 7.55 Debt ratio changes and financial deficits (DEF1), based on different industries

This table also shows similar results to Table 7.54. Firms in steel and marine transportation are positively associated with debt ratio changes and those in internet or software industries are negatively associated.

Note, ΔBDR: book-based debt ratio change, $DEF1=DIV_t+I_t+\Delta WC_t-C_t$, DEF1: financial deficit defined by Frank and Goyal (2003), DIV: dividend, I: investment (capital expenditure), WC: working capital, C: cash-flow after interest and taxes (=internal cash-flow or net income+depreciation). All items are scaled by total asset. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level. The full industry names are defined in Table A.1.1 in Appendix 1.

	ΔBDR_t								
OLS	Aluminium	Steel	Heavy-cons	Delivery	M-transport	Auto	Brewers	Distil & vin	So-drink
Cons	-.0017 (-0.25)	-.0133 (-4.93)***	-.0076 (-4.67)***	-.0108 (-1.68)*	-.0123 (-3.43)***	.0002 (0.04)	-.0026 (-0.60)	.0027 (0.45)	-.0051 (-0.76)
$DEF1_t$	-.0206 (-0.86)	.0697 (5.94)***	-.0059 (-0.92)	.0165 (0.72)	.0559 (3.20)***	.0413 (1.57)	.0127 (0.62)	.0106 (0.66)	-.0075 (-4.09)***
Adj-R^2	0.0000	0.0200	0.0000	0.0000	0.0166	0.0029	0.0000	0.0000	0.0338
Obs	230	1682	3058	261	548	504	319	464	449
	ΔBDR_t								
	Food prod	Home-cons	Health	Biotech	Drug retail	BR-retail	Bro & Ent	Airlines	Gamble
Cons	-.0008 (-0.39)	-.0056 (-1.49)	.0016 (0.33)	.0200 (3.98)***	-.0034 (-0.43)	-.0086 (-3.03)***	.0087 (2.24)**	.0019 (0.27)	.0094 (1.23)
$DEF1_t$	-.0310 (-4.57)***	.0046 (0.35)	-.0276 (-2.33)**	-.0316 (-4.45)***	.0054 (0.26)	.0458 (3.47)***	-.0472 (-4.77)***	-.0004 (-0.02)	-.0283 (-1.58)
Adj-R^2	0.0056	0.0000	0.0026	0.0071	0.0000	0.0107	0.0113	0.0000	0.0017
Obs	3532	890	1544	2654	378	1020	1915	375	854
	ΔBDR_t								
	Hotels	Travel	Fixed tel	Mobil tel	Com-serv	Internet	Software	Com-hard	Semicon
Cons	-.0012 (-0.28)	-.0035 (-1.00)	.0044 (0.51)	-.0001 (-0.01)	.0002 (0.05)	.0058 (0.91)	-.0011 (-0.45)	-.0024 (-0.96)	-.0046 (-2.44)**
$DEF1_t$	-.0038 (-0.23)	-.0087 (-0.83)	.0082 (0.48)	-.0393 (-1.80)*	-.0161 (-2.10)**	-.0234 (-2.08)**	-.0055 (-1.19)	-.0166 (-2.26)**	-.0017 (-0.27)
Adj-R^2	0.0000	0.0000	0.0000	0.0047	0.0013	0.0031	0.0001	0.0016	0.0000
Obs	564	665	710	481	2537	1088	4925	2607	3875

Table 7.56 Capital structure adjustment speed comparison, based on different industries

The table indicates that the ‘capital structure adjusting speed’ is high for frims in travel, telecommunication, marine-transportation, steel, bio-technology, drug retailing and technology industries, while, firms in aluminium, food production, health providers, broad line retailing, soft-drinks and the hotel industries adjust capital structure slowly.

Note, BDR: book-based debt ratio. BDR_{t-1} is instrumented. The options of small robust small and twostep are used for xtabond2 command, and the sub-options of eq(level) and laglimits(1 2) for gmm-style, and of eq(level) for iv-style. The values in the square brackets are the significant levels of J statistic (Hansen p-value); C test value suggests the endogenous variables. All variables are defined in Section 5.3. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level. The full industry names are defined in Table A.1.1 in Appendix 1.

	BDR_t								
OLS	Aluminium	Steel	Heavy-cons	Delivery	M-transport	Auto	Brewers	Distil & vin	So-drink
Cons	.0336 (0.85)	.0212 (0.94)	-.0051 (-0.61)	.1780 (0.29)	-.0704 (-0.15)	.1118 (1.33)	.1201 (0.81)	.0091 (0.20)	.0405 (1.32)
BDR_{t-1}	.9526 (21.30)***	.7025 (6.50)***	.8907 (21.35)***	1.271 (1.82)	.5421 (2.23)**	.5376 (3.98)***	.4284 (1.13)	.8513 (4.40)***	.9930 (14.48)***
AR(1)	-2.93***	-2.40**	-3.00***	-0.63	-1.39	-2.01**	-2.03**	-1.54	-2.14**
AR(2)	0.65	0.44	1.50	-0.58	-1.26	-1.79*	0.30	-2.04**	1.24
Hansen [P-value]	12.47 [0.999]	41.86 [0.114]	34.56 [0.346]	2.80 [1.00]	12.25 [0.998]	27.22 [0.707]	0.60 [1.000]	9.64 [1.000]	17.92 [0.979]
Inst	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2
Inst No	41	41	41	40	39	41	41	41	41
Obs	139	923	1759	58	95	410	94	130	172

Table 7.56 Continued

	BDR$_t$								
	Food prod	Home-cons	Health	Biotech	Drug retail	BR-retail	Bro & Ent	Airlines	Gamble
Cons	-.0045 (-0.27)	.0911 (2.20)**	.0377 (1.13)	-.0336 (-1.61)	.1195 (1.15)	.0084 (0.22)	.0372 (2.02)**	-.0208 (-0.23)	-.035 (-0.94)
BDR$_{t-1}$	.7641 (7.40)***	.7885 (13.10)***	.8072 (5.22)***	.8271 (10.77)***	.7002 (3.49)***	.8344 (11.81)***	.9063 (14.87)***	.7359 (4.49)***	.8582 (11.53)***
AR(1)	-2.19**	-2.70***	-3.37***	-3.27***	-2.15**	-2.49**	-3.74***	-1.68*	-2.20**
AR(2)	1.07	0.64	-1.59	-0.24	-0.69	1.42	1.17	0.27	0.10
Hansen [P-value]	32.93 [0.421]	31.25 [0.504]	32.17 [0.458]	22.95 [0.880]	12.02 [0.999]	33.72 [0.384]	27.97 [0.671]	5.48 [1.000]	33.79 [0.381]
Inst	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2
Inst No	41	41	41	41	41	41	41	40	41
Obs	2020	406	491	1416	132	328	527	93	409
	BDR$_t$								
	Hotels	Travel	Fixed tel	Mobil tel	Com-serv	Internet	Software	Com-hard	Semicon
Cons	.0748 (0.37)	.0455 (0.36)	.1552 (2.16)**	.1275 (2.96)	.0176 (1.09)	.0187 (0.46)	.0315 (2.73)***	.0173 (1.26)	.0237 (2.41)**
BDR$_{t-1}$	.9425 (2.80)**	.7010 (1.98)*	.5934 (5.29)***	.5590 (2.98)***	.6217 (4.80)***	.8241 (4.62)***	.8044 (11.34)***	.7038 (7.38)***	.8409 (18.21)***
AR(1)	-1.72*	-1.04	-1.64	-1.07	-3.46***	-3.09***	-4.92***	-5.85***	-6.20***
AR(2)	-1.43	0.99	-0.70	0.92	0.57	-1.08	1.31	0.31	0.89
Hansen [P-value]	10.93 [0.999]	9.53 [1.000]	27.00 [0.718]	21.24 [0.850]	25.24 [0.796]	17.53 [0.733]	33.12 [0.412]	24.32 [0.833]	30.83 [0.526]
Inst	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2
Inst No	39	40	41	38	41	31	41	41	41
Obs	134	106	274	137	1207	454	3408	2075	3144

7.12.1 Conclusion with regard to debt ratio and different industries

This section relates to all sub-sections in this chapter, with the exception of Section 7.11. Each industry refers to a particular combination of business cycle, earning volatility, asset tangibility and asymmetric information. Furthermore, firms in high-technology industries have higher asymmetric information costs because it is more difficult for outside investors to access the inside information and to understand their business. For example, prior research argues that firms with high R&D expenses (Fama and French, 2002; Frank and Goyal, 2003) and with high growth (Frank and Foyal, 2003) have high asymmetric information. That implies that firms in high-technology industries that have high R&D expenses and growth, could have higher asymmetric information problem than others.

The data shows that firms in aluminium, steel, marine transportation, home construction, broad-line retailers, airline, hotels, 'travel and tourism' and fixed line telecommunications, have generally high debt ratios. We define these industries as a traditional industry group. Firms in high technology industries, such as computer services, Internet, software, computer hardware and semiconductors have low debt ratios compared to firms in other industries. We define these industries as a high technology industry group. There are, of course, many other industries between these two industry groups. Firms in the traditional industry group generally use more debt for their new investments compared with firms in the high technology industry group. Firms in the traditional industry group show a strong association between changes in the debt ratio and financial deficits. In other words, more firms in the traditional industry group show positive associations between debt ratio changes and financial deficits, compared to firms from our entire sample, including firms in the high technology industry group. This implies that the debt ratios associated with industry classification more closely relate to the trade-off theory as our results indicate that financially, more secure firms use more debt.

This section is particularly inconsistent with the pecking order theory for two reasons. First, firms, without taking into consideration the industries they belong to, are generally associated with using equity issue to cover their financial deficits. Second, firms in the high technology industry group which has higher asymmetric information costs, are more strongly associated with equity issuance. Our overall conclusion in this section is that financial stability (bankruptcy costs) has a stronger influence on firms' debt ratio adjustment.

7.13 Conclusion and remarks

7.13.1 Conclusion

We conclude this chapter by confirming that the segments of firms' characteristics significantly affect its gearing levels. This is particularly the case in terms of firms' size, previous years' leverage levels, profitability, asset tangibility and bankruptcy probability. The overall conclusion in this chapter is that these characteristics are generally related to financial stability and, of course, to the trade-off theory.

Most previous research, such as that of Fischer et al. (1989), Hovakimian et al. (2004) and Leary and Roberts (2005), suggests that the 'capital structure adjustment speed' depends upon 'transaction costs', mainly issuing costs. If the 'capital structure adjustment speed' relies entirely on transaction costs, financially secure companies will change their debt ratios more rapidly than those which are less secure. This idea is consistent with the pecking order theory and is not entirely consistent with the trade-off theory because, if firms' bankruptcy costs are greater than their transaction costs, then financially less secure firms should change their debt ratios first.

Our results show, in this chapter, that the 'capital structure adjustment speed' varies with different segments of firms' characteristics and this adjustment speed relies more on financial stability than transaction costs (see Table 7.57 for details). For example, firms with low profits, small size, and a short history, have higher adjustment speeds than firms which do not evidence these characteristics. This implies that staying in a financially secure place is a top priority and transaction cost is a less important factor. This conclusion is consistent with Bolton and Freixas (2000) and Korteweg (2010). Korteweg (2010) finds that over-leveraged firms are more likely to rebalance their debt ratios, but not if they have potential profits in the future. Furthermore, Bolton and Freixas (2000) likewise argue, in terms of the importance of financial stability, that if bond financing is not feasible (due to high bankruptcy probability), then a firm's only option is to issue equity. However, our results also show that the 'capital structure adjustment speeds' increase with increasing profitability and stock return. This is clear evidence of the pecking order theory. Therefore, in terms of 'capital structure adjustment speed,' we can assume that firms jointly take into account transaction costs and bankruptcy costs. This phenomenon supports both the trade-off theory and the pecking order theory.

Our results also show that firms issue equity when they face financial difficulties or when their stock returns are very high in that they can have arbitrage (abnormal) benefits from over-valued stocks. Specifically, firms issue equity in order to obtain excess benefits when the stock price is high, and for survival when they face financial difficulties. This also supports both the trade-off theory and the market timing theory.

To explain this, in terms of the segments of firms' characteristics, our results shows that firms' behaviours associated with extremely high debt ratios, small size, net loss, low tangible assets and the industries of high-technology, or high earnings volatility, generally are explained more easily by the trade-off theory. On the other hand, firms' behaviours associated with high profits and high stock returns are more easily explained by the market timing theory.

In this chapter, we can observe more clearly, evidence of firms' debt ratio changing behaviours in line with the segments of firms' characteristics. The results in this chapter indicate that the cluster analysis is more efficient and provides a stronger method for investigating the detail of firms' debt ratio changing behaviours, the most appropriate capital structure theory, and important capital structure determinants.

Finally, the results summarised in Table 7.57 indicate that capital structure does not rely entirely upon tax shields, bankruptcy costs or adverse selection costs. Firms also consider the benefits from a high stock price, and increasing future debt capability and transaction costs when they issue equity and debt.

Table 7.57 Summary of results

The table shows the relationship between 'debt ratio choice behaviours' and capital structure determinants.

	Increase	Decrease
Debt ratio	Large firm size, high asset tangibility	High stock return, high profits, high cash holding, high capital expenditure, high R&D expenses, high bankruptcy probability, high earnings volatility, high market-to-book ratio
Equity issue	Short history, high bankruptcy probability, extremely over-leveraged, capital expenditure, R&D expenses, high stock returns, low profits	Long history
Debt issue	Large firm size, long history, extremely under-leveraged, high asset tangibility	Short history, high bankruptcy probability
Debt ratio adjustment speed	Short history, high bankruptcy probability, extremely over-leveraged, second time period, high capital expenditure, high profits, high stock returns	High asset tangibility, large firm size, long history, extremely under-leveraged

7.13.2 Environmental factors and overall remarks

The results in this chapter indicate that debt levels vary with different environmental factors such as, changes in the economy, industry and time. For example, there is a significant relationship between leverage levels and GDP growth, inflation and the legal system. The civil law system and inflation are positively related to debt ratio, and GDP growth is negatively related. Frank and Goyal (2009) and Desai et al. (2004) also show a positive relationship between inflation and the debt ratio. This result is inconsistent with Booth et al. (2001) who explain that companies borrow more during times of real economic growth, but not during times of inflation.

In the sample period under consideration, firms increase equity and reduce debt continuously. This shows the existence of a time trend (or macro-economic effect) in terms of debt ratios. It can also be seen as evidence for the trade-off theory, in that firms adjust their leverage levels in order to achieve their optimal capital structures, based on the macro-economic situation and their own condition.

The chapter closes by mentioning that debt ratio change can be partially explained by all capital structure theories, such as the trade-off, the pecking order and the market timing theories. However, debt ratio changing behaviours are more likely to support the trade-off theory and subordinately support other theories concerned with the market situation. This conclusion is consistent with Brounen et al. (2006) who also support the trade-off theory as well as the market timing theory. They find that firms have target debt ratios and consider market situations such as the financial market system and country factors. Fitzpatrick and Ogden (2011) also conclude that firms' capital structure adjustment behaviours are mainly explained by the trade-off theory and arbitrage by taking advantage of any mispricing of their securities.

Chapter VIII Conclusions and implications

There are many prior studies such as DeAngelo and Masulis (1980), Hovakimian et al. (2004) and Leary and Roberts (2005), which argue the existence of an optimal capital structure. Our results also show some evidence of the trade-off theory. For example, firms suffering from financial distress issue equity and change debt ratios rapidly.

However, there are some obstacles with regard to quick capital structure adjustment e.g. issuing costs, adverse selection costs, market timing and operating profits. In therms of market timing theory, for example, firms issue equity with high stock prices in order to have extra incoming cash-flows without taking into account present leverage levels because this is an opportunity for firms to obtain abnormal benefits. Although taking the opportunity does not lead the firms to their optimal leverage levels, the over-priced equity issue still increases the firms' value. Taking the opportunity is probably a priority because firms can increase their value by reducing the future issuing costs, and by creating extra cash inflow. In other words, attempting to take all the opportunities not to lose any chances which can increase a firm's value or reduce its costs, thereby maximising its value. The optimal capital structure, in the static trade-off theory, is achieved by a firm's value maximisation which is completed by minimising its capital costs. This therefore implies that the asymmetric information based models are also based on the same principle.

Overall, this thesis suggests that firms try to stay near the optimal leverage level, and attempt to take low adverse selection cost opportunities at the same time in order to maximise their value.

8.1 Research aims and findings

Since capital structure is related to many factors, determining the key elements in leverage levels decisions is a difficult matter. Even though the observed phenomena are complicated, the basic idea is simple: we presume that firms attempt to increase their values by changing leverage levels, wherever possible. When investigating this question, we looked at only three main factors: firms' future cash-flows, bankruptcy costs and their characteristics under the condition of asymmetric information.

As there is a tax shield in the real world, it entices firms to use debt with considering the bankruptcy probability. These two factors are the most important elements, together with the transaction costs of securities in the trade-off theory. After Modigliani and Miller (1963), Myers (1984) also argues that debt issue is a better strategy than the issuance of equity, as long as firms do not go bankrupt and asymmetric information costs are low. This implies that both the static trade-off and pecking order theories indicate the same conclusion under these two conditions.

The main finding of this research is that firms change their leverage levels and most firms' debt ratios move in the same direction. In other words, most firms in our sample have reduced their debt ratios by issuing equity over the last twenty years. This finding suggests that there are factors that guide firms' gearing levels in a specific direction. This thesis also suggests that some variables continually reveal their importance. The variables are asset tangibility, firm size, profitability, bankruptcy probability and market-to-book ratio. These variables are generally considered to be related to bankruptcy probability.

The results also show that capital structure is related to country, industry and macro-economic factors. The relationship between debt ratio and industry is closely related to the variables of asset tangibility, profits and earnings volatility, because firms within the same industry would be in a similar situation. Thus, they could have similar leverage levels. At the same time, the results also show the significant difference in debt ratios between countries. Hence, high technology firms have low debt ratios compared with the hotel or marine transportation industries across different countries, but the debt levels for these industries varies between countries. Namely, leverage levels of industries are of a similar order across countries, but they continuously show different debt levels. Firms in Korea, for instance, generally hold more debt than others, although they also have a similar order in terms of leverage levels, beased on industries.

8.2 Conclusions

Overall, the results of the thesis suggest that the trade-off theory becomes a priority theory, which considers a firm's survival, as well as its costs. The results also imply that both the pecking order and the market timing theories can explain how firms increase benefits and decrease costs, as well as obtain some arbitrage opportunities such as the issue of over-valued stock. As both the pecking order and the market timing theories are based on the phenomenon of asymmetric information, we could say that the market timing theory is part of the pecking order theory. In addition, the phenomena based on the pecking order and market timing theories do not necessarily mean that the static trade-off theory is wrong. In other words, the pecking order theory does not deny the static trade-off theory, but it emphasises more adverse selection costs due to high asymmetric information. Namely, it assumes that adverse selection costs caused by asymmetric information overwhelm tax benefits. Therefore, Myers and Majluf (1984) even assert that if there were no asymmetric information, the pecking order theory would be the same as the static trade-off theory.

The overall conclusions with regard to our results can be summarised as follows:

1. As Ross et al. (1995) mention, the capital structure decision is always about how to maximise the share price. Therefore, maximising a firm's value by capital structure adjustment (in the static trade-off theory), by issuing stocks with overvalued prices (in the market timing theory) and minimising the 'debt financing costs' by not taking on too much debt (in the static trade-off theory), and by not issuing undervalued securities (in the pecking order theory) can be explained by Ross' insight. Chapters 5, 6 and 7 show some evidence of this.

2. In Chapters 5, 6 and 7, the evidence demonstrates that trade-off theory is the most appropriate theory in terms of debt level decisions, in terms of firms trying to achieve the optimal leverage levels. From the results, we can conclude that firms are more concerned with survival itself, rather than financing costs. This implies that bankruptcy costs are much greater than we previously thought. In other words, as

Fitzpatrick and Ogden (2011) mention, the equity issue might suggest that the asymmetric information costs are not as great as we previously though. According to their findings, and as well as our own findings, firms with an 'operating loss' more actively use equity than firms with an 'operating profit.'

3. Our results indicate that the 'optimal capital structure' based on static trade-off theory, could not properly explain firms' capital-structure-adjustment modes. Our results suggest that to change leverage levels, firms rely on their own characteristic circumstances as well as the two traditional factors of bankruptcy probability and tax shields. This implies that all firms might have their own optimal capital structures in line with their own circumstances (characteristics). Therefore, firms will change their debt levels as their circumstances change, not only with regard to a tax shield and bankruptcy probability change. This implies that the dynamic trade-off theory could give a better explanation than static trade-off theory with regard to our results. The overall conclusions of Chapter 7 demonstrate this argument.

4. From Chapters 5, 6 and 7, the simple pecking order theory and market timing theory can partially explain the 'leverage ratio alteration.' For example, the leverage ratio shows the negative association with profits, and firms with high stock returns lead to equity issuance. However, the pecking order theory cannot explain why firms have issued more equity over the last twenty years. Furthermore, in our sample, many firms issue equity and debt simultaneously every year (see, Table 6.13 in which the equity and debt issue are fully described). This is difficult to explain with the pecking order theory and with inertia theory, because if asymmetric information costs are too high, then firms should choose only one best method to reduce their issuing costs.

5. The statistical evidence in Chapters 5, 6 and 7 indicates that the market timing theory is a part of the pecking order theory. The market timing theory simply suggests that firms take arbitrage opportunities by issuing overvalued stock. On the other hand, the pecking order theory suggests that firms use internal capital due to

undervalued securities in the market. Furthermore, we find it difficult to accept the inertia theory proposed by Welch (2004), as firms change their debt levels gradually.

6. In our research, we have observed some capital structure determinants which continuously show their importance. These variables are previous year debt ratio, asset tangibility, firm size, profitability, bankruptcy probability, market-to-book ratio and macro-economic environmental factors. These determinants are generally related to trade-off theory and market timing theory.

7. From Chapters 5, 6 and 7, the variables of investment opportunity, e.g. capital expenditure, R&D expenses and GDP growth, are all considerably negatively related to debt ratio. This implies that firms generally use equity for new investments. This is inconsistent with both the pecking order theory and the trade-off theory. This might be reflected by the pessimistic expectations of future cash-flows or risk aversive behaviours on the part of management: because firms use external funds only when they have a positive NPV of new investment opportunity; and firms use debt rather than equity for such a new investment, depending on the probability of success and profits of the new project.

8. Chapters 5, 6 and 7 show some different results each other, occasionally. For example, profits are negatively associated with debt ratio in Chapters 5 and 6 but profitable firms issue more debt in Chapter 7. We can also observe the similar phenomenon with regard to bankruptcy probability. This indicates that cluster analysis shows clearer evidence of trade-off theory.

9. Finally, we suggest the reason why it is so difficult to close optimal capital structure, even in the same industry and country. As Emery and Finnerty (1997) mention, a company cannot easily close the industry average gearing level (optimal leverage level) because all companies have different conditions such as size, competitive position, operating risk, bond rating, business prospects and willingness to bear financial risk. Similarly, DeAngelo and Masulis (1980) also mention that each firm has a unique debt ratio, because all firms have different taxes, financing

costs and financial distress costs. From our results, we can likewise suggest that different firms' characteristics influence them to stay in different debt ratios. This implies that, as each firm faces a different situation e.g. in terms of future profits, bankruptcy probability, industry, country and firm size etc., each firm has a unique optimal debt ratio based on its own situation. Chapter 7 provices evidence for this argument.

8.3 Contributions

The contributions of this thesis to the literature can be summarised as follows:

1. This thesis suggests the importance of macro-economic factors and their impact on changes in capital structure. In other words, we suggest that macro-economic factors and countries' characteristics (e.g. culture, legal system, and the attitude to firms' debt ratios and so on) affect firms' debt ratios. There are some previous studies, such as Antoniou et al. (2008), Gugler et al. (2004), and Jong et al. (2008), that consider country factors. However, in this thesis, we test the differences in firms' debt ratio changing behaviours using cluster analysis in Chapter 7, and comparison of debt ratios in Chapter 4. Our methods suggest clearer evidence showing that there are systematic differences in firms' debt ratios in line with different macro-economic factors and countries. We also show that firms continuously reduce their debt ratios over time. This indicates that there is a trend in terms of firms' debt ratio change on a world scale. This is important because most of the previous research noted above does not show that firms across the world continuously change their debt ratios in one direction. Therefore, in their research they do not take account the effect of trends in debt ratio shifting in their research, nor when they interpret the results of their research.

2. In this thesis, we compared three different economy groups, Anglo-Saxon, European and Asian Economies. Previous research such as that of Antoniou et al. (2008), Jong et al. (2008), Booth et al. (2001), La Porta et al. (2000) and many others, in general classifies their sample based on an individual county or legal system. Therefore, they generally consider a country's legal system and country specific

factors such as the size of the financial market, interest rates, and GDP growth. However, in this thesis, we also take account of the different economies as capital structure is also affected by such differences. We address whether there are general differences in firms' leverage levels, debt-and-equity issuances, capital structure adjustment speeds in line with the different economies to which our sample firms belong. Our results indicate that there are significant differences in debt ratios and capital structure adjusting behaviours in different economies.

3. Evidence in the thesis likewise suggests that the biggest concern for firms is their survival, rather than obtaining benefits from leverage level adjustments. This idea has not often been considered in capital structure theory and in the literature. Traditional capital structure theories do not take the possibility of bankruptcy seriously. For example, most important research into capital structure such as, Modigliani and Miller (1963), Myers (1984), and Myers and Majluf (1984), do not consider bankruptcy costs as being important. According to our survey of the literature, only Beattie et al. (2006) and Shefrin (2007) suggest that survival is the most important factor when firms decide on their capital structure. We have confirmed their argument and furthermore have firmly established and embodied the likelihood that a firm's survival is the most important capital structure determinant.

4. We use the GMM methods which statistically suggest more accurate results with regard to endogeneity in panel data. Therefore, our statistical results are more reliable than those of previous studies. There are only a few articles on capital structure using this method, including those of Antoniou et al. (2008), Gonzalez and Gonzalez (2008) and Lemmon et al. (2008). In other words, we can take endogeneity problems into account because the GMM is more efficient than OLS.

5. We have shown how the 'capital structure adjustment speed' varies across the segments of a firm's characteristics. Particularly, our findings imply that that the adjustment speed relies more on bankruptcy costs than on transaction costs. Our results also show that survival is more of a priority than adjustment costs. This is not consistent with most previous research as we mentioned earlier. For example,

Hovakimian et al. (2004) and Leary and Roberts (2005) argue that transaction costs are an important matter for changing debt ratios. This is because firms need to spend to change their debt ratios. This implies that firms change their capital structure when their transaction costs are low. In addition, in terms of the pecking order theory, firms with high profits, high stock prices, high market-to-book ratios, or a long history, would change their debt ratios more quickly than other types of firms. Our results, however, indicate that firms' capital structure adjustment speeds are faster for those with a short history, extremely over-leveraged, small size or have a net loss. These phenomena imply that firms consider bankruptcy costs more seriously than transaction costs. We were able to observe this situation because we used cluster analysis to segment the firms in our sample.

6. The methods we used in Chapters 4 and 7 are rarely observed in academic journals. In Chapter 4, we used comparisons in debt ratios based on classifications. We classified our sample in respect of economies, countries and industries to which the firms under consideration belong. According to the details of our review of the literature, not since Stonehill and Stitzel (1969) has a study such as ours examined the fact that there are debt ratio differences based on these classifications, although many researchers have already presumed that there are differences in debt ratios based on firms' classification. This chapter is important for two reasons. First, since Stonehill and Stitzel (1969) work, about 40 years have passed and it is worthwhile to test again whether the situation has changed as our economic environment, technology, and financial market conditions have all greatly changed during this period. Second, this is the first step in developing all capital structure theories. This is because, since Modigliani and Miller (1958), it is still regarded as controversial as to whether there is an optimal capital structure. As was discussed in Chapter 4, if there is no systemic difference in debt ratio in respect of firms' characteristics, we could argue that there is no optimal capital structure as Modigliani and Miller (1958) indicate. The trade-off theory does not explain firms' debt ratios.

In Chapter 7, we used cluster analysis, which is rarely used in work published in academic journals. However, as we have seen from Chapter 7, it reveals very significant and different phenomena in line with the segments of firms' characteristics compared to that found in many published papers. Autore and Kovacs (2010) and Ovtchinnikov (2010) use cluster analysis for their research, but they focus only on one or two characteristics, such as economic deregulation level (Ovtchinnikov, 2010) and asymmetric information levels (Autore and Kovacs, 2010). However, these studies do not focus on testing different capital structure theories. In Chapter 7, we mainly focus on searching for the most appropriate capital structure theory and important debt ratio determinants within our sample. The results in Chapter 7 elaborate on the details of firms' gearing ratio adjusting behaviours.

For example, in terms of capital structure adjustment, Huang and Ritter (2009), Leary and Roberts (2005), and many others, show that firms change their debt ratios, but do not show the change in adjustment speeds based on firms' characteristics. On the contrary, we show that capital structure adjustment speeds can vary in line with different firms' characteristics and with different segments of these firms' characteristics. In other words, our study takes account of a much greater number of determinants and, more importantly, our cluster analysis tests all three major capital structure theories together.

Last but not least, our results in Chapter 7 reinforce the importance of firms' bankruptcy costs and survival. The cluster analysis suggests that all three major capital structure theories partially work to explain firms' gearing level adjusting behaviours. In other words, Chapter 7 mainly supports the trade-off theory by admitting to the idea that firms use opportunities to increase their values by issuing over-priced stock. That is to say, the cluster analysis strongly supports the wider trade-off theory as the most appropriate capital structure theory. Therefore, the method we used in Chapter 7 contributes to finding the most important capital structure theory and debt ratio determinants, and embodies three traditional major capital structure theories by explaining how they can relate to each other.

7. In this thesis, we created a new measure for testing firms' genuine choices in the situation where firms usually issue equity and debt simultaneously. With prior

measures, there is always some positive correlation between net equity-or-debt issues, and financial deficits and new investments.

However, our new variables, the pure debt issuance (which is the negative value of pure equity issuance) and the pure equity issuance, indicate what firms really choose (increase) between equity and debt when they issue both debt and equity simultaneously every year. According to our survey of the literature, we have not yet found any previous studies which have used this measure as a proxy of firms' debt-and-equity choice. (see Section 5.3.2.6 which describes full details of the pure issuance measure).

8. Last but not least, this thesis tries to integrate three different capital structure theories with one general principle in that all firms try to increase their value and reduce their expenses. This idea was suggested by Megginson (1977) and Ross (1995). Myers (2001) mentioned that one debt ratio changing behaviour may be related to more than one capital structure theory, and these theories may be correlated to each other. Recently, many researchers such as Morellec (2004), Fama and French (2005), and Frank and Goyal (2009), consider the trade-off theory with factors from other capital structure theories, such as the pecking order and market timing theories. In this thesis, we try to show deeper associations between these major capital structure theories by using various methods, such as the static model, the dynamic model, cluster analysis and the pure issuance of equity-and-debt.

We have successfully shown that, in terms of the trade-off theory, there is an optimal capital structure for each firm. We have also indicated that, in terms of the pecking order theory and the market timing theory, firms issue equity when stock is overpriced. Therefore, we suggested that these three major capital structure theories could be integrated in terms of the wider trade-off theory (see Section 2.2.2.2 which describes the details of the wider trade-off theory). It also implies that these three major capital structure theories have, in principle, the same motivation. In other words, firms like to minimise their costs and maximise the benefits.

8.4 The limitations of the thesis

In this thesis, there are several limitations which may well reduce the reliability of our research results. Our forthcoming research should improve its quality by resolving these limitations.

1. This thesis mainly focused on quantitative methods but qualitative methods could point to different conclusions in terms of changes in firms' debt ratios. As Shefrin (2007) and Wald (1999) mention, CFOs' experiences, manager's risk preference and cultural factors in a country, could affect firms' leverage levels. In other words, considering both quantitative and qualitative methods, and related data, could improve our research results and reliability.

2. When we classified our sample based on firms' ages in Section 7.3, we based it on the years in which our sample firms first appear in the database we used. As we could not obtain the data for the years in which the firms in our sample were founded, we had to decide on a date using the most rational method, as far as possible, by studying earlier research. For instance, Fama and French (2002) use firms' size as a proxy for firms' ages because they thought that bigger firms probably have a longer history. Our criterion is a result of the limitations of the database we used (Thomson One Banker). Although our criterion cannot represent exact years for when firms were founded, our results indicate significant differences between the two age groups (see Sections 2.3.4, 3.4.5 and 7.3 for more details of a proxy of firms' ages and the relationship between debt ratio and their ages).

3. In this thesis, we use only listed firms. These are generally big firms and their managers have a reasonable level of knowledge of capital structure decision matters. Therefore, they may have target capital structures and will change their debt ratios to achieve these. They are also more likely to be able to access the financial markets compared to unlisted firms. However, unlisted firms are generally small, could have less knowledge of capital structure theories, and do not have a chance to access the financial market. Excluding these unlisted firms could have affected our results, therefore our results cannot represent the debt ratio changing behaviours of all firms.

4. When we were in the process of collecting our data, we realised that some countries did not have enough sample firms, which means that the ones used may not represent their countries' capital structure very well. For example, we have only 24, 62 and 194 sample firms from the countries of Austria, Italy and Canada, respectively. We consider that these firms may not fully represent all companies in their countries, and particularly in the industries of these countries.

5. As we mentioned in the limitation section of Chapter 6, we do not know what debt ratio can truly represent a firm's target debt ratio. Since we do not know the authentic target debt ratio, many researchers use different proxies for these unseen target ratios, such as the mean debt ratio of an industry (Emery and Finnerty, 1997), each firm's historical mean across their samples (Marsh, 1982), estimated values by using OLS cross-section regression (Fama and French, 2002) or by using Tobit regression (Nguyen and Shekhar, 2007). Furthermore, some researchers (e.g. Fama and French, 2002) estimate target debt ratios year-by-year as we did, while some (e.g. Shyam-Sunder and Myers, 1999) estimate the target debt ratio only once using the entire sample. It is therefore the case that, although we tried to obtain the best target debt ratios by estimating new target debt ratios every year, and including more capital structure determinants through a careful study of a great deal of previous research, there might be better ways to determine target debt ratios than those we estimated.

8.5 Further research

1. From the results of our thesis, debt ratio is affected by country factors. The term 'country' implies the legal system (including (de-) regulations for new industry, see Ovtchinnikov, 2010), macro-economic variables and cyclical behaviour. In particular, the relationship between regulation and capital structure is a relatively new area of study.

2. From the results, 'capital structure adjustment speeds' vary based on a firm's size, asset tangibility, profitability and macro-economic factors. We can observe that the

adjustment speeds are affected by these variables, but we still do not know what the most important driving factors are, and how these factors are combined. This is a new and challenging research area.

3. Since a large body of research has generally investigated only listed firms, the capital-structure-decision modes of non-public corporations are not yet clear. There may be some differences between listed and unlisted firms. However, according to the details of our research survey, no paper has been published in this area. This research might give us other views on capital structure theory.

4. From Chapters 5 and 7, cash holding and debt ratios show a negative relationship. The cash holding has two aspects. Holding too much cash has a cost implication but reduces the technical default probability. This implies that understanding cash holdings could help us understand capital structure.

5. This research explains observed phenomena, based on three major capital structure theories using statistical methods, rather than explain them in terms of management's decision making criteria, e.g. CFOs' risk preference. The method of interviewing financial directors and CEOs may offer different reasons for the 'leverage level change modes' of firms than do our statistical interpretations. In addition, this can give us a new chance to confirm our conclusions, or to consider other factors which previous capital structure models did not include. This method can also bridge a gap between two methodologies incorporating statistical and psychological methods.

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Appendices

These appendices have been added to the thesis and they include supplements which help to understand the thesis.

The appendix construction

Appendix 1 describes the data and offers definitions of the variables.
Appendix 2 presents capital structure theory with tax.
Appendix 3 describes statistical considerations.
Appendix 4 shows additional analyses of results contained in Chapter 4.
Appendix 5 presents the full study results of analyses based on firms' characteristics. Parts of the results are used in Chapter 7.

Appendix 1 Data and definition of variables

1.1 Number of firms in industry and period

The tables in this section show the number of firms in different industries, countries and time ranges.

Table A.1.1 The codes of ICB industry and dummy variables, and the number of firms

ICB sub-sector	ICB sub-sector code	ICB industry	ICB code	ICB dummy code	No of firms (89-98)	No of firms (99-08)
Aluminium	1753	Basic Materials	1000	0	131	208
Steel	1757					
Heavy Construction	2357	Industrials	2000	1	311	424
Delivery Services	2771					
Marine Transportation	2773					
Automobiles	3353	Consumer Goods	3000	2	464	665
Brewers	3533					
Distillers & Vintners	3535					
Soft Drinks	3537					
Food Products	3577					
Home Construction	3728					
Health Care Providers	4533	Health care	4000	3	278	520
Biotechnology	4573					
Drug Retailers	5333	Consumer Services	5000	4	382	673
Broad-line Retailers	5373					
Broadcasting & Entertainment	5553					
Airlines	5751					
Gambling	5752					
Hotels	5753					
Travel & Tourism	5759					
Fixed Line Telecommunications	6535	Telecommunications	6000	5	75	156
Mobile Telecommunications	6575					
Computer Services	9533	Technology	9000	6	863	1952
Internet	9535					
Software	9537					
Computer Hardware	9572					
Semiconductors	9576					
Total					2504	4598

Table A.1.2 The codes of the ICB sub-sector and the number of firms

ICB sub-sector	Code	ICB sub-sector dummy code	No of firms (89-98)	No of firms (99-08)
Aluminium	1753	0	15	24
Steel	1757	1	116	184
Heavy Construction	2357	2	252	338
Delivery Services	2771	3	17	26
Marine Transportation	2773	4	42	60
Automobiles	3353	5	33	44
Brewers	3533	6	25	30
Distillers & Vintners	3535	7	31	47
Soft Drinks	3537	8	33	55
Food Products	3577	9	285	398
Home Construction	3728	10	57	91
Health Care Providers	4533	11	117	186
Biotechnology	4573	12	161	334
Drug Retailers	5333	13	21	43
Broad-line Retailers	5373	14	73	104
Broadcasting & Entertainment	5553	15	117	241
Airlines	5751	16	21	37
Gambling	5752	17	57	101
Hotels	5753	18	42	65
Travel & Tourism	5759	19	51	82
Fixed Line Telecommunications	6535	20	50	91
Mobile Telecommunications	6575	21	25	65
Computer Services	9533	22	149	346
Internet	9535	23	57	180
Software	9537	24	328	654
Computer Hardware	9572	25	128	309
Semiconductors	9576	26	201	463
Total			2504	4598

Table A.1.3 The number of firms based on economies and countries

Economy	Code of Dummy	Number of firms (89-98)	Number of firms (99-08)	Country	Code of Dummy	Number of firms (89-98)	Number of firms (99-08)
Anglo-Saxon Economy	0	1300	2212	Australia (AUS)	0	45	247
				Canada (CAN)	1	76	194
				Britain (GBR)	2	142	301
				USA	3	1037	1470
Sub-total						1300	2212
Continental Economy	1	364	548	Austria (AUT)	4	14	24
				Germany (DEU)	5	166	235
				France (FRA)	6	151	227
				Italy (ITA)	7	33	62
Sub-total						364	548
East Asia Economy	2	840	1838	Japan (JPN)	8	684	1046
				Korea (KOR)	9	92	315
				Taiwan (TWN)	10	64	477
Sub-total						840	1838
Total		2504	4598	Total		2504	4598

Table A.1.4 Tax and countries

	Corporate tax[17]	Income tax[18]	Capital gains tax[19]	Tax on dividends
Austria	25% (flat rate)[20]	0% ~ 50%	25%	25%
Australia	30% (general)	0 ~ 47%	Included in income tax[21]	NA
Canada	32% ~ 38%	16% ~ 29%	50%	25%
France	33.83% (general)	0% ~ 40%	Included in income tax	0~1.7%
Germany	25%	0% ~ 42%	25%, 60%	26.37%
Great Britain	10% ~ 30%	10%, 40%	18%	10%, 32.5%[22]
Italy	33%	23 ~ 43%	12.5%, 25%	27%
Japan	30.80 ~ 44.79%	10 ~ 37%	Included in income tax	Included in income tax
Korea	13 ~ 25%[23]	9 ~ 36%	6~35%	15.4%
Taiwan	0 ~ 25%	6 ~ 40%	20% (flat rate)	NA
United States	15% ~ 35%	10% ~ 35%	Included in income tax	0%[24], 30%

[17] Source: The Federation of International Trade Associations (FITA)

[18] Source: The Federation of International Trade Associations (FITA)

[19] Source: www.worldwide-tax.com, for the data of tax on capital gain and dividend based on 2010.

[20] Before, 1st January 2005 corporate tax rate was 34%. Since 2005, the calculation of taxes in Austria has altered.

[21] Source: www.globalpropertyguide.com, for the data on tax on capital gains and dividends for Australia, South Korea and Taiwan.

[22] http://www.direct.gov.uk/en/MoneyTaxAndBenefits/Taxes/TaxOnSavingsAndInvestments/DG_4016453

[23] Surtax of 10% is not included

[24] By the Job and Growth Tax Relief Reconciliation Act of 2003, there are no dividend taxes in 2008.

1.2 Theoretical background to the selection of variables

The theoretical background and the research hypotheses in this thesis are related to three major capital structure theories. These hypotheses are related to the cost of capital, bankruptcy costs, tax shields, and some nominal measures such as industry, time and country.

1.2.1 Taxes

When Modigliani and Miller (1963) corrected their irrelevance theorem (1958), taxes were classed as the most important matter in the capital structure decision. Miller (1977) further developed the irrelevance theorem by using the personal tax effect.

In 1963, Modigliani and Miller assumed that T_p (tax rate on personal income) and T_E (tax rate on dividend) equals zero. In this case, the benefits from debt are changed into $T_c \times D$ and the value of a firm which has debts D, changes to Equation (1.1).

$$\text{Value}_{\text{with debt}} = \text{Value}_{\text{no debt}} + T_c r_D D / r_D = \text{Value}_{\text{no debt}} + T_c D \tag{1.1}$$

where, r: interest rate on debt, T_cD: tax shield

From Miller's (1977) model, which includes taxes on personal income and dividend, the benefit of having debt is calculated using Equation (1.2):

$$\text{Tax shield } (T_cD) = [1-(1-T_c)(1-T_E)/(1-T_p)] \times D \tag{1.2}$$

where, T_c: tax rate on company income, T_E: tax rate on dividend, T_p: tax rate on personal income, D: amount of debt issued by a firm

Note that Equation (1.1) is identical to Equation (1.2) if we follow Modigliani and Miller's 1963 criterion that T_p and T_E equals zero, $T_P=T_E$, as Graham showed (2003). This is called the marginal tax rate and is employed by Modigliani and Miller (1963) and by Graham et al. (1998). Equation (1.1) is applicable to an investigation at both country and individual company levels for two reasons. Firstly, generally speaking, the difference between T_P and T_E is not as great as Miller (1977) argued, although it is different between countries. Secondly, Modigliani and Miller's assumption of no bankruptcy costs is partly fulfilled, because firms in the real world do not have extreme levels of debt. Therefore, the debt levels for most of the firms in our sample, after removing outliers, generally speaking, are not such that the firm is in danger of bankruptcy.

1.2.2 Bankruptcy probability

It is generally presumed that financial distress reduces the wealth of firms, as the costs of financial distress are positively associated with the possibility of bankruptcy. The financial costs are encountering increasing financing costs, legal fees, creditor pressures, decreasing sales, and so on. Modigliani and Miller (1958, 1963) and Miller (1977) assumed that the costs of financial distress[25] are small, or do not even exist. Deangelo and Masulis (1980) however, show the significance of bankruptcy costs.

[25] Myers (1984) explained financial distress costs as the legal and administrative costs associated with bankruptcy, moral hazard, monitoring and contracting costs.

Shefrin (2007) states that a tax shield is a less important matter than bankruptcy costs. It is clear that, in the real world, firms go bankrupt and the probability of bankruptcy increases as debt increases. When firms increase debt levels, their costs will be increased (Sanz, 2006). Andrade and Kaplan (1998) suggest that the cost of financial distress is about 10% to 20% of a firm's value. Altman (1984) also shows that bankruptcy costs are between about 11% and 20% of the value measured in the year prior to going bankrupt. Opler and Titman (1994) also indirectly support this argument that highly leveraged firms lose relatively more market share when industry takes a downturn.

The probability of bankruptcy is therefore considered to play an important role in the market. Therefore the market attempts to measure the bankruptcy probability in order to accurately estimate a firm's value.

1.2.2.1 The measurements of bankruptcy probability

In order to evaluate bankruptcy probability, this study generally uses an accounting-based measurement. However, this section describes both accounting- and market-based measurements for Section 7.4 in which we compare the two different measurements. In the 1930s, studies found that failing firms show significant differences in terms of accounting ratios, particularly profitability, liquidity and solvency (Hickman, 1958; Altman, 1968). On the other hand, Merton (1974) realises that stockholders are in the same position as call (or put) option holders. Using Merton's idea, we can analyse bankruptcy probability by using the Black-Sholes-

Merton (BSM) model. An important factor is that, regardless of methodology, the two methods imply that debt ratios and growth rates are the most important factors in terms of deciding on bankruptcy probability.

1.2.2.1.1 Z-score models (Altman's ZPROB)

Z-score (1968), Z'-score (1983), and Z''-score (1993) models were developed by Altman, while the EM-score model (1995, 2005) was developed by Hartzell, Peck, Altman, and Heine (1995) and Altman (2005).

Z-score is calculated by using five different ratios.

$$\text{Z-score}=1.2\frac{\text{WC}}{\text{TA}}+1.4\frac{\text{RE}}{\text{TA}}+3.3\frac{\text{EBIT}}{\text{TA}}+0.6\frac{\text{ME}}{\text{BD}}+0.99\frac{\text{SALE}}{\text{TA}} \tag{1.3}$$

Where, Z: Overall Index, WC: Working Capital, TA: Total Asset, RE: Retained Earnings, ME: Market Value Equity, EBIT: Earnings Before Interest and Taxes, BD: Book Value of Total Debt, SALE: sale.

Altman (1968) notes that if a firm's Z-score is greater than 2.99, below 1.81, and between 1.81 and 2.99, it will fall into non-bankruptcy, bankruptcy and gray area, respectively.

The Z-Score model has limitations because it was developed for US listed manufacturing companies. In order to apply the Z-score model to private firms, Altman developed a modified Z-score model (Z'-Score).

$$Z'\text{-Score} = 0.717\frac{\text{WC}}{\text{TA}} + 0.847\frac{\text{RE}}{\text{TA}} + 3.107\frac{\text{EBIT}}{\text{TA}} + 0.42\frac{\text{BE}}{\text{BTL}} + 0.998\frac{\text{SALE}}{\text{TA}} \quad (1.4)$$

where, BE: Book Value Equity, BTL: Book Value of Total Liabilities

With a revised Z-Score model (Z'-Score), the non-bankruptcy area is greater than 2.09 in terms of the Z'-Score, the gray area is between 2.09 and 1.23 and the bankruptcy area is below 1.23, respectively.

The Z-score model has been, once again, modified for non-manufacturing firms and for firms in emerging markets. This model also applies to non-US corporations (Altman et al., 1995; Altman, 2002).

$$Z''\text{-Score} = 6.56\frac{\text{WC}}{\text{TA}} + 3.26\frac{\text{RE}}{\text{TA}} + 6.72\frac{\text{EBIT}}{\text{TA}} + 1.05\frac{\text{BE}}{\text{BTL}} \quad (1.5)$$

With a further revised Z-Score model (Z''-Score), the Z''-Score of the non-bankruptcy area is greater than 2.60, the gray area is between 2.60 and 1.1, and the bankruptcy area is below 1.1, respectively. Samarakoon and Hasan (2003) test Z-score models by using Sri Lankan firms. They find that all three models work well, though the Z''-Score model shows the best predicted performance.

1.2.2.1.2 Emerging Market Score Model (EMS model)

The Emerging Market Score Model (EMS model) was developed by Hartzell, Peck, Altman and Heine (1995) and Altman (2005) for rating credits in emerging markets. This EMS model is an upgraded version of the Z''-Score model. Unlike the original Z-Score model, EMS can be used for non-manufacturing companies, and firms in emerging markets, as well as for manufacturers (Altman, 2005). Altman (2005) shows that the EMS model can be successfully applied to non-US firms. The EMS model should involve six steps when it comes to obtaining an appropriate bond rating. Analysts first of all should obtain a bond rating using the EM score, through the use of the following model:

$$\text{EM Score} = 6.56\frac{\text{WC}}{\text{TA}} + 2.36\frac{\text{RE}}{\text{TA}} + 6.72\frac{\text{OI}}{\text{TA}} + 1.05\frac{\text{BE}}{\text{TL}} + 3.25 \qquad (1.6)$$

where, OI: Operating Income, BE: Book of Equity TL: Total Liabilities

The constant 3.25 in the model is the median Z''-Score for bankrupt US entities. If the Z''-Score (EM score) is greater than 5.85, between 4.15 and 5.85 and smaller than 4.14, then the bond is in a safe, gray and distress zone, respectively. There are five more steps to consider after obtaining the EM score. The second, involves adjusted bond ratings for foreign currency devaluation vulnerability; the third, adjusted for industry; the fourth, adjusted for competitive positiveness; the fifth, incorporates special debt issue features; and the sixth, involves a comparison with the sovereign spread. Altman however, suggests that even without Steps 2 to 6, the EM score is still applicable. The

EMS model should be used to measure bond ratings and intrinsic fixed income values (Hartzell et al., 1995).

1.2.2.1.3 O-score models

The O-score models were developed by Ohlson (1980), using the logit model. Ohlson finds that the size of a firm's 'total liability to total asset,' 'net income to total asset' and 'working capital to total asset' are the most important factors when deciding the probability of bankruptcy. He suggests three models for firms expecting to go bankrupt in one or two years, or within one or two years. He also suggests that each model is reasonable for predicting bankruptcy under different conditions, even though Model I has a better error rate and R-square. In the case of Model I, the cut-off point of whether a firm goes bankrupt is 3.8%. At this point, prediction error is minimum in Type I, as well as in Type II[26]. Deciding the cut-off point is very important for lenders. If there are too many Type I errors, then the creditors will lose their lending opportunities by wrongly estimating borrowers' credit; or if there are too many Type II errors, then borrowers could fail to make repayments. Therefore, Stein (2005) shows that a firm with a more accurate cut-off point will have higher profits.

One year O-score model

$$= -1.32 - 0.407\left(\log \frac{\text{Total Assets}}{\text{GNP price level index}}\right) + 6.03\frac{TL}{TA} - 1.43\frac{WC}{TA} + 0.0757\frac{CL}{CA} \qquad (1.7)$$

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[26] Type I error is when a firm is expected to go bankrupt, but this does not happen; and Type II error is when a firm is not expected to go bankrupt, but it actually does go bankrupt.

$$-2.37\frac{NI}{TA}-1.83\frac{FU}{TL}+0.285\times INTWO-1.72\times OENEG-0.521\frac{NI_t-NI_{t-1}}{|NI_t|-|NI_{t-1}|}$$

Two year O-score model

=

$$1.84-0.519\left(\log\frac{Total\,Assets}{GNP\,price\,level\,index}\right)+4.76\frac{TL}{TA}-1.71\frac{WC}{TA}-0.297\frac{CL}{CA}$$

$$-2.74\frac{NI}{TA}-2.18\frac{FU}{TL}-0.78\times INTWO-1.98\times OENEG+0.4218\frac{NI_t-NI_{t-1}}{|NI_t|-|NI_{t-1}|} \quad (1.8)$$

One or two year O-score model

$$=1.13-0.478\left(\log\frac{Total\,Assets}{GNP\,price\,level\,index}\right)+5.29\frac{TL}{TA}-0.99\frac{WC}{TA}+0.062\frac{CL}{CA}$$

$$-4.62\frac{NI}{TA}-2.25\frac{FU}{TL}-0.521\times INTWO-1.91\times OENEG+0.212\frac{NI_t-NI_{t-1}}{|NI_t|-|NI_{t-1}|} \quad (1.9)$$

where, SIZE: log(total assets/GNP price-level index). The GNP price-level index is based on the value of 100 for 1968. TL: Total Liability, CL: Current Liability, CA: Current Asset, NI: Net Income, FU: Fund provided by operations=EBITDA (earnings before interest and taxes (Chartkou et al., unknown year)), INTWO: one if net income was negative for last two years, zero otherwise, OENEG: one if total liabilities exceeds total assets, zero otherwise.

1.2.2.1.4 Black-Sholes-Merton model

The Black-Sholes option pricing model can be used for calculating bankruptcy probability. Unlike the 'accounting-based bankruptcy probability' model, the Black-

Sholes-Merton (BSM) model uses market-based variables, such as the market value of equity and the standard deviation of equity returns (Hillegeist et al., 2004).

The value of a European call option (c) is the stock price (p) minus the strike price (x) on the expired day, c=p-x. Black-Sholes (1973) realised that equity can be a call (or put) option, and Merton (1973, 1974) cemented this idea. Therefore, the formula, c=p-x, can be interpreted as the value of equity. c is the value of equity, p is the value of asset, and x is the value of debt when a firm goes into liquidation. When x is greater than p, then there is no value in call options and shares, and firms no longer belong to the shareholders.

As was discussed, the Black-Scholes formula as the equation of the BSM model, the call option price is the value of shareholders; and the formula can be re-interpreted as follows:

$$V_E = V_A e^{-\delta T} N(d_1) - X e^{-rT} N(d_2) \quad (1.10)$$

$$d_1 = (\ln(V_A / X) + (r - \delta + (\sigma_A^2 / 2))T) \big/ \sigma_A \sqrt{T} \quad (1.11)$$

$$d_2 = d_1 - \sigma_A \sqrt{T} = (\ln(V_A / X) + (r - \delta - (\sigma_A^2 / 2))T) \big/ \sigma_A \sqrt{T} \quad (1.12)$$

where, V_E: current market value of equity, V_A: current market value of assets, X: the face value of debt maturing at time T, r: continuously compounded risk-free rate, σ_A: standard deviation of asset returns, δ: continuous dividend rate, N(d): cumulative normal distribution function

From the formula, $N(d_1)$ is the probability of the stock price (V_A) that is no less than the exercise price (X) at time T[27]; and $N(d_2)$ is the probability of the call option that is stuck; because N(d) is the probability from a cumulative normal distribution function which is less than d (McDonald, 2009). Therefore, firms go bankrupt when total debt (X) is greater than total assets (V_A). From the option pricing model, the probability of bankruptcy at time, T (V_A (T) < X), can be expressed as follows (McDonald, 2006):

$$N\left(-(\ln(V_A/X)+(\mu-\delta-(\sigma_A^2/2))T)/\sigma_A\sqrt{T}\right)=\text{BSM-Prob} \tag{1.13}$$

where, μ: return of asset

Here, $\mu(t)=\max\left[(V_A(t)+\text{Dividends}-V_A(t-1))/V_A(t-1),\, r\right]$ replaces risk-free interest rates (r) from the original Black-Scholes model, because return of assets (μ) represents the future growth of a firm's cash-flows. The $N(-d_2)$ in this formula is based on the Black-Sholes model; and d_2 expresses the 'distance to default' (McDonald, 2006). This BSM formula shows that the probability of bankruptcy relies on a firm's current value (V_A), debt (X) and future growth (μ) (Hillegeist et al. 2004). These assumptions are the same as those associated with the 'accounting-based bankruptcy probability model.'

[27] When the stock price is higher, the call option is very likely to be in-the-money (Jarrow and Turnbull, 2000). Therefore, this can be a delta or hedge ratio, $\partial c/\partial S$.

1.2.2.1.5 The Expected Default Frequency (EDF) Model

From Equation (1.13), the probability of bankruptcy relies on a firm's current value (V_A), debt (X), and future growth (μ). As indicated in Equation (1.14), in the EDF model, as in the BSM model, the market value of the equity of a public listed firm is decided by the book value of liabilities, the market value of assets, the volatility of assets and time horizons. This indicates that the EDF model is also based on the same ground as the market-based models.

$$\begin{bmatrix}\text{Equity}\\ \text{Value}\end{bmatrix} = \text{option function}\left(\begin{bmatrix}\text{Asset}\\ \text{Value}\end{bmatrix},\begin{bmatrix}\text{Asset}\\ \text{Volatility}\end{bmatrix},\begin{bmatrix}\text{captial}\\ \text{Structure}\end{bmatrix},\begin{bmatrix}\text{Interest}\\ \text{Rate}\end{bmatrix}\right) \quad (1.14)$$

$$\begin{bmatrix}\text{Equity}\\ \text{Volatility}\end{bmatrix} = \text{option function}\left(\begin{bmatrix}\text{Asset}\\ \text{Value}\end{bmatrix},\begin{bmatrix}\text{Asset}\\ \text{Volatility}\end{bmatrix},\begin{bmatrix}\text{captial}\\ \text{Structure}\end{bmatrix},\begin{bmatrix}\text{Interest}\\ \text{Rate}\end{bmatrix}\right) \quad (1.15)$$

If we do not take the cumulative distribution function into account from Formula (1.13), then the formula can be written as follows:

$$\begin{aligned}&(\log(V_A) - \log(X) + (\mu - \delta - (\sigma_A^2/2))T)\big/\sigma_A\sqrt{T}\\ &= (E\log(V_{AT}) - \log(X))\big/\sigma_A\sqrt{T} \qquad (1.16)\end{aligned}$$

where, V_{AT}: asset value at time T

Formula (1.16) defines the 'distance to default' and shows that the bankruptcy probability is due to asset value at time T (V_{AT}), future growth (μ) and the debt (X). When X is greater than V_{AT}, the firm would go into bankruptcy. However, as Lando (2004) argues, the 'distance to default' greatly differs from the model, in practice.

Therefore, the distance of the default value should be combined with the empirically estimated default frequency. This is the basic idea of EDF. The KMV[28] has found the most frequent default point and was defined in Crosbie and Kocagil (2003) (cited by Altman, 2002; Lando, 2004).

The default point =0.5[long-term debt] + [short term debt] (1.17)

From this we can get the net value of a firm;

The net value of a firm = [the market value of asset]-[the default point] (1.18)

where, the market value of assets = market value of equity + book value of liability

From Formula (1.16), if normal or log-normal distribution is not used, the distance from default will be as indicated in the following Equation:

$$= \frac{\text{EXPECTED MARKET VALUE OF ASSETS} - \text{DEFAULT POINT}}{\text{EXPECTED MARKET VALUE OF ASSETS} \times \text{VOLATILITY OF ASSETS}} \qquad (1.19)$$

where, expected market value of assets: market value of assets

The stock price, the volatility of stock price and the book value of liabilities are collected from the financial market for listed firms; and from observed characteristics and values, based on market comparables for private firms (Altman, 2002). Using

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[28] The EDF model was developed by the KMV Corporation which was merged with Moody's. The EDF from Moody's KMV was based on the BSM model. The EDF is defined as the area of distribution that is below the book liabilities of a firm.

Formula (1.19), we can calculate the default probability after considering other variables, such as industry, size, time, etc.

1.2.2.1.6 Accounting-based models versus market-based models

Begley et al. (1996) and Hillegeist et al. (2004) show that the coefficients from the Altman (1968) and Ohlson (1980) models have changed over time. This implies that the probability of bankruptcy decision making criteria have changed from time to time. According to Altman (2002), the probability of bankruptcy varies over time, and more firms go bankrupt when economic situations are poor, and vice versa. Accounting-based models, however, do not indicate change in macro-economic situations in general.

Hillegeist et al. (2004) compare expected bankruptcy probabilities between accounting-based scoring models and the BSM, using the methodology of Vuong (1989), and show that the BSM model shows better results even though there are some problems. As the BSM model uses market data, market participants can observe the structure of bankruptcy risk from the market price. Financial markets, however, do not take all information into account if they are not efficient (Hillegeist et al., 2004). Therefore, the BSM model cannot predict the bankruptcy probability for high risk firms; markets over-estimate the real probability of bankruptcy. They also show that accounting-based models under-estimate the probability of bankruptcy (Hillegeist et al., 2004).

Reisz and Perlich (2007) find that accounting-based models (Altman's models) show better performance, at least for a one year prediction. Campbell et al. (2008) conclude that market-based models do little to help increase explanatory powers, but the importance increases as time horizons increase. All in all, even though there are some differences between the two model groups, there is a strong correlation between them (Hillegeist et al., 2004). Agarwal and Taffler (2008) also compare the performance of market-based and accounting-based bankruptcy prediction models, and conclude that there are no significant differences in the power of prediction between them.

1.2.3 Growth opportunity and investment

A firm with a high growth opportunity should increase debt level in order to have tax benefits as debt in growing firms is almost a risk free asset. Namely, if firms show continuous growth, they try to use more quasi risk-free debt[29]. On the other hand, Goyal et al. (2002) expect low levels of debt ratio for a firm with a great growth opportunity, and it will have short-term, private and senior debt (e.g. secured debt) instead of long-term or public debt, because it needs to prepare cash-holdings for future investment in terms of the pecking order theory.

According to Goyal et al. (2002, p.40), five proxies are generally used for growth opportunities; "1. *the ratio of the market value of a firm's assets to the book value of its assets (MBA)* …2. *the ratio of the market value of equity to the book value of equity (MBE)…* 3. *the earning-to-price ratio (EPR)…* 4. *the ratio of capital expenditure to the book value of asset*

[29] Myers (1984) suggests that new debt with a certain amount of future income is as good as cash.

(CAPEX)…. and finally, the ratio of research and development (R&D) expenditure to the book value of assets."

Here, MBA, MBE and EPR are related to market expectancy for firms' future value, and CAPEX and R&D expenditure are related to the operation of firms. This thesis uses CAPEX and R&D expenses as proxies for investment and growth opportunities but they have very different characteristics.

Capital expenditure and R&D expenses are associated with future profitability and risk profiles (Amir et al., 2007). They also find that the importance of capital expenditure, and research and development expenses depend on the industry concerned, and whether firms belong to R&D intensive industries or to CAPEX intensive industries. They also suggest that this importance is related to a time period when a certain industry begins to develop. When the Internet industry booms, for example, R&D expenses are more important than CAPEX. One more important finding of theirs is that CAPEX is less risky in terms of future operating income, but R&D expense has greater uncertainty in terms of future cash flows in R&D intensive firms.

Opler et al. (1999) suggest that R&D expense is related to asymmetry information and the financing hierarchy theory. The financing hierarchy problems can occur when the financial market has asymmetric information; thus, the price of securities can be either under- or over-valued[30]. They suggest that a firm with high R&D expenses should have high financial costs. They give two reasons for this: (1) high asymmetric information leads to a high level of discount rate when firms issue new securities; and if so (2) an investment opportunity leads to a shortage of liquid assets (cash) (Opler et al., 1999; Opler and Titman, 1994). Thus, R&D expenses lead to holding more cash (Opler et al., 1999). Graham (2000) also shows that R&D expenses are positively related to financial distress costs and growth opportunities. This implies that firms with high investment opportunities or R&D expenses, would have a high risk of uncertainty in terms of either present or future cash-flows. This conclusion is consistent with Chapter 4 in this thesis. The leverage levels of hi-technology industries are lower than those of other industries. This implies that high R&D expenses in these hi-technology industries increase the volatility of income. This is supported by the findings of Coles et al. (2006) in that R&D expenses are positively associated with stock price volatility. This implies that R&D expenses increase the volatility of future cash-flows and make the expectation of cash-flows difficult.

As we have seen, those two variables (CAPEX and R&D expenditures) are very similar. We can easily presume that these similarities could lead to a correlation problem and the validity of the variable. From the correlation tables (Tables 5.3 and 5.4), however, there is not a strong correlation between the two variables and from

[30] A firm with a high level of R&D expenditure has a problem with a high level of asymmetry information. The price of newly issued securities could be over- or under-estimated. In the event that security prices are under-estimated, the pecking order theory would prove correct (Opler et al., 1999).

some previous research, we can easily find articles which use those two variables together, such as that of Hovakimian et al. (2006).

1.2.4 Profitability

Profitability is one of the most important matter in a financial decision. Modigliani and Miller's (1958) conclusion is that the value of a firm is decided only by its profits and not by its leverage levels. Profitability is the core item when borrowing more money (Wald, 1999)[31]. Profitability is generally negatively related to debt ratios (Mitton, 2007; Antoniou et al., 2008; Hennessy and Whited, 2005). This can support the pecking order theory as well as the static trade-off theory with transaction costs. Titman and Wessels (1988) mention that firms use more debt when they have high profits, although the results from regression indicate a negative relationship between market-based debt ratio and profits. They suggest that this is because operating income increases the firm's value.

In terms of the pecking order theory, profitability is negatively associated with debt ratio because the issuing costs lead to an accumulation of earnings. Jensen (1986) however, documents that bankruptcy costs and agency costs caused by issuing new debt are not important for rapidly growing firms with high profitability. This implies that high profits cause high debt levels. This idea is consistent not only with the static trade-off theory, but also with Myers' (1984, 2001)[32] suggestion. Antoniou et al. (2008) add that a growth opportunity could be positively associated with leverage. As profits

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[31] He finds that profitability is the most important determinant of the leverage level.

[32] Myers (2001) mentions that firms with profitability could use more debt to obtain more tax benefits without considering increasing debt levels and bankruptcy probability.

reduce leverage levels, firms do not need to issue equity when they need to reduce debt levels based on the static trade-off theory; and when firms need external finance for a positive NPV investment plan because their financial slack is not enough for the investment, then issuing debt is a better strategy according to the pecking order theory. Namely, a positive incoming project increases debt capacity, and reduces the need to issue new stock (Myers, 1974; Titman and Wessels, 1988).

1.2.5 Firm size

Stonehill and Stitzel (1969), Remmers et al. (1974) and Huizinga et al. (2008) and others point to the importance of a firm's size in the capital structure theory. Kurshev and Strevulaev (2006) and Shumway (2001) consider that a firm's size is a vital variable for estimating bankruptcy probability. The size of a firm has been thought to be related to managerial risk and credit standing. In general, most research shows that a firm's size is positively related to debt ratios, as large firms have greater financial stability and less asymmetric information. Frank and Goyal (2003) conclude that smaller firms do not follow the pecking order theory but that larger firms do because small high-growth firms probably have more problems with asymmetric information.

1.2.6 Financial slack

Financial slack was defined by Myers and Majluf (1984, p.190) as "*…the sum of cash on hand and marketable securities,[...] and default-risk-free debt the firm can issue.*" There are two different points of view with regard to cash holding. One the one hand, there is no optimal cash-holding level such as is suggested by the pecking order hierarchy model.

Cash holding is simply created by firms accumulating internal funds (Opler et al., 1999). On the other hand, in terms of the point of view of the trade-off theory, too low a level of cash holding could cause a firm to miss positive investment opportunities, and a very high level of financial slack could lead to inefficiency in terms of the costs of capital. Opler et al. (1999) also argue that there are two disadvantages for firms which have financial slack, lower rates of return from those assets and tax disadvantages, and two advantages, savings transaction costs and having investment opportunities. From the point of view of the agency theory, Opler et al. (1999) also indicate that managers prefer to have cash holdings in order to reduce risk to the firm and to increase their discretion. However, their findings suggest that excess cash holding is used mostly for covering operation losses rather than for new investments. Similarly, judging by the recent financial crash, since 2007, financial slack is not the main concern for new investments but for survival. A Korean newspaper, for example, announced that the most vital concern for Korean firms is cash holding whilst in the middle of this economic recession[33]. Sanyal Dev, group treasurer at BP, the energy group, also mentioned at the Association of Corporate Treasurers annual meeting that "*…holding cash had moved from being economically inefficient... to being a vital element in the battle to maintain liquidity at times of capital market disruptions.*[34]" John (1993) finds that financial slack is used more for firms with high debt ratios and low tangible asset ratios. This implies that financial slack prevents increasing financial distress costs, particularly when firms have high levels of probability of financial distress. This also

[33] www.edaily.co.kr, April 16th 2009.

[34] www.ft.com, April 28th 2009, Welcome to a world of low predictability

implies that financial slack is closely related to a firm's financial policy, especially when it is in financial difficulties (John, 1993) or during an economic recession (Brealey et al., 2008).

In terms of asymmetric information, as firms with a high volatility in terms of future income have high financing costs, they prefer to hold more cash. For example, Bates et al. (2009) suggest the motivation for cash holding is that holding cash helps firms to cope better when accessing the costly capital market. Agency and financing hierarchy theories together suggest that firms like to hold more cash.

1.2.7 Tangibility

It is widely accepted that a firm with high tangibility has a high collateral value. Thus, the firm can have higher levels of debt ratio. Harris and Raviv (1990) and Rajan and Zingales (1995) explain that firms with tangible assets generally have a higher liquidation value. Braun and Larranin (2005) also show that firms which are tangible are affected less by the impact of recession, than firms which are less tangible, even in the same industries. They also suggest this phenomenon is universal across countries and industries. Lee et al. (2000), using Korean firms, however, argue that high levels of fixed assets increase fixed operating costs, and therefore the probability of bankruptcy increases. Thus, there will be a negative relationship between the two variables. Alderson and Betker (1995) also explain that tangibility does not always align collateral values because there are liquidation costs. When liquidation costs are high, the leverage levels would be low, even though the firm has high tangibility. This implies that a high level of tangibility is not a sufficient condition for available collateral. Low liquidation costs or easy encashment are necessary for tangible assets. This implies that leverage levels are associated with tangibility as well as liquidation costs.

1.2.8 Earnings volatility

Outside investors as well as inside managers can easily presume future cash-flows when earnings volatility is low. In other words, low earnings volatility makes easy and accurate expectations of a firm's future cash-flows. Titman and Wessels (1988) and Fama and French (2002) therefore expect a negative relationship between earnings volatility and leverage levels. Fama and French (2002) explain that high earnings volatility increases bankruptcy costs by reducing tax benefits and increasing bankruptcy probability. They use a firm's size (log(total asset)) as a proxy of earnings volatility, because they think that larger firms have a lower earnings volatility[35]. This thesis follows Titman and Wessels (1988) who use the standard deviation of the annual percentage change in operating income (operating $income_{t+1}$/operating $income_{t}$). Bradely et al. (1984) also use this variable and show a negatively correlated debt ratio with volatility in annual operating earnings.

[35] Fama and French (2002) use this because of lack of data. They mention that 5 or 10 years clearly estimated volatility better than the proxy by log(firm size).

1.2.9 Market-to-book ratio

The variable, market-to-book ratio (M/B), is used for various purposes. As described before, market-to-book ratio can be a proxy of growth opportunity (Goyal et al., 2002). The ratio of 'market value over book value shares' can be used as a proxy of Tobin's Q (Smith and Watts, 1992). This implies that this can be a proxy of market efficiency or market timing (Baker and Wurgler, 2002). Thus, this variable is related to asymmetric information costs by having too high or too low stock prices.

Leary and Roberts (2005) suggest, by citing Titman and Wessels (1988), that a firm's growth (investment) opportunities should be measured by the ratio of capital expenditure to total assets and that the market-to-book ratio (a proxy of Tobin's Q) should be used less.

1.2.10 Leverage level differences with some nominal measures

1.2.10.1 Country differences

In Chapter 4, the differences in debt level have been noted between countries. Leverage levels might be affected by country effects. For example, Far Eastern economies in Chapter 4 had higher leverage levels than Anglo-Saxon and Continental economies in the first and second period. The average debt ratios, especially in the case of Korean firms, dropped dramatically in the second period. This happened when Korea was affected by the Asian Financial Crisis in 1997 (Kim et al., 2006). This reflects that a country's factors play an important role in terms of decisions on capital structures.

Chui et al. (2002) show that capital structure is affected by aspects of national culture such as ‘conservatism.’ Using country specific variables such as legal enforcement, creditor and shareholder rights’ protection, and GDP growth, Jong et al. (2008) and La Porta et al. (1997) find that external financing is affected by the legal system[36] (Section 2.3.1 has a clearer description). McClure et al. (1999) suggest that the 1980’s globalisation of the financial market has increased, yet there is still a capital structure difference.

1.2.10.2 Industry differences

Firms in different industries use different assets in order to operate their businesses (Brav, 2009). Thus, firms in different industries show different leverage levels. For example, firms in the hotel industry have more debt ratios than those in other industries, especially in high-technology industries. Opler et al. (1999) expect that firms with high R&D have a lower debt ratio. Miao (2005, p.1464) also conclude that “…*mean capital structure is systematically related to technology and risk choices relative to industry.*” MacKay and Phillips (2005) analyse industries in terms of several factors such as the speed of technology growth, risky technology, bankruptcy costs, fixed operating costs and high entry costs, and suggest that debt levels are related to industry. Bradley et al. (1984) find that 56% of advertising and R&D expenses is explained by variables in the industry under consideration.

[36] Korea, Germany, Italy, Austria, Taiwan, France and Japan have a civil or Romano-German legal system, and the U.K, U.S, Canada, and Australia have a common legal system (Porta et al., 1998).

Appendix 2 Capital structure theories with tax

To explain the static trade-off theory, this appendix begins with Modigliani and Miller's irrelevance theory, their amendment in 1963, and Miller's (1977) paper including personal tax. Millers' model is followed by DeAngelo and Masulis' (1980) extension model; and this section finishes with DeAngelo and Masulis' optimal capital structure.

2.1 Irrelevance theory

Modigliani and Miller (1958) argue that capital structure is not relevant to the value of a firm based on seven assumptions (Megginson, 1997): (1) all physical assets are owned by corporations; (2) capital markets are frictionless; (3) corporations can issue […] only risk equity and risk-free debt; (4) both individuals and corporations can borrow and lend at the risk-free interest rate; (5) investors have homogenous expectations about the future stream of corporate profits; (6) there is no growth; and (7) all corporations can be classified into one of several 'equivalent return classes.'

2.1.1 Proposition I

"*That is, the market value of any firm is independent of its capital structure and is given by capitalizing its expected return at the rate* ρ_k *appropriate to its class.* (Modigliani and Miller,1958, p.268)."

$$V_j \equiv (S_j + D_j)(\overline{X}_j / \rho_k) \qquad (2.1)$$

where, V_j : the market value of firm j, S_j : the market value of common shares of firm j, D_j : the market value of debts of firm j, $\overline{X}_j$: expected return of firm j, ρ_k : market rate of capitalization for k class firm (weighted average cost of capital).

Proposition I can be valid with an 'arbitrage argument' and 'homemade leverage.' If there is an inequality between two firms (i.e. $V_L > V_U$ or $V_L < V_U$, where, V_L: the value of leveraged firm, V_U: the value of unleveraged firm) whose expected returns are the same, then, by an arbitrage transaction, the value of these two firms becomes equal. By this arbitrage transaction, it is clear that the value of firms is not based on capital structure.

2.1.2 Proposition II

> "*That is, the expected yield of a share of stock is equal to the appropriate capitalization rate ρ_k for a pure equity stream in the class, plus a premium related to financial risk equal to the debt-to-equity ratio times the spread between ρ_k and r*" (Modigliani and Miller, 1958, p.271).

Modigliani and Miller (ibid.) derive the expected rate of return of company i_j from proposition I.

$$i_j = \rho_k + (\rho_k - r)(D_j / S_j) \tag{2.2}$$

where, r: interest rate for debts

From Equation (2.2), the fact that i_j is increased as D_j increases does not happen as long as managers have the ability to undo the debt ratio without having transaction costs; namely from Equation (2.2), ρ_k can be constant by an arbitrage opportunity (Modigliani and Miller, 1958). Thus, as long as a firm does not go bankrupt, Modigliani and Miller's Proposition I is valid and compensation from increasing debt will be offset against increasing risks because ρ_k does not change.

2.1.3 Proposition III

> "*The cut-off point for investment in the firm in all cases be* ρ_k *and will be completely unaffected by the type of security used to finance the investment*" (Modigliani and Miller, 1958, p.288).

From Propositions I and II, if a firm's value is not affected by its capital structure, financing sources would not affect stockholders' wealth.

2.2 Modigliani and Miller's theory with taxes

Modigliani and Miller (1963) issued a new capital structure theory incorporating existing taxes, and amended their previous propositions.

2.2.1 Amended Proposition I

Modigliani and Miller (1963, p.434) amended their (1958) Proposition I by stating;

> "*Since the distribution of returns after taxes of two firms will not be proportional, there can be no "arbitrage" process which forces their values to be proportional to their expected after-tax returns.*"

From Modigliani and Miller (1963), the value of a leveraged firm is composed of the value of the unleveraged firm and its tax shield. From the their (1963) paper, we can cite Equation (2.3).

$$V_L = (1-\tau)\overline{X}/\rho^{\tau} + \tau R/r = V_U + \tau \cdot D_L \tag{2.3}$$

Where, ρ^{τ}: the rate at which the market capitalise the expected returns net of tax of an unleveraged company of size $\overline{X}$, $\rho^{\tau} = (1-\tau)\overline{X}/V_U$, therefore, $V_U = (1-\tau)\overline{X}/\rho^{\tau}$; $\tau \cdot D_L$: tax shield, τ : the marginal corporate tax, D_L : permanent level of debt, R: interest payment, r: interest rate on debt

According to Modigliani and Miller (1963), if they follow their original assumption that the distribution of returns after taxes from two firms[37] is proportional, then Equation (2.3) becomes Equation (2.4).

$$V_L = \frac{\overline{X}^{\tau}}{\rho^{\tau}} = \frac{(1-\tau)\overline{X}}{\rho^{\tau}} + \frac{\tau R}{\rho^{\tau}} = V_U + \frac{r}{\rho^{\tau}}\tau \cdot D_L \tag{2.4}$$

[37] Two firms have different levels of leverage.

where, $\bar{X}^{\tau}$: the variance of after-tax returns, $E(X^{\tau}) \equiv \bar{X}^{\tau} = (1-\tau)\bar{X} + \tau \cdot R$

Both Equations (2.3) and (2.4) indicate that the value of a firm is decided by tax and leverage. The difference between the two equations is that Equation (2.4) considers the relationship between the rate of debt capitalisation and the weighted average cost of capital, r/ρ^{τ} [38]. Equations (2.3) and (2.4) are the same as Equation (2.8) in Miller's (1977) model, which included personal tax in certain circumstances[39].

2.2.2 Amended Proposition II

From Equation (2.3), if we replace $(1-\tau)\bar{X}$ to $(\bar{X}^{\tau} - \tau R)$, we can obtain Equation (2.5).

$$V = (\bar{X}^{\tau} - \tau R)/\rho^{\tau} + \tau \cdot D_L \tag{2.5}$$

To obtain the after-tax yield on the equity capital, D must be subtracted from Equation (2.5), and $\bar{X}^{\tau}$ needs to be broken down into two components, expected net profits after taxes, $\bar{\pi}^{\tau}$,and interest payments, R = r ·D, (Modigliani and Miller, 1963)

$$S = V - D = \bar{\pi}^{\tau}/\rho^{\tau} - (1-\tau)((\rho^{\tau} - r)/\rho^{\tau})D \tag{2.6}$$

where, S: equity value, V: firm value, D: debt value, $\bar{\pi}^{\tau}$:net profits after taxes, R = r ·D: interest payment

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[38] If ρ^{τ}=r, Equation (3) is the same as Equation (4). The difference arises from the changes in their assumptions between 1958 and 1963.

[39] If $(1-T_{PB})<(1-T_C)(1-T_{PS})$ is satisfied in Equation (10), Equation (4) will be the same as Miller's model.

From Equation (2.6), we can get Equation (2.7).

$$\frac{\bar{\pi}^{\tau}}{S} = \rho^{\tau} + (1-\tau)(\rho^{\tau} - r)\frac{D}{S} \tag{2.7}$$

Equation (2.2) is replaced by Equation (2.7) in Modigliani and Miller (1963). Equation (2.7) implies that the expected return of equity is greater than that of the original argument by (1-τ), and that the expected return of equity is not completely independent of leverage level (Modigliani and Miller, 1963). Modigliani and Miller (1963) confirm that if there were no bankruptcy costs and the other basic assumptions from Modigliani and Miller (1958) were still valid, debt financing is always the best financial policy.

2.2.3 Miller's model

Miller (1977) declared that Modigliani and Miller (1963) were wrong because bankruptcy and agency costs were too small, or because the tax advantage of debt financing is too small.

From Equation (2.3), $V_L - V_U = T_C \cdot D = G$, where Tc: tax for firm, D: debt, and G: the gain from leverage. If we presume the existence of personal tax as well as income tax, Equation (2.3) becomes (Copeland and Weston, 1992):

$$V_L = \frac{\bar{X}(1-T_C)(1-T_{PS})}{\rho^{\tau}} + \frac{rD[(1-T_{PB})-(1-T_C)(1-T_{PS})]}{k_b}$$

$$= V_U + [1 - \frac{(1-T_C)(1-T_{PS})}{(1-T_{PB})}]B_L \qquad (2.8)$$

where, k_b: risk-free rate, B_L: $k_d D(1-T_{PB})/k_b$, the market value of the levered firm's debt

Miller (1977) included personal tax as a new element in the capital structure consideration.

$$G_L = \left[1 - \frac{(1-T_C)(1-T_{PS})}{1-T_{PB}}\right]B_L \qquad (2.9)$$

where, G_L: the gain from leverage, T_C: the corporate tax rate, T_{PS}: the personal tax rate on income from stocks, T_{PB}: the personal tax rate on income from bonds

Equation (2.8) is identical to Equation (2.4) when $T_{PS} = T_{PB}$ or T_{PS} and T_{PB} are equal to zero as Modigliani and Miller stated in their correction (Modigliani and Miller, 1963). Equation (2.9) implies that personal income tax on bonds reduces the gain from leverage or tax shields. Generally, personal income tax on interest income is greater than personal income tax on stocks. If Equation (2.10) turns out to be true, there is no more tax advantage (Copeland and Weston, 1992).

$$(1-T_{PB}) = (1-T_C)(1-T_{PS}) \qquad (2.10)$$

Miller's explanation of Equation (2.10) with market equilibrium being that whenever investors could have extra income (from arbitrage transactions) by holding stocks or bonds, they would change their ownership patterns to stocks or bonds, respectively, to have extra income. Therefore, Equation (2.10) is always true. This also implies that leverage levels are irrelevant to the value of firms. If $(1-T_{PB})<(1-T_C)(1-T_{PS})$, firms would have 100% debt in order to maximise their value and, vice versa. Leverage levels, therefore, should be at the equilibrium point, and capital structure is irrelevant at that point.

2.2.4 Extension of the Miller model

DeAngelo and Masulis (1980) extended Miller's model. They developed Miller's model using more realistic assumptions and employed heterogeneous personal and corporate tax rates, and corporate tax deductions from accounting depreciation, e.g. depreciation, oil depletion allowances and investment tax credits (Copeland and Weston, 1992).

They made a new equilibrium Equation (2.11) from Miller's model, including heterogeneous tax rates, tax shield and corporate tax deductions. This equation also considers the market prices of debt and equity. Namely, marginal incomes from debt and equity must be the same as the market equilibrium price, $(1-\mathrm{T}^{u}_{PD})/\overline{\mathrm{P}}_{D} = (1-\mathrm{T}^{u}_{PE}/\overline{\mathrm{P}}_{E})$, due to Miller's Equation (2.10) (DeAngelo and Masulis, 1980). If they are not in equilibrium, then prices will move towards the market equilibrium in terms of Equation (2.11). This equation must be achieved without regarding individual marginal income.

$$\frac{\partial V}{\partial B}=\frac{\overline{P}_D}{1-T^u_{PD}}[\{(1-T^u_{PD})-(1-T^u_{PE})(1-T_c)\}\int_{s^1}^{\bar{s}}\pi(s)ds] \tag{2.11}$$

where, $\overline{P}_D$: The market equilibrium price of debt, current price per unit of before personal tax expected debt; $\overline{P}_E$: The market equilibrium price of equity, current price of units of equity, before personal tax expected equity; T^u_{PD} : Tax rates for marginal investors for debt; T^u_{PE} : Tax rates for marginal investors for equity; S^1: The state in which earnings just cover debt charges; $\bar{S}$: The state in which a corporate tax bill is positive and all deductions and credits are fully utilised; $\pi(s)$: The probability of state S occurs.

Since the bracketed term is zero for equilibrium, when, $T_c = T^u_{PD}$, marginal corporate tax advantage offsets personal tax disadvantage of debt, instead of $T^u_{PE} = T^u_{PD} = 0$ in Millers' case (DeAngelo and Masulis, 1980).

2.2.4.1 Optimal leverage level in DeAngelo and Masulis

Extending Miller's model, they arrive at an equilibrium equation which argues that each firm has a different optimum leverage level, based on debt prices, earning situations, individual personal tax rate and a firm's individual tax rate.

$$\frac{\partial V}{\partial B}[B^*] = \frac{\overline{P}_D}{1-T^u_{PD}}[\, T_C\{\int_{s^3}^{\bar{s}} \pi(s)ds - (1-\theta)\int_{s^2}^{s^3} \pi(s)ds\} - T^u_{PD}] = 0 \qquad (2.12)$$

where, S^2: the state in which the corporate tax bill is just driven to zero, S^3: the state in which all deductions and credits are just fully utilised, B^*: The firm's interior optimum leverage

From Equation (2.12), Deangelo and Masulis (ibid.) show that optimum capital leverage depends on a firm's earning state. Therefore, all firms have different optimum leverage levels. If $\partial V/\partial B < 0$, there will be no more debt beyond B^{full}[40] at price $\overline{P}_D = \overline{P}_E(1-T_c)$, where B^{full} is the maximum promised debt level (Deangelo and Masulis, ibid.).

As a firm increases its leverage level beyond B^{full}, a higher debt price is required as compensation[41]. With any given price of $\overline{P}_D, \overline{P}_E$ and $\overline{P}_E(1-T_C)$, each firm has a unique interior optimum leverage B^* when $\partial V/\partial B = 0$. From Equation (2.12), the term in brackets equals zero at an equilibrium point (B^*); namely, the expected

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[40] $B^{full} \equiv X(0) - \Delta - \Gamma/\theta \cdot T_c < X(0)$, where, X(0): earning of zero, Δ: corporate tax deductions resulting from non-cash charges such as accounting depreciation, Γ: dollar value of tax credits, θ: statutory maximum fraction of gross tax liability which can be shielded by tax credits.

[41] Deangelo and Masulis (1980) assert that with a high debt level between $B^{full} < B \le X(0)$, debt is still risk free, but as debt levels increase, the tax shield decreases in a low earning state. It is therefore the case that new issuing debt requires a higher price.

marginal corporate tax benefit equals the expected marginal personal tax disadvantage of debt (T^{u}_{PD}).

By using Equations (2.11) and (2.12), DeAngelo and Masulis (1980) explain that each firm has a unique interior optimum leverage level, and show the differences in leverage levels across industry, time and tax rates[42].

2.2.5 Weighted Average Cost of Capital

The Weighted Average Cost of Capital (hereafter, WACC), $\rho_k = r \cdot B/V + k \cdot S/V$, is "*…the weighted sum of costs of the individual capital sources*" (Reilly and Wecker, 1973, p.124) and is related to investment and capital structure decisions (Myers, 1974[43]; Miles and Ezzell, 1980). The expected return of a new investment must be higher than the WACC. Otherwise, the firm's value will collapse.

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[42] Brennan (1970) also shows that in terms of marginal tax rates, optimal financial policies differ across investors.

[43] Myers (1974) formulates WACC; $\hat{\rho}^*_j = \rho_{oj}(1-\tau \cdot L)$ with MM Proposition I and $\hat{\rho}^*_j = (1-\tau)r \cdot B/V + k \cdot S/V$ with MM Proposition II. These two formulae come from Myers' general condition for the 'optimal investment condition' (APV_j). This implies that MM propositions are a special case of the Myers model, and also implies that investment and financing policies are based on the same criteria. In this formulation, ρ_{oj}: appropriate discount rate from all equity financing, $\hat{\rho}^*_j$: A proposed value for ρ^*_j, τ: corporate tax rate, r: firm's borrowing rate at time zero, k: the cost of equity capital, B: the market value of currently outstanding debt, S: the market value of currently outstanding stock, V: B+S, the total current market value of the firm.

In general, to obtain the value of WACC, very simple criteria are required (Reilly and Wecker, 1973; Linke and Kim, 1974). In the real world however, WACC is calculated in terms of different expectations in the market, and there are many different kinds of financing sources, because it is about future risk expectations associated with paying back credit. This implies that if an expectation of future earnings is great, the risk of lending money is expected to be low, and WACC will also be low. This implies that optimal leverage levels are not the same between companies, as noted by DeAngelo and Masulis (1980).

2.3 Optimal capital structure

Damodaran's formula (1999, see Section 2.2.2.1) can be simplified as follow (Ho and Lee, 2004):

$$V_L = V_U + \tau_c \cdot D - C(D) \quad (2.13)$$

$$\partial V_L / \partial D = \tau_c - \partial C(D^*) / \partial D = 0$$

$$\tau_c = \partial C(D^*) / \partial D \quad (2.14)$$

where, D^*: debt level of maximum firm value, C(D): bankruptcy costs

From Equation (2.14), the value of a leveraged firm begins to decline when the leverage level is above the level of D^*. Here, D^* is the optimal capital structure with regard to which the tax shield maximises.

Altman (1984, 1993) also shows the optimum debt level by using an expression of bankruptcy probability. The optimum debt level is the point where the tax benefit from debt and the expected bankruptcy costs are the same.

$$P_{B,t}(BCD_t + BCI_t) \cdot (PV_t) = (PV_t)T_C(Id_t) \cdot (1 - P_{B,t}) \tag{2.15}$$

where, $P_{B,t}$: the probability of bankruptcy estimated in period t, BCD_t: direct bankruptcy costs estimated in t, BCI_t: indirect bankruptcy costs estimated in t, PV_t: present value adjustment to period t, TC: marginal tax bracket of the corporation, Id_t: interest expenses from period t to infinity.

Appendix 3 Statistical consideration

3.1 Statistical consideration with panel data

Panel data generally have an endogeneity problem and, in particular, partial adjustment method has a strong probability of endogeneity. Ozkan (2001) adds that endogeneity problems can occur because capital structure decision matters are affected by observable and unobservable factors, and by a firm's specific characteristics, e.g. the market value of equity. Thus, the GMM method is more efficient than OLS in dealing with this endogeneity problem. In order to use GMM estimators in this thesis, this section studies the panel data and the GMM estimator. Furthermore, Arellano and Bond (1991, p.291) suggest that "…*there is a serious upward bias on lagged dependent variables* [in OLS estimation using panel data]." Ozkan (ibid.) also shows consistent results.

3.1.1 Panel data

In this research, fiscal data have two aspects, cross-sectional and time series aspects. An independently pooled cross-sectional data set and a panel data set (longitudinal data) have these aspects. Pooled cross-sectional data sets are collected from randomly selected samples taken annually or at very regular time periods. Panel data sets, however, are randomly selected from the research population at the beginning of the research, and collected at very regular intervals from the same samples. Therefore, from the panel data, we can observe historical changes in the samples over a period of time, and we should not assume that the observations are independently distributed across that time period (Wooldridge, 2006). In addition, the panel data sets generally have a wide range of cross-sectional samples in relatively short periods of time. Since a panel data set is cross-sectional, each individual (firm, country and economy, for example) could have different intercepts called 'cross-sectional heterogeneity.' It is most likely that an individual could be affected by the same factors over time. If this is the case, there would be a different intercept across the cross-section. These problems can be resolved by using fixed effect and random effect estimators.

$$Y_{i,t} = \alpha + \sum_{i=1}^{n}\sum_{k=1}^{n}\sum_{t=1}^{n} X_{i,t,k} + u_{i,t}\left(\varepsilon_{i,t} + \xi_i\right) \qquad (3.1)$$

where, Y_{it} is the debt ratios of firm i at time t, $X_{i,t,k}$ is a matrix for k variables of i firms at time t, and vector residual u_{it}.

In most panel data applications, the vector residual $u_{i,t}$ is compounded with $\varepsilon_{i,t}$ and ξ_i. ξ_i is unaffected by time (e_t) or unknown factors (f_u) that are not included in the regression, whereas $\varepsilon_{i,t}$[44] is affected by time, individual variables and "other *usual disturbance in the regression*" (Baltagi, 2005, p.11; Davison and MacKinnon, 2004). This implies that ξ_i is referred to as an unobserved heterogeneity (Wooldridge, 2006).

3.1.1.1 First differenced and fixed effect (within) estimator

Since, panel data generally have correlation problems over time (Verbeek, 2008, p.356), removing the fixed effect (ξ_i) is an important matter. From Equation (3.1), ξ_i is

[44] $\varepsilon_{i,t}$ is called an idiosyncratic error or time-varying error because it represents unobserved factors that change across time and affect dependent variables (Wooldridge, 2006).

correlated to regressors. Using the fixed effect (FE) model or first differencing (FD) model, ξ_i can be removed. The first effect model and first differencing model are identical when the length of time is 2 (T=2) (Wooldridge, 2006).

From Equation (3.1),

$$u_{it} = \xi_i + \varepsilon_{it} \tag{3.2}$$

where, ε_{it} is homoskedastic and is uncorrelated over time, and ξ_i is time invariant and homoskedastic across individuals (Verbeek, 2008).

The equation $y_{it} - y_{i,t-1} = (x_{it} - x_{i,t-1})'\beta + (u_{it} - u_{i,t-1})$ or $\Delta y_{it} = \Delta x'_{it}\beta + \Delta u_{it}$ expresses a first-differenced estimator (FD): and the fixed effect estimator (FE) is expressed by the following equation, $y_{it} - \bar{y}_i = (x_{it} - \bar{x}_i)'\beta + (u_{it} - \bar{u}_i)$ [45] (Verbeek, 2008).

When u_{it} are serially uncorrelated, the fixed effect estimator is more efficient, and if u_{it} follows a random walk [46], the first differenced estimator is a better estimator (Wooldridge, 2006). The serial correlation in the first-differenced model can easily be checked with the AR(1) model (Wooldridge, 2006). Let, $r_{it} = \Delta u_{it}$, then AR(1) model

[45] Note that, $\bar{y}_i = \alpha_i + \bar{x}'_i\beta + \bar{u}_i$, where $\bar{y}_i = T^{-1}\sum_t y_{it}$.

[46] This implies that there is positive serial correlation, and Δu_{it} is serially uncorrelated

$r_{it} = \rho r_{i,t-1} + e_{it}$. If H_0: $\rho = o$ from pooled OLS, there is no serial correlation. However, it is not generally clear about how to decide the right methodology between FD and FE, particularly when T (time) is large, and K (the number of variables) is relatively small. It is therefore used to report both sets of outcomes with an explanation of the reason for the differences (Wooldridge, 2006).

3.1.1.2 Random effect (EGLS) estimator

From FD and FE, we assume that ξ_i is correlated, and we try to have it removed. Unlike FD and FE, if we assume that ξ_i is not correlated to independent variables, ξ_i is independent of regressors, and Equation (3.1) becomes a random effect model (RE)[47,48].

The ideal random effect model shows that unobserved effects are not correlated with any independent variables.

$$Cov(x_{itj}, \xi_i) = 0, \text{ t=1,2, …, T; j=1,2, …, k} \tag{3.3}$$

Even though ξ_i is not correlated to independent variables in each time period, it is still correlated to auto-regressive time serial correlation.

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47 If ξ_i is uncorrelated to regressors, the equation is the same as a simple cross sectional OLS, except that the cross-sectional OLS would not count the information from across time periods (Wooldridge, 2006).

48 If a random effect transformation is close to one, the results from the random effect and from the fixed effect are close to each other; and by using the Hausman test, we can decide whether the random effect is close to the fixed effect. When the Hausman test rejects a null hypothesis H_0, we should use the fixed effect (Wooldridge, 2006). In other words, if the statistic fails to reject the H_0, FE and RE leads to similar outcomes (Wooldridge, 2006; Baltagi, 2005).

$$\mathrm{Corr}(u_{it}, u_{is}) = \sigma_{\xi}^{2} \big/ (\sigma_{\xi}^{2} + \sigma_{\varepsilon}^{2}), t \neq s \tag{3.4}$$

where, u_{it} is a composite error term.

This can be solved by a feasible GLS estimator (FGLS) or estimated GLS (EGLS) (Verbeek, 2008).

Let GLS transformation that removes serial correlation, be $\lambda = 1 - [\sigma_{\varepsilon}^{2} \big/ (\sigma_{\varepsilon}^{2} + T\sigma_{\xi}^{2})]^{1/2}$. From practice, however, we never know the λ. We generally use an alternative that is taken from the error term of the pooled OLS or the fixed effect model; the alternative GLS transformation is $\hat{\lambda} = 1 - \{1 \big/ [1 + T(\hat{\sigma}_{\xi}^{2} \big/ \hat{\sigma}_{\varepsilon}^{2})]\}^{1/2}$. FGLS equation is derived by $\hat{\lambda}$, $y_{it} - \hat{\lambda}\bar{y}_{i} = \beta_0(1 - \hat{\lambda}) + \beta_1(x_{i,t1} - \hat{\lambda}\bar{x}_{i1}) + ... + \beta_k(x_{i,tk} - \hat{\lambda}\bar{x}_{ik}) + (u_{it} - \hat{\lambda}\bar{u}_{i})$; and the random effect estimator can be computed by regressing pooled OLS. In practice, unlike the assumption of FD or FE, the "*…random effect (RE) model […] assumes that unobserved effect is uncorrelated with all explanatory variables*" (Wooldridge, 2006, p.497). Thus, the RE can use variables such as, gender, country or dummy variables, which do not change over time. The RE should be used when there is a large K and a small T. As T gets larger, $\hat{\lambda}$ closes to one, and the outcome will be similar to the FE (Wooldridge, 2006).

3.1.1.3 Fixed Effect (FE) or Random Effect (RE)?

Wooldridge (2006) mentions that when ξ_i is correlated with any independent variables, the fixed effect (FE) estimator or first differencing estimator should be used; and when ξ_i is uncorrelated $Cov(x_{itj}, \xi_i) = 0$ with regressors, random effect (RE) estimators should be used. The FE is thought to be in a more general form than the RE, because the RE became the FE, as $\hat{\lambda}$ tends to be close to one with increasing the length of time period of the sample. The RE, however, has one advantage in that it can be used with variables that do not change over time. It is therefore the case that if we are interested in time varying explanatory variables, the FE would be preferred to the RE, otherwise the RE is a more general estimator with one condition in which $\mathrm{Cov}(x_{itj}, \xi_i) = 0$.

3.1.2 Methodology for the panel static model

Either non-panel data sets or panel data sets with i.i.d. (Independent and Identically Distributed) error terms would not be a problem when using an Ordinary Least Square (OLS) estimator. Sufficiency of the i.i.d. assumption, however, is hardly realistic with panel data (Davidson and Mackinnon, 2004).

Panel data, like time series data, are likely to have correlation problems between explanatory variables and error terms, and these can occur in between times[49]. This problem can be solved by using Maximum Likelihood (MLE), Instrumental Variables

[49] This correlation can be checked by the first-order auto-correlation (AR(1)) model or Lagrange Multiplier (LM) tests.

(IV), Generalised Method of Moments (GMM), Two or Three-stage Least Square Estimators (2SLS or 3SLS) and Hayashi-Sims (Verbeek, 2008; Phillips, 1993).

To use Instrumental Variable (IV) or General Method of Moments (GMM) estimators, the instrumental variables (or instruments) play an important role in estimating equations. To estimate equations based on IV or GMM estimators, the number of instruments required must be at least the same as the numbers of [endogenous] independent variables (known as just identified). Namely, the number of instruments should be no less than the number of moments ([endogenous] independent variables), otherwise the equation could not find a unique solution (Davidson and Mackinnon, 2004). We do not know the optimal number of instrumental variables, but asymptotically, we will not have a bad result, but we can get better results when we use a larger number of instruments (Wooldridge, 2002). However, it is better to use a small set of optimal instruments instead of using many instruments, because it is getting more difficult to find suitable instruments (Wooldridge, 2002). Any variables can be instruments with two conditions. Firstly, instrumental variables (z) should be highly correlated with independent variables (x), and should be uncorrelated (orthogonalised) with the error term (ε), $\text{cov(z, x)} \neq 0$, and $\text{cov(z, ε)} = 0$ (Wooldridge, 2006). There is no assumption as to how the residuals (ε) are formed in the GMM model (Kapinos, 2006). Any vectors can be instrumental variables if the vectors satisfy the two conditions; but finding the right instrumental variable is the most important and difficult matter in using the GMM model. One of the most common methods is to choose lagged values as instrumental variables (Anderson and Hsiao, 1981; Phillips, 1993; Kennedy, 1988).

In addition, Baum et al. (2003, p.11) mention that "*the advantages of GMM over IV are clear: if heteroskedasticity is present, the GMM estimator is more efficient than the simple IV estimator, whereas if the heteroskedasticity is not present, the GMM is no worse asymptotically than the IV estimator.*"

This thesis mainly uses the GMM estimator because, as Baum et al. (ibid.) mention, GMM is one of the most general methods for panel data. Some other estimators for panel data, such as IV, two-stage least square, three-stage least square, are special cases of GMM (Baum et al., 2003). GMM estimators are mainly sorted by weight matrices. Namely, GMM uses the same algorithm to analyse data, but it has the most general weight matrices.

3.1.2.1 Generalised Method of Moments (GMM)

3.1.2.1.1 Identification problem

The meaning of being identified is that, from a given regression, ($y_i = x'_{1i}\beta_1 + x_{2i}\beta_2 + \varepsilon_i$), $E\{\varepsilon_i x_{1i}\} = 0$ and $E\{\varepsilon_i x_{2i}\} = 0$, so $N^{-1}\sum_{i=1}^{N}(y_i - x'_{1i}b_1 - x_{2i}b_2)x_{1i} = 0$ and $N^{-1}\sum_{i=1}^{N}(y_i - x'_{1i}b_1 - x_{2i}b_2)x_{2i} = 0$ [50]. Where, this regression fulfils a moment condition, then β_1 and β_2 are identified. Therefore, this regression needs no additional moment condition which is generally derived from instruments (Verbeek, 2008; *Ma'tya's* , 1999).

[50] This formula comes from OLS estimator $b = (b'_1, b_2)'$ for $\beta = (\beta'_1, \beta'_2)'$ (Verbeek, 2008)

Let us suppose that β is $p \times 1$ vector and instruments (z) are $q \times 1$ vector. As was discussed, the number of instruments required must be $q \geq p$ for identification. This is called the "order condition," and when q = p, this is called "just identified", and when q > p, this is called "over identified".

Identifying moment conditions can be tested statistically using the Hausman test, when instruments are over-identified (Verbeek, 2008), because the optimal weighing matrix for instrument estimators is asymptotically chi-squared distributed with a $q - p$ degrees of freedom. If q=p, the degree of freedom will be zero, and it cannot be tested (Verbeek, 2008, see next section for details).

3.1.2.1.2 GMM

The most noticeable advantages of using GMM are:

> "(1) *it does not require distribution assumptions;* (2) *it can allow for heteroskedasticity of unknown from; and* (3) *it can estimate parameters even if the model cannot be solved analytically from the first-order conditions*" (Verbeek, 2008, p. 161).

To understand the GMM easily, let us explain OLS using matrices. From the basic assumption of OLS, error term $u = 0$. Therefore, from the regression y=bX+u, we can get the coefficient, $b=(X'X)^{-1}X'y$[51], in the form of matrices, and $\hat{y}=X(X'X)^{-1}X'y=P_Xy$ because y=bX+u, where P_X is a projection matrix.

From the assumptions of the instruments, $\text{cov}(z, x) \neq 0$ and $\text{cov}(z, \varepsilon) = 0$, the IV estimator can be expressed as follows: $E\{u_i z_i\} = E\{(y_i - x_i'b)z_i\} = 0$, where z is $T \times k$ instruments which satisfy the moment condition, $E(Z_i'u_i) = 0$; and $b_{IV} = (Z'X)^{-1}Z'y$ if endogenous variables are just identified. In the case of over identification, then the instrument matrix is not symmetric and is impossible to calculate. To solve this, we need to bring a minimising quadric form with weighting matrix W_N.

$$Q_N(b) = [N^{-1}Z'(y - Xb)]'W_N[N^{-1}Z'(y - Xb)] \qquad (3.5)$$

This implies $X'ZW_NZ'y = X'ZW_NZ'Xb_{IV}$, and $b_{IV} = (X'ZW_NZ'X)^{-1}X'ZW_NZ'y$.

Since W_N follows the method of moment with minimising the quadric loss function, the optimal weighting matrix is $N^{-1}\sum_{i=1}^{N} z_i z_i'$.

Therefore,

$$b_{IV} = (X'Z(Z'Z)^{-1}Z'X)^{-1}X'Z(Z'Z)^{-1}Z'y \qquad (3.6)$$

(Verbeek, 2008).

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[51] Since error term $u = y - Xb$ orthogonal to X ($X'u = 0$) from the OLS assumption, $X'(y - Xb) = 0$, $b = (X'X)^{-1}X'y$

The IV is a special case of GMM[52]. When an equation is just identified, IV and GMM arrive at the same outcome. Unlike the IV estimator, GMM does not require i.i.d of error term. Just like IV, coefficients of GMM are decided by $b_{GMM} = (X'ZW_N Z'X)^{-1} X'ZW_N Z'y$. The GMM estimator depends upon W_N, $W_N = (N^{-1}\sum_{i=1}^{N} \hat{u}^2 z_i z_i')^{-1} = (Z'uu'Z)^{-1}$ [53], where weighing matrix W_N is a covariance matrix. Thus the GMM allows heteroskedasticity of u_i (Davidson and Mackinnon, 2004; Baum, 2006; Verbeek, 2008). Therefore, the GMM estimator becomes;

$$b_{GMM} = (X'Z(Z'uu'Z)^{-1} Z'X)^{-1} X'Z(Z'uu'Z)^{-1} Z'y \quad (3.7)$$

3.1.2.1.3 System GMM

The Difference GMM estimator shows sample bias and poor precision in simulation studies, when it is used for linear dynamic panel data models[54]. One explanation is weak instruments (Blundell and Bond, 1999 cited by Blundell et al., 2000)[55]. The

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[52] Not only the IV but also the OLS are special cases of GMM. In the special case when instruments are the same as regressors, then:

$$\begin{aligned} b_{GMM} &= (X'X(X'uu'X)^{-1} X'X)^{-1} X'X(X'uu'X)^{-1} X'y \\ &= (X'X)^{-1}(X'uu'X)(X'X)^{-1}(X'X)(X'uu'X)^{-1} X'y \\ &= (X'X)^{-1}(X'uu'X)(X'uu'X)^{-1} X'y \\ &= (X'X)^{-1} X'y = b_{OLS} \qquad \text{(Davidson and MacKinnon, 2004, p.358)} \end{aligned}$$

[53] Where uu' is a covariance matrix from an OLS estimator.

[54] An example of the dynamic panel data model is $y_{it} = \alpha y_{it-1} + b'x_{it} + u_{it}$, $u_{it} = \xi_i + \varepsilon_{it}$.

[55] Blundell and Bond (1999) use first-differenced variables. The term "weak instrument" refers to instruments which become less informative for various reasons.

problem with weak instruments occurs when α goes towards unity, and ξ_i comes close to ε_{it} in the Difference GMM for the pure auto-regressive model (Blundell et al., 2000). Blundell and Bond (1998) propose System GMM, using the Difference GMM with an extra moment condition called "initial condition"[56] and a Levels GMM.

The Difference GMM is suggested by Arellano and Bond (1991). The orthogonal condition of Difference GMM is $E[Z'_{d,i}\Delta u_i] = 0$

$$\text{where, } Z_{d,i} = \begin{bmatrix} y_{i,1} & 0 & 0 & \dots & 0 & \dots & 0 \\ 0 & y_{i,1} & y_{i,2} & \dots & 0 & \dots & 0 \\ . & . & . & \dots & . & \dots & . \\ 0 & 0 & 0 & \dots & y_{i,1} & \dots & y_{i,T-2} \end{bmatrix}, \ \Delta u_i = \begin{bmatrix} \Delta u_{i3} \\ \Delta u_{i4} \\ . \\ \Delta u_{i,T} \end{bmatrix}$$

Therefore, the coefficient of the Difference GMM is:

$$b^{DIF}_{GMM} = (\Delta y'_{-1} Z_d W_N Z'_d \Delta y_{-1})^{-1} \Delta y'_{-1} Z_d W_N Z'_d \Delta y \qquad (3.8)$$

where, $W_N = (N^{-1}\sum_{i=1}^{N} Z_{d,i}\Delta u_i \Delta u'_i Z_{d,i})^{-1}$.

The Level GMM is suggested by Arellano and Bover (1995). The orthogonal condition of Levels GMM is $E[Z'_{l,i}u_i] = 0$.

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[56] $E(u_{i3}\Delta y_{i2}) = 0$, $E\left[(y_{i1} - \frac{\xi_i}{1-\alpha})\xi_i\right] = 0$, see Blundell and Bond (1988)

$$\text{where, } Z_{l,i} = \begin{bmatrix} \Delta y_{i,2} & 0 & 0 & \ldots & 0 & \ldots & 0 \\ 0 & \Delta y_{i,2} & \Delta y_{i,3} & \ldots & 0 & \ldots & 0 \\ . & . & . & \ldots & . & \ldots & . \\ 0 & 0 & 0 & \ldots & \Delta y_{i,2} & \ldots & \Delta y_{i,T-1} \end{bmatrix}, \; u_i = \begin{bmatrix} u_{i3} \\ u_{i4} \\ . \\ u_{iT} \end{bmatrix}$$

The coefficient of the Levels GMM is:

$$b_{GMM}^{LEV} = (y'_{-1} Z_l (Z'_l Z_l)^{-1} Z'_l y_{-1})^{-1} y'_{-1} Z_l (Z'_l Z_l)^{-1} Z'_l y \qquad (3.9)$$

One advantage of the Levels GMM is that the lagged differences are still informative, even if α goes towards unity (Soto, 2007).

A weak instrument problem can also occur in the Levels GMM, when the time series data are persistent (Bun and Windmeijer, 2007). Therefore, the System GMM is proposed by Blundell and Bond (1998) in order to improve the efficiency of the estimator, especially when the number of time-series observations is small. The System GMM is made by combining the Difference GMM and the Levels GMM. Therefore, the System GMM estimator is a weighted average between the two estimators, and while the explanatory power of instruments decrease, the System GMM comes closer to the Levels GMM (Soto, 2007). The moment condition of the System GMM is given by $E(Z'_{s,i} q_i) = 0$,

$$\text{where, } q_i = \begin{bmatrix} \Delta u_i \\ u_i \end{bmatrix}, \text{ and } Z_{s,i} = \begin{bmatrix} Z_{d,i} & 0 \\ 0 & Z_{l,i}^{p} \end{bmatrix} = \begin{bmatrix} Z_{d,i} & 0 & 0 & \ldots & 0 \\ 0 & \Delta y_{i,2} & 0 & \ldots & 0 \\ 0 & 0 & \Delta y_{i,3} & \ldots & 0 \\ . & . & . & \ldots & 0 \\ 0 & 0 & 0 & \ldots & \Delta y_{i,T-1} \end{bmatrix}$$

where, $Z^{p}_{l,i}$ is the non-redundant subset of $Z_{l,i}$.

As $q'_{-1}Z_s(Z'_sZ_s)^{-1}Z'_sq_{-1} = \Delta y'_{-1}Z_d(Z'_dZ_d)^{-1}Z'_d\Delta y_{-1} + y'_{-1}Z^{p}_{l}(Z'^{p}_{l}Z^{p}_{l})Z'^{p}_{l}y_{-1}$, the coefficient of the System GMM is:

$$b^{SYS}_{GMM} = (q'_{-1}Z_s(Z'_sZ_s)^{-1}Z'_sq_{-1})^{-1}q'_{-1}Z_s(Z'_sZ_s)^{-1}Z'_sq \qquad (3.10)$$

Blundell et al. (2000, p.30) mention that "*the System GMM can both greatly improve the precision and greatly reduce the finite sample bias when these additional moment conditions are valid*". Hayakawa (2007) also finds a smaller bias in the System GMM estimator.

3.2 Variables choice criteria

This section describes some matters which have to be considered for better analysis while using panel data. The section shows the variables choice criteria and testing methods with regard to the reliability of variables, including instrument variables.

3.2.1 Causal relationship between regressands and regressors

To analyse regression models, there are several criteria for choosing regressands and regressors. There must be a causal relationship between them (Wooldridge, 2006) and regressors should affect regressands, not the other way round. Namely, regression models should make sense and should reflect the researcher's research purpose (Wooldridge, 2006).

3.2.1.1 Correlation

In general, if a regressor is correlated with other independent variables in a regression, then the regressor will be removed from the regression because "*…it will reduce error variance*" (Wooldridge, 2006, p.213). Davidson and MacKinnon (2004) mention however, that as a sample size increases, the correlation between independent variables is dismissed. Correlation can be checked using the correlation matrix. When there are more than two dummy variables in a regression, the measure of correlation, based on a correlation coefficient calculation, is not appropriate. If this is the case, the correlation matrix should be made by the measure of correlation based on the Chi-Squared test, with one degree of freedom (Cameron, 2005).

3.2.1.2 Multi-collinearity:

Correlations between independent variables lead to multi-collinearity (Kennedy, 1998). Even though there is no correlation between a pair of variables, multi-collinearity can occur with two, three or more independent variables combined together (Cameron, 2005). Auxiliary regression (see Section 3.2.2.1.1.1 in Appendix 3 in which auxiliary regression is described) can calculate multi-collinearity with its R squared value; VIF (variance inflation factors) estimates can also be used (Cameron, 2005). The auxiliary regression is that one of the explanatory variables (x_1) becomes a dependent variable, and all independent variables become independent variables for the x_1 (Shiu, 2002).

$$X_1 = \alpha_1 + \beta_k \sum_{k=2}^{n} X_k + \varepsilon_1 \qquad (3.11)$$

where, X: independent variables, α_1: intercept, β_1: coefficient, k: the number of independent variables, ε_1: stochastic error term

The VIF_1 associated with X_1 is defined as:

$$VIF_1 = 1/(1 - R_1^2) \tag{3.12}$$

In general, if the largest value of VIF from any variable is greater than 10, then there is evidence of collinearity (Baum, 2006). This multi-collinearity can occur for several reasons; especially the dummy variable trap where there are too many dummies, over-specification, common trends and seasonal effects are the most common reasons (Cameron, 2005) and they are difficult to control, even if we know the reasons for the multi-collinearity. Cameron (ibid.) suggests that if the purpose of research is forecasting, or the problem of multi-collinearity occurs locally in a regression, researchers might not worry too much. Kennedy (1998, pp.187-189) suggests eight ways to solve the multi-collinearity in multi-variate regression with multi-collinearity; "(a) *Do nothing*[57]*,* (b) *Obtain more data,* (c) *Formalize relationships among regressors,* (d) *Specify a relationship among some parameters,* (e) *Drop a variable,* (f) *Incorporate estimates from other studies,* (g) *From a principal component, and* (h) *Shrink the OLS estimates.*"

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[57] Kennedy (1998, pp.187-189) suggests this with three reasons, "1) *if R^2 from the regression exceeds the R^2 of any independent variable regressed on the other independent variables,* 2) *if the t statistic are all greater than 2,* 3) *if researcher's interest centers on this multi-collinearity combination of variables.*"

3.2.2 Heteroskedasticity

The homoskedasticity assumption (constant variance assumption) can be completed when the variance of error terms (unobservable, ε) is independent of explanatory variables. In other words, variance of error terms and dependent variables are constant given by any explanatory variables. The heteroskedasticity assumption means, however, that the error term is affected by explanatory variables, Var(ε| explanatory variable) = Var(dependent variable | explanatory variable) (Wooldridge, 2006). There is a problem of using OLS if there is heteroskedasticity, because OLS (Ordinary Least Squares) is no longer BLUE (Best Linear Unbiased Estimator) oriented by Gauss-Markov's assumptions [58] (Wooldridge, ibid.) and i.i.d (independent, identically distributed) (Green, 2003). If there is heteroskedasticity present, GLS (Weighted Least Squares) (Wooldridge, ibid; Cameron, 2005) or GMM should be used as estimators.

3.2.2.1 Testing for Heteroskedasticity

The LM (Lagrange Multiplier), BP (Breush-Pagan), and White tests are generally used for testing for heteroskedasticity.

3.2.2.1.1 LM test (Breusch-Pagan test)

3.2.2.1.1.1 Auxiliary regression

Suppose there are *m* variables in a regression model 'A', and we like to ascertain the existence of heteroskadesity from the regression model. From regression A, we can

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[58] Hypotheses tests based on Gauss-Markov assumptions.

obtain an error term $\hat{\varepsilon}$. Using this error term $\hat{\varepsilon}$, we can regress the second regression with the same independent m variables. That is an auxiliary regression.

Auxiliary regression, $\hat{\varepsilon}^2 = \delta_0 + \delta_1 x_1 + \delta_2 x_2 + ... + \delta_m x_m + \text{error term}$ (3.13)

The value of the LM test is computed after auxiliary OLS regression because the LM statistic is based on auxiliary regression.

H_0 : There is a homoskedastic error in regression

LM = size of observations × $R^2_{\hat{\varepsilon}^2}$, p-value = χ^2 cdf(LM value, df) (3.14)

where, $R^2_{\hat{\varepsilon}^2}$: R^2 of auxiliary regression, cdf: cumulative distributive function, df: degree of freedom, number of restrictions being tested (number of new regressors) (Wooldridge, 2003; Kennedy, 1998).

3.2.2.1.2 White test

The White test is a special form of the LM test. It has a different auxiliary regression compared to the LM test. Supposing that, if there are three variables in an OLS regression, then the auxiliary regression for the White test is:

Auxiliary regression,

$\hat{\varepsilon}^2 = \delta_0 + \delta_1 x_1 + \delta_2 x_2 + \delta_3 x_3 + \delta_4 x_1^2 + \delta_5 x_2^2 + \delta_6 x_3^2 + \delta_7 x_1 x_2 + \delta_8 x_1 x_3 + \delta_9 x_2 x_3 + \text{error term}$ (3.15)

After auxiliary regression, it follows the same process as the LM test.

3.2.3 Endogeneity

In the OLS estimator, we presume that the error term is zero (exogeneity, $\varepsilon = 0$) and is not correlated to independent variables. If these assumptions are not sufficient, (endogeneity, $\varepsilon \neq 0$), the OLS estimator cannot be used. As was discussed before, if there are correlations between independent variables, we should use the Maximum Likelihood (MLE) or the Instrumental Variables (IV), instead of using endogenous independent variables (Verbeek, 2008).

The second problem of endogeneity is reverse causality and simultaneity (Verbeek, 2008). That is to say, the error term ε is affected, not only by regressors, but also by the regressand. This can happen when regressors and regressand affect each other simultaneously. An equation for the demand and supply curves in economics is an exemplar. An equilibrium price is decided by simultaneous effects among the variables from the supply and demand equations. This should not occur for OLS estimator.

Using GMM and IV, it is not clear as to whether the models have an endogeneity problem (Green, 2003). However, it is possible to find out this by using the Hausman test. Hall (2005) also suggests that exogeneity can be tested by comparing the OLS with the IV estimator.

3.2.3.1 Hausman test

$$\text{Hausman statistic} = (\beta_{IV} - \beta_{OLS})'[(V(\beta_{IV}) - V(\beta_{OLS})]^{-1}(\beta_{IV} - \beta_{OLS}) \qquad (3.16)$$

Where β_{IV}: a vector of coefficients from IV estimator, β_{OLS}: a vector of coefficients from OLS estimator, V: the estimates of covariance matrix

Hausman statistic follows the chi-square distribution with a degree of freedom equal to the number of coefficients (Kennedy, 2003).

3.2.4 Over-identifying restriction

The validity of the instrumental variables can be tested by the condition of over-identifying restrictions. Namely, the validity of the GMM estimator itself can also be tested by this method. When there are more instrumental variables (exogenous variables) than explanatory variables (Wooldridge, 2002), the over-identifying restriction can be tested in terms of whether additional instrumental variables are uncorrelated with ε (Wooldridge, 2002). When the instrumental variables are "just identified", there is no over-identification problem, because the weighting matrix of GMM is not relevant to the calculation of the estimator (Green, 2003).

3.2.4.1 J-test

The J-statistic test from Hansen (1982) is employed as one of the most common estimators in order to evaluate the 'goodness of fitness' of the GMM estimator (Baum, et al. 2003).

H_0: The difference in coefficients is not systemic (the over-identifying restrictions are valid (Wooldridge, 2002)).

J-statistic = $m \times$ F (3.17)

p-value = χ^2~cdf (J-statistic, degree of over-identification) (Pettersson-Lidbom, 2006)

where, m: number of instrumental variables, F: F-statistic from an auxiliary regression of $\hat{\varepsilon}_{IV}$, or $\hat{\varepsilon}_{GMM}$. This auxiliary regression is regressed with all instrumental and control variables.

The J-test follows the χ^2 distribution with a degree of freedom of over-identification, equal to when a 'number of instrumental variables subtract a number of independent variables.'

3.2.4.2 Sargan test

The Sargan test is another important method for testing over-identifying restrictions for GMM and IV estimators. The Sargan test is basically the same as the LM test. In the LM test, error terms ($\hat{\varepsilon}$) are collected from OLS regression for auxiliary regression. However, in the Sargan test, the error terms ($\hat{\varepsilon}_{IV}$ or $\hat{\varepsilon}_{GMM}$) are collected from IV or GMM estimators. The independent variables of auxiliary regression for the Sargan test are a full set of instrumental variables (Verbeek, 2008).

S=$n \times R^2$ (3.18)

where, S: Sargan statistic (Sagan, 1958), n: number of observations, R^2: R square from the auxiliary regression

Just like the J-test, the Sargan test also follows the chi-square distribution. The p-value of the Sargan test is, therefore, that p-value = χ^2~cdf (Sargan statistic, degree of over-identification) (Pettersson-Lidbom, 2006).

3.2.5 R square and adjusted R square

$$R^2 = \sum_i (\hat{y}_i - \bar{y})^2 \Big/ \sum_i (y_i - \bar{y})^2 = SSR/SST$$
$$= 1 - \sum_i e^2 \Big/ \sum_i (y_i - \bar{y})^2 = 1 - SSE/SST \qquad (3.19)$$

where, $\hat{y}_i = a + bx_i$ from $y_i = a + bx_i + e_i$

From Formula (3.19) [59], the R square lies between zero and unity.

$$\bar{R}^2 = 1 - (\sum_i e_i^2 \big/ (n-k)) \Big/ (\sum_i (y_i - \bar{y})^2 \big/ (n-1))$$
$$= 1 - ((n-1)/(n-k)) \times (1 - R^2) \qquad (3.20)$$

From Formula (3.20)[60], the adjusted R square can be negative.

The R square expresses how the amount of the variation of dependent variables is explained by independent variables. There is no required R square level. A small R

[59] Newbold, 1995, p.454 and Goldberger, 1991, p.177

[60] Cameron, 2005, p.128 and Goldberger, 1991, p.178

square presumes that the error variance of y is large and there is difficulty when estimating the coefficients of independents. The matter of large error variance, however, can be solved with bigger sample size (Wooldridge, 2002). Some authors (Wooldridge, 2006; Kennedy, 1998) state that the value of R^2 is not as important as econometricians think. Cramer (1987, p.253, cited by Kennedy, 1998, p.27) mentions that:

> "*These measures of goodness of fit have a fatal attraction. Although it is generally conceded among insiders that they do not mean a thing, high values are still a source of price and satisfaction to their authors, however hard they may try to conceal these feelings.*"

Cameron (2005, p.358) says that:

> "*Don't try to compare different estimation techniques for an equation, in a system of equations, using the R squared, as this is not relevant.*"

Similarly, Wooldridge (2006) states that it could be a problem using an R square as a main criterion for econometric analysis, and that this "*can lead to nonsensical models*" (p.207).

Unlike the R square, the value of the adjusted R square can either rise or fall when a variable is newly included (The value of the R square only rises when a new variable is included in an unadjusted R square estimation). Therefore, it is not possible for researchers to increase the R square by adding more variables when using adjusted R square (Cameron, 2005). This property makes the adjusted R square a better estimator.

We note that methods which use instruments do not report on the (adjusted) R square, because the definition of the (adjusted) R^2 is not unique when an OLS estimator is not used (Verbeek, 2008).

Appendix 4 Additional results for the Chapter 4

Table A.4.1 presents the results of the ANOVA test between two periods with regard to different industries. The table shows that 11 industries at the 0.05% level and 3 industries at the 0.1% level are significantly different between two periods. This implies that 14 industries in the sample have changed their leverage levels significantly.

Table A.4.1 Anova test between two periods based on industry

Note, Icbsub: the codes of ICB industry subsector classification are defined in Table A.1.1 in Appendix 1.

	F Statistic	Prob > F		F Statistic	Prob > F
Airlines	4.07**	0.0442	Gambling	0.11	0.7348
Aluminium	0.75	0.3864	Health Care Providers	0.60	0.4400
Automobile	0.05	0.8223	Heavy Construction	7.68***	0.0056
Biotechnology	6.14**	0.0133	Home Construction	1.14	0.2869
Broad-line retailer	5.91**	0.0152	Hotels	11.35***	0.0008
Brewers	1.96	0.1625	Internet	3.70*	0.0547
Broadcasting &Entertainment	3.86**	0.0497	Marine Transportation	17.49***	0.0000
Computer Hardware	0.09	0.7701	Mobile Telecom	14.87***	0.0001
Computer Service	4.16**	0.0415	Semiconductors	0.00	0.9551
Delivery Service	0.87	0.3529	Soft Drinks	0.64	0.4243
Distillers & Vintners	3.74*	0.0535	Softwares	1.04	0.3077
Drug Retailers	1.70	0.1930	Steels	3.38*	0.066
Fixed Line Telecom	0.04	0.8382	Travel and Tourism	31.52***	0.0000
Food Products	0.14	0.7096			

Table A.4.2 Means of debt ratio by industry and country.
Note, means of debt ratio with industries and countries and medians are in the square bracket. NA: no data, P1: period one, P2: period two. Icbsub: the codes of ICB industry subsector classification are defined in Table A.1.1 in Appendix 1.

Industries	AUS		AUT		CAN		DEU		FRA		GBR	
Period	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2
Airlines	.3725 [.3711]	.2535 [.2748]	NA	.3148 [.1956]	NA	.371 [.3668]	.2363 [.217]	.2984 [.2258]	.457 [.4835]	.3355 [.3395]	.2337 [.2808]	.2200 [.1639]
Aluminium	.2183 [.2342]	.2237 [.2378]	NA	NA	NA	.1906 [.1084]	.3052 [.3351]	.1924 [.2040]	NA	NA	NA	NA
Auto Mobile	NA	NA	NA	.4233 [.3692]	NA	NA	.1761 [.2183]	.2811 [.3173]	.3211 [.3008]	.4778 [.4541]	NA	NA
Biotechnology	.1098 [0]	.0732 [0]	NA	.2807 [.0693]	.0547 [.0160]	.1274 [.0095]	.0715 [.0037]	.1007 [.0091]	.1652 [.1260]	.1642 [.0972]	.0811 [.0400]	.1083 [.0043]
Broad-line retailers	.2293 [.2665]	.1938 [.1790]	NA	NA	.4074 [.4074]	.2132 [.1943]	.2812 [.2339]	.3254 [.2968]	.2737 [.2815]	.3102 [.3048]	.1038 [.1381]	.2424 [.2352]
Brewers	.3273 [.3190]	.2688 [.3150]	.2989 [.2916]	.1936 [.1807]	.3385 [.3385]	.2702 [.2044]	.1438 [.0940]	.1584 [.0849]	.3487 [.3068]	.2245 [.2446]	.2315 [.2349]	.2443 [.2608]
Broadcasting and entertainment	.3187 [.3255]	.2809 [.2331]	NA	.1244 [.0478]	.3623 [.4252]	.3187 [.3265]	.1600 [.1413]	.2745 [.2420]	.1751 [.1670]	.2261 [.1803]	.2021 [.1379]	.2345 [.1314]
Computer hardware	NA	.0627 [.0029]	NA	NA	NA	.0812 [.0020]	.1766 [.1732]	.1529 [.1768]	.2412 [.2611]	.1867 [.1239]	.1334 [.1139]	.0837 [.0305]
Computer Services	.0201 [.0184]	.1240 [.0280]	.0903 [.0774]	.2833 [.2675]	.2339 [.2192]	.1263 [.0396]	.1515 [.0494]	.1066 [.0362]	.1648 [.1520]	.1360 [.1064]	.1120 [.0586]	.1307 [.0506]
Delivery Services	NA	NA	NA	.0715 [.0807]	NA	NA	.1238 [.0765]	.1918 [.1019]	.2918 [.2708]	.2246 [.2312]	.1001 [.0988]	.1144 [.0982]
distillers and vintners	.1516 [.1364]	.2709 [.2305]	.1821 [.2418]	.2841 [.2768]	.0935 [.0255]	.3798 [.4033]	.3509 [.3071]	.2962 [.3204]	.3673 [.3688]	.3646 [.3721]	.2886 [.2665]	.3705 [.4023]

Table A.4.2 Continued

Industries	AUS		AUT		CAN		DEU		FRA		GBR	
Period	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2
Drug retailers	.1638 [.1638]	.1580 [.0785]	NA	NA	.1864 [.1884]	.2455 [.2190]	.2553 [.2649]	.2635 [.2761]	NA	NA	NA	NA
Fixed line telecommunications	.2799 [.2858]	.0954 [.0307]	.4252 [.4252]	.4655 [.4494]	.4083 [.3606]	.3245 [.3315]	.6303 [.6718]	.3062 [.3656]	.3024 [.3459]	.1679 [.0931]	.1801 [.1807]	.2799 [.2147]
Food Products	.2152 [.1524]	.1723 [.1735]	.0456 [.0000]	.1576 [.1947]	.2286 [.1102]	.2255 [.1494]	.3098 [.2493]	.2217 [.2337]	.1895 [.1815]	.1726 [.1198]	.1743 [.1727]	.2549 [.2236]
Gambling	.0929 [.0354]	.1847 [.1293]	NA	.0002 [0]	NA	.1713 [.1428]	.8538 [.8538]	.2854 [.1397]	.1167 [.0744]	.1990 [.0869]	.3678 [.3298]	.2831 [.1549]
Health Care Providers	.3142 [.2908]	.2677 [.3086]	NA	NA	NA	.3851 [.4257]	.3582 [.3914]	.3772 [.3697]	.2835 [.1709]	.4167 [.4165]	.4578 [.4096]	.3240 [.3152]
Heavy Construction	.1780 [.1836]	.1698 [.1522]	.1608 [.1767]	.2852 [.3178]	.1383 [.0664]	.1792 [.1385]	.0271 [.0280]	.1815 [.1415]	.1017 [.0916]	.1648 [.1254]	.1092 [.0767]	.1079 [.0754]
Home Construction	NA	.1193 [.0922]	NA	NA	NA	NA	.0755 [.0284]	.1409 [.1662]	.1551 [.1551]	.1478 [.1323]	.0962 [.0919]	.1814 [.1629]
Hotels	NA	.3095 [.3405]	NA	NA	NA	.2869 [.4052]	.3985 [.3356]	.5614 [.5574]	.4219 [.4002]	.3981 [.3388]	.2652 [.2654]	.2181 [.1888]
Internet	.0399 [.0399]	.1061 [.0156]	NA	NA	.0721 [.0721]	.2095 [.0972]	.2115 [.0975]	.1424 [.0257]	.1061 [.0708]	.0928 [.0434]	.1252 [.0821]	.1219 [.0329]
Marine transportation	NA	.2557 [.3432]	NA	NA	.2389 [.2075]	.1206 [.1345]	.3044 [.3015]	.2557 [.1098]	.2897 [.3044]	.2421 [.2372]	NA	NA

Table A.4.2 Continued

Industries	AUS		AUT		CAN		DEU		FRA		GBR	
Period	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2
Mobile Telecommunications	.3433 [.3787]	.1943 [.0402]	NA	NA	.6961 [.6962]	.4074 [.5075]	.1384 [.1150]	.1314 [.0073]	NA	.1882 [.0559]	.1065 [.0192]	.2845 [.1629]
Semiconductors	NA	.3152 [.2982]	.2755 [.2251]	.3111 [.2497]	.0615 [.0360]	.0817 [.0033]	.1193 [.0811]	.1519 [.1189]	.2292 [.1702]	.2051 [.1933]	.0112 [0]	.0678 [.0035]
Soft Drinks	.3892 [.3959]	.3939 [.4001]	NA	NA	.3167 [.3467]	.2889 [.2922]	.0765 [.0377]	.1686 [.1481]	0 [0]	.0080 [.0052]	.1304 [.1665]	.1464 [.0555]
Software	NA	.0644 [0]	.1141 [.0668]	.0466 [.0157]	.1722 [.0400]	.1133 [.0027]	.2035 [.1002]	.1125 [.0202]	.1977 [.1595]	.1298 [.0693]	.1491 [.0742]	.1380 [.0248]
Steel	.1642 [.0135]	.1918 [.0343]	.2300 [.2134]	.2512 [.2340]	.3444 [.3904]	.2276 [.2020]	.1450 [.0185]	.1198 [.0839]	.1216 [.1143]	.2048 [.2256]	NA	.3624 [.3958]
Travel and Tourism	.0791 [.0791]	.0444 [.0285]	NA	.0837 [.1062]	.0833 [0]	.1268 [.0396]	.2105 [.1629]	.2458 [.2085]	.375 [.3594]	.1838 [.1646]	.4039 [.3896]	.3302 [.3251]
Total	.2298 [.2416]	.1610 [.0663]	.1607 [.1835]	.1860 [.1584]	.2554 [.2434]	.1911 [.1157]	.2064 [.1547]	.1801 [.1219]	.2267 [.2017]	.1964 [.1516]	.1630 [.1268]	.1815 [.0963]

Table A.4.2 Continued

Industries	ITA		JPN		KOR		TWN		USA	
Period	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2
Airline	NA	.1135 [.0933]	.6854 [.6933]	.6215 [.6652]	.3678 [.3688]	.5100 [.5095]	.4331 [.4258]	.5259 [.5581]	.3320 [.2864]	.4352 [.4145]
Aluminium	NA	NA	.5053 [.4087]	.4477 [.4373]	.4251 [.2909]	.4442 [.4565]	NA	.2660 [.2582]	.2775 [.2703]	.3921 [.3736]
Auto Mobile	.1908 [.2238]	.3128 [.3280]	.3500 [.3500]	.2994 [.2998]	.5604 [.5501]	.4224 [.3863]	.1547 [.1384]	.16201 [.1742]	.3693 [.4237]	.4492 [.4340]
Biotechnology	NA	.0973 [.0440]	NA	.0745 [.0200]	.4148 [.4328]	.1510 [.1130]	NA	.1595 [.0704]	.1419 [.0403]	.2030 [.0332]
Broad-line retailer	.1370 [.1370]	.1861 [.1456]	.3503 [.3337]	.3518 [.3629]	.4815 [.4539]	.2175 [.2106]	.1779 [.1949]	.2216 [.2361]	.2321 [.2279]	.1791 [.1349]
Brewer	NA	NA	.3710 [.4218]	.2450 [.2681]	.5803 [.6006]	.3962 [.3726]	NA	NA	.1273 [.0992]	.2067 [.0882]
Broadcasting and entertainment	.1475 [.2062]	.2245 [.2320]	.2800 [.2586]	.1990 [.1467]	.2899 [.2793]	.2327 [.1782]	NA	.2083 [.2431]	.4768 [.4517]	.4091 [.3129]
Computer hardware	.5197 [.5197]	.2797 [.2399]	.2349 [.2559]	.2287 [.2036]	.1595 [.1492]	.2304 [.2028]	.2238 [.2444]	.1778 [.1508]	.1410 [.0923]	.1503 [.0763]
Computer Service	.2814 [.2592]	.2435 [.2496]	.2587 [.2213]	.1256 [.0560]	.3260 [.3486]	.1916 [.1696]	NA	.1476 [.0866]	.1792 [.1074]	.2182 [.1036]
Delivery Service	NA	NA	.3239 [.3408]	.2990 [.2744]	NA	.5317 [.5421]	NA	.0947 [.0724]	.2572 [.1999]	.1675 [.1265]
distillate and vintners	.0481 [.0481]	.2626 [.2626]	.1795 [.1718]	.2199 [.2318]	.4308 [.4308]	.0828 [.0012]	NA	NA	.2726 [.2877]	.2956 [.2886]

Table A.4.2 Continued

Industries	ITA		JPN		KOR		TWN		USA	
Period	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2
Drug retailer	NA	NA	.1922 [.1024]	.2308 [.2370]	NA	NA	NA	NA	.1844 [.1408]	.2146 [.1252]
Fixed line telecommunication	.3864 [.3864]	.2273 [.1328]	.3678 [.3677]	.3166 [.3094]	.2189 [.2189]	.3496 [.3401]	NA	.0084 [.0014]	.3647 [.3343]	.4909 [.4211]
Food Product	.1950 [.2323]	.2522 [.2633]	.2631 [.2410]	.2468 [.2149]	.4720 [.4856]	.2589 [.2442]	.1988 [.1703]	.2680 [.2707]	.2323 [.2188]	.2799 [.2151]
Gambling	.0332 [.0145]	.3060 [.3281]	.1117 [.0228]	.1454 [.0744]	NA	.1185 [.0738]	NA	.1382 [.1372]	.4022 [.3728]	.4117 [3871]
Health Care Provider	NA	NA	.3623 [.3633]	.2801 [.2860]	NA	NA	NA	.0035 [0]	.2568 [.2113]	.2786 [.1727]
Heavy Construction	.1740 [.1462]	.2196 [1970]	.2077 [.1838]	.1881 [.1401]	.5250 [.5375]	.2548 [.2645]	.2253 [.2999]	.2965 [.2948]	.2291 [.2267]	.2337 [.1910]
Home Construction	NA	NA	.2553 [.2420]	.2713 [.2490]	.5287 [.5463]	.2305 [.1990]	.4747 [.5223]	.4313 [.4487]	.3981 [.4477]	.3405 [.3658]
Hotel	.1637 [.1637]	.3367 [.3548]	.4021 [.4714]	.4034 [.4745]	.4220 [.4263]	.1095 [.0894]	.0058 [.0028]	.0803 [.0135]	.4845 [.4538]	.4399 [.4273]
Internet	.0610 [.0202]	.1780 [.1267]	.3171 [.3888]	.1424 [.0258]	NA	.0752 [.0103]	NA	.0494 [0]	.2741 [.1128]	.2406 [.0568]
Marine transportation	.4985 [.5719]	.5046 [.4858]	.5026 [.6146]	.4248 [.4479]	.4782 [.3889]	.3495 [.3466]	.3495 [.3720]	.3510 [.3693]	.4092 [.4092]	.4187 [.4059]

Table A.4.2 Continued

Industries	ITA		JPN		KOR		TWN		USA	
Period	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2
Mobile Telecommunication	NA	NA	.4667 [.5208]	.2521 [.2342]	.1833 [.1542]	.3163 [.2958]	NA	.2145 [.2211]	.3254 [.3149]	.2469 [.1817]
Semiconductor	NA	.2378 [.2179]	.2282 [.2212]	.1817 [.1464]	.4651 [.482]	.1894 [.1664]	.2473 [.2633]	.1740 [.1454]	.1187 [.0655]	.1248 [.0116]
Soft Drink	NA	NA	.1428 [.1129]	.1107 [.0188]	.3836 [.3787]	.0606 [.0209]	NA	.0801 [.0510]	.4048 [.4063]	.3656 [.2745]
Software	.1005 [.1005]	.1401 [.0139]	.2751 [.2887]	.1319 [.0516]	.6131 [.6131]	.1506 [.0661]	NA	.1442 [.0790]	.0829 [.0099]	.1791 [.0153]
Steel	.0443 [.0149]	.4570 [.4969]	.3311 [.3455]	.2961 [.2948]	.4557 [.3916]	.2796 [.2931]	.3555 [.3595]	.3894 [.3943]	.1704 [.1639]	.2355 [.1956]
Travel and Tourism	NA	NA	.5028 [.5404]	.4722 [.5654]	NA	.0582 [0]	NA	.0160 [0]	.2208 [.0374]	.2935 [.0675]
Total	.2067 [.1843]	.2391 [.2385]	.2864 [.2681]	.2260 [.1853]	.4749 [.4720]	.2273 [.2064]	.2672 [.2551]	.2062 [.1809]	.2158 [.1420]	.2452 [.1244]

Table A.4.3 The rank of mean debt ratio in countries in the first period

Note, the industry names are in parentheses. soft wa: software, semico: semiconductors, brewer: brewers, com ha: computer hardware, bio tech: biotechnology, com ser: computer services, drug ret: drug retailers, travel: travel & tourism, heavy: heavy construction, bro reta: broad-line retailers, food: food products, health: health care providers, delivery: delivery service, dist&vin: distillers & vintners, alumi: aluminium, mobile: mobile telecommunications, fixed tel: fixed line telecommunications, auto: auto mobile, home: home construction, gamble: gambling, soft dri: soft drinks, marine: marine transportation, broadcast: broadcasting & entertainment. Icbsub: the codes of ICB industry subsector classification are defined in Table A.1.1 in Appendix 1.

Rank	AUS(P1)	AUT(p1)	CAN(p1)	DEU(p1)	FRA(p1)	GBR(p1)	ITA(p1)	JPN(p1)	KOR(P1)	TWN(P1)	USA(P1)
1	0.0201 (com ser)	0.0456 (food)	0.0547 (bio tech)	0.0271 (heavy)	0 (soft dri)	0.0112 (semico)	0.0332 (gamble)	0.1117 (gamble)	0.1595 (comha)	0.0058 (hotel)	0.0829 (soft wa)
2	0.0399 (internet)	0.0903 (com ser)	0.0615 (semico)	0.0715 (bio tech)	0.1017 (heavy)	0.0811 (bio tech)	0.0443 (steel)	0.1428 (soft dri)	0.1833 (mobile)	0.1547 (auto)	0.1187 (semico)
3	0.0791 (travel)	0.1141 (soft wa)	0.0721 (internet)	0.0755 (home)	0.1061 (internet)	0.0962 (home)	0.0481 (dist&vin)	0.1795 (dist&vin)	0.2189 (fixed tel)	0.1779 (bro reta)	0.1273 (brewer)
4	0.0929 (gamble)	0.1608 (heavy)	0.0833 (travel)	0.0765 (soft dri)	0.1167 (gamble)	0.1001 (delivery)	0.061 (internet)	0.1922 (drug ret)	0.2899 (broadcas)	0.1988 (food)	0.141 (comha)
5	0.1098 (bio tech)	0.1821 (dist&vin)	0.0935 (dist&vin)	0.1193 (semico)	0.1216 (steel)	0.1038 (bro reta)	0.1005 (soft wa)	0.2077 (heavy)	0.326 (com ser)	0.2238 (comha)	0.1419 (bio tech)
6	0.1516 (dist&vin)	0.23 (steel)	0.1383 (heavy)	0.1238 (delivery)	0.1551 (home)	0.1065 (mobile)	0.137 (bro reta)	0.2282 (semico)	0.3678 (airline)	0.2253 (heavy)	0.1704 (steel)
7	0.1638 (drug ret)	0.2755 (semico)	0.1722 (soft wa)	0.1384 (mobile)	0.1648 (com ser)	0.1092 (heavy)	0.1475 (broadcas)	0.2349 (comha)	0.3836 (soft dri)	0.2473 (semico)	0.1792 (com ser)
8	0.1642 (steel)	0.2989 (brewer)	0.1864 (drug ret)	0.1438 (brewer)	0.1652 (bio tech)	0.112 (com ser)	0.1637 (hotel)	0.2553 (home)	0.4148 (bio tech)	0.3495 (marine)	0.1844 (drug ret)
9	0.178 (heavy)	0.4252 (fixed tel)	0.2286 (food)	0.145 (steel)	0.1751 (broadcas)	0.1252 (internet)	0.174 (heavy)	0.2587 (com ser)	0.422 (hotel)	0.3555 (steel)	0.2208 (travel)

Table A.4.3 Continued

Rank	AUS(P1)	AUT(p1)	CAN(p1)	DEU(p1)	FRA(p1)	GBR(p1)	ITA(p1)	JPN(p1)	KOR(P1)	TWN(P1)	USA(P1)
10	0.2152 (food)		0.2339 (com ser)	0.1515 (com ser)	0.1895 (food)	0.1304 (soft dri)	0.1908 (auto)	0.2631 (food)	0.4251 (alumi)	0.4331 (airline)	0.2291 (heavy)
11	0.2183 (alumi)		0.2389 (marine)	0.16 (broadcas)	0.1977 (soft wa)	0.1334 (comha)	0.195 (food)	0.2751 (soft wa)	0.4308 (dist&vin)	0.4747 (home)	0.2321 (bro reta)
12	0.2293 (bro reta)		0.3167 (soft dri)	0.1761 (auto)	0.2292 (semico)	0.1491 (soft wa)	0.2814 (com ser)	0.28 (broadcas)	0.4557 (steel)		0.2323 (food)
13	0.2799 (fixed tel)		0.3385 (brewer)	0.1766 (comha)	0.2412 (comha)	0.1743 (food)	0.3864 (fixed tel)	0.3171 (internet)	0.4651 (semico)		0.2568 (health)
14	0.3142 (health)		0.3444 (steel)	0.2035 (soft wa)	0.2737 (bro reta)	0.1801 (fixed tel)	0.4985 (marine)	0.3239 (delivery)	0.472 (food)		0.2572 (delivery)
15	0.3187 (broadcas)		0.3623 (broadcas)	0.2105 (travel)	0.2835 (health)	0.2021 (broadcas)	0.5197 (comha)	0.3311 (steel)	0.4782 (marine)		0.2726 (dist&vin)
16	0.3273 (brewer)		0.4074 (bro reta)	0.2115 (internet)	0.2897 (marine)	0.2315 (brewer)		0.35 (auto)	0.4815 (bro reta)		0.2741 (internet)
17	0.3433 (mobile)		0.4083 (fixed tel)	0.2363 (airline)	0.2918 (delivery)	0.2337 (airline)		0.3503 (bro reta)	0.525 (heavy)		0.2775 (alumi)
18	0.3725 (airline)		0.6961 (mobile)	0.2553 (drug ret)	0.3024 (fixed tel)	0.2652 (hotel)		0.3623 (health)	0.5287 (home)		0.3254 (mobile)

Table A.4.3 Continued

Rank	AUS(P1)	AUT(p1)	CAN(p1)	DEU(p1)	FRA(p1)	GBR(p1)	ITA(p1)	JPN(p1)	KOR(P1)	TWN(P1)	USA(P1)
19	0.3892 (soft dri)			0.2812 (bro reta)	0.3211 (auto)	0.2886 (dist&vin)		0.3678 (fixed tel)	0.5604 (auto)		0.332 (airline)
20				0.3044 (marine)	0.3487 (brewer)	0.3678 (gamble)		0.371 (brewer)	0.5803 (brewer)		0.3647 (fixed tel)
21				0.3052 (alumi)	0.3673 (dist&vin)	0.4039 (travel)		0.4021 (hotel)	0.6131 (soft wa)		0.3693 (auto)
22				0.3098 (food)	0.375 (travel)	0.4578 (health)		0.4667 (mobile)			0.3981 (home)
23				0.3509 (dist&vin)	0.4219 (hotel)			0.5026 (marine)			0.4022 (gamble)
24				0.3582 (health)	0.457 (airline)			0.5028 (travel)			0.4048 (soft dri)
25				0.3985 (hotel)				0.5053 (alumi)			0.4092 (marine)
26				0.6303 (fixed tel)				0.6854 (airline)			0.4768 (broadcas)
27				0.8538 (gamble)							0.4845 (hotel)

Table A.4.4 The rank of mean debt ratio in countries in the second period

Note, the industry names are in parentheses. soft wa: software, semico: semiconductors, brewer: brewers, com ha: computer hardware, bio tech: biotechnology, com ser: computer services, drug ret: drug retailers, travel: travel & tourism, heavy: heavy construction, bro reta: broad-line retailers, food: food products, health: health care providers, delivery: delivery service, dist&vin: distillers & vintners, alumi: aluminium, mobile: mobile telecommunications, fixed tel: fixed line telecommunications, auto: auto mobile, home: home construction, gamble: gambling, soft dri: soft drinks, marine: marine transportation, broadcast: broadcasting & entertainment. Icbsub: the codes of ICB industry subsector classification are defined in Table A.1.1 in Appendix 1.

Rank	AUS(P2)	AUT(P2)	CAN(P2)	DEU(P2)	FRA(P2)	GBR(P2)	ITA(P2)	JPN(P2)	KOR(P2)	TWN(P2)	USA(P2)
1	0.0444 (travel)	0.0002 (gamble)	0.0812 (comha)	0.1007 (bio tech)	0.008 (soft dri)	0.0678 (semico)	0.0973 (bio tech)	0.0745 (bio tech)	0.0582 (travel)	0.0035 (health)	0.1248 (semico)
2	0.0627 (comha)	0.0466 (soft wa)	0.0817 (semico)	0.1066 (com ser)	0.0928 (internet)	0.0837 (comha)	0.1135 (airline)	0.1107 (soft dri)	0.0606 (soft dri)	0.0084 (fixed tel)	0.1503 (comha)
3	0.0644 (soft wa)	0.0715 (delivery)	0.1133 (soft wa)	0.1125 (soft wa)	0.1298 (soft wa)	0.1079 (heavy)	0.1401 (soft wa)	0.1256 (com ser)	0.0752 (internet)	0.016 (travel)	0.1675 (delivery)
4	0.0732 (bio tech)	0.0837 (travel)	0.1206 (marine)	0.1198 (steel)	0.136 (com ser)	0.1083 (bio tech)	0.178 (internet)	0.1319 (soft wa)	0.0828 (dist&vin)	0.0494 (internet)	0.1791 (bro retail)
5	0.0954 (fixed tel)	0.1244 (broadcas)	0.1263 (com ser)	0.1314 (mobile)	0.1478 (home)	0.1144 (delivery)	0.1861 (bro retail)	0.1424 (internet)	0.1095 (hotel)	0.0801 (soft dri)	0.1791 (soft wa)
6	0.1061 (internet)	0.1576 (food)	0.1268 (travel)	0.1409 (home)	0.1642 (bio tech)	0.1219 (internet)	0.2196 (heavy)	0.1454 (gamble)	0.1185 (gamble)	0.0803 (hotel)	0.203 (bio tech)
7	0.1193 (home)	0.1936 (brewer)	0.1274 (bio tech)	0.1424 (internet)	0.1648 (heavy)	0.1307 (com ser)	0.2245 (broadcas)	0.1817 (semico)	0.1506 (soft wa)	0.0947 (delivery)	0.2067 (brewer)
8	0.124 (com ser)	0.2512 (steel)	0.1713 (gamble)	0.1519 (semico)	0.1679 (fixed tel)	0.138 (soft wa)	0.2273 (fixed tel)	0.1881 (heavy)	0.151 (bio tech)	0.1382 (gamble)	0.2146 (drug ret)
9	0.158 (drug ret)	0.2807 (bio tech)	0.1792 (heavy)	0.1529 (comha)	0.1726 (food)	0.1464 (soft dri)	0.2378 (semico)	0.199 (broadcas)	0.1894 (semico)	0.1442 (soft wa)	0.2182 (com ser)

Table A.4.4 Continued

Rank	AUS(P2)	AUT(P2)	CAN(P2)	DEU(P2)	FRA(P2)	GBR(P2)	ITA(P2)	JPN(P2)	KOR(P2)	TWN(P2)	USA(P2)
10	0.1698 (heavy)	0.2833 (com ser)	0.1906 (alumi)	0.1584 (brewer)	0.1838 (travel)	0.1814 (home)	0.2435 (com ser)	0.2199 (dist&vin)	0.1916 (com ser)	0.1476 (com ser)	0.2337 (heavy)
11	0.1723 (food)	0.2841 (dist&vin)	0.2095 (internet)	0.1686 (soft dri)	0.1867 (comha)	0.2181 (hotel)	0.2522 (food)	0.2287 (comha)	0.2175 (bro retail)	0.1595 (bio tech)	0.2355 (steel)
12	0.1847 (gamble)	0.2852 (heavy)	0.2132 (bro retail)	0.1815 (heavy)	0.1882 (mobile)	0.22 (airline)	0.2626 (dist&vin)	0.2308 (drug ret)	0.2304 (comha)	0.1620 (auto)	0.2406 (internet)
13	0.1918 (steel)	0.3111 (semico)	0.2255 (food)	0.1918 (delivery)	0.199 (gamble)	0.2345 (broadcas)	0.2797 (comha)	0.245 (brewer)	0.2305 (home)	0.174 (semico)	0.2469 (mobile)
14	0.1938 (bro retail)	0.3148 (airline)	0.2276 (steel)	0.1924 (alumi)	0.2048 (steel)	0.2424 (bro retail)	0.306 (gamble)	0.2468 (food)	0.2327 (broadcas)	0.1778 (comha)	0.2786 (health)
15	0.1943 (mobile)	0.4233 (auto)	0.2455 (drug ret)	0.2217 (food)	0.2051 (semico)	0.2443 (brewer)	0.3128 (auto)	0.2521 (mobile)	0.2548 (heavy)	0.2083 (broadcas)	0.2799 (food)
16	0.2237 (alumi)	0.4655 (fixed tel)	0.2702 (brewer)	0.2458 (travel)	0.2245 (brewer)	0.2549 (food)	0.3367 (hotel)	0.2713 (home)	0.2589 (food)	0.2145 (mobile)	0.2935 (travel)
17	0.2535 (airline)		0.2869 (hotel)	0.2557 (marine)	0.2246 (delivery)	0.2799 (fixed tel)	0.457 (steel)	0.2801 (health)	0.2796 (steel)	0.2216 (bro retail)	0.2956 (dist&vin)
18	0.2557 (marine)		0.2889 (soft dri)	0.2635 (drug ret)	0.2261 (broadcas)	0.2831 (gamble)	0.5046 (marine)	0.2961 (steel)	0.3163 (mobile)	0.266 (alumi)	0.3405 (home)

Table A.4.4 Continued

Rank	AUS(P2)	AUT(P2)	CAN(P2)	DEU(P2)	FRA(P2)	GBR(P2)	ITA(P2)	JPN(P2)	KOR(P2)	TWN(P2)	USA(P2)
19	0.2677 (health)		0.3187 (broadcas)	0.2745 (broadcas)	0.2421 (marine)	0.2845 (mobile)		0.299 (delivery)	0.3495 (marine)	0.268 (food)	0.3656 (soft dri)
20	0.2688 (brewer)		0.3245 (fixed tel)	0.2811 (auto)	0.3102 (bro retail)	0.324 (health)		0.2994 (auto)	0.3496 (fixed tel)	0.2965 (heavy)	0.3921 (alumi)
21	0.2709 (dist&vin)		0.371 (airline)	0.2854 (gamble)	0.3355 (airline)	0.3302 (travel)		0.3166 (fixed tel)	0.3962 (brewer)	0.351 (marine)	0.4091 (broadcas)
22	0.2809 (broadcas)		0.3798 (dist&vin)	0.2962 (dist&vin)	0.3646 (dist&vin)	0.3624 (steel)		0.3518 (bro retail)	0.4224 (auto)	0.3894 (steel)	0.4117 (gamble)
23	0.3095 (hotel)		0.3851 (health)	0.2984 (airline)	0.3981 (hotel)	0.3705 (dist&vin)		0.4034 (hotel)	0.4442 (alumi)	0.4313 (home)	0.4187 (marine)
24	0.3152 (semico)		0.4074 (mobile)	0.3062 (fixed tel)	0.4167 (health)			0.4248 (marine)	0.51 (airline)	0.5259 (airline)	0.4352 (airline)
25	0.3939 (soft dri)			0.3254 (bro retail)	0.4778 (auto)			0.4477 (alumi)	0.5317 (delivery)		0.4399 (hotel)
26				0.3772 (health)				0.4722 (travel)			0.4492 (auto)
27				0.5614 (hotel)				0.6215 (airline)			0.4909 (fixed tel)

Table A.4.5 Representative stock indices across countries for two decades

Note, all indices used the stock prices at the end of each year. ASX: Australian Securities Exchange, ATX: Austira Stock Exchange, Wiener borse, CAC 40: Cotation Assistee en Continu 40 Index, DAX: Deutscher Aktien Index, FTSE 100: Financial Times and the London Stock Exchange 100 Index, KOSPI: Korea Stock Price Index, MIB: Milano Italia Borsa, NYSE: New York Stock Exchange, S&P/TSX 60: SToronto Stock Exchange 60 Index, TAIEX: Taiwan Capitalisation Weighted Stock Index, TOPIX: Tokyo Stock Price Index

	AUS	AUT	CAN	DEU	FRA	ITA	GBR	JPN	KOR	TWN	USA
	ASX	ATX	S&P/TSX60	DAX	CAC40	MIB[61]	FTSE100	TOPIX	KOSPI	TAIEX[62]	NYSE
87	1318.85	473.61	156.93	1000	1000	7560	1712.7	1562.55	525.11	NA	1461.61
88	1487.2	535.97	167.48	1327.87	1573.94	9169	1793.1	1690.44	907.2	NA	1652.25
89	1649.84	1164.22	197.96	1790.37	2001.1	10684	2422.7	2375.3	909.72	NA	2062.3
90	1279.82	1038.54	168.42	1398.23	1517.93	8007	2143.5	2867.7	696.11	4,503.16	1908.45
91	1651.4	883.25	184.39	1577.98	1765.66	7830	2493.1	1740.92	610.92	4,600.67	2426.04
92	1589.9	747.7	175.07	1545.05	1857.78	6916	2846.5	1714.68	678.44	3,377.06	2539.92
93	2173.6	1128.78	221.49	2266.68	2268.22	9500	3418.4	1305.81	866.18	6,070.56	2739.44
94	1912.7	1055.24	221.84	2106.58	1881.15	9813	3065.5	1445.97	1027.37	7,124.66	2653.37
95	2203	959.79	250.51	2253.88	1871.97	9138	3689.3	1553.4	882.94	5,173.73	3484.15
96	2424.6	1140.19	321.59	2888.69	2315.73	10332	4118.5	1631.06	651.22	6,933.94	4148.07
97	2616.5	1294.94	378.09	4249.69	2998.91	16341	5135.5	1470.94	376.31	8,187.27	5405.19
98	2813.4	1120.77	375.98	5002.39	3942.66	23035	5882.6	1175.03	562.46	6,418.43	6299.93
99	3152.5	1197.82	495.86	6958.14	5958.32	28169	6930.2	1064.92	1028.07	8,448.84	6876.1
00	3154.7	1073.3	528.72	6433.61	5926.42	29681	6222.46	1717.47	504.62	4,739.09	6945.57
01	3359.9	1140.36	442.55	5160.1	4624.58	22232	5217.35	1280.94	693.70	5,551.24	6236.39
02	2975.5	1150.05	373.15	2892.63	3063.91	16954	3940.36	1053.96	627.55	4,452.45	5000
03	3306	1545.15	458.72	3965.16	3557.9	19483	4476.87	843.29	810.71	5,890.69	6440.3
04	4053.1	2431.38	511.91	4256.08	3821.16	22886	4814.3	1043.69	895.92	6,139.69	7250.06
05	4715.2	3667.03	634.72	5408.26	4715.23	26056	5618.76	1153.38	1379.37	6,548.34	7753.95
06	5644.3	4463.47	742.77	6596.92	5541.76	31005	6220.81	1673.07	1434.46	7823.72	9139.02

[61] Milan Mib Storico General – price index

[62] From World Federation Exchange and Financial Times, TAIEX is called as WeightedPr in the Financial Times

Appendix 5 Full study results with characteristics

This appendix presents the full study results with different characteristics as discussed in Chapter 7.

5.1 Firm size

Table A.5.1 Descriptive characteristics, based on firms' size
The univariate comparison of means and medians of measures of firms' characteristics based on their size between 1989 and 2008.
Note, median values are in square brackets. -4.6052< 1st quartile < 3.4366, 3.4366 ≤ 2nd quartile < 4.9822, 4.9822 ≤ 3rd quartile < 6.5403 and 6.54 ≤4th quartile <13.044 in Log(total asset). All variables are defined in Section 5.3.

Variables	Fist quartile	Second quartile	Third quartile	Fourth quartile
BDR	.1899 [.0543]	.1759 [.1051]	.2405 [.1983]	.2952 [.2817]
MDR	.0924 [.0221]	.1403 [.0689]	.1938 [.1496]	.2291 [.2008]
Netcash	1.2122 [.3357]	.8693 [.2257]	.4248 [.1551]	.2147 [.1123]
Tax	.1361 [0]	.3361 [.2963]	.4063 [.3752]	.4295 [.3690]
Tang	.1564 [.0796]	.2184 [.1603]	.2762 [.2326]	.3175 [.2892]
Capex	.0492 [.0181]	.0535 [.0268]	.0569 [.0328]	.0655 [.0451]
M/B	2.6344 [1.9097]	1.8173 [1.2987]	1.5639 [1.1878]	1.5564 [1.2502]
R&D	.1537 [.0643]	.0813 [.0342]	.0432 [.0082]	.0284 [.0078]
Profit	-.2787 [-.0777]	.0112 [.0419]	.0459 [.048]	.0612 [.0522]
Vol	.187 [.1326]	.0837 [.0489]	.0473 [.027]	.0306 [.0189]
Lnasset	1.7975 [2.2721]	4.2414 [4.2593]	5.7152 [5.6925]	8.054 [7.736]
BP	1.9663 [2]	1.5788 [1]	1.6878 [1]	1.875 [2]
Obs	13326	13321	13327	13324

Table A.5.2 Debt ratio changes based on firms' size, using the Baker and Wurgler model (2002)
Note, ΔBDR: book-based debt ratio change, ΔMDR: market-based debt ratio change, A: total asset, RE: retained earnings, e: equity, -(e/A): equity issue, -(RE/A): increased retained earnings, -(E_{t-1}(1/A_t-1/A_{t-1}): the residual change in leverage. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	Panel A: ΔBDR_t			
OLS	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0003 (0.10)	-.0019 (-1.28)	-.0038 (-2.99)***	-.0043 (-4.97)***
$-\left(\frac{e}{A}\right)_t$	.2089 (19.41)***	.1668 (21.66)***	.3702 (35.01)***	.3591 (27.37)***
$-\left(\frac{\Delta RE}{A}\right)_t$	.1152 (26.44)***	.1267 (23.14)***	.3049 (41.97)***	.2635 (37.07)***
$-\left[E_{t-1}\left(\frac{1}{A_t}-\frac{1}{A_{t-1}}\right)\right]$	.1153 (17.24)***	.1272 (18.96)***	.3196 (38.34)***	.2775 (35.50)***
Obs	6210	6606	8031	10178
Adj-R^2	0.1246	0.1058	0.2420	0.1813
	Panel B: ΔMDR_t			
OLS	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0021 (1.37)	.0026 (2.24)**	.0009 (0.93)	.0029 (3.53)***
$-\left(\frac{e}{A}\right)_t$	.0452 (8.05)***	.0879 (12.10)***	.1791 (18.48)***	.1654 (12.69)***
$-\left(\frac{\Delta RE}{A}\right)_t$	.0222 (10.52)***	.0665 (15.55)***	.1449 (23.71)***	.1308 (19.24)***
$-\left[E_{t-1}\left(\frac{1}{A_t}-\frac{1}{A_{t-1}}\right)\right]$	.0122 (3.90)***	.0753 (13.55)***	.1704 (24.18)***	.1622 (21.67)***
Obs	5611	6039	7543	9746
Adj-R^2	0.0229	0.0480	0.0972	0.0615

Table A.5.3 Debt ratio changes and financial deficit components, based on firms' size

Note, $DEF1=DIV_t+I_t+\Delta WC_t-C_t$, ΔBDR: book-based debt ratio change, ΔMDR: market-based debt ratio change, DEF1: financial deficit defined by Frank and Goyal (2003), DIV: dividend, I: investment (capital expenditure), WC: working capital, C: cash-flow after interest and taxes (=internal cash-flow or net income+depreciation). All items are scaled by total asset. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level.

	Panel A: ΔBDR_t			
OLS	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	-.0128 (-4.23)***	-.0115 (-7.43)***	-.0042 (-2.63)***	.0007 (0.50)
DIV_t	.0277 (1.81)*	.0162 (3.67)***	.0385 (3.15)***	.2067 (3.66)***
I_t	-.0521 (-1.80)*	.1465 (9.83)***	.1513 (9.89)***	.1524 (11.83)***
ΔWC_t	-.1715 (-26.14)	-.1304 (-24.00)***	-.1273 (-16.76)***	-.1132 (-13.48)***
C_t	-.0199 (-4.94)	-.0366 (-6.80)***	-.1061 (-14.21)***	-.1484 (-16.60)***
Obs	8104	9899	9819	10310
Adj-R^2	0.1023	0.0806	0.0645	0.06
	Panel B: ΔMDR_t			
OLS	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	-.008 (-5.12)***	-.0069 (-5.43)***	-.0058 (-4.58)***	-.0023 (-1.84)*
DIV_t	.0112 (1.34)	.0084 (2.37)***	.0441 (4.69)***	.2023 (4.31)***
I_t	.1039 (6.23)***	.1857 (13.75)***	.1891 (15.25)***	.1924 (17.42)***
ΔWC_t	-.053 (-16.25)	-.0608 (-12.09)***	-.0514 (-8.02)***	-.0662 (-8.69)***
C_t	-.0058 (-3.03)	-.0269 (-6.03)***	-.0693 (-11.53)***	-.0801 (-10.59)***
Obs	6865	8826	9177	9844
Adj-R^2	0.0502	0.0474	0.0466	0.048

Table A.5.3 Continued

Note, Net equity issuance/asset =(sale stock-repurchase stock)/total asset, Net long-term debt issuance/asset=('long-term debt issue'-'long-term debt retirement')/total asset, $DEF1=DIV_t+I_t+\Delta WC_t-C_t$, DEF1: financial deficit defined by Frank and Goyal (2003), DIV: dividend, I: investment (capital expenditure), WC: working capital, C: cash-flow after interest and taxes (=internal cash-flow or net income+depreciation). All items are scaled by total asset. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level.

	Panel C: Net long-term debt issue / $asset_t$			
OLS	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	-.0089 (-4.87)***	-.0101 (-7.50)***	-.0063 (-4.39)***	-.0029 (-2.33)**
DIV_t	-.0007 (-0.06)	.0133 (3.02)***	.0311 (2.62)***	.0301 (0.59)
I_t	.1509 (8.65)***	.2002 (15.26)***	.2528 (18.85)***	.301 (27.05)***
ΔWC_t	-.0063 (-1.69)*	.0053 (1.21)	.0530 (8.30)***	.0981 (13.45)***
C_t	-.0227 (-10.17)***	-.0313 (-7.40)***	-.0512 (-8.36)***	-.0724 (-9.50)***
Obs	6144	6600	7775	9578
Adj-R^2	0.0314	0.0388	0.0536	0.0846
	Panel D: Net equity issue / $asset_t$			
OLS	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0825 (21.75)***	.0476 (17.96)***	.0203 (11.57)***	-.0018 (-1.69)*
DIV_t	-.092 (-3.93)***	-.0347 (-3.98)***	-.0739 (-5.09)***	.1114 (2.66)***
I_t	.3356 (8.92)***	.3363 (12.92)***	.2715 (16.48)***	.1745 (19.09)***
ΔWC_t	.2864 (35.46)***	.4063 (46.82)***	.3225 (41.22)***	.1552 (26.00)***
C_t	-.2139 (-41.00)***	-.3528 (-42.00)***	-.2149 (-28.49)***	-.1512 (-24.09)***
Obs	5954	6569	7771	9558
Adj-R^2	0.2680	0.3360	0.2371	0.1146

Table A.5.4 Debt ratio changes and financial deficits (DEF1), based on firms' size

Note, $DEF1=DIV_t+I_t+\Delta WC_t-C_t$, ΔBDR: book-based debt ratio change, ΔMDR: market-based debt ratio change, Net equity issuance/asset =(sale stock-repurchase stock)/total asset, Net long-term debt issuance/asset=('long-term debt issue'-'long-term debt retirement')/total asset, DEF1: financial deficit defined by Frank and Goyal (2003), DIV: dividend, I: investment (capital expenditure), WC: working capital, C: cash-flow after interest and taxes (=internal cash-flow or net income+depreciation). All items are scaled by total asset. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level.

	Panel A: ΔBDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0009 (0.30)	-.001 (-0.72)	-.0024 (-1.88)*	-.0001 (-0.06)
$DEF1_t$	-.0157 (-3.96)***	-.0179 (-5.12)***	.0067 (1.20)	.0269 (4.12)***
R^2	0.0018	0.0025	0.0001	0.0015
Obs	8104	9899	9819	10307
	Panel B: ΔMDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0022 (1.57)	.0028 (2.49)**	.0001 (0.10)	.005 (6.39)***
$DEF1_t$	-.0022 (-1.19)	.0006 (0.21)	.0313 (6.80)***	.0382 (6.72)***
R^2	0.0001	0.0000	0.0049	0.0045
Obs	6865	8826	9177	9844
	Panel C: Net long-term debt issuance/ $asset_t$			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	-.0008 (-0.47)	-.0018 (-1.35)	.0035 (3.22)***	.0117 (14.41)***
$DEF1_t$	.0198 (9.32)***	.0239 (7.97)***	.0688 (14.71)***	.1248 (22.47)***
R^2	0.0138	0.0094	0.0269	0.05
Obs	6144	6600	7775	9578
	Panel D: Net equity issuance/ $asset_t$			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0763 (22.48)***	.0294 (11.51)***	.0099 (7.28)***	-.0006 (-0.89)
$DEF1_t$	.2188 (42.74)***	.2325 (35.19)***	.2377 (40.54)***	.1572 (35.12)***
R^2	0.2348	0.1586	0.1745	0.1142
Obs	5954	6569	7771	9558

Table A.5.5 Debt ratio change and stock price effect, based on the size of firms

From Panels A and B, stock price more affects small firms. The small firms more likely adjust their leverage levels in Panel B. As a consequence, from Panel C that stock returns are more related to big firms' debt ratio because the change of debt ratio are solely affected by stock price without adjustment for great firms. From Panels D and E, it seems that there is no relation between equity issuance with stock prices and firm size in terms of book based debt ratio.

Note, BDR: book-based debt ratio, Net equity issuance/asset =(sale stock-repurchase stock)/total asset, MDR: market-based debt ratio, IDR: Implied debt ratio, $IDR_{t-1,t}$=D_{t-1}/(E_{t-1} (1+stock $return_{t-1,t}$)+D_{t-1}), SR: stock return, log(1+annual stock return). $SPE_{t-1,t}$=$IDR_{t-1,t}$-MDR_{t-1}, $Speed2_t$: $target2_t$-MDR_{t-1}, target2: 'market-based target debt ratio' calculated using OLS. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level.

OLS	Panel A: MDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0204 (17.17)***	.01574 (15.44)***	.018 (16.81)***	.0193 (18.06)***
MDR_{t-1}	.371 (28.96)***	.4889 (44.34)***	.6253 (67.04)***	.6722 (82.62)***
$IDR_{t,t+1}$	.2558 (34.37)***	.2997 (39.24)***	.2137 (33.56)***	.1901 (35.07)***
R^2	0.5805	0.7783	0.8129	0.8355
Obs	8667	10451	11442	11777
	Panel B: ΔMDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0002 (0.06)	-.0003 (-0.16)	.0001 (0.10)	.0021 (1.69)*
Speed2	.3643 (21.98)***	.2753 (26.98)***	.1928 (23.64)***	.1888 (25.84)***
$SPE_{t,t+1}$	.2331 (15.37)***	.3503 (26.75)***	.2167 (22.33)***	.1965 (25.53)***
R^2	0.2326	0.2348	0.1476	0.1467
Obs	1875	3379	4407	5460
	Panel C: ΔMDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	-.0077 (-6.84)***	-.0001 (-0.16)	.003 (4.19)***	.0059 (9.54)
$SR_{t,t+1}$	-.0378 (-31.10)***	-.049 (-39.06)***	-.0576 (-44.53)***	-.0686 (-54.91)***
R^2	0.1007	0.1274	0.1477	0.2038
Obs	8643	10447	11442	11777
	Panel D: ΔBDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	-.0021 (-0.79)	-.0016 (-1.55)	.0004 (0.35)	.002 (2.56)***
$SR_{t,t+1}$	-.0276 (-9.31)***	-.0212 (-13.26)***	-.0196 (-12.18)***	-.0243 (-15.92)***
R^2	0.0101	0.016	0.0124	0.0207
Obs	8527	10745	11776	11978
	Panel E: Net equity issue / $asset_t$			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.1383 (41.26)***	.0568 (28.02)***	.0230 (19.09)***	-.0003 (-0.44)
$SR_{t,t+1}$	-.007 (-2.01)**	.0065 (2.29)**	-.0032 (-1.66)*	.0003 (0.26)
R^2	0.0005	0.0006	0.0002	0.00
Obs	6773	6690	8225	10194

Table A.5.6 Capital structure adjustment speed comparison between different measures, based on firms' size

Note, BDR: book-based debt ratio, MDR: market-based debt ratio. Panels C and D use System GMM. We do not report the capital structure determinants since the purpose of this regression is to test the capital structure adjustment speed rather than to investigate their effects. speed1= target1$_t$-BDR$_{t-1}$, speed2= target2$_t$-MDR$_{t-1}$, target1: book-based target debt ratio is calculated using OLS, target2: market-based target debt ratio is calculated using OLS. The coefficient values are λ (capital structure adjustment speed) in Panels A and B. The coefficient values of 'capital structure adjustment speed' in Panels C and D are (1-λ). Thus, the adjustment speed λ is (1-coefficient). In calculating Panels C and D, we use all 7 capital structure determinants although we do not report those coefficients here. BDR$_{t-1}$ is instrumented and the 7 variables are assumed exogenous in Panel C used by the System GMM. MDR$_{t-1}$ and R&Dexpenditure$_{t-1}$ are instrumented for Panels D. The values in the square brackets are the significant levels of J statistic (Hansen p-value); C test value suggests the endogenous variables. Options for xtabond2 syntax are small, twostep, and robust; and the sub-options for gmm-style are equation(level), laglimits(1 2), collapse and for iv-style is equation(level). *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level.

OLS	Panel A: ΔBDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0228 (6.36)***	.0075 (4.70)***	.0076 (5.36)***	.0114 (9.48)***
Speed1	.2401 (17.50)***	.1461 (16.60)***	.1028 (15.49)***	.1184 (19.44)***
R^2	0.0877	0.0672	0.0438	0.0592
Obs	3176	4527	5217	5992
	Panel B: ΔMDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0149 (5.88)***	.0148 (8.36)***	.0133 (9.29)***	.0161 (13.36)***
Speed2	.2859 (17.46)***	.176 (17.01)***	.1283 (16.27)***	.1117 (15.85)***
R^2	0.1345	0.0773	0.0557	0.0430
Obs	1955	3442	4474	5572

Table A.5.6 Continued

	Panel C: BDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0503 (2.67)***	.0207 (1.15)	.0146 (0.73)	.028 (2.49)**
BDR_{t-1}	.6254 (6.93)***	.8141 (15.50)***	.903 (22.81)	.8274 (15.29)***
AR(1)	-3.91***	-7.52***	-4.18***	-6.75***
AR(2)	-0.09	-0.40	1.72*	0.45
Hansen [P-value]	1.22 [0.27]	0.26 [0.613]	1.26 [0.261]	0.03 [0.874]
Inst	L1, L2	L1, L2	L1, L2	L1, L2
Inst No	10	10	10	10
Obs	3730	5145	5557	6109
	Panel D: MDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0211 (2.55)**	.0390 (2.93)***	.041 (2.21)**	.0479 (3.23)***
MDR_{t-1}	.6198 (10.20)***	.7829 (12.98)***	.8181 (19.71)***	.7961 (14.63)***
AR(1)	-6.25***	-8.33***	-10.08***	-9.93***
AR(2)	-0.75	0.08	1.64	1.60
Hansen [P-value]	0.64 [0.725]	1.67 [0.434]	4.29 [0.117]	2.52 [0.284]
Inst	L1. L2	L1. L2	L1. L2	L1. L2
Inst No	11	11	11	11
Obs	3775	5126	5485	6043

5.2 Firm age

Table A.5.7 Descriptive characteristics, based on firms' age

Univariate comparison of means and medians of measures of firm characteristics based on firms' history between 1989 and 2008. Median values are in square brackets.

Note, long: long history firms, short: short history firms. All variables are defined in Section 5.3.

Variables	Long history	Short history
BDR	.2493 [.2222]	.2096 [.1293]
MDR	.2087 [.1723]	.1513 [.0802]
Netcash	.2936 [.1175]	.812 [.2099]
Tax	.4111 [.3662]	.2768 [.2093]
Tang	.296 [.2707]	.2129 [.1344]
Capex	.0465 [.0324]	.0493 [.0236]
M/B	1.4676 [1.1293]	1.9224 [1.3328]
R&D	.0408 [.0073]	.0901 [.0278]
Profit	.04149 [.0437]	-.0789 [.0302]
Vol	.03699 [.0196]	.1048 [.0531]
Lnasset	6.9338 [6.8314]	4.285 [4.3976]
BP	1.821 [2]	1.798 [1]
Obs	8810	25722

Table A.5.8 Debt ratio changes based on firms' age, using the Baker and Wurgler model (2002)

Note, ΔBDR: book-based debt ratio change, ΔMDR: market-based debt ratio change, long: long history firms, short: short history firms, A: total asset, RE: retained earnings, e: equity, -(e/A): equity issue, -(RE/A): increased retained earnings, $-(E_{t-1}(1/A_t-1/A_{t-1})$: the residual change in leverage. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level.

	Panel A: ΔBDR_t		Panel B: ΔMDR_t	
OLS	long	short	long	Short
Cons	-.005 (-5.22)***	-.0004 (-0.31)	-.002 (-2.18)**	.0057 (6.97)***
$-\left(\frac{e}{A}\right)_t$	.2815 (22.05)***	.2022 (31.38)***	.1292 (11.66)***	.0658 (14.29)***
$-\left(\frac{\Delta RE}{A}\right)_t$	.1846 (30.97)***	.1255 (41.55)***	.0736 (13.99)***	.0329 (17.05)***
$-\left[E_{t-1}\left(\frac{1}{A_t}-\frac{1}{A_{t-1}}\right)\right]$	.1705 (21.83)***	.1348 (29.97)***	.1114 (16.61)***	.0342 (12.13)***
Obs	7198	15936	7108	14977
Adj-R^2	0.1406	0.1202	0.0493	0.03

Table A.5.9 Debt ratio changes and financial deficit components, based on firms' age

The table shows that firms with long history use more debt for a new investment from Panels A, B and C; and Panel D indicates that short history firms use more equity for a new investment.

Note, $DEF1=DIV_t+I_t+\Delta WC_t-C_t$, ΔBDR: book-based debt ratio change, ΔMDR: market-based debt ratio change, Net equity issuance/asset =(sale stock-repurchase stock)/total asset, Net long-term debt issuance/asset=('long-term debt issue'-'long-term debt retirement')/total asset, DEF1: financial deficit defined by Frank and Goyal (2003), DIV: dividend, I: investment (capital expenditure), WC: working capital, C: cash-flow after interest and taxes (=internal cash-flow or net income+depreciation). All items are scaled by total asset. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	Panel A: ΔBDR_t		Panel B: ΔMDR_t	
OLS	long	short	long	short
Cons	-.0069 (-4.93)***	-.0078 (-5.73)***	-.0102 (-8.90)***	-.0058 (-6.45)***
DIV_t	.0045 (0.56)	.0184 (3.07)***	.0052 (0.78)	.0076 (1.94)*
I_t	.1196 (6.18)***	.0884 (6.42)***	.162 (10.18)***	.1675 (16.97)***
ΔWC_t	-.1383 (-17.19)***	-.1458 (-34.03)***	-.0595 (-8.87)***	-.0577 (-20.22)***
C_t	-.0655 (-10.10)***	-.0261 (-9.59)***	-.0140 (-2.61)***	-.0068 (-4.03)***
Obs	7412	20560	7305	19065
Adj-R^2	0.0748	0.0742	0.0280	0.0392
	Panel C: Net long-term debt issue/ $asset_t$		Panel D: Net equity issue/ $asset_t$	
OLS	long	short	long	short
Cons	-.0099 (-8.10)***	-.0061 (-6.16)***	.0052 (4.12)***	.0392 (22.74)***
DIV_t	-.0003 (-0.04)	.0075 (1.32)	.0246 (2.83)***	-.0513 (-5.59)***
I_t	.2476 (14.74)***	.2230 (21.78)***	.2043 (11.73)***	.2928 (16.23)***
ΔWC_t	.0667 (9.52)***	.0042 (1.45)	.2464 (34.03)***	.3102 (57.51)***
C_t	-.0272 (-4.96)***	-.0206 (-11.25)***	-.2763 (-45.62)***	-.2574 (-71.07)***
Obs	6423	15808	6410	15637
Adj-R^2	0.0423	0.03	0.28	0.29

Table A.5.10 Debt ratio changes and financial deficits (DEF1), based on firms' age

Note, $DEF1=DIV_t+I_t+\Delta WC_t-C_t$, ΔBDR: book-based debt ratio change, ΔMDR: market-based debt ratio change, Net equity issuance/asset =(sale stock-repurchase stock)/total asset, Net long-term debt issuance/asset=('long-term debt issue'-'long-term debt retirement')/total asset, DEF1: financial deficit defined by Frank and Goyal (2003), DIV: dividend, I: investment (capital expenditure), WC: working capital, C: cash-flow after interest and taxes (=internal cash-flow or net income+depreciation). All items are scaled by total asset. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	Panel A: ΔBDR_t		Panel B: ΔMDR_t	
	long	short	long	short
Cons	-.0055 (-5.23)***	.0001 (0.04)	-.0034 (-4.05)***	.0037 (4.87)
$DEF1_t$	-.0004 (-0.07)	-.0061 (-2.37)**	-.003 (-0.64)	-.0009 (-0.58)
Adj-R^2	0.00	0.0002	0.00	0.00
Obs	7412	20560	7305	19065
	Panel C: Net long-term debt issue/ $asset_t$		Panel D: Net equity issue/$asset_t$	
	long	short	long	short
Cons	-.0001 (-0.07)	.0039 (4.74)***	-.0046 (-4.80)***	.0298 (20.10)***
$DEF1_t$	.0352 (7.90)***	.0212 (12.28)***	.2009 (40.85)***	.2443 (69.94)***
Adj-R^2	0.0095	0.0094	0.2065	0.2383
Obs	6423	15808	6410	15637

Table A.5.11 Debt ratio change and stock price effect with firms' age

Note, MDR: market-based debt ratio, BDR: book-based debt ratio, Net equity issuance/asset =(sale stock-repurchase stock)/total asset, IDR: Implied debt ratio, $IDR_{t-1,t}\equiv D_{t-1}/(E_{t-1}\ (1+\text{stock return}_{t-1,t})+D_{t-1})$, SR: stock return, log(1+annual stock return). $SPE_{t-1,t}=IDR_{t-1,t}-MDR_{t-1}$, $speed2_t$: $target2_t-MDR_{t-1}$, target2: 'market-based target debt ratio' calculated using OLS. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level.

	Panel A: MDR_t			Panel B: ΔMDR_t	
	long	short		long	short
Cons	.0109 (9.86)***	.0186 (23.54)***	Cons	-.0032 (-2.50)**	.001 (0.88)
MDR_{t-1}	.7297 (80.58)***	.5093 (69.82)***	Speed2	.1806 (23.98)***	.2739 (39.51)***
$IDR_{t,t+1}$	.1433 (23.59)***	.2675 (54.55)***	$SPE_{t,t+1}$	.137 (16.68)***	.2971 (38.10)***
R^2	0.8658	0.7460	R^2	0.1253	0.2193
Obs	8566	22033	Obs	4292	8016

	Panel C: ΔMDR_t		Panel D: ΔBDR_t		Panel E: Net equity issue/$asset_t$	
	long	short	long	short	long	short
Cons	-.0017 (-2.40)**	-.0022 (-3.64)***	-.0034 (-3.77)***	-.0002 (-0.18)	.0028 (2.99)***	.06 (39.89)***
$SR_{t,t+1}$	-.0507 (-35.01)***	-.0495 (-58.24)***	-.0209 (-11.46)***	-.0230 (-15.58)***	-.0012 (-0.64)	-.0137 (-7.12)***
Adj-R^2	0.1251	0.1335	0.0148	0.0108	0.00	0.003
Obs	8565	22010	8666	22143	7192	16468

Table A.5.12 Capital structure adjustment speed comparison between different measures, based on firms' age

Note, BDR: book-based debt ratio, MDR: market-based debt ratio, speed1= $target1_t$-BDR_{t-1}, speed2= $target2_t$-MDR_{t-1}, target1: book based target debt ratio calculated using OLS, target2: market-based target debt ratio calculated using OLS. The coefficient values are λ (capital structure adjustment speed) in Panels A and B. The coefficient values of 'capital structure adjustment speed' in Panels C and D are (1-λ). Thus, the adjusting speed λ is (1-coefficient). In calculating Panels C and D, we use all 7 capital structure determinants though we do not report these coefficients here. BDR_{t-1} and MDR_{t-1} are used as instruments in Panels C and D respectively. For the syntax of xtabond2, eq(level) lag(1 2) and collapse options are used for gmm-style and eq(level) option is used for iv-style. The values in the square brackets are the significant levels of J statistic (Hansen p-value); C test value suggests the endogenous variables. All variables are defined in Section 5.3. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level.

	Panel A: ΔBDR_t		Panel B: ΔMDR_t	
	long	short	long	short
Cons	.0022 (1.81) *	.0128 (9.61) ***	.0069 (5.94) ***	.0167 (14.25) ***
Speed1	.1064 (16.12) ***	.1724 (27.59) ***		
Speed2			.1222 (17.70) ***	.1869 (26.44) ***
Adj-R^2	0.0521	0.0675	0.0673	0.0791
Obs	4708	10506	4329	8127
	Panel C: BDR_t		Panel D: MDR_t	
	long	short	long	short
Cons	-.0024 (-0.37)	.0088 (1.48)	.0077 (1.24)	.0057 (1.40)
BDR_{t-1}	.8718 (15.82)***	.7509 (16.74)***		
MDR_{t-1}			.7846 (16.56)***	.7451 (23.65)***
AR(1)	-6.37***	-7.39***	-9.19***	-12.08***
AR(2)	0.21	0.91	1.15	1.54
Hansen [P-value]	0.03 [0.863]	2.83 [0.092]	0.92 [0.337]	0.93 [0.334]
Inst	L1. L2	L1. L2	L1. L2	L1. L2
Inst No	10	10	10	10
Obs	4787	11201	4754	11167

5.3 Bankruptcy Probability

Table A.5.13 Descriptive characteristics, based on bankruptcy probability

A univariate comparison of the means and medians of measures of firm characteristics are based on the bankruptcy probability between 1989 and 2008.
Note, Median values are in square brackets. The combined pb-area is defined by a series of z'-score based models (see Section 5.3.2.2.6 in which the details of Z-score models are described). All variables are defined in Section 5.3.

Variables	Combined bp area			Z' score area		
	Good area	Gray area	Bad area	Good area	Gray area	Bad area
BDR	.1302 [.0886]	.293 [.2927]	.4201 [.3977]	.1465 [.1132]	.3314 [.3234]	.5018 [.4601]
MDR	.0953 [.0532]	.2507 [.2403]	.2925 [.2877]	.0947 [.069]	.2875 [.2779]	.3698 [.3801]
Netcash	.6768 [.2476]	.1907 [.1108]	.4145 [.1011]	.5296 [.1946]	.1751 [.1091]	.2961 [.0907]
Tax	.3498 [.3499]	.432 [.3726]	.2975 [.0732]	.3532 [.3513]	.4589 [.3841]	.3035 [.077]
Tang	.2131 [.17]	.2964 [.263]	.3036 [.2484]	.2243 [.1816]	.3166 [.3026]	.337 [.303]
Capex	.0579 [0.328]	0.0617 [.0373]	0.0535 [.0267]	.0606 [.0372]	.0599 [.0366]	.0506 [.0251]
M/B	1.9367 [1.4419]	1.33 [1.15]	1.7309 [1.2085]	1.9765 [1.5117]	1.196 [1.0992]	1.5096 [1.0926]
R&D	.0592 [.0205]	.0286 [.0065]	.1048 [.0086]	.0637 [.0202]	.0243 [.0059]	.0835 [.0053]
Profit	.0439 [.069]	.0312 [.0407]	-.1826 [.0043]	.0234 [.0632]	.026 [.038]	-.1531 [.0093]
Vol	.0682 [.0358]	.0437 [.023]	.1080 [.0406]	.0705 [.0354]	.0411 [.0226]	.0915 [.0312]
Lnasset	5.069 [4.9601]	5.937 [5.8411]	4.6752 [4.8787]	5.3196 [5.2552]	6.095 [5.918]	5.079 [5.361]
BP	1	2	3	1	2	3
Obs	23137	8049	13189	21358	6456	10114

Table A.5.14 Debt ratio and the component of Z'-score model, based on bankruptcy probability

Note, BDR: book-based debt ratio, $(\Delta)DR_t=(WC/TA)_t+(RE/TA)_t+(EBIT/TA)_t+(ME/BD)_t+(SALE/TA)_t+\varepsilon_t$. This table is based on Z'-score model rather than using the values from combined models since the variable of combined bankruptcy probability (BP) is calculated with different variables from different models. Therefore, even though firms are in the same good area in bankruptcy probability, they contain different determinants for the bankruptcy probability decision. WC: Working Capital, TA: Total Asset, RE: Retained Earnings, ME: Market Value Equity, EBIT: Earnings Before Interest and Taxes, BD: Book Value of Total Debt, SALE: sale, *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

OLS	Panel A							
			BDR_t			MDR_t		
	BDR_t	MDR_t	good	gray	bad	good	gray	bad
Cons	.4522 (224.23)***	.3802 (256.50)***	.2922 (109.23)***	.4853 (41.96)***	.5629 (122.61)***	.1838 (129.72)***	.4602 (63.36)***	.5008 (179.50)***
$\frac{WC}{TA}$	-.1713 (-37.79)***	-.1053 (-31.65)***	-.0486 (-10.42)***	-.1253 (-11.76)***	-.119 (-11.75)***	.0366 (14.80)***	-.0127 (-1.90)*	-.0447 (-7.27)***
$\frac{RE}{TA}$	.0569 (-42.15)***	.0017 (1.74)*	-.0618 (-28.90)***	-.1531 (-19.10)***	.065 (-27.51)***	-.0088 (-7.74)***	-.1094 (-21.73)***	-.001 (-0.69)
$\frac{EBIT}{TA}$	.0946 (13.38)***	-.0066 (-1.28)	.2275 (26.98)***	.1056 (4.46)***	.0358 (2.87)***	.0243 (5.43)***	-.0996 (-6.71)***	.0521 (7.01)***
$\frac{ME}{BD}$	-.0171 (-93.93)***	-.0188 (-142.72)***	-.0103 (-67.52)***	-.0523 (-17.79)***	-.0607 (-35.35)***	-.0101 (-124.44)***	-.0765 (-41.50)***	-.0549 (-53.59)***
$\frac{SALE}{TA}$	-.049 (-32.56)***	-.0338 (-30.77)***	-.0122 (-8.92)***	-.0444 (-8.30)***	-.0631 (-12.94)***	.0121 (16.64)***	-.0269 (-8.01)***	-.0382 (-13.09)***
Adj-R^2	0.3798	0.5028	0.2897	0.1199	0.1668	0.5537	0.4317	0.4211
No of Obs	29163	28847	14173	6431	8559	14173	6427	8247

Table A.5.14 Continued

	Panel B							
			ΔBDR_t			ΔMDR_t		
	ΔBDR_t	ΔMDR_t	good	gray	bad	good	gray	bad
Cons	-.0034 (-6.36)***	.004 (8.05)***	-.0117 (-18.14)***	-.0071 (-7.51)***	.0052 (3.86)***	-.0091 (-17.29)***	-.0008 (-0.85)	.0155 (13.04)***
$\Delta \frac{WC}{TA}$	-.1453 (-29.13)***	-.0926 (-19.90)***	-.1354 (-19.78)***	-.0988 (-9.91)***	-.1434 (-15.26)***	-.0663 (-11.79)***	-.039 (-3.83)***	-.0842 (-9.82)***
$\Delta \frac{RE}{TA}$	-.0588 (-32.16)***	.0016 (0.98)	-.0547 (-18.04)***	-.0752 (-14.47)***	-.0516 (-17.30)***	-.0024 (-0.95)	-.0159 (-3.03)***	.0131 (5.02)***
$\Delta \frac{EBIT}{TA}$	-.0802 (-17.72)***	-.0789 (-18.82)***	-.0464 (-7.04)***	-.0830 (-8.11)***	-.0874 (-11.05)***	-.0602 (-11.12)***	-.0933 (-9.00)***	-.0663 (-9.37)***
$\Delta \frac{ME}{BD}$	-.0088 (-62.80)***	-.011 (-85.56)***	-.0076 (-58.55)***	-.0146 (-38.03)***	-.0126 (-23.38)***	-.0082 (-76.80)***	-.0206 (-53.37)***	-.0201 (-44.68)***
$\Delta \frac{SALE}{TA}$	-.0401 (-16.76)***	-.0421 (-19.30)***	-.0383 (-13.83)***	-.0537 (-12.35)***	-.0305 (-5.44)***	-.0314 (-13.82)***	-.0423 (-9.63)***	-.048 (-9.79)***
Adj-R^2	0.2828	0.3103	0.3541	0.3253	0.2057	0.4180	0.3982	0.2774
No of Obs	24383	23984	11071	5774	7538	11068	5762	7154

Table A.5.15 Debt ratio changes based on bankruptcy probability, using the Baker and Wurgler model (2002)

The combined pb-area is defined by a series of z'-score based models (see Section 5.3.2.2.6 in which the details of Z-score models are described).
Note, BDR: book-based debt ratio, MDR: market-based debt ratio, A: total asset, RE: retained earnings, e: equity, -(e/A): equity issue, -(RE/A): increased retained earnings, $-(E_{t-1}(1/A_t-1/A_{t-1})$: the residual change in leverage. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

OLS	Panel A: ΔBDR_t					
	Combined pbarea			Z'-score area		
BP condition at t-1	Good $area_{t-1}$	Gray $area_{t-1}$	Bad $area_{t-1}$	Good $area_{t-1}$	Gray $area_{t-1}$	Bad $area_{t-1}$
Cons	.0014 (1.80)*	-.005 (-3.91)***	-.0085 (-3.56)***	.0029 (3.55)***	-.0071 (-5.05)***	-.0137 (-5.09)***
$-\left(\frac{e}{A}\right)_t$	.2315 (37.68)***	.4851 (33.80)***	.3026 (24.5)***	.23 (37.15)***	.5847 (30.26)***	.4772 (26.64)***
$-\left(\frac{\Delta RE}{A}\right)_t$	.164 (48.37)***	.2959 (34.45)***	.1334 (28.52)***	.1549 (47.35)***	.236 (26.93)***	.1726 (29.97)***
$-\left[E_{t-1}\left(\frac{1}{A_t}-\frac{1}{A_{t-1}}\right)\right]$	.1846 (42.39)***	.2379 (20.77)***	.132 (15.48)***	.1833 (39.98)***	.1357 (10.29)***	.1282 (12.94)***
Adj-R^2	0.1630	0.2845	0.1362	0.1598	0.2654	0.1821
Obs	14460	4653	7381	14242	3657	5822
OLS	Panel B: ΔMDR_t					
	Combined pbarea			Z'-score area		
BP condition at t-1	Good $area_{t-1}$	Gray $area_{t-1}$	Bad $area_{t-1}$	Good $area_{t-1}$	Gray $area_{t-1}$	Bad $area_{t-1}$
Cons	.0092 (14.89)***	.0003 (0.24)	-.0105 (-7.02)***	.0123 (19.8)***	-.0015 (-0.95)	-.021 (-11.98)***
$-\left(\frac{e}{A}\right)_t$	.0923 (18.52)***	.2623 (14.72)***	.0776 (9.76)***	.087 (18.35)***	.2631 (12.1)***	.1449 (12.99)***
$-\left(\frac{\Delta RE}{A}\right)_t$	.0778 (29.12)***	.1701 (17.8)***	.0277 (10.2)***	.0691 (27.59)***	.1228 (12.53)***	.0429 (12.59)***
$-\left[E_{t-1}\left(\frac{1}{A_t}-\frac{1}{A_{t-1}}\right)\right]$	.0875 (25.58)***	.1478 (12.33)***	.0085 (1.87)*	.0823 (23.66)***	.0756 (5.43)***	.0021 (0.40)
Adj-R^2	0.0642	0.894	0.0210	0.0579	0.0623	0.0413
Obs	14011	4437	6800	14233	3642	5580

Table A.5.16 Debt ratio changes and financial deficit components, based on bankruptcy probability

Panels A and B show that working capital increase dramatically and investment is negatively associated with debt ratio for bad condition firms. This implies that financially bad firms increase equity for new investment unlike rest conditional firms and they also accumulate or increase cash-holding in the firms by issuing equity.

Note, DEF1=$DIV_t+I_t+\Delta WC_t-C_t$, ΔMDR: market-based debt ratio change, ΔBDR: book-based debt ratio change, Net equity issuance/asset =(sale stock-repurchase stock)/total asset, Net long-term debt issuance/asset=('long-term debt issue'-'long-term debt retirement')/total asset, DEF1: financial deficit defined by Frank and Goyal (2003), DIV: dividend, I: investment (capital expenditure), WC: working capital, C: cash-flow after interest and taxes (=internal cash-flow or net income+depreciation). All items are scaled by total asset. This table is based by combined bankruptcy probability rather than z'-score area. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	Panel A: ΔBDR_t			Panel B: ΔMDR_t		
Bp area	$Good_{t-1}$	$gray_{t-1}$	bad_{t-1}	$good_{t-1}$	$gray_{t-1}$	Bad_{t-1}
Cons	-.0018 (-1.83)*	-.0154 (-9.16)***	-.0179 (-6.95)***	.003 (3.97)***	-.0123 (-9.16)***	-.0229 (-14.71)***
DIV_t	.0039 (1.05)	.0244 (3.24)***	.0356 (1.65)*	-.0032 (-1.11)	.0154 (2.00)**	.0264 (2.03)**
I_t	.1599 (16.31)***	.1471 (8.81)***	-.0642 (-2.38)**	.1556 (20.25)***	.1962 (10.91)***	.1505 (8.03)**
ΔWC_t	-.0683 (-16.53)***	-.1451 (-14.58)***	-.2658 (-35.89)***	-.0307 (-9.43)***	-.0877 (-8.00)***	-.0826 (-19.18)***
C_t	-.0545 (-17.73)	-.1118 (-12.58)***	-.0196 (-4.39)***	-.0263 (-11.63)***	-.0672 (7.34)***	-.0094 (-3.91)***
Adj-R^2	0.0637	0.1021	0.1396	0.0434	0.0522	0.0569
Obs	17361	5680	9096	16363	5292	8282
	Panel C: Net long-term debt issue/ $asset_t$			Panel D: Net equity issue/ $asset_t$		
Bp area	$Good_{t-1}$	$gray_{t-1}$	bad_{t-1}	$good_{t-1}$	$gray_{t-1}$	Bad_{t-1}
Cons	-.001 (-0.34)	-.0134 (-7.49)***	-.0177 (-10.27)***	.0231 (17.23)***	.0209 (12.21)***	.0429 (16.38)***
DIV_t	-.001 (-0.25)	.0042 (0.44)	-.0209 (-1.16)	-.0027 (-0.44)	.0031 (0.34)	-.0533 (-1.95)*
I_t	.2112 (24.08)***	.3344 (18.67)***	.271 (15.16)***	.2824 (21.61)***	.1864 (11.01)***	.2308 (8.32)***
ΔWC_t	.0358 (9.64)***	.0577 (5.37)***	-.009 (-1.94)*	.3956 (69.70)***	.2983 (.29.44)***	.2528 (34.03)***
C_t	-.0327 (-12.55)***	-.0667 (-7.38)***	-.0298 (-10.88)***	-.3255 (-78.03)***	-.2162 (-25.10)***	-.2145 (-46.46)***
Adj-R^2	0.0517	0.0815	0.0468	0.3728	0.2136	0.2677
Obs	13278	4185	7129	13294	4156	6976

Table A.5.17 Debt ratio changes and financial deficits (DEF1), based on bankruptcy probability

Note, ΔMDR: market-based debt ratio change, ΔBDR: book-based debt ratio change, Net equity issuance/asset =(sale stock-repurchase stock)/total asset, Net long-term debt issuance/asset=('long-term debt issue'-'long-term debt retirement')/total asset, $DEF1=DIV_t+I_t+\Delta WC_t-C_t$, DEF1: financial deficit defined by Frank and Goyal (2003), DIV: dividend, I: investment (capital expenditure), WC: working capital, C: cash-flow after interest and taxes (=internal cash-flow or net income+depreciation). All items are scaled by total asset. This table is based by combined bankruptcy probability rather than z'-score area. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	Panel A: ΔBDR_t			Panel B: ΔMDR_t		
Bp area	$Good_{t-1}$	$gray_{t-1}$	bad_{t-1}	$good_{t-1}$	$gray_{t-1}$	Bad_{t-1}
Cons	.0033 (4.01)***	-.0123 (-8.70)***	-.014 (-5.96)***	.0095 (15.45)***	-.0046 (-3.31)***	-.0138 (-10.25)***
$DEF1_t$	.0172 (7.05)***	.018 (3.15)***	-.0405 (-9.19)***	.011 (5.93)***	.0222 (3.83)***	-.0039 (-1.68)*
Adj-R^2	0.0028	0.0016	0.0091	0.0021	0.0026	0.0002
Obs	17361	5680	9096	16363	5292	8282
	Panel C: Net long-term debt issue/$asset_t$			Panel D: Net equity issue/$asset_t$		
Bp area	$Good_{t-1}$	$gray_{t-1}$	bad_{t-1}	$good_{t-1}$	$gray_{t-1}$	Bad_{t-1}
Cons	.0086 (11.91)***	.0007 (0.48)	-.0051 (-3.44)***	.0077 (6.66)***	.0130 (9.31)***	.0395 (17.82)***
$DEF1_t$	.0331 (14.68)***	.0654 (10.28)***	.0263 (10.09)***	.2518 (66.41)***	.1492 (24.01)***	.2174 (48.86)***
Adj-R^2	0.0159	0.0244	0.0139	0.2491	0.1216	0.2549
Obs	13278	4185	7129	13294	4156	6976

Table A.5.18 Debt ratio change and stock price effect with leverage level, based on bankruptcy probability

The first columns imply that capital structure is not decided by only stock prices and does not support Welch's (2004) inertia theory. It is clear however that observing MDR_{t-1}, and $IDR_{t,t+1}$, firms in good area are more affected by stock price effect. This implies that rather issuing new securities, firms let change their capital structure by stock price effect when their bankruptcy probabilities are low. From the second column, that firms likely change capital structures more actively and stock price effect ($SPE_{t,t+1}$) is getting reduced as bankruptcy probability increases. This implies that firms with high level of bankruptcy probability conduct more actively to escape from the situation.
Note, MDR: market-based debt ratio, BDR: book-based debt ratio, Net equity issuance/asset =(sale stock-repurchase stock)/total asset. This table is based by combined bankruptcy probability rather than z'-score area. MDR: market-based debt ratio, IDR: Implied debt ratio, $IDR_{t-1,t} \equiv D_{t-1}/(E_{t-1}(1+\text{stock return}_{t-1,t})+D_{t-1})$, SR: stock return, log(1+annual stock return). $SPE_{t-1,t}=IDR_{t-1,t}-MDR_{t-1}$, $Speed2_t$: $target2_t-MDR_{t-1}$, target2: 'market-based target debt ratio' calculated using OLS. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level.

	Panel A: $Good_{t-1}$				
	MDR	ΔMDR	ΔMDR	ΔBDR	net equity issue /asset
Cons	.0165 (26.25)***	-.0017 (-1.89)*	.0078 (16.02)***	.0055 (7.84)***	.0299 (25.33)***
MDR_{t-1}	.4422 (47.38)***				
$IDR_{t,t+1}$	.3565 (57.06)***				
Speed2		.2131 (27.65)***			
$SPE_{t,t+1}$		.3697 (38.00)***			
$SR_{t,t+1}$			-.0448 (-56.43)***	-.0198 (-17.49)***	-.0121 (-6.54)***
Adj-R^2	0.7131	0.1811	0.1401	0.0152	0.003
Obs	19541	7572	19539	19769	13978
	Panel B: $Gray_{t-1}$				
	MDR	ΔMDR	ΔMDR	ΔBDR	net equity issue /asset
Cons	.0186 (8.91)***	-.0065 (-2.31)**	-.0021 (-2.09)**	-.007 (-6.16)***	.0198 (15.73)***
MDR_{t-1}	.603 (52.65)***				
$IDR_{t,t+1}$	.2235 (28.51)***				
Speed2		.1973 (16.15)***			
$SPE_{t,t+1}$		.2458 (20.61)***			
$SR_{t,t+1}$			-.0727 (-40.29)***	-.0232 (-11.52)***	-.001 (-0.51)*
Adj-R^2	0.7119	0.1951	0.1937	0.0187	0.00
Obs	6754	2522	6752	6889	4464

Table A.5.18 Continued

	Panel C: Bad_{t-1}				
	MDR	ΔMDR	ΔMDR	ΔBDR	net equity issue /asset
Cons	.0139 (7.18)***	-.0082 (-2.60)***	-.0162 (-15.42)***	-.017 (-8.24)***	.0755 (32.57)***
MDR_{t-1}	.6567 (73.59)***				
$IDR_{t,t+1}$	.1749 (28.31)***				
Speed2		.2166 (19.66)***			
$SPE_{t,t+1}$		.1892 (18.48)***			
$SR_{t,t+1}$			-.054 (-38.45)***	-.0308 (-10.72)***	-.0158 (-5.48)***
Adj-R^2	0.7313	0.1694	0.1273	0.011	0.0039
Obs	10170	3215	10130	10218	7406

Table A.5.19 Capital structure adjustment speed comparison between different measures, based on bankruptcy probability

Note, BDR: book-based debt ratio, MDR: market-based debt ratio, speed1= $target1_t - BDR_{t-1}$, speed2= $target2_t-MDR_{t-1}$, target1: book based target debt ratio calculated using OLS, target2: market-based target debt ratio calculated using OLS. The coefficient values are λ (capital structure adjustment speed) in Panels A and B. The coefficient values of 'capital structure adjustment speed' in Panels C and D are (1-λ). Thus, the adjustment speed λ is (1-coefficient). In calculating Panels C and D, we use all 7 capital structure determinants though we do not report those coefficients here. BDR and capital expenditure is instrumented in Panel C. MDR and capital expenditure is used as instruments in Panel D. Command xtabond2 uses eq(level) lag(1 2) collapsed for gmm-style, and eq(level) for iv-style. The values in the square brackets are the significant levels of J statistic (Hansen p-value); C test value suggests the endogenous variables. All variables are defined in Section 5.3. This table is based by combined bankruptcy probability rather than z'-score area. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	Panel A: ΔBDR_t			Panel B: ΔMDR_t		
Bp area	good $_{t-1}$	gray $_{t-1}$	bad $_{t-1}$	good $_{t-1}$	gray $_{t-1}$	Bad $_{t-1}$
Cons	.0077 (8.64)***	.0106 (4.73)***	.0309 (7.96)***	.0128 (14.66)***	.0232 (8.77)***	.0196 (6.79)***
Speed1	.1243 (18.95)***	.1426 (13.38)***	.1967 (17.74)***			
Speed2				.1145 (14.66)***	.1719 (13.19)***	.1954 (17.23)***
Adj-R^2	0.0363	0.0619	0.0741	0.0268	0.0629	0.0820
Obs	9503	2698	3924	7724	2579	3315
	Panel C: BDR_t			Panel D: MDR_t		
Bp area	good $_{t-1}$	gray $_{t-1}$	bad $_{t-1}$	good $_{t-1}$	gray $_{t-1}$	Bad $_{t-1}$
Cons	.0254 (4.48)***	-.0197 (-1.10)	.0280 (1.53)	.032 (4.53)***	.0187 (0.72)	-.0077 (-0.71)
BDR_{t-1}	.6602 (10.62)***	.9553 (9.70)***	.7674 (11.21)			
MDR_{t-1}				.7328 (10.35)***	.8129 (9.52)***	.7595 (15.36)***
AR(1)	-8.99***	-1.97**	-4.63***	-7.00***	-5.34***	-7.43***
AR(2)	3.13***	1.00	2.15**	3.50***	2.44**	1.99**
Hansen [P-value]	1.09 [0.581]	3.86 [0.145]	1.91 [0.384]	3.71 [0.156]	2.01 [0.366]	0.61 [0.736]
Inst	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2
Inst No	11	11	11	11	11	11
Obs	10456	2725	4037	10450	2703	3967

5.4 Overleveraged and underleveraged firms

Table A.5.20 Descriptive statistics of over-and-under-leverage level firms with different target debt ratios

Note, BDR-un: the levels of underleveraged book based debt ratios, the target calculated using OLS regression. BDR-ov: the level of overleveraged book based debt ratios, the target calculated using OLS regression. MDR-un: the levels of underleveraged market-based debt ratios, the target calculated using OLS regression. MDR-ov: the levels of overleveraged market-based debt ratios, the target calculated using OLS regression. TBDR-un: the levels of underleveraged book based debt ratios, the target calculated using Tobit model, TBDR-ov: the levels of overleveraged book based debt ratios, the target calculated using Tobit model, TMDR-un: the levels of underleveraged market-based debt ratios, the target calculated using Tobit model, TMDR-ov: the levels of overleveraged market-based debt ratios, the target calculated using Tobit model.

	BDR-un	BDR-ov	MDR-un	MDR-ov	TBDR-un	TBDR-ov	TMDR-un	TMDR-ov
N	8864	10060	5794	9703	9691	8803	6321	8922
mean	0.082	-0.204	0.051	-0.172	0.100	-0.195	0.063	-0.165
min	0.000	-1.837	0.000	-0.709	0.000	-1.837	0.000	-0.685
p25	0.037	-0.275	0.018	-0.254	0.044	-0.259	0.023	-0.243
p50	0.070	-0.153	0.039	-0.142	0.085	-0.140	0.050	-0.133
p75	0.113	-0.071	0.073	-0.061	0.140	-0.063	0.090	-0.059
p99	0.280	-0.003	0.185	-0.002	0.331	-0.002	0.225	-0.002
max	0.659	0.000	0.329	0.000	0.795	-0.000	0.471	0.000
sd	0.062	0.200	0.043	0.136	0.075	0.200	0.051	0.132
skewness	1.719	-2.699	1.387	-0.927	1.595	-2.772	1.330	-0.976
kurtosis	9.441	14.667	5.639	3.321	8.685	14.886	5.659	3.480

Table A.5.21 Descriptive characteristics by leverage levels

Univariate comparison of means and medians of measures of firm characteristics based on leverage level between 1989 and 2008. Median values are in square brackets.
Note, all variables are defined in Section 5.3. Extremely over- and under-leveraged firms are defined as firms are in the fourth quartile among the under-leveraged firms, and in the first quartile among the over-leveraged firms respectively. For example, the value (of target debt ratio-actual debt ratio) is greater than 0.113 and smaller than -0.275 with book-based debt ratios (see, Table A.5.20 in Appendix 5).

	OLS regressed target				Tobit regressed target			
	BDR-target		MDR-target		BDR-target		MDR-target	
Variables	Extreme -under$_t$	Extreme -over$_t$	Extreme -under$_t$	Extreme -over$_t$	Extreme -under$_t$	Extreme -over$_t$	Extreme -under$_t$	Extreme -over$_t$
BDR	.0266 [.0044]	.6091 [.5465]	.0448 [.0103]	.5098 [.4765]	.0416 [.0126]	.6590 [.5848]	.0541 [.0164]	.5157 [.4831]
MDR	.0228 [.0026]	.3982 [.4053]	.0274 [.0087]	.4782 [.4687]	.0370 [.0087]	.4008 [.4062]	.0348 [.0139]	.4815 [.4743]
Netcash	.6097 [.2886]	.3783 [.0936]	.3599 [.2182]	.1727 [.0832]	.4623 [.2375]	.3810 [.0952]	.3314 [.2022]	.1758 [.0821]
Tax	.2946 [.3013]	.3147 [.1901]	.3495 [.3711]	.3922 [.2982]	.3106 [.3176]	.2897 [.1165]	.3549 [.3726]	3999 [.3023]
Tang	.2865 [.2688]	.2532 [.1923]	.3613 [.3479]	.3011 [.2642]	.3082 [.2941]	.2347 [.1633]	.3649 [.3558]	.2898 [.2475]
Capex	.0487 [.0282]	.0483 [.0257]	.0514 [.0326]	.0473 [.0253]	.0494 [.0295]	.0461 [.024]	.0516 [.0336]	.0456 [.0242]
R&D	.0793 [.0147]	.0609 [.0053]	.0322 [.0067]	.0239 [.0031]	.0625 [.0111]	.0706 [.0064]	.0322 [.0062]	.0249 [.0029]
M/B	1.8727 [1.277]	1.809 [1.301]	1.5229 [1.149]	1.1004 [.9988]	1.6693 [1.1642]	1.9466 [1.3962]	1.4832 [1.1359]	1.1053 [.9997]
Profit	-.0934 [.0359]	-.064 [.0272]	.0003 [.0538]	-.0061 [.0275]	-1.1642 [.0405]	-.0849 [.0243]	.0001 [.0519]	-.0064 [.0279]
Lnasset	5.3547 [5.527]	5.524 [5.659]	6.0411 [6.016]	6.0371 [5.944]	5.6882 [5.7829]	5.1910 [5.4192]	6.1620 [6.1288]	5.9422 [5.8745]
Vol	.1017 [.0383]	.0919 [.0424]	.0569 [.0253]	.0547 [.0268]	.0874 [.0325]	.1065 [.0537]	.0551 [.0244]	.0558 [.0272]
BP	1.35 [1]	2.461 [3]	1.239 [1]	2.425 [3]	1.3708 [1]	2.4887 [3]	1.2649 [1]	2.4142 [3]
Obs	2219	2517	1450	2432	2440	1786	1607	2228

Table A.5.22 Debt ratio changes based on leverage levels, using the Baker and Wurgler model (2002)

Note, extremely over- and under-leveraged firms are defined as firms are in the fourth quartile among the under-leveraged firms, and in the first quartile among the over-leveraged firms respectively. For example, the value (of target debt ratio-actual debt ratio) is greater than 0.113 and smaller than -0.275 with book-based debt ratios (see, Table A.5.20 in Appendix 5). ΔMDR: market-based debt ratio change,
ΔBDR: book-based debt ratio change, A: total asset, e: equity, RE: retained earnings, -(e/A): equity issue, -(RE/A): increased retained earnings, $-(E_{t-1}(1/A_t-1/A_{t-1})$: the residual change in leverage. Independent variables with ΔMDR are based on market-based target debt ratios for the decision of level of debt ratio criteria, and the independent variables with ΔBDR are based on book based target debt ratio. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	Panel A: ΔBDR_t		Panel B: ΔMDR_t	
Leverage level	Ex-over $_{t-1}$	Ex-under $_{t-1}$	Ex-over $_{t-1}$	Ex-under $_{t-1}$
Cons	-.0372 (-7.54)***	.0130 (4.80)***	-.0358 (-10.94)***	.0096 (5.24)***
$-\left(\frac{e}{A}\right)_t$	.6211 (17.67)***	.0467 (2.89)***	.4111 (9.59)***	.0756 (3.82)***
$-\left(\frac{\Delta RE}{A}\right)_t$	.2342 (16.89)***	.0741 (9.02)***	.0524 (4.43)***	.0639 (6.87)***
$-\left[E_{t-1}\left(\frac{1}{A_t}-\frac{1}{A_{t-1}}\right)\right]$	.0842 (3.69)***	.0810 (6.77)***	.1369 (6.23)***	.0308 (2.85)***
Adj-R^2	0.2181	0.0623	0.0873	0.0464
Obs	1742	1356	1415	919

Table A.5.23 Debt ratio changes and financial deficit components, based on leverage levels

Panels A and B show that debt increasing with extremely overleveraged firms is less associated with new investment while extremely underleveraged firms is more associated with new investment. This implies that underleveraged firms more use debt for new investment than overleveraged firms. This is also evidence of static trade-off theory.
Note, extremely over- and under-leveraged firms are defined as firms in the fourth quartile among the under-leveraged firms and in the first quartile among the over-leveraged firms respectively (see, Table A.5.20 in Appendix 5). $DEF1=DIV_t+I_t+\Delta WC_t-C_t$, ΔMDR: market-based debt ratio change, ΔBDR: book-based debt ratio change, Net equity issuance/asset =(sale stock-repurchase stock)/total asset, Net long-term debt issuance/asset=('long-term debt issue'-'long-term debt retirement')/total asset, DEF1: financial deficit defined by Frank and Goyal (2003), DIV: dividend, I: investment (capital expenditure), WC: working capital, C: cash-flow after interest and taxes (=internal cash-flow or net income+depreciation). All items are scaled by total asset. All regressions in this table are based on book based target ratio except the models with the independent variable of ΔMDR. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	Panel A: ΔBDR_t		Panel B: ΔMDR_t	
Leverage level	Ex-over$_{t-1}$	Ex-under$_{t-1}$	Ex-over$_{t-1}$	Ex-under$_{t-1}$
Cons	-.0535 (-9.06)***	.0052 (1.44)	-.0578 (-15.69)***	.0017 (0.66)
DIV_t	.0502 (1.03)	-.0021 (-0.10)	.0643 (2.46)***	-.0003 (-0.03)
I_t	.0998 (1.31)	.2438 (6.34)***	.1995 (3.78)***	.1836 (6.84)***
ΔWC_t	-.3053 (-16.25)***	.0296 (2.28)**	-.1233 (-7.73)***	-.0146 (-1.19)
C_t	-.071 (-4.42)***	-.0692 (-9.50)***	.0057 (0.39)	-.0172 (-3.22)***
Adj-R^2	0.1597	0.0719	0.0472	0.05
Obs	1946	1543	1676	1078
	Panel C: Net long-term debt issue / $asset_t$		Panel D: Net equity issue / $asset_t$	
Leverage level	Ex-over$_{t-1}$	Ex-under$_{t-1}$	Ex-over$_{t-1}$	Ex-under$_{t-1}$
Cons	-.0244 (-6.29)***	.0014 (0.54)	.0259 (6.65)***	.0194 (3.80)***
DIV_t	.0353 (0.81)	.0243 (1.39)	-.0398 (-0.92)	-.0225 (-0.64)
I_t	.4289 (8.83)***	.1396 (5.11)***	.1959 (3.95)***	.3226 (5.80)***
ΔWC_t	.0499 (3.96)***	.0261 (2.91)***	.1759 (14.19)***	.5003 (25.73)***
C_t	-.1164 (-11.71)***	-.0324 (-6.49)***	-.2014 (-20.51)***	-.4322 (-37.55)***
Adj-R^2	0.1001	0.0413	0.2158	0.5333
Obs	1686	1323	1701	1321

Table A.5.24 Debt ratio changes and financial deficits (DEF1) with Flannery and Rangan's (2006) model, based on leverage levels

The table implies that over-leveraged firms at time t-1 use equity at time t, while under-leveraged firms use debt for new investments.

Note, extremely over- and under-leveraged firms are defined as firms in the fourth quartile among the under-leveraged firms and in the first quartile among the over-leveraged firms respectively (see, Table A.5.20 in Appendix 5). $DEF1_t=DIV_t+I_t+\Delta WC_t-C_t$, ΔBDR: book-based debt ratio change, ΔMDR: market-based debt ratio change, DEF1: financial deficit defined by Frank and Goyal (2003), DIV: dividend, I: investment (capital expenditure), WC: working capital, C: cash-flow after interest and taxes (=internal cash-flow or net income+depreciation). All items are scaled by total asset. DEF1 levels indicate the levels of financial deficit for only firms who are extremely over-leveraged or under-leveraged at time t-1. The regression with ΔBDR uses book based OLS regressed-target debt ratio and with ΔMDR uses market-based OLS regressed-target debt ratio. Independent variables with ΔMDR are based on market-based target debt ratios for the decision of level of debt ratio criteria, and the independent variables with ΔBDR are based on book based target debt ratio. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

Leverage level	Panel A : Extremely overleveraged at time t-1			
	ΔBDR_t		ΔMDR_t	
DEF1 level at t	$DEF1_t>0$	$DEF1_t<0$	$DEF1_t>0$	$DEF1_t<0$
Cons	-.0133 (-1.49)	-.0411 (-5.37)***	-.0352 (-7.39)***	-.0311 (-5.90)***
$DEF1_t$	-.1342 (-6.13)***	.0491 (1.57)	-.0811 (-5.30)***	.1592 (5.05)***
Adj-R^2	0.0293	0.002	0.0256	0.0367
Obs	1214	732	1031	645
Leverage level	Panel B : Extremely underleveraged at time t-1			
	ΔBDR_t		ΔMDR_t	
DEF1 level at t	$DEF1_t>0$	$DEF1_t<0$	$DEF1_t>0$	$DEF1_t<0$
Cons	.0119 (2.68)***	.018 (0.68)	.0116 (4.35)***	.0006 (0.21)
$DEF1_t$	.0652 (6.96)***	-.0495 (-2.43)**	.0129 (2.14)**	-.0744 (-3.03)***
Adj-R^2	0.0422	0.0105	0.005	0.0224
Obs	1078	464	719	359

Table A.5.25 Debt ratio changes and financial deficits (DEF1), based on leverage levels

Note, extremely over- and under-leveraged firms are defined as firms are in the fourth quartile among the under-leveraged firms, and in the first quartile among the over-leveraged firms respectively. For example, the value (of target debt ratio-actual debt ratio) is greater than 0.113 and smaller than -0.275 with book-based debt ratios (see, Table A.5.20 in Appendix 5). ΔMDR: market-based debt ratio change, ΔBDR: book-based debt ratio change, Net equity issuance/asset =(sale stock-repurchase stock)/total asset, Net long-term debt issuance/asset=('long-term debt issue'-'long-term debt retirement')/total asset, $DEF1=DIV_t+I_t+\Delta WC_t-C_t$, DEF1: financial deficit defined by Frank and Goyal (2003), DIV: dividend, I: investment (capital expenditure), WC: working capital, C: cash-flow after interest and taxes (=internal cash-flow or net income+depreciation). All items are scaled by total asset. The leverage level is based on time t-1. All regressions in this table are based on book based target ratio except the models with the independent variable of ΔMDR. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level.

	Panel A: ΔBDR_t		Panel B: ΔMDR_t	
Leverage level	Ex-over $_{t-1}$	Ex-under $_{t-1}$	Ex-over $_{t-1}$	Ex-under $_{t-1}$
Cons	-.0399 (-7.55)***	.012 (4.17)***	-.0456 (-14.78)***	.0099 (5.40)***
$DEF1_t$	-.0675 (-4.54)	.0628 (8.75)***	-.0352 (-3.02)***	.0131 (2.62)***
Adj-R^2	0.01	0.0467	0.0048	0.0054
Obs	1946	1543	1676	1078
	Panel C: Net long-term debt issue/ $asset_t$		Panel D: Net equity issue / $asset_t$	
Leverage level	Ex-over $_{t-1}$	Ex-under $_{t-1}$	Ex-over $_{t-1}$	Ex-under $_{t-1}$
Cons	-.0093 (-2.85)***	.0069 (3.49)***	.02 (7.48)***	-.0006 (-0.13)
$DEF1_t$	.0989 (10.63)***	.0326 (6.65)***	.19 (20.75)***	.4099 (34.24)***
Adj-R^2	0.0623	0.0316	0.20	0.4702
Obs	1686	1323	1701	1321

Table A.5.26 Debt ratio change and stock price effect with leverage levels

Table shows that stock price effect is greater for extremely overleveraged firms and that extremely overleveraged firms adjust capital structure more rapidly than extremely underleveraged firms. It also shows stock prices lead debt decrease more for extremely overleveraged firms. This result is not much different with the result moderately over- or under-leveraged firms.
Note, extremely over- and under-leveraged firms are defined as firms are in the fourth quartile among the under-leveraged firms, and in the first quartile among the over-leveraged firms respectively. For example, the value (of target debt ratio-actual debt ratio) is greater than 0.113 and smaller than -0.275 with book-based debt ratios (see, Table A.5.20 in Appendix 5). Independent variables with MDR and ΔMDR are based on market-based target debt ratio for the decision of level of debt ratio criteria, and the independent variables with ΔBDR and stock issue to asset are based on book based target debt ratio. MDR: market-based debt ratio, BDR: book-based debt ratio, Net equity issuance/asset =(sale stock-repurchase stock)/total asset, IDR: Implied debt ratio, $IDR_{t-1,t} \equiv D_{t-1}/(E_{t-1}\ (1+\text{stock return}_{t-1,t})+D_{t-1})$, SR: stock return, log(1+annual stock return). $SPE_{t-1,t}=IDR_{t-1,t}-MDR_{t-1}$, $Speed2_t$: $target2_t-MDR_{t-1}$, target2: 'market-based target debt ratio' calculated using OLS. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	Panel A: Extremely overleveraged $_{t-1}$				
	MDR	ΔMDR	ΔBDR	ΔMDR	Stock issue/asset
Cons	.0026 (0.20)	.0136 (1.22)	-.0531 (-10.89)***	-.0432 (-17.01)***	.0419 (12.22)***
MDR_{t-1}	.5636 (18.71)***				
$IDR_{t,t+1}$	.2553 (14.74)***				
Speed2		.2734 (9.43)***			
$SPE_{t,t+1}$		.268 (15.44)***			
$SR_{t,t+1}$			-.0511 (-7.84)***	-.0719 (-19.27)***	-.0064 (-1.47)
Adj-R^2	0.3880	0.1637	0.0276	0.1608	0.0006
Obs	1937	1807	2130	1934	1822
	Panel B: Extremely underleveraged$_{t-1}$				
	MDR	ΔMDR	ΔBDR	ΔMDR	Stock issue/asset
Cons	.0115 (5.47)***	-.0035 (-0.82)	.0221 (8.00)***	.0116 (6.92)***	.049 (9.67)***
MDR_{t-1}	.7491 (11.51)***				
$IDR_{t,t+1}$	.1661 (5.33)***				
Speed2		.1187 (2.98)***			
$SPE_{t,t+1}$		.1615 (5.50)***			
$SR_{t,t+1}$			-.0222 (-5.18)***	-.0294 (-8.41)***	-.0289 (-3.73)***
Adj-R^2	0.3197	0.0310	0.0150	0.0553	0.0091
Obs	1191	1117	1693	1191	1413

Table A.5.27 A comparison of 'capital structure adjustment speeds', based on leverage levels

Independent variables with (Δ)MDR are based on market-based target debt ratios for the decision of level of debt ratio criteria, and the independent variables with (Δ)BDR are based on book based target debt ratio.

Note, BDR: book-based debt ratio, MDR: market-based debt ratio. $Over_{t-1}$ and $under_{t-1}$ indicate that over-and under leveraged firms and $ex\text{-}un_{t-1}$ and $ex\text{-}ov_{t-1}$ are extremely underleveraged and overleveraged. Extremely over- and under-leveraged firms are defined as firms are in the fourth quartile among the under-leveraged firms, and in the first quartile among the over-leveraged firms respectively. For example, the value (of target debt ratio-actual debt ratio) is greater than 0.113 and smaller than -0.275 with book-based debt ratios (see, Table A.5.20 in Appendix 5). Speed1= $target1_t$-BDR_{t-1}, speed2= $target2_t$-MDR_{t-1}, target1: book based target debt ratio calculated using OLS, target2: market-based target debt ratio calculated using OLS. The coefficient values are λ (capital structure adjustment speed) in Panels A and B. The coefficient values of 'capital structure adjustment speed' in Panels C and D are (1-λ). Thus, the adjustment speed λ is (1-coefficient). BDR_{t-1} is instrumented for Panel C, MDR_{t-1} and profitability are instrumented for Panel D. Panels C and D use System GMM with options of small robust and two step, with sub-options of eq(level) and lag(1 2) collapsed for gmm-style, and of eq(level) for iv-style. The values in the square brackets are the significant levels of J statistic (Hansen p-value); C test value suggests the endogenous variables. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	Panel A: ΔBDR_t				Panel B: ΔMDR_t			
	$Over_{t-1}$	$under_{t-1}$	$Ex\text{-}ov_{t-1}$	$Ex\text{-}un_{t-1}$	$over_{t-1}$	$under_{t-1}$	$Ex\text{-}ov_{t-1}$	$Ex\text{-}un_{t-1}$
Cons	.0168 (8.45)***	.0061 (3.72)***	.0797 (7.78)***	-.0202 (-3.23)***	.0277 (16.04)***	.0069 (5.43)***	.073 (6.56)***	.0001 (0.02)
Speed1	.1629 (21.83)***	.1422 (8.81)***	.2773 (12.97)***	.2845 (7.25)***				
Speed2					.1984 (24.16)***	.1192 (6.33)***	.3139 (10.27)***	.1140 (2.85)***
Ajd R^2	0.0541	0.0109	0.0764	0.0311	0.0702	0.0089	0.0537	0.0063
Obs	8311	6959	2022	1606	7725	4337	1842	1132
	Panel C: BDR_t				Panel D: MDR_t			
	$Over_{t-1}$	$under_{t-1}$	$Ex\text{-}ov_{t-1}$	$Ex\text{-}un_{t-1}$	$over_{t-1}$	$under_{t-1}$	$Ex\text{-}ov_{t-1}$	$Ex\text{-}un_{t-1}$
Cons	.0165 (1.50)	.0150 (2.13)**	.0535 (0.83)	.0059 (0.37)	-.0832 (-2.04)**	.0029 (0.70)	.0954 (1.71)*	-.0073 (-0.48)
BDR_{t-1}	.8178 (15.95)***	.9593 (5.00)***	.7744 (5.51)***	.6045 (2.19)**				
MDR_{t-1}					.7164 (12.02)***	.5527 (4.04)***	.4983 (3.53)***	.6961 (3.19)***
AR(1)	-7.04***	-1.09	-3.70***	0.60	-6.74***	-1.11	-2.55**	0.84
AR(2)	2.28**	5.03***	2.47**	2.34**	-0.87	4.25***	1.87*	2.31**
Hansen [P-value]	29.75 [0.581]	23.14 [0.874]	27.11 [0.713]	21.58 [0.869]	5.74 [0.125]	60.06 [0.617]	69.52 [0.297]	62.65 [0.453]
Inst	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2
Inst No	41	41	41	39	12	73	73	71
Obs	8483	7179	2059	1621	8030	4794	1872	1155

5.5 Different period

Table A.5.28 Descriptive characteristics with two periods

Univariate comparison of means and medians of measures of firm characteristics based on two different periods between 1989 and 2008. Median values are in square brackets.
Note, all variables are defined in Section 5.3. 1995 is the first year in this table because the variable of 'Vol' is a 5 year standard deviation of earnings.

	1995-2001		2002-2008	
	Mean	Median	Mean	Median
BDR	.23	[.18]	.22	[.15]
MDR	.18	[.12]	.16	[.1]
Netcash	.69	[.16]	.71	[.19]
Lnasset	5.05	[5.11]	4.69	[4.69]
Tang	.26	[.21]	.22	[.15]
Tax	.35	[.34]	.30	[.26]
Capex	.07	[.04]	.05	[.02]
R&D	.08	[.02]	.08	[.02]
MB	1.92	[1.28]	1.81	[1.29]
Profit	-.03	[.04]	-.05	[.038]
Vol	.07	[.03]	.09	[.04]
BP	1.69	[1]	1.8	[1]
Obs	17003		30318	

Table A.5.29 Debt ratio changes between different period, using the Baker and Wurgler model (2002)

Note, ΔMDR: market-based debt ratio change, ΔBDR: book-based debt ratio change, A: total asset, RE: retained earnings, e: equity, -(e/A): equity issue, -(RE/A): increased retained earnings, -(E_{t-1}(1/A_t-1/A_{t-1}): the residual change in leverage. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level.

	Panel A: ΔBDR_t		Panel B: ΔMDR_t	
OLS	1995-2001	2002-2008	1995-2001	2002-2008
Cons	.0011 (0.76)	-.002 (-1.94)**	.0059 (5.90)***	.0041 (6.18)***
$-\left(\frac{e}{A}\right)_t$	.2368 (32.47)***	.2219 (34.40)***	.0788 (12.47)***	.0721 (16.18)***
$-\left(\frac{\Delta RE}{A}\right)_t$	.1842 (39.24)***	.1237 (45.00)***	.0576 (16.38)***	.0338 (19.47)***
$-\left[E_{t-1}\left(\frac{1}{A_t}-\frac{1}{A_{t-1}}\right)\right]$	.1976 (31.03)***	.1365 (32.75)***	.0753 (16.62)***	.0315 (12.14)***
Obs	9236	19499	8371	18398
Adj-R^2	0.1772	0.1178	0.0427	0.0259

Table A.5.30 Debt ratio changes and financial deficit components, based on different period

The two periods are very similar, but table shows that new investment are less associated debt increase and firm increase working capital in the second period. This implies that firms decrease debt in the second period.

Note, DEF1=DIV_t+I_t+ΔWC_t-C_t, ΔBDR: book-based debt ratio change, ΔMDR: market-based debt ratio change, Net equity issuance/asset =(sale stock-repurchase stock)/total asset, Net long-term debt issuance/asset=('long-term debt issue'-'long-term debt retirement')/total asset, DEF1: financial deficit defined by Frank and Goyal (2003), DIV: dividend, I: investment (capital expenditure), WC: working capital, C: cash-flow after interest and taxes (=internal cash-flow or net income+depreciation). All items are scaled by total asset. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level.

	Panel A: ΔBDR_t		Panel B: ΔMDR_t	
	1995-2001	2002-2008	1995-2001	2002-2008
Cons	-.0074 (-4.41)***	-.0072 (-6.07)***	-.0044 (-3.72)***	-.0066 (-8.61)***
DIV_t	.0149 (1.80)*	.01666 (3.15)***	.01 (1.76)*	.0103 (3.01)***
I_t	.0892 (6.35)***	.0826 (6.12)***	.1552 (14.63)***	.1699 (18.48)***
ΔWC_t	-.1454 (-27.33)***	-.1619 (-39.00)***	-.0533 (-13.09)***	-.058 (-21.38)***
C_t	-.0242 (-6.00)***	-.0211 (-8.29)***	-.0094 (-3.28)***	-.009 (-5.78)***
Adj-R^2	0.0823	0.0756	0.0410	0.0401
Obs	10972	24748	9739	22690
	Panel C: Net long-term debt issue/ $asset_t$		Panel D: Net equity issue / $asset_t$	
	1995-2001	2002-2008	1995-2001	2002-2008
Cons	-.0026 (-1.96)**	-.0071 (-8.45)***	.0435 (19.15)***	.0299 (21.99)***
DIV_t	-.0053 (-0.70)	.0081 (1.66)*	-.0299 (-2.37)**	-.0314 (-3.99)***
I_t	.2195 (19.5)***	.2356 (24.60)***	.2759 (14.47)***	.1888 (11.98)***
ΔWC_t	.0001 (0.01)	.0099 (3.53)***	.3965 (54.3)***	.2291 (58.95)***
C_t	-.017 (-5.63)***	-.0237 (-14.26)***	-.3354 (-57.51)***	-.2426 (-81.03)***
Adj-R^2	0.0421	0.0388	0.3483	0.2879
Obs	9015	18897	8881	18788

Table A.5.31 Debt ratio changes and financial deficits (DEF1), based on different period

Note, $DEF1=DIV_t+I_t+\Delta WC_t-C_t$, ΔMDR: market-based debt ratio change, ΔBDR: book-based debt ratio change, Net equity issuance/asset =(sale stock-repurchase stock)/total asset, Net long-term debt issuance/asset=('long-term debt issue'-'long-term debt retirement')/total asset, DEF1: financial deficit defined by Frank and Goyal (2003), DIV: dividend, I: investment (capital expenditure), WC: working capital, C: cash-flow after interest and taxes (=internal cash-flow or net income+depreciation). All items are scaled by total asset. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	ΔBDR_t		ΔMDR_t	
	1995-2001	2002-2008	1995-2001	2002-2008
Cons	.0018 (1.30)	-.0014 (-1.35)	.0071 (7.50) ***	.0019 (2.96) ***
DEF_t	-.0209 (-5.93) ***	-.0092 (-3.88) ***	.0012 (0.47)	.0019 (1.32)
Adj-R^2	0.0031	0.0006	0.00	0.00
Obs	10972	24748	9739	22690
	net long-term debt issue / $asset_t$		Net equity issue / $asset_t$	
	1995-2001	2002-2008	1995-2001	2002-2008
Cons	.0112 (10.35) ***	.0024 (3.49) ***	.0287 (15.27) ***	.0178 (15.54) ***
$DEF1_t$	.0209 (7.85) ***	.0245 (15.49) ***	.3085 (58.97) ***	.2235 (77.20) ***
Adj-R^2	0.0067	0.0125	0.2814	0.24
Obs	9015	18897	8881	18788

Table A.5.32 Debt ratio change and stock price effect with different period

Table shows that stock price effect is greater in the second period than in the first period though the difference is not great.

Note, MDR: market-based debt ratio, BDR: book-based debt ratio, Net equity issuance/asset =(sale stock-repurchase stock)/total asset, IDR: Implied debt ratio, $IDR_{t-1,t} \equiv D_{t-1}/(E_{t-1}(1+\text{stock return}_{t-1,t})+D_{t-1})$, SR: stock return, log(1+annual stock return). $SPE_{t-1,t}=IDR_{t-1,t}-MDR_{t-1}$, $Speed2_t=target2_t-MDR_{t-1}$, target2: 'market-based target debt ratio' calculated using OLS. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	Panel A: 1995-2001				
	MDR_t	ΔMDR_t	ΔMDR_t	ΔBDR_t	Stock issue/asset
Cons	.0165 (16.60)***	.003 (1.44)	.0025 (3.54)***	.0014 (1.30)	.0561 (30.69)***
MDR_{t-1}	.6486 (71.30)***				
$IDR_{t,t+1}$	.2039 (33.51)***				
Speed2		.1892 (18.58)***			
$SPE_{t,t+1}$		.2029 (17.85)***			
$SR_{t,t+1}$			-.0429 (-39.91)***	-.0149 (-9.21)***	-.0136 (-5.33)***
Adj-R^2	0.8262	0.1410	0.1152	0.0066	0.0029
Obs	12225	2896	12225	12583	9307
	Panel B: 2002-2008				
	MDR_t	ΔMDR_t	ΔMDR_t	ΔBDR_t	Stock issue/asset
Cons	.0187 (26.18)***	-.0002 (-0.03)	-.0011 (-2.00)**	-.0008 (-0.83)	.0424 (35.71)***
MDR_{t-1}	.5562 (86.48)***				
$IDR_{t,t+1}$	.237 (55.47)***				
Speed2		.2453 (43.39)***			
$SPE_{t,t+1}$		.2437 (39.94)***			
$SR_{t,t+1}$			-.0503 (-64.00)***	-.0272 (-19.89)***	-.0132 (-7.97)***
Adj-R^2	0.7609	0.1822	0.1351	0.0147	0.0031
Obs	26258	11430	2614	26472	20088

Table A.5.33 Capital structure adjustment speed comparison between two periods

Note, BDR: book-based debt ratio, MDR: market-based debt ratio, Speed1= $target1_t$-BDR_{t-1}, speed2= $target2_t$-MDR_{t-1}, target1: book based target debt ratio calculated using OLS, target2: market-based target debt ratio calculated using OLS. The coefficient values are λ (capital structure adjustment speed) in Panels A and B. The coefficient values of 'capital structure adjustment speed' in Panels C and D are (1-λ). Thus, the adjustment speed λ is (1-coefficient). Panels C and D use the System GMM. BDR_{t-1} and MDR_{t-1} are instrumented for Panels C and D respectively. The values in the square brackets are the significant levels of J statistic (Hansen p-value); C test value suggests the endogenous variables. xtabond2 uses options of robust small and twosteps, and eq(level) lag(1 2) collapsed as sub-options for gmm-style and eq(level) for iv-style. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	Panel A: ΔBDR_t		Panel B: ΔMDR_t	
	1995-2001	2002-2008	1995-2001	2002-2008
Cons	.0189 (9.17)***	.0102 (9.68)***	.0171 (8.43)***	.0146 (16.41)***
$Speed1_t$	.1524 (15.89)***	.1579 (30.75)***		
$Speed2_t$			.1162 (11.78)***	.1646 (29.49)***
Adj-R^2	0.0623	0.0625	0.0441	0.0696
Obs	3785	14178	2984	11614
	Panel C: BDR		Panel D: MDR	
	1995-2001	2002-2008	1995-2001	2002-2008
Cons	.0077 (0.91)	.0128 (2.68)***	.0201 (2.80)***	.0144 (3.97)***
BDR_{t-1}	.9051 (15.28)***	.7466 (16.86)***		
MDR_{t-1}			.7921 (16.37)***	.7425 (23.62)***
AR(1)	-4.50***	-9.08***	-9.02***	-13.01***
AR(2)	0.63	0.67	0.53	1.18
Hansen [P-value]	1.43 [0.232]	0.39 [0.535]	1.54 [0.215]	1.47 [0.225]
Inst	L1, L2	L1, L2	L1, L2	L1, L2
Inst No	10	10	10	10
Obs	4536	14692	4467	14665

5.6 Stock return

Table A.5.34 Descriptive characteristics by stock return

Univariate comparison of means and medians of measures of firm characteristics based on stock return between 1989 and 2008. Median values are in square brackets.
Note, we segregate data based on log(stock return). 1Q<-.43, -.43≤2Q<-.046, -.046≤3Q <.25 and .25≤ 4Q. All variables are defined in Section 5.3.

Variables	Fist quartile	Second quartile	Third quartile	Fourth quartile
BDR	.244 [.1732]	.2272 [.1812]	.2214 [.1758]	.2139 [.1539]
MDR	.1859 [.1259]	.1801 [.1353]	.1698 [.1229]	.1472 [.0851]
Netcash	.7661 [.1936]	.5388 [.1581]	.4825 [.1527]	.6531 [.1773]
Tax	.2835 [.1181]	.3845 [.3548]	.3643 [.3526]	.3191 [.3036]
Tang	.2114 [.1400]	.2604 [.2143]	.2740 [.2322]	.2402 [.1811]
Capex	.0494 [.0237]	.0514 [.0301]	.0536 [.0328]	.0573 [.032]
R&D	.1015 [.0298]	.0631 [.0132]	.0557 [.0109]	.0695 [.0175]
M/B	1.672 [1.1763]	1.599 [1.209]	1.7196 [1.2895]	2.187 [1.5374]
Profit	-.154 [.0045]	-.0099 [.0373]	.0146 [.279]	.0064 [.0543]
Vol	.1167 [.0625]	.0636 [.0286]	.0592 [.0258]	.0809 [.0391]
Lnasset	4.381 [4.4325]	5.448 [5.4226]	5.585 [5.5589]	5.1476 [5.1648]
BP	2.0322 [2]	1.7717 [1]	1.6989 [1]	1.6679 [1]
SR	-1.0356 [-.8346]	-.2181 [-.207]	.0954 [.0925]	.5481 [.4809]
Obs	10877	11355	12158	11502

Table A.5.35 Debt ratio changes based on stock return, using the Baker and Wurgler model (2002)

Note, ΔMDR: market-based debt ratio change, ΔBDR: book-based debt ratio change, A: total asset, RE: retained earnings, e: equity, -(e/A): equity issue, -(RE/A): increased retained earnings, $-(E_{t-1}(1/A_t-1/A_{t-1})$: the residual change in leverage. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	Panel A: ΔBDR_t			
OLS	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0166 (7.95)***	.0032 (2.70)***	-.0059 (-4.56)***	-.0164 (-12.03)***
$-\left(\frac{e}{A}\right)_t$	.2222 (19.96)***	.2132 (22.88)***	.222 (21.9)***	.2597 (29.85)***
$-\left(\frac{\Delta RE}{A}\right)_t$	.1217 (28.2)***	.1281 (28.00)***	.1219 (23.96)***	.1480 (31.03)***
$-\left[E_{t-1}\left(\frac{1}{A_t}-\frac{1}{A_{t-1}}\right)\right]$	.1089 (17.15)***	.1448 (22.23)***	.1515 (20.56)***	.2467 (36.11)***
Adj-R^2	0.1198	0.1313	0.1081	0.1847
Obs	6687	6863	7199	8053
	Panel B: ΔMDR_t			
OLS	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0529 (37.29)***	.0151 (19.11)***	-.0073 (-9.55)***	-.0342 (-36.21)***
$-\left(\frac{e}{A}\right)_t$	.0974 (12.78)***	.0693 (11.11)***	.0699 (11.52)***	.0515 (8.65)***
$-\left(\frac{\Delta RE}{A}\right)_t$	.0297 (10.67)***	.0216 (7.51)***	.0215 (7.24)***	.0299 (9.49)***
$-\left[E_{t-1}\left(\frac{1}{A_t}-\frac{1}{A_{t-1}}\right)\right]$	.0391 (9.48)***	.0616 (15.34)***	.0677 (15.96)***	.0846 (20.02)***
Adj-R^2	0.0329	0.0414	0.0432	0.0499
Obs	6479	6742	7086	7875

Table A.5.36 Debt ratio changes and financial deficit components, based on stock return

From Panel D, the new investment reduces as stock return increase and working capital change and internal cash increase. This implies that new issuance of equity is more related to increase liquidity asset rather than to real investment. This supports the idea of issuing equity caused by overvalued stock price.

Note, DEF1=$DIV_t+I_t+\Delta WC_t-C_t$, ΔMDR: market-based debt ratio change, ΔBDR: book-based debt ratio change, Net equity issuance/asset =(sale stock-repurchase stock)/total asset, Net long-term debt issuance/asset=('long-term debt issue'-'long-term debt retirement')/total asset, DEF1: financial deficit defined by Frank and Goyal (2003), DIV: dividend, I: investment (capital expenditure), WC: working capital, C: cash-flow after interest and taxes (=internal cash-flow or net income+depreciation). All items are scaled by total asset. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	Panel A: ΔBDR_t			
OLS	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0008 (0.35)	-.0063 (-3.94)***	-.0104 (-6.26)***	-.0153 (-8.84)***
DIV_t	.0195 (1.61)	.0091 (1.37)	.0174 (2.56)**	.0206 (2.49)**
I_t	.1006 (4.2)***	.1338 (7.72)***	.134 (7.33)***	.1204 (7.03)***
ΔWC_t	-.1386 (-21.33)***	-.1303 (-19.27)***	-.1382 (-19.07)***	-.1347 (-20.57)***
C_t	-.0257 (-6.61)***	-.0097 (-2.22)**	-.0475 (-9.86)***	-.0094 (-2.08)**
Adj-R^2	0.0817	0.0539	0.0652	0.0511
Obs	8049	8427	8732	9449
	Panel B: ΔMDR_t			
OLS	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0337 (21.62)***	.0016 (1.64)	-.015 (-15.16)***	-.0398 (-34.64)***
DIV_t	-.0074 (-0.94)	.0029 (0.72)	.0114 (2.81)***	.0323 (5.87)***
I_t	.2386 (14.94)***	.2031 (19.19)***	.1359 (12.36)***	.1113 (9.78)***
ΔWC_t	-.0483 (-11.39)***	-.0209 (-5.13)***	-.0513 (-11.99)***	-.0266 (-6.19)***
C_t	.0017 (0.67)	.0064 (2.52)**	.0063 (2.32)**	-.0017 (-0.61)
Adj-R^2	0.0431	0.0471	0.0346	0.0174
Obs	7782	8254	8574	9243

Table A.5.36 Continued

	Panel C: Net long-term debt issue / $asset_t$			
OLS	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	-.0029 (-1.78) *	-.0062 (-4.68) ***	-.0056 (-4.22) ***	-.0081 (-6.11) ***
DIV_t	.0078 (0.77)	.0000 (.00)	.0038 (0.56)	.0004 (0.05)
I_t	.2409 (14.82) ***	.2852 (20.11) ***	.2426 (16.85) ***	.2271 (17.20) ***
ΔWC_t	.0179 (4.16) ***	.0159 (2.91) ***	.007 (1.26)	.0152 (3.17) ***
C_t	-.0187 (-7.32) ***	-.0269 (-7.78) ***	-.0409 (-11.36) ***	-.0248 (-7.66) ***
Adj-R^2	0.0386	0.0621	0.0511	0.0408
Obs	6459	6487	6918	7929
	Panel D : Net equity issue / $asset_t$			
OLS	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0339 (12.27) ***	.0247 (13.18) ***	.0205 (11.20)***	.0309 (15.88) ***
DIV_t	-.0506 (-2.96)***	-.0022 (-0.23)	-.0055 (-0.59)	-.0086 (-0.78)
I_t	.3136 (11.15) ***	.1803 (8.95) ***	.2225 (11.06)***	.2222 (11.53) ***
ΔWC_t	.2353 (30.63) ***	.3152 (39.40) ***	.3675 (45.45)***	.4022 (54.91) ***
C_t	-.2095 (-43.16) ***	-.3140 (-56.40) ***	-.3020 (-55.6)***	-.3256 (-59.94) ***
Adj-R^2	0.2490	0.3605	0.3665	0.3925
Obs	6383	6435	6883	7879

Table A.5.37 Debt ratio changes and financial deficits (DEF1), based on stock return

From Panel D, gradual increase of equity issuance with increasing stock return is observed.
Note, ΔMDR: market-based debt ratio change, ΔBDR: book-based debt ratio change, Net equity issuance/asset =(sale stock-repurchase stock)/total asset, Net long-term debt issuance/asset=('long-term debt issue'-'long-term debt retirement')/total asset, $DEF1=DIV_t+I_t+\Delta WC_t-C_t$, DEF1: financial deficit defined by Frank and Goyal (2003), DIV: dividend, I: investment (capital expenditure), WC: working capital, C: cash-flow after interest and taxes (=internal cash-flow or net income+depreciation). All items are scaled by total asset. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	Panel A: ΔBDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0199 (10.02) ***	.0035 (2.71) ***	-.0065 (-4.85) ***	-.0111 (-7.75) ***
$DEF1_t$	.0021 (0.54)	-.0136 (-3.66) ***	.005 (1.26)	-.0189 (-4.9) ***
Adj-R^2	0.00	0.0015	0.0001	0.0024
Obs	8049	8427	8732	9449
	Panel B: ΔMDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0496 (38.80) ***	.0129 (16.37) ***	-.0066 (-8.49) ***	-.0332 (-35.68) ***
$DEF1_t$	-.0053 (-2.20) ***	-.003 (-1.36)	-.007 (-3.12) ***	.0036 (1.46)
Adj-R^2	0.0005	0.0001	0.001	0.0001
Obs	7782	8254	8574	9243
	Panel C: Net long-term debt issuance/ $asset_t$			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0081 (6.09) ***	.0069 (6.40) ***	.0042 (4.01) ***	.0024 (2.24) **
$DEF1_t$	.0213 (8.52) ***	.0276 (8.76) ***	.03335 (10.74) ***	.0271 (9.56) ***
Adj-R^2	0.0110	0.0115	0.02	0.0113
Obs	6459	6487	6918	7929
	Panel D: Net equity issuance/ $asset_t$			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0305 (13.55) ***	.0071 (4.50) ***	.0055 (3.65) ***	.0172 (10.40) ***
$DEF1_t$	.2028 (42.33) ***	.2482 (48.46) ***	.2493 (50.07) ***	.2969 (60.01) ***
Adj-R^2	0.2191	0.2673	0.2669	0.3137
Obs	6383	6435	6883	7879

Table A.5.38 Debt ratio change and stock price effect with stock return

Table shows that stock return affects on mostly first and fourth quartile firms, but Panel B indicates that stock price effects are similar across the sample, based on stock return. Panel D shows clear evidence that firms with extremely overvalued (high stock returns) issue equity otherwise stock return is in generally negatively associated to equity issuance.

Note, MDR: market-based debt ratio, BDR: book-based debt ratio, Net equity issuance/asset =(sale stock-repurchase stock)/total asset, Net long-term debt issuance/asset=('long-term debt issue'-'long-term debt retirement')/total asset, IDR: Implied debt ratio, $IDR_{t-1,t} \equiv D_{t-1}/(E_{t-1}\ (1+\text{stock return}_{t-1,t})+D_{t-1})$, SR: stock return, log(1+annual stock return). $SPE_{t-1,t}=IDR_{t-1,t}-MDR_{t-1}$, $Speed2_t$: $target2_t-MDR_{t-1}$, target2: 'market-based target debt ratio' calculated using OLS. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

OLS	Panel A: MDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0381 (26.33)***	.0202 (21.61)***	.0119 (13.37)***	.0075 (7.80)***
MDR_{t-1}	.6616 (43.20)***	.9866 (81.04)	.8687 (80.38)***	.5815 (58.95)
$IDR_{t,t+1}$	.1975 (23.96)***	-.0161 (-1.98)**	.0279 (3.53)***	.1876 (23.10)***
Adj-R^2	0.7154	0.8519	0.8521	0.8011
Obs	9999	10728	10749	10817
	Panel B: ΔMDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0360 (13.59)***	.0179 (12.04)***	-.0002 (-0.16)	-.0153 (-11.55)***
Speed2	.1556 (10.70)***	.0617 (6.43)***	.1459 (18.64)***	.2724 (38.57)***
$SPE_{t,t+1}$	.1744 (13.59)***	-.0108 (-0.87)	.0286 (2.45)**	.1806 (15.79)***
Adj-R^2	0.0553	0.0183	0.0929	0.2777
Obs	3342	3826	3923	4018
	Panel C: ΔMDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0154 (7.72)***	.0036 (2.49)**	-.0003 (-0.35)	.00 (0.01)
$SR_{t,t+1}$	-.0351 (-20.50)***	-.0471 (-7.86)***	-.0409 (-5.36)***	-.0541 (-16.64)***
Adj-R^2	0.0402	0.0056	0.0026	0.0249
Obs	9999	10728	10749	10817
	Panel D: ΔBDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	-.0051 (-1.54)	.0012 (0.51)	-.0034 (-2.03)**	.0024 (0.75)
$SR_{t,t+1}$	-.0285 (-9.97)***	-.0123 (-1.24)	-.0023 (-0.18)	-.0236 (-4.41)
Adj-R^2	0.0096	0.00	0.00	0.0017
Obs	10189	10921	10906	11010
	Panel E: Net equity issue / $asset_t$			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0350 (8.50)***	.0251 (6.78)***	.0344 (14.01)***	.0084 (1.91)*
$SR_{t,t+1}$	-.0326 (-9.75)***	-.0378 (-2.49)**	-.0255 (-1.34)	0.831 (11.49)***
Adj-R^2	0.0119	0.0007	0.0001	0.0147
Obs	7795	7503	7787	8797

Table A.5.39 Capital structure adjustment speed comparison between different stock return

The table shows that 'capital structure speed' increases as stock returns increase.
Note, BDR: book-based debt ratio, MDR: market-based debt ratio, speed1= $target1_t$-BDR_{t-1}, speed2= $target2_t$-MDR_{t-1}, target1: book based target debt ratio calculated using OLS, target2: market-based target debt ratio calculated using OLS. The coefficient values are λ (capital structure adjustment speed) in Panels A and B. The coefficient values of 'capital structure adjustment speed' in Panels C and D are (1-λ). Thus, the adjustment speed λ is (1-coefficient). In calculating Panels C and D, we use all 7 capital structure determinants though we do not report those coefficients here. BDR_{t-1} and MDR_{t-1} are used as instrument for Panels C and D respectively. The Panels C and D use System GMM and use options of small, robust and twostep for options of xtabond2, the suboptions of eq(level) lag(1 2) collapsed for gmm-style and of eq(level) for iv-style. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

OLS	Panel A: ΔBDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0337 (14.39)***	.0099 (6.72)***	.0053 (3.25)***	.0015 (0.89)
Speed1	.1361 (12.96)***	.1035 (13.54)***	.1694 (20.83)***	.1986 (24.22)***
Adj-R^2	0.0358	0.0383	0.0868	0.1075
Obs	4502	4585	4559	4865
	Panel B: ΔMDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0597 (29.06)***	.0172 (13.73)***	.0009 (0.81)	-.0137 (-10.08)***
Speed2	.0426 (3.48)***	0.665 (8.52)***	.1366 (19.93)***	.2484 (34.95)***
Adj-R^2	0.0033	0.0184	0.0917	0.2330
Obs	3342	3826	3923	4018
	Panel C: BDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0356 (3.75)***	.0102 (2.01)**	.0011 (0.17)	.0007 (0.10)
BDR_{t-1}	.8186 (10.99)***	.8459 (15.65)***	.6411 (7.51)***	.7922 (16.48)***
AR(1)	-3.03***	-5.92***	-4.40***	-3.06***
AR(2)	-0.74	-0.05	-0.15	1.21
Hansen [P-value]	0.09 [0.762]	5.17 [0.023]	0.29 [0.591]	2.77 [0.096]
Inst	L1, L2	L1, L2	L1, L2	L1, L2
Inst No	10	10	10	10
Obs	4868	4917	4856	5447
	Panel D: MDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0362 (5.22)***	.0124 (2.62)***	.0094 (1.79)*	-.0066 (-1.31)
MDR_{t-1}	.9585 (16.55)***	.8630 (19.75)***	.7137 (16.15)***	.6354 (16.55)***
AR(1)	-3.85***	-6.38***	-6.26***	-4.83***
AR(2)	4.77***	1.64	0.70	3.86***
Hansen [P-value]	2.02 [0.155]	2.69 [0.101]	2.16 [0.141]	0.30 [0.584]
Inst	L1, L2	L1, L2	L1, L2	L1, L2
Inst No	10	10	10	10
Obs	4819	4898	4850	5419

5.7 Growth opportunities

Table A.5.40 Descriptive characteristics by growth opportunities

The univariate comparison of means and medians of measures of firm characteristics based on capital expenditure and research and development expenses between 1989 and 2008.
Note, median values are in square brackets. The criteria of capital expenditure and R&D expenses are as follows: 1Q<0.011, 0.011≤ 2Q<.031, 0.031≤3Q<0.07, 0.07≤4Q in capital expenditure to asset; 1Q<0.0017, 0.0017≤2Q<0.018, 0.018≤3Q<0.092, 0.092≤4Q in R&D to asset. All variables are defined in Section 5.3.

	Capital expenditure / $asset_t$				R&D / $asset_t$			
	1st Q	2nd Q	3rd Q	4th Q	1st Q	2nd Q	3rd Q	4th Q
BDR	.2150 [.121]	.2009 [.1275]	.2264 [.181]	.2513 [.2122]	.2768 [.2332]	.2319 [.2054]	.1604 [.0971]	.1304 [.0222]
MDR	.1602 [.0855]	.1565 [.0873]	.1727 [.1261]	.1763 [.1295]	.2064 [.1634]	.1962 [.1639]	.1155 [.0572]	.0589 [.007]
Netcash	1.039 [.2061]	.6964 [.1977]	.5079 [.1549]	.4396 [.1342]	.3839 [.1099]	.3006 [.1448]	.7309 [.2711]	1.54 [.627]
Tax	.2768 [.1597]	.3462 [.3062]	.3487 [.3294]	.3142 [.3152]	.3399 [.3333]	.4263 [.3853]	.3014 [.2689]	.1708 [.0173]
Tang	.1323 [.0566]	.1875 [.1163]	.2684 [.2313]	.3726 [.3607]	.2721 [.2157]	.2863 [.2721]	.1968 [.1478]	.1353 [.0949]
Capex	.0045 [.0041]	.0201 [.0196]	.0477 [.0464]	.1535 [.1181]	.0562 [.0298]	.053 [.0308]	.0581 [.0344]	.0517 [.0292]
R&D	.0817 [.0121]	.083 [.0276]	.072 [.0207]	.0688 [.0187]	.0002 [0]	.0077 [.0066]	.04811 [.0445]	.2463 [.174]
M/B	1.7341 [1.152]	1.771 [1.276]	1.8447 [1.319]	2.0521 [1.478]	1.686 [1.219]	1.41 [1.123]	2.0309 [1.485]	2.853 [2.264]
Profit	-.1238 [.0161]	-.0302 [.0377]	.0041 [.0489]	.0095 [.0606]	-.0189 [.0503]	.04442 [.0478]	.026 [.0527]	-.2081 [-.063]
Vol	.1048 [.0458]	.0843 [.0415]	.0714 [.0339]	.0764 [.0380]	.0728 [.0301]	.0414 [.0217]	.0829 [.0505]	.1674 [.1148]
Lnasset	4.0022 [4.177]	5.012 [4.959]	5.6329 [5.539]	5.5407 [5.461]	5.0929 [5.469]	6.0108 [5.841]	5.2518 [4.888]	3.9107 [3.802]
BP	1.8837 [2]	1.755 [1]	1.735 [1]	1.741 [1]	1.838 [2]	1.6502 [1]	1.4573 [1]	1.7076 [1]
Obs	11285	11384	11294	11329	7004	7097	7028	7035

Table A.5.41 Debt ratio changes based on growth opportunities, using the Baker and Wurgler model (2002)

Note, ΔMDR: market-based debt ratio change, ΔBDR: book-based debt ratio change, A: total asset, RE: retained earnings, e: equity, -(e/A): equity issue, -(RE/A): increased retained earnings, -(E_{t-1}(1/A_t-1/A_{t-1}): the residual change in leverage. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	Panel A: Capital expenditure / asset							
	ΔBDR_t				ΔMDR_t			
OLS	1st Q	2nd Q	3rd Q	4th Q	1st Q	2nd Q	3rd Q	4th Q
Cons	-.0034 (-1.65)*	-.0064 (-4.66)***	-.0044 (-3.36)***	.0047 (2.98)***	-.0027 (-2.01)**	-.0014 (-1.45)	.0023 (2.47)**	.0158 (14.07)***
$-\left(\frac{e}{A}\right)_t$	.1746 (15.46)***	.1953 (21.76)***	.2396 (26.03)***	.2939 (33.91)***	.0567 (7.54)***	.0693 (10.24)***	.1992 (13.83)***	.956 (13.35)***
$-\left(\frac{\Delta RE}{A}\right)_t$	.1085 (25.74)***	.1389 (31.68)***	.1612 (31.74)***	.1847 (32.22)***	.0290 (11.06)***	.0421 (14.46)***	.0589 (16.44)***	.0557 (13.36)***
$-\left[E_{t-1}\left(\frac{1}{A_t}-\frac{1}{A_{t-1}}\right)\right]$	.0952 (14.69)***	.1265 (19.85)***	.1844 (24.80)***	.2182 (29.94)***	.0284 (7.24)***	.0301 (7.27)***	.0586 (11.35)***	.0676 (12.24)***
Obs	6634	7986	8128	7837	6243	7540	7703	7110
Adj-R^2	0.0972	0.1232	0.1418	0.1981	0.0222	0.0296	0.0423	0.0413

Table A.5.41 Continued

	Panel B: R&D / asset							
	ΔBDR_t				ΔMDR_t			
OLS	1st Q	2nd Q	3rd Q	4th Q	1st Q	2nd Q	3rd Q	4th Q
Cons	-.0014 (-0.64)	-.0061 (-3.94)***	-.0029 (-1.68)*	-.0023 (-1.00)	.0041 (2.70)***	-.0023 (-1.83)*	.0043 (3.61)***	.0034 (3.04)***
$-\left(\frac{e}{A}\right)_t$	.2972 (16.73)***	.3808 (23.41)***	.2328 (23.23)***	.1651 (18.27)***	.0803 (6.11)***	.1445 (9.63)***	.908 (10.67)***	.0467 (9.76)***
$-\left(\frac{\Delta RE}{A}\right)_t$	.1359 (21.22)***	.1387 (16.93)***	.1333 (21.78)***	.1218 (25.02)***	.0345 (8.09)***	.0656 (9.46)***	.0498 (11.06)***	.0267 (11.65)***
$-\left[E_{t-1}\left(\frac{1}{A_t}-\frac{1}{A_{t-1}}\right)\right]$	.1566 (16.55)***	.199 (18.78)***	.1662 (20.76)***	.1113 (15.61)***	.0448 (7.22)***	.0884 (10.10)***	.067 (9.72)***	.0161 (4.76)***
Obs	4737	4060	4700	5269	4388	3871	4439	5000
Adj-R^2	0.1276	0.1673	0.1571	0.1189	0.0244	0.0462	0.0415	0.0321

Table A.5.42 Debt ratio changes and financial deficit components with capital expenditure

Table shows that the association between debt ratio change and working capital change is increased with increasing capital expenditure whereas the association between debt ratio change and working capital change is decreased.

Note, DEF1=DIV_t+I_t+ΔWC_t-C_t, ΔMDR: market-based debt ratio change, ΔBDR: book-based debt ratio change, Net equity issuance/asset =(sale stock-repurchase stock)/total asset, Net long-term debt issuance/asset=('long-term debt issue'-'long-term debt retirement')/total asset, DEF1: financial deficit defined by Frank and Goyal (2003), DIV: dividend, I: investment (capital expenditure), WC: working capital, C: cash-flow after interest and taxes (=internal cash-flow or net income+depreciation). All items are scaled by total asset. We do not analysis based on research expenditure, because the DEF1 includes the capital expenditures. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	Capital expenditure/ asset							
	Panel A: ΔBDR_t				Panel B: ΔMDR_t			
OLS	1st quartile	2nd quartile	3rd quartile	4th quartile	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	-.0099 (-3.34)***	-.0126 (-2.81)***	-.0095 (-1.75)**	-.002 (-0.68)	-.0095 (-4.71)***	-.0053 (-1.71)**	-.0096 (-2.60)***	-.002 (-1.10)
DIV_t	.0131 (1.46)	.0166 (2.26)**	.0125 (1.65)	.0207 (2.18)**	.0117 (1.92)*	.0065 (1.28)	.0106 (2.03)**	.0097 (1.63)
I_t	.0295 (0.06)	.2389 (1.13)	.1640 (1.49)	.0682 (4.40)***	.4642 (1.44)	.1148 (0.79)	.2542 (3.38)***	.1388 (13.3)***
ΔWC_t	-.1245 (-20.08)***	-.1215 (-20.22)***	-.1655 (-25.85)***	-.2186 (-31.67)***	-.0513 (-12.28)***	-.0468 (-11.25)***	-.0677 (-14.45)***	-.0734 (-14.99)***
C_t	-.0356 (-9.18)***	-.1215 (-20.22)***	-.0398 (-8.88)***	.0109 (2.20)**	-.0067 (-2.69)***	-.0151 (-5.63)***	-.0201 (-6.78)***	-.0049 (-1.65)*
Adj-R^2	0.0778	0.0671	0.0860	0.0960	0.0258	0.0254	0.0363	0.0475
Obs	9004	9723	9731	9671	8315	8957	8957	8483

Table A.5.42 Continued

	Capital expenditure/ asset							
	Panel C: Net long-term debt issue / $asset_t$				Panel D: Net equity issue / $asset_t$			
OLS	1st quartile	2nd quartile	3rd quartile	4th quartile	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	-.0096 (-4.54) ***	-.0063 (-1.79) *	-.0024 (-0.57)	-.0006 (-0.30)	.0438 (11.50) ***	.0336 (5.72) ***	.0342 (5.16) ***	.0369 (11.83) ***
DIV_t	.0169 (1.82) *	.0122 (1.71) *	.0014 (0.2)	-.0143 (-1.88) *	-.0614 (-3.72) ***	-.0255 (-2.17) **	-.0262 (-2.42) **	-.0049 (-0.43)
I_t	.6046 (1.81) *	.1588 (0.95)	.1661 (1.93) *	.2129 (19.16) ***	-.5917 (-0.98)	.1957 (0.71)	.1977 (1.46)	.2247 (13.13) ***
ΔWC_t	.0196 (4.92) ***	.0299 (6.52) ***	.0055 (1.12)	-.0232 (-4.89) ***	.2588 (34.88)***	.3135 (40.24) ***	.3233 (40.37)***	.3955 (50.38)***
C_t	-.0272 (-10.97) ***	-.0315 (-10.30)***	-.0294 (-8.85) ***	-.0116 (-3.58) ***	-.2126 (-44.23) ***	-.28 (-51.82) ***	-.29887 (-50.08) ***	-.3312 (-54.69)***
Adj-R^2	0.0178	0.0142	0.0098	0.0491	0.2692	0.2914	0.2911	0.3732
Obs	6448	7613	7960	8076	6425	7613	7861	7953

Table A.5.43 Debt ratio changes and financial deficits (DEF1), based on capital expenditure

Note, $DEF1=DIV_t+I_t+\Delta WC_t-C_t$, ΔMDR: market-based debt ratio change, ΔBDR: book-based debt ratio change, Net equity issuance/asset =(sale stock-repurchase stock)/total asset, Net long-term debt issuance/asset=('long-term debt issue'-'long-term debt retirement')/total asset, DEF1: financial deficit defined by Frank and Goyal (2003), DIV: dividend, I: investment (capital expenditure), WC: working capital, C: cash-flow after interest and taxes (=internal cash-flow or net income+depreciation). All items are scaled by total asset. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	Capital Expenditure / asset			
	Panel A: ΔBDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	-.0037 (-2.06)**	-.0062 (-4.64)***	-.0034 (-2.54)**	.0136 (7.75)***
$DEF1_t$	.0086 (2.27)**	.0011 (0.3)	-.0136 (-3.50)***	-.0537 (-13.30)***
Adj-R^2	0.0005	0.00	0.001	0.0179
Obs	9004	9723	9731	9671
	Panel B: ΔMDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	-.0043 (-3.58)***	-.0022 (-2.40)**	.0018 (2.09)**	.0176 (16.44)***
$DEF1_t$	-.0006 (-0.24)	.0028 (1.16)	.0021 (0.79)	-.0005 (-0.19)
Adj-R^2	0.00	0.00	0.00	0.00
Obs	8315	8957	8957	8483
	Panel C: Net long-term debt issuance/ $asset_t$			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	-.0066 (-5.33)***	-.0043 (-4.28)***	.0033 (3.31)***	.0267 (22.37)***
$DEF1_t$	.0253 (10.63)***	.0289 (10.31)***	.0203 (6.99)***	.0161 (6.06)***
Adj-R^2	0.0171	0.0136	0.006	0.004
Obs	6448	7613	7960	8076
	Panel D: Net equity issuance/ $asset_t$			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0288 (12.71)***	.0219 (12.57)***	.0192 (11.82)***	.0128 (6.67)***
$DEF1_t$	.2083 (44.19)***	.2457 (47.88)***	.2483 (46.67)***	.2971 (58.60)***
Adj-R^2	0.2331	0.2314	0.2169	0.3016
Obs	6425	7613	7861	7953

Table A.5.44 Debt ratio changes and financial deficits (DEF1), based on R&D expenditure

Note, $DEF1_t=DIV_t+I_t+\Delta WC_t-C_t$, ΔMDR: market-based debt ratio change, ΔBDR: book-based debt ratio change, Net equity issuance/asset =(sale stock-repurchase stock)/total asset, Net long-term debt issuance/asset=('long-term debt issue'-'long-term debt retirement')/total asset, DEF1: financial deficit defined by Frank and Goyal (2003), DIV: dividend, I: investment (capital expenditure), WC: working capital, C: cash-flow after interest and taxes (=internal cash-flow or net income+depreciation). All items are scaled by total asset. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	Research and Development Expenditure / asset			
	Panel E: ΔBDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	-.0032 (-1.36)	-.0039 (-2.58)***	-.0014 (-0.80)	.0033 (1.41)
$DEF1_t$	-.0017 (-0.29)	-.0415 (-7.59)***	-.0144 (-2.83)***	-.0075 (-1.68)*
Adj-R^2	0.00	0.0105	0.0012	0.0003
Obs	5245	5342	5708	5827
	Panel F: ΔMDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0019 (1.25)	-.0018 (-1.44)	.0025 (2.11)**	.0041 (3.76)***
$DEF1_t$	.0054 (1.49)	.0006 (0.14)	.0036 (1.00)	.001 (0.50)
Adj-R^2	0.0003	0.00	0.00	0.00
Obs	4823	4998	5204	5383
	Panel G: Net long-term debt issuance/ $asset_t$			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0062 (4.12)***	.0042 (3.50)***	.0047 (3.59)***	-.0005 (-.038)
$DEF1_t$	.0265 (7.32)***	.0394 (7.94)***	.0384 (10.03)***	.0267 (10.36)***
Adj-R^2	0.0111	0.0154	0.0210	0.0196
Obs	4674	3989	4638	5320
	Panel H: Net equity issuance/ $asset_t$			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0151 (8.01)***	.0047 (3.25)***	.0183 (7.82)***	.0415 (13.62)***
$DEF1_t$	.1485 (29.56)***	.1969 (30.94)***	.2592 (37.43)***	.3271 (50.38)***
Adj-R^2	0.1572	0.1936	0.2318	0.3255
Obs	4679	3985	4642	5258

Table A.5.45 Debt ratio change and stock price effect, based on capital expenditure

Note, MDR: market-based debt ratio, Net equity issuance/asset =(sale stock-repurchase stock)/total asset, BDR: book-based debt ratio, IDR: Implied debt ratio, $IDR_{t-1,t} \equiv D_{t-1}/(E_{t-1}\ (1+\text{stock return}_{t-1,t})+D_{t-1})$, SR: stock return, log(1+annual stock return). $SPE_{t-1,t}=IDR_{t-1,t}-MDR_{t-1}$, $Speed2_t$: $target2_t-MDR_{t-1}$, target2: 'market-based target debt ratio' calculated using OLS. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

OLS	Capital expenditure /asset			
	Panel A: MDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0147 (11.59)***	.0109 (11.07)***	.0154 (15.25)***	.0277 (22.82)***
MDR_{t-1}	.5662 (53.84)***	.5757 (59.32)***	.5575 (56.75)***	.4469 (38.02)***
$IDR_{t,t+1}$	.2043 (30.73)***	.2357 (36.32)***	.2611 (38.69)***	.3653 (44.08)***
Adj-R^2	0.7401	0.8269	0.8295	0.7741
Obs	9942	10117	9955	9132
	Panel B: ΔMDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	-.0053 (-2.73)***	-.0033 (-2.40)**	-.0023 (-1.63)	.0091 (5.30)***
Speed2	.222 (22.45)***	.1974 (24.27)***	.2214 (26.00)***	.2586 (23.41)***
$SPE_{t,t+1}$	.1743 (17.57)***	.2077 (22.10)***	.2738 (26.71)***	.4029 (31.01)***
Adj-R^2	0.1432	0.1534	.0716	0.2672
Obs	3559	4202	4040	3264
	Panel C: ΔMDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	-.0094 (-9.44)***	-.0053 (-7.03)***	-.0001 (-0.15)	.0151 (17.46)***
$SR_{t,t+1}$	-.0435 (-33.03)***	-.0456 (-40.00)***	-.0537 (-45.01)***	-.0634 (-46.26)***
Adj-R^2	0.99	0.1366	0.1692	0.1898
Obs	9919	10110	9947	9129
	Panel D: ΔBDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	-.0026 (-1.56)	-.0044 (-3.65)***	-.0025 (-2.18)**	.0091 (6.02)***
$SR_{t,t+1}$	-.0262 (-11.56)***	-.0216 (-11.86)***	-.0281 (-14.73)***	-.0246 (-10.43)***
Adj-R^2	0.0131	0.0134	0.0209	0.0114
Obs	10028	10265	10118	9343
	Panel E: Net equity issue / $asset_t$			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0561 (24.96)***	.0364 (21.11)***	.0314 (19.97)***	.0501 (26.93)***
$SR_{t,t+1}$	-.009 (-3.31)***	-.0133 (-5.28)***	-.0039 (-1.54)	-.0157 (-5.42)***
Adj-R^2	0.0014	0.0034	0.0002	0.004
Obs	7014	7943	8100	7675

Table A.5.46 Debt ratio change and stock price effect, based on R&D expenditure

Note, MDR: market-based debt ratio, BDR: book-based debt ratio, Net equity issuance/asset =(sale stock-repurchase stock)/total asset, IDR: Implied debt ratio, $IDR_{t-1,t} \equiv D_{t-1}/(E_{t-1}\ (1+\text{stock return}_{t-1,t})+D_{t-1})$, SR: stock return, log(1+annual stock return), $SPE_{t-1,t}=IDR_{t-1,t}-MDR_{t-1}$, speed2$_t$: target2$_t$-MDR$_{t-1}$, target2: 'market-based target debt ratio' calculated using OLS. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

OLS	Research and Development expenditure / asset			
	Panel A: MDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.023 (12.51)***	.0186 (12.51)***	.0178 (14.94)***	.0123 (12.57)***
MDR_{t-1}	.5918 (44.87)***	.6479 (53.61)***	.3568 (23.52)***	.2791 (16.87)***
$IDR_{t,t+1}$	.2139 (24.78)***	.1807 (22.03)***	.3639 (36.90)***	.3747 (37.19)***
Adj-R^2	0.7602	0.8007	0.76	0.64
Obs	5696	6246	5782	5694
	Panel B: ΔMDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0047 (2.39)**	.0002 (0.13)	-.0009 (-0.66)	-.0004 (-0.24)
Speed2	.1972 (21.54)***	.1964 (25.36)***	.3001 (29.87)***	.3259 (22.12)***
$SPE_{t,t+1}$	.1972 (19.41)***	.1796 (19.82)***	.3387 (30.89)***	.3492 (23.16)***
Adj-R^2	0.1391	0.1396	0.2556	0.2573
Obs	3885	4762	3862	2173
	Panel C: ΔMDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	-.0001 (-0.06)	-.0011 (-1.20)	-.0001 (-0.07)	-.0031 (-3.27)***
$SR_{t,t+1}$	-.0553 (-31.07)***	-.0561 (-32.14)***	-.0485 (-31.47)***	-.0374 (-31.60)***
Adj-R^2	0.1451	0.1418	0.1461	0.1492
Obs	5684	6246	5780	5689
	Panel D: ΔBDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	-.0015 (-0.68)	-.0045 (-4.03)***	-.0009 (-0.56)	-.001 (-0.42)
$SR_{t,t+1}$	-.0285 (-9.29)***	-.0209 (-10.23)***	-.0221 (-9.06)***	-.03 (-10.17)***
Adj-R^2	0.0145	0.0161	0.0137	0.0177
Obs	5784	6356	5854	5666
	Panel E: Net equity issue / $asset_t$			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0298 (15.42)***	.0142 (10.63)***	.0349 (16.23)***	.097 (28.99)***
$SR_{t,t+1}$	-.0162 (-6.39)***	-.0166 (-7.15)***	-.0005 (-0.17)	-.0053 (-1.25)
Adj-R^2	0.0079	0.0113	0.00	0.0001
Obs	5014	4401	4759	5252

Table A.5.47 Capital structure adjustment speed comparison, based on capital expenditure

Note, ΔMDR: market-based debt ratio change, ΔBDR: book-based debt ratio change, speed1= $target1_t$-BDR_{t-1}, speed2= $target2_t$-MDR_{t-1}, target1: book based target debt ratio calculated using OLS, target2: market-based target debt ratio calculated using OLS. The coefficient values are λ (capital structure adjustment speed) in Panels A and B. The coefficient values of 'capital structure adjustment speed' in Panels C and D are (1-λ). Thus, the adjustment speed λ is (1-coefficient). In calculating panels C and D, we use all 7 capital structure determinants though we do not report those coefficients here. BDR_{t-1} and MDR_{t-1} are instrumented for Panels C and D respectively. The options for xtabond2 command are twostep small robust and suboptions for gmm-style are eq(level) lag(1 2) and collapsed and for iv-style is eq(level) for the Panels C and D. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

OLS	Capital Expenditure / Asset			
	Panel A: ΔBDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0124 (5.25)***	.006 (3.88)***	.0092 (6.19)***	.025 (13.27)***
Speed1	.1578 (15.54)***	.1268 (16.79)***	.155 (21.18)***	.1671 (17.58)***
Adj-R^2	0.0506	0.0496	0.0826	0.0721
Obs	4518	5378	4972	3964
	Panel B: ΔMDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0086 (4.66)***	.008 (5.9)***	.0136 (9.60)***	.0304 (17.17)***
Speed2	.1599 (16.89)***	.1242 (15.85)***	.1405 (16.44)***	.1613 (13.72)***
Adj-R^2	0.0728	0.0554	0.0614	0.0524
Obs	3621	4262	4115	3388
	Panel C: BDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0111 (1.16)	.0031 (0.42)	.0049 (0.84)	.0548 (4.72)***
BDR_{t-1}	8896 (11.95)***	.7549 (12.25)***	.7912 (15.53)***	.6121 (8.46)***
AR(1)	-3.66***	-4.26***	-6.15***	-5.02***
AR(2)	0.96	1.07	0.56	1.33
Hansen [P-value]	0.85 [0.357]	1.08 [0.299]	0.35 [0.555]	0.15 [0.702]
Inst	L1, L2	L1, L2	L1, L2	L1, L2
Inst No	10	10	10	10
Obs	4814	5790	5419	4429
	Panel D: MDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0064 (1.07)	0053 (1.19)	.0163 (3.22)***	.0547 (5.07)***
MDR_{t-1}	.7701 (17.77)***	.8176 (18.56)***	.7659 (15.79)***	.6332 (7.20)***
AR(1)	-6.98***	-7.50***	-7.52***	-5.45***
AR(2)	0.27	2.00	1.39	1.39
Hansen [P-value]	0.52 [0.471]	3.52 [0.061]	0.14 [0.710]	0.12 [0.731]
Inst	L1, L2	L1, L2	L1, L2	L1, L2
Inst No	10	10	10	10
Obs	4789	5764	5397	4395

Table A.5.48 Capital structure adjustment speed comparison, based on R&D expenditure

Note, BDR: book-based debt ratio, MDR: market-based debt ratio, speed1= target1$_t$-BDR$_{t-1}$, speed2= target2$_t$-MDR$_{t-1}$, target1: book based target debt ratio calculated using OLS, target2: market-based target debt ratio calculated using OLS. The coefficient values are λ (capital structure adjustment speed) in Panels A and B. The coefficient values of 'capital structure adjustment speed' in Panels C and D are (1-λ). Thus, the adjustment speed λ is (1-coefficient). In calculating Panels C and D, we use all 7 capital structure determinants though we do not report those coefficients here. BDR$_{t-1}$ and MDR$_{t-1}$ are instrumented for Panels C and D respectively. The options for xtabond2 are twostep small robust and suboptions for gmm-style are eq(level) lag(1 2) and collapsed and for iv-style is eq(level) for the Panels C and D. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

OLS	Research and Development Expenditure/ Asset			
	Panel A: ΔBDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0191 (8.39)***	.0057 (4.54)***	.0091 (6.08)***	.0142 (6.16)***
Speed1	.1587 (17.84)***	.1178 (17.61)***	.1703 (20.32)***	.1661 (155)***
Adj-R^2	0.0661	0.057	0.0784	0.0566
Obs	4486	5113	4847	3911
	Panel B: ΔMDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0199 (10.68)***	.0135 (10.12)***	.0148 (10.18)***	.0109 (6.03)***
Speed2	.1401 (15.75)***	.1413 (18.83)***	.1859 (18.17)***	.2075 (13.63)***
Adj-R^2	0.0579	0.0687	0.0769	0.077
Obs	4022	4794	3956	2215
	Panel C: BDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0278 (2.02)**	.0102 (1.42)	.0107 (1.60)	.0048 (0.53)
BDR_{t-1}	.7361 (9.50)***	.7939 (14.70)***	.7957 (12.88)***	.7527 (10.10)***
AR(1)	-4.95***	-6.83***	-5.55***	-5.66***
AR(2)	0.71	-0.02	-0.30	1.20
Hansen [P-value]	0.96 [0.328]	0.46 [0.496]	0.05 [0.825]	0.86 [0.354]
Inst	L1, L2	L1, L2	L1, L2	L1, L2
Inst No	10	10	10	10
Obs	4608	5169	5219	4949
	Panel D: MDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0297 (2.67)***	.0139 (1.83)*	.0164 (2.88)***	.0076 (1.36)
MDR_{t-1}	.7267 (13.82)***	.8272 (18.26)***	.6938 (14.60)***	.7566 (11.49)***
AR(1)	-7.64***	-7.27***	-8.70***	-6.06***
AR(2)	-0.49	2.21**	-0.01	0.83
Hansen [P-value]	0.02 [0.878]	0.85 [0.358]	6.74 [0.009]	0.02 [0.900]
Inst	L1, L2	L1, L2	L1, L2	L1, L2
Inst No	10	10	10	10
Obs	4516	5136	5214	4967

5.8 Profitability

Table A.5.49 Descriptive characteristics by profitability

Univariate comparison of means and medians of measures of firms' characteristics based on profitability between 1989 and 2008.
Note, median values are in square brackets. The value of 1st Q <= -0.022, -0.022 < 2nd Q <= 0.04, 0.04 < 3rd Q <= 0.093, and 4th Q > 0.093. All variables are defined in Section 5.3.

	Profit / asset			
	1st Q	2nd Q	3rd Q	4th Q
BDR	0.2157 [0.891]	0.2749 [0.2522]	0.2457 [0.2213]	.1613 [.0941]
MDR	0.126 [0.044]	0.2464 [0.2252]	0.1983 [0.1685]	.0963 [.0441]
SR	-0.403 [-0.2613]	-0.1153 [-0.0599]	-0.0417 [0.00]	0.052 [0.0929]
Netcash	1.595 [0.333]	0.3185 [0.1337]	0.2751 [0.1372]	.5044 [.221]
Tax	0.0823 [0.00]	0.5212 [0.3897]	0.3962 [0.3823]	.3283 [.35]
Tang	0.1781 [0.0968]	0.2858 [0.246]	0.2803 [0.248]	.2286 [.17]
Capex	.0487 [.0202]	.0497 [.0274]	.0572 [.0358]	.0706 [.0446]
R&D	.1637 [.0942]	.0336 [.0067]	.0311 [.0085]	.0524 [.0208]
MB	2.3242 [1.561]	1.2601 [1.0537]	1.4156 [1.2085]	2.42 [1.9126]
Profit	-0.4004 [-0.1993]	0.0164 [0.0188]	0.0639 [0.0628]	.1755 [.1427]
Vol	0.1788 [0.1263]	0.0435 [0.0213]	0.0399 [0.0217]	.0663 [.0394]
Lnasset	3.2577 [3.225]	5.8313 [5.7208]	5.9258 [5.7842]	5.2245 [5.0482]
Bp	2.178 [3.00]	1.9845 [2.00]	1.6534 [1.00]	1.2464 [1]
Obs	13034	12976	13079	13046

Table A.5.50 Debt ratio changes based on profitability, using the Baker and Wurgler model (2002)

Note, A: total asset, RE: retained earnings, e: equity, -(e/A): equity issue, -(RE/A): increased retained earnings, $-(E_{t-1}(1/A_t-1/A_{t-1})$: the residual change in leverage, ΔBDR: book-based debt ratio change, ΔMDR: market-based debt ratio change, *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	Panel A: ΔBDR_t			
OLS	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0184 (6.81)***	.0004 (0.34)	-.0084 (-8.05)***	-.0188 (-14.90)***
$-\left(\frac{e}{A}\right)_t$	.2041 (24.29)***	.2551 (17.84)***	.4153 (35.87)***	.3389 (33.43)***
$-\left(\frac{\Delta RE}{A}\right)_t$	.1086 (26.87)***	.1922 (21.68)	.2407 (28.93)***	.1952 (28.46)***
$-\left[E_{t-1}\left(\frac{1}{A_t}-\frac{1}{A_{t-1}}\right)\right]$	.1155 (19.93)***	.2112 (23.38)***	.3865 (44.96)***	.2823 (35.90)***
Adj-R^2	0.1168	0.1222	0.2779	0.2123
Obs	8197	6672	7426	8653
	Panel B: ΔMDR_t			
OLS	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0161 (10.71)***	.0081 (7.23)***	-.001 (-1.02)	-.0103 (-12.03)***
$-\left(\frac{e}{A}\right)_t$	.0612 (12.12)***	.1616 (10.60)***	.2299 (17.33)***	.1384 (17.53)***
$-\left(\frac{\Delta RE}{A}\right)_t$	.021 (9.59)***	.0715 (8.76)***	.1139 (13.99)***	.0577 (12.16)***
$-\left[E_{t-1}\left(\frac{1}{A_t}-\frac{1}{A_{t-1}}\right)\right]$	.0207 (6.69)***	.1423 (16.27)***	.2317 (26.66)***	.1093 (20.7)***
Adj-R^2	0.0241	0.0462	0.1056	0.07
Obs	7592	6256	7018	8000

Table A.5.51 Debt ratio changes and financial deficit components, based on profitability

Note, DEF1=DIV_t+I_t+ΔWC_t-C_t, ΔBDR: book-based debt ratio change, ΔMDR: market-based debt ratio change, Net equity issuance/asset =(sale stock-repurchase stock)/total asset, Net long-term debt issuance/asset=('long-term debt issue'-'long-term debt retirement')/total asset, DEF1: financial deficit defined by Frank and Goyal (2003), DIV: dividend, I: investment (capital expenditure), WC: working capital, C: cash-flow after interest and taxes (=internal cash-flow or net income+depreciation). All items are scaled by total asset. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	Panel A: ΔBDR_t			
OLS	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	-.0041 (-1.52)	-.0021 (-1.39)	-.0024 (-1.52)	-.0024 (-1.13)
DIV_t	.0469 (1.63)	.0071 (1.03)	.0161 (3.06)***	.0239 (4.47)***
I_t	.0094 (0.37)	.1759 (10.67)***	.2142 (15.34)***	.0982 (7.21)***
ΔWC_t	-.1613 (-28.41)***	-.1387 (-17.58)***	-.1151 (-14.32)***	-.1401 (-18.8)***
C_t	-.0186 (-4.64)***	-.1382 (-11.68)***	-.1945 (-14.54)***	-.0956 (-9.38)***
Adj-R^2	0.0915	0.0629	0.0635	0.0572
Obs	9831	8353	9689	10146
	Panel B: ΔMDR_t			
OLS	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0012 (0.79)	-.0026 (-1.99)**	-.0041 (-2.90)***	-.0077 (-5.57)***
DIV_t	.0367 (2.43)**	.0026 (0.45)	.0175 (3.73)***	.0175 (4.91)***
I_t	.1497 (9.75)***	.2892 (18.86)***	.2439 (18.8)***	.1049 (11.08)***
ΔWC_t	-.0539 (-17.16)***	-.0931 (-12.19)***	-.0539 (-6.68)***	-.0303 (-5.62)***
C_t	-.0006 (-0.30)	-.0713 (-6.55)***	-.1168 (-9.41)***	-.0498 (-7.14)***
Adj-R^2	0.0426	0.0660	0.0508	0.0255
Obs	8941	7736	8930	8993

Table A.5.51 Continued

	Panel C: Net long-term debt issue / $asset_t$			
OLS	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	-.0049 (-2.94) ***	-.0077 (-5.88) ***	-.0032 (-2.14) **	-.0031 (-1.88) *
DIV_t	.009 (0.41)	-.005 (-0.65)	.0082 (1.2)	.0118 (2.43) **
I_t	.2053 (13.20) ***	.3362 (23.72) ***	.3001 (22.27) ***	.187 (17.22) ***
ΔWC_t	.0011 (0.35)	.0207 (3.00)***	.0692 (7.07) ***	.0383 (6.31) ***
C_t	-.0205 (-8.77) ***	-.0484 (-4.69)***	-.0693 (-5.64) ***	-.0757 (-9.35) ***
Adj-R^2	0.0294	0.0876	0.0667	0.0401
Obs	8299	5942	7374	8393
	Panel D: Net equity issue / $asset_t$			
OLS	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0874 (24.99) ***	.0137 (9.06) ***	.0088 (5.97) ***	.001 (0.52)
DIV_t	-.1635 (-3.59) ***	-.0111 (-1.26)	.0029 (0.43)	.0217 (3.70) ***
I_t	.3952 (11.68) ***	.2088 (12.74) ***	.1983 (14.93) ***	.2519 (19.45) ***
ΔWC_t	.3309 (45.39) ***	.2535 (32.63) ***	.3273 (42.82) ***	.3445 (47.97) ***
C_t	-.2239 (-41.36) ***	-.1223 (-10.36) ***	-.1459 (-12.16) ***	-.2159 (-22.62)***
Adj-R^2	0.2679	0.1759	0.2156	0.2379
Obs	8098	5896	7317	8467

Table A.5.52 Debt ratio changes and financial deficits (DEF1), based on profitability

Note, $DEF1_t = DIV_t + I_t + \Delta WC_t - C_t$, ΔBDR: book-based debt ratio change, ΔMDR: market-based debt ratio change, Net equity issuance/asset =(sale stock-repurchase stock)/total asset, Net long-term debt issuance/asset=('long-term debt issue'-'long-term debt retirement')/total asset, DEF1: financial deficit defined by Frank and Goyal (2003), DIV: dividend, I: investment (capital expenditure), WC: working capital, C: cash-flow after interest and taxes (=internal cash-flow or net income+depreciation). All items are scaled by total asset. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	Panel A: ΔBDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0242 (9.93)***	.0018 (1.43)	-.071 (-6.74)***	-.0169 (-14.17)***
$DEF1_t$	-.0311 (-8.30)***	-.0163 (-3.22)***	.0073 (1.66)*	-.0052 (-1.19)
Adj-R^2	0.0069	0.0011	0.0002	0.00
Obs	9831	8353	9689	10146
	Panel B: ΔMDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0158 (12.35)***	.0083 (7.67)***	-.001 (-0.93)	-.0091 (-11.93)***
$DEF1_t$	-.0094 (-4.8)***	-.002 (-0.44)	.0214 (5.26)***	.0153 (5.17)***
Adj-R^2	0.0025	0.00	0.003	0.003
Obs	8941	7736	8930	8993
	Panel C: Net long-term debt issuance/ $asset_t$			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0055 (3.82)***	.0054 (4.95)***	.0081 (7.98)***	.00003 (0.03)
$DEF1_t$	.0199 (9.46)***	.0455 (9.24)***	.0579 (11.52)***	.0406 (10.89)***
Adj-R^2	0.0105	0.0140	0.0176	0.0137
Obs	8299	5942	7374	8393
	Panel D: Net equity issuance/ $asset_t$			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0746 (24.74)***	.0129 (10.24)***	.0092 (8.86)***	.0012 (1.05)
$DEF1_t$	.2555 (50.46)***	.1421 (25.16)***	.1465 (28.50)***	.1564 (33.09)***
Adj-R^2	0.2392	0.969	0.0998	0.1145
Obs	8098	5896	7317	8467

Table A.5.53 Debt ratio change and stock price effect with profitability

From the table, firms in the fourth quartile and in the first quartile are affected most by stock price effect. This table also implies that firms in the first quartile adjust capital structure rapidly. This is consistent to the next analyse of partial adjustment speed.

Note, MDR: market-based debt ratio, BDR: book-based debt ratio, Net equity issuance/asset =(sale stock-repurchase stock)/total asset, IDR: Implied debt ratio, $IDR_{t-1,t} \equiv D_{t-1}/(E_{t-1}\ (1+\text{stock return}_{t-1,t})+D_{t-1})$, SR: stock return, log(1+annual stock return), $SPE_{t-1,t}=IDR_{t-1,t}-MDR_{t-1}$, speed2$_t$: target2$_t$-$MDR_{t-1}$, target2: 'market-based target debt ratio' calculated using OLS. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

OLS	Panel A: MDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0235 (19.06)***	.0232 (18.21)***	.0208 (18.74)***	.0113 (15.12)***
MDR_{t-1}	.4381 (35.91)***	.7532 (84.77)***	.5927 (59.50)***	.4046 (36.7)***
$IDR_{t,t+1}$	.2751 (38.07)***	.1331 (21.97)***	.2254 (31.85)***	.3445 (39.93)***
Adj-R^2	0.6589	0.8241	0.8024	0.7821
Obs	9988	11081	10770	9828
	Panel B: ΔMDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0058 (2.37)***	.0076 (4.40)***	.0004 (0.28)	-.0077 (-6.59)***
Speed2	.3334 (25.91)***	.1516 (18.21)***	.2082 (25.35)***	.2702 (31.99)***
$SPE_{t,t+1}$	.2823 (24.58)***	.1473 (16.15)***	.2303 (21.92)***	.299 (20.67)***
Adj-R^2	0.2256	0.0933	0.1563	0.2608
Obs	3235	4164	4348	3332
	Panel C: ΔMDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	-.0022 (-2.01)**	.0079 (10.5)***	.0014 (1.97)**	-.0038 (-5.98)***
$SR_{t,t+1}$	-.0432 (-36.29)***	-.0554 (-39.39)***	-.0629 (-43.44)***	-.0500 (-40.02)***
Adj-R^2	0.1167	0.1228	0.1491	0.1401
Obs	9960	11081	10769	9827
	Panel D: ΔBDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0093 (4.12)***	.0039 (4.67)***	-.004 (-4.69)***	-.0118 (-11.89)***
$SR_{t,t+1}$	-.0242 (-10.03)***	-.0159 (-10.33)***	-.0142 (-8.38)***	-.0189 (-9.94)***
Adj-R^2	0.0098	0.0092	0.0062	0.0096
Obs	10110	11402	11050	10042
	Panel E: Net equity issue / asset$_t$			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.1442 (47.78)***	.0179 (17.94)***	.0149 (16.73)***	.005 (4.57)***
$SR_{t,t+1}$	.0147 (4.73)***	.0071 (4.20)***	.0017 (3.60)***	.0077 (3.62)***
Adj-R^2	0.0025	0.0024	0.0016	0.0014
Obs	8465	6926	7672	8465

Table A.5.54 Capital structure adjustment speed comparison, based on profitability

Note, BDR: book-based debt ratio, MDR: market-based debt ratio, speed1= $target1_t$-BDR_{t-1}, speed2= $target2_t$-MDR_{t-1}, target1: book-based target debt ratio calculated using OLS, target2: market-based target debt ratio calculated using OLS. The coefficient values are λ (capital structure adjustment speed) in Panels A and B. The coefficient values of 'capital structure adjustment speed' in Panels C and D are (1-λ). Thus, the adjustment speed λ is (1-coefficient). In calculating Panels C and D, we use all 7 capital structure determinants though we do not report those coefficients here. BDR_{t-1} and MDR_{t-1} are instrumented for Panels C and D respectively. xtabond2 command uses options of small robust twostep, and sub-options of eq(level) lag(1 2) collapsed for gmm-style and of eq(level) for iv-style for Panels C and D. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

OLS	Panel A: ΔBDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0299 (11.32)***	.0116 (8.70)***	.0071 (5.35)***	-.0036 (-2.61)***
$Speed1_t$	.1753 (15.87)***	.1052 (16.06)***	.1397 (20.64)***	.1728 (25.24)***
Adj-R^2	0.0513	0.0522	0.0795	0.1212
Obs	4658	4669	4923	4615
	Panel B: ΔMDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0271 (12.91)***	.0214 (13.77)***	.0132 (9.45)***	-.0014 (-1.16)
$Speed2_t$	.2217 (17.08)***	.1037 (13.11)***	.1367 (17.33)***	.2316 (26.94)***
Adj-R^2	0.0808	0.0387	0.0633	0.175
Obs	3308	4241	4434	3418
Sys-GMM	Panel C: BDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0275 (2.92)***	.0004 (0.07)	.0101 (1.35)	-.0081 (-1.02)
BDR_{t-1}	.7919 (11.17)***	.8520 (18.87)***	.7287 (15.06)***	.7298 (13.33)***
AR(1)	-4.29***	-6.53***	-4.44***	-5.75***
AR(2)	0.16	0.21	0.15	0.25
Hansen [P-value]	1.14 [0.286]	0.22 [0.642]	1.21 [0.270]	0.00 [0.969]
Inst	L1, L2	L1, L2	L1, L2	L1, L2
Inst No	10	10	10	10
Obs	5190	4802	5070	5430
	Panel D: MDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0121 (2.12)**	.006 (1.05)	.0296 (2.91)***	.0199 (2.20)**
MDR_{t-1}	.7748 (15.90)***	.8628 (23.92)***	.6405 (10.18)***	.5662 (8.12)***
AR(1)	-7.93***	-7.89***	-7.59***	-6.38***
AR(2)	-0.88	1.49	-1.46	-1.24
Hansen [P-value]	0.40 [0.528]	4.75 [0.029]	0.18 [0.672]	0.07 [0.786]
Inst	L1, L2	L1, L2	L1, L2	L1, L2
Inst No	10	10	10	10
Obs	5174	4743	5017	5423

5.9 Asset tangibility

Table A.5.55 Descriptive characteristics with asset tangibility

Univariate comparison of means and medians of measures of firm characteristics based on tangibility between 1989 and 2008.
Note, median values are in square brackets. The value of 1st Q<0.063, 0.063≤2nd Q <0.183, 0.183≤3rd Q < 0.376, 0.376 ≤4th Q in asset tangibility. All variables are defined in Section 5.3.

	Tangibility			
	1st Q	2nd Q	3rd Q	4th Q
BDR	.1491 [.0299]	.1878 [.1009]	.2301 [.1933]	.3418 [.3214]
MDR	.0939 [.015]	.1213 [.0581]	.1767 [.1381]	.2725 [.2545]
Netcash	1.6324 [.3875]	.6602 [.2734]	.2807 [.1654]	.1307 [.0884]
Tax	.2585 [.1704]	.3263 [.3]	.3788 [.3549]	.3622 [.3333]
Tang	.0283 [.0274]	.1168 [.1134]	.2741 [.2716]	.5508 [.5245]
Capex	.0236 [.0109]	.0435 [.0275]	.0631 [.0441]	.0972 [.0669]
R&D	.0994 [.0504]	.1039 [.0445]	.0575 [.0128]	.0291 [.0053]
MB	2.2704 [1.5929]	2.0505 [1.447]	1.644 [1.2334]	1.442 [1.175]
Profit	-.943 [.0231]	-.0546 [.0385]	.0003 [.0478]	.0115 [.0434]
Vol	.1341 [.0781]	.0929 [.0469]	.0561 [.0266]	.0448 [.0239]
Lnasset	3.769 [3.759]	4.817 [4.853]	5.432 [5.377]	5.8627 [5.8549]
Bp	1.685 [1]	1.675 [1]	1.663 [1]	2.0439 [2]
Obs	13122	13143	13163	13124

Table A.5.56 Debt ratio changes based on asset tangibility, using the Baker and Wurgler model (2002)

Note, ΔMDR: market-based debt ratio change, ΔBDR: book-based debt ratio change, A: total asset, RE: retained earnings, e: equity, -(e/A): equity issue, -(RE/A): increased retained earnings, $-(E_{t-1}(1/A_t-1/A_{t-1})$: the residual change in leverage. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	Panel A: ΔBDR_t			
OLS	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0014 (0.70)	-.0045 (-3.03)***	-.0022 (-1.67)*	.0008 (0.60)
$-\left(\frac{e}{A}\right)_t$	.1661 (20.32)***	.2444 (28.52)***	.3139 (28.29)***	.3774 (27.19)***
$-\left(\frac{\Delta RE}{A}\right)_t$	.0875 (20.52)***	.1563 (38.15)***	.1821 (36.56)***	.2464 (39.66)***
$-\left[E_{t-1}\left(\frac{1}{A_t}-\frac{1}{A_{t-1}}\right)\right]$	.1285 (22.03)***	.1576 (25.84)***	.2030 (25.90)***	.2169 (22.68)***
Adj-R^2	0.0945	0.1767	0.1757	0.1952
Obs	7888	8045	7358	7530
	Baker and Wurgler (2002): ΔMDR_t			
OLS	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0086 (7.97)***	.0031 (3.32)***	.0024 (2.49)**	.0036 (2.97)***
$-\left(\frac{e}{A}\right)_t$	.0504 (9.96)***	.0717 (12.26)***	.0958 (10.74)***	.1878 (13.45)***
$-\left(\frac{\Delta RE}{A}\right)_t$	.0211 (8.96)***	.0422 (17.13)***	.0468 (12.82)***	.0843 (15.28)***
$-\left[E_{t-1}\left(\frac{1}{A_t}-\frac{1}{A_{t-1}}\right)\right]$	.0283 (8.80)***	.0463 (12.57)***	.0525 (8.98)***	.0925 (11.54)***
Adj-R^2	0.0210	0.0441	0.0283	0.0457
Obs	7248	7597	6973	6957

Table A.5.57 Debt ratio changes and financial deficit components, based on asset tangibility

Note, DEF1=DIV_t+I_t+ΔWC_t-C_t, ΔMDR: market-based debt ratio change, ΔBDR: book-based debt ratio change, Net equity issuance/asset =(sale stock-repurchase stock)/total asset, Net long-term debt issuance/asset=('long-term debt issue'-'long-term debt retirement')/total asset, DEF1: financial deficit defined by Frank and Goyal (2003), DIV: dividend, I: investment (capital expenditure), WC: working capital, C: cash-flow after interest and taxes (=internal cash-flow or net income+depreciation). All items are scaled by total asset. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	Panel A: ΔBDR_t			
OLS	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0014 (0.69)	-.0054 (-2.90)***	-.0094 (-5.62)***	-.0158 (-9.15)***
DIV_t	.0198 (1.78)*	.0164 (1.98)**	.0127 (2.04)**	.0167 (2.2)**
I_t	-.0994 (-2.72)***	.0253 (1.01)	.1288 (7.71)***	.1649 (13.84)***
ΔWC_t	-.1293 (-21.33)***	-.1718 (-27.38)***	-.1696 (-24.50)***	-.1936 (-23.72)***
C_t	-.0054 (-1.24)	-.0172 (-4.53)***	-.0224 (-5.35)***	-.0799 (-15.56)***
Adj-R^2	0.0568	0.0975	0.0858	0.1283
Obs	9674	9785	9299	9202
	Panel B: ΔMDR_t			
OLS	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0037 (3.19)***	-.0052 (-4.45)***	-.0117 (-9.27)***	-.0194 (-12.69)***
DIV_t	.0141 (2.27)**	.0075 (1.48)	.0129 (2.77)***	.0109 (1.67)*
I_t	.1591 (6.31)***	.1879 (10.56)***	.1881 (14.18)***	.2132 (19.82)***
ΔWC_t	-.0410 (-12.11)***	-.0537 (-13.81)***	-.0959 (-18.29)***	-.1199 (-16.05)***
C_t	-.002 (-0.89)	-.0069 (3.14)***	-.0014 (-0.49)	-.0173 (-3.89)***
Adj-R^2	0.0219	0.0365	0.0617	0.0824
Obs	8468	8994	8703	8409

Table A.5.57 Continued

	Panel C: Net long-term debt issue / $asset_t$			
OLS	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0057 (4.57) ***	-.0012 (-0.88)	-.0098 (-6.97) ***	-.0229 (-14.94) ***
DIV_t	.0136 (1.53)	.0049 (0.66)	-.0004 (-0.06)	.0012 (0.15)
I_t	.0594 (2.58) **	.1532 (7.93) ***	.2571 (18.95) ***	.3449 (33.06) ***
ΔWC_t	.0097 (2.78) ***	.0124 (2.67) ***	-.0051 (-0.92)	.02 (2.97) ***
C_t	-.0167 (-6.91) ***	-.0153 (-5.64) ***	-.0202 (-6.27) ***	-.054 (-12.5) ***
Adj-R^2	0.0072	0.0128	0.0537	0.1406
Obs	7709	7996	7060	7181
	Panel D: Net equity issue / $asset_t$			
OLS	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0548 (20.23) ***	.0136 (6.03) ***	.0092 (5.01) ***	.0123 (8.16) ***
DIV_t	-.0632 (-3.31) ***	-.0319 (-2.65) ***	.0011 (0.13)	-.0074 (-0.96)
I_t	.6312 (12.01) ***	.7575 (23.96)***	.316 (17.67) ***	.179 (17.28) ***
ΔWC_t	.3464 (43.9) ***	.3095 (39.16) ***	.2351 (32.05) ***	.1331 (19.43) ***
C_t	-.2658 (-45.63)	-.2688 (-54.23)***	-.2401 (-51.92) ***	-.1943 (-41.39) ***
Adj-R^2	0.3121	0.3455	0.3023	0.2102
Obs	7638	7873	7009	7179

Table A.5.58 Debt ratio changes and financial deficits (DEF1), based on asset tangibility

Note, $DEF1=DIV_t+I_t+\Delta WC_t-C_t$, ΔBDR: book-based debt ratio change, ΔMDR: market-based debt ratio change, Net equity issuance/asset =(sale stock-repurchase stock)/total asset, Net long-term debt issuance/asset=('long-term debt issue'-'long-term debt retirement')/total asset, DEF1: financial deficit defined by Frank and Goyal (2003), DIV: dividend, I: investment (capital expenditure), WC: working capital, C: cash-flow after interest and taxes (=internal cash-flow or net income+depreciation). All items are scaled by total asset. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	Panel A: ΔBDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0023 (1.19)	-.0007 (-0.47)	-.0009 (-0.76)	-.0045 (-3.37)***
$DEF1_t$	-.0349 (-9.06)***	-.0136 (-3.80)***	-.0011 (-0.31)	.0336 (7.53)***
Adj-R^2	0.0083	0.0014	0.00	0.006
Obs	9674	9785	9299	9202
	Panel B: ΔMDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0083 (7.95)***	.0031 (3.40)***	.001 (1.06)	.0006 (0.48)
$DEF1_t$	-.0057 (-2.76)***	.0029 (1.40)	-.00005 (0.02)	.0121 (3.23)***
Adj-R^2	0.0008	0.0001	0.00	0.0011
Obs	8468	8994	8703	8409
	Panel C: Net long-term debt / $asset_t$			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0065 (5.78)***	.004 (3.61)***	.005 (4.81)***	.0043 (3.78)***
$DEF1_t$	.0157 (7.33)***	0.0187 (7.36)***	.0247 (8.36)***	.0643 (16.76)***
Adj-R^2	0.0068	0.0066	0.0097	0.0375
Obs	7709	7996	7060	7181
	Panel D: Net equity issuance/ $asset_t$			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0521 (20.58)***	.0235 (12.60)***	.0057 (4.04)***	.0069 (6.21)***
$DEF1_t$	.2831 (52.78)***	.2592 (53.30)***	.1976 (45.79)***	.1399 (34.94)***
Adj-R^2	0.2672	0.2651	0.2302	0.1452
Obs	7638	7873	7009	7179

Table A.5.59 Debt ratio change and stock price effect, based on asset tangibility

Note, MDR: market-based debt ratio, BDR: book-based debt ratio, Net equity issuance/asset =(sale stock-repurchase stock)/total asset, IDR: Implied debt ratio, $IDR_{t-1,t} \equiv D_{t-1}/(E_{t-1}\ (1+\text{stock return}_{t-1,t})+D_{t-1})$, SR: stock return, log(1+annual stock return). $SPE_{t-1,t}=IDR_{t-1,t}-MDR_{t-1}$, $speed2_t$: $target2_t-MDR_{t-1}$, target2: 'market-based target debt ratio' calculated using OLS. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

OLS	Panel A: MDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0173 (17.19)***	.0151 (15.94)***	.0195 (18.62)***	.0301 (20.03)***
MDR_{t-1}	.5996 (41.78)***	.5441 (50.62)***	.5953 (60.93)***	.5280 (54.38)***
$IDR_{t,t+1}$	.2373 (33.02)***	.2277 (35.60)***	.2131 (33.67)***	.2825 (40.33)***
Adj-R^2	0.671	0.7486	0.79	0.7831
Obs	9929	10610	10950	10636
	Panel B: ΔMDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.006 (2.84)***	.0036 (2.40)**	-.0008 (-0.63)	-.0043 (-2.41)**
Speed2	.2443 (18.39)***	.2429 (23.65)***	.2075 (26.92)***	.2259 (26.12)***
$SPE_{t,t+1}$	.2317 (16.83)***	.2015 (20.49)***	.2099 (23.71)***	.3061 (28.06)***
Adj-R^2	0.1550	0.1478	0.1611	0.2233
Obs	2399	3904	4773	4030
	Panel C: ΔMDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.001 (1.14)	-.0002 (-0.28)	.0008 (1.11)	.0025 (3.00)***
$SR_{t,t+1}$	-.0343 (-30.04)***	-.0434 (-40.02)***	-.0519 (-42.09)***	-.0765 (-51.35)***
Adj-R^2	0.0834	0.1311	0.1393	0.1987
Obs	9905	10605	10941	10632
	Panel D: ΔBDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	-.0025 (-1.42)	-.001 (-0.77)	.0008 (0.74)	.0022 (1.97)**
$SR_{t,t+1}$	-.0169 (-7.50)***	-.0287 (-14.74)***	-.0231 (-12.66)***	-.0279 (-14.01)***
Adj-R^2	0.0055	0.0198	0.0141	0.0175
Obs	10034	10684	11098	10982
	Panel E: Net equity issue / $asset_t$			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0869 (34.34)***	.0509 (26.14)***	.0262 (17.66)***	.0193 (17.19)***
$SR_{t,t+1}$	-.0041 (-1.32)	-.0123 (-4.60)***	-.0150 (-6.30)***	-.0138 (-7.58)***
Adj-R^2	0.0001	0.0024	0.005	0.0071
Obs	7928	8259	7650	7841

Table A.5.60 Capital structure adjustment speed comparison based on asset tangibility

Note, BDR: book-based debt ratio, MDR: market-based debt ratio, speed1= $target1_t$-BDR_{t-1}, speed2= $target2_t$-MDR_{t-1}, target1: book-based target debt ratio calculated using OLS, target2: market-based target debt ratio calculated using OLS. The coefficient values are λ (capital structure adjustment speed) in Panels A and B. The coefficient values of 'capital structure adjustment speed' in Panels C and D are (1-λ). Thus, the adjustment speed λ is (1-coefficient). In calculating Panels C and D, we use all 7 capital structure determinants though we do not report those coefficients here. BDR_{t-1} and MDR_{t-1} are used as instruments in the Panels C and D. xtabond2 uses options of twostep robust and small and sub-options of eq(level) lag(1 2) collapsed for gmm-style and of eq(level) for iv-style for Panels C and D. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

OLS	Panel A: ΔBDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0161 (7.08)***	.0122 (6.96)***	.0081 (5.69)***	.0128 (6.90)***
Speed1	.2335 (22.5)***	.1276 (14.97)***	.1144 (15.44)***	.1346 (16.38)***
Adj-R^2	0.1087	0.0414	0.0433	0.0581
Obs	4143	5165	5249	4337
	Panel B: ΔMDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0159 (7.45)***	.0141 (9.47)***	.0125 (10.12)***	.0192 (10.98)***
Speed2	.1557 (12.23)***	.1511 (15.77)***	.1339 (18.10)***	.1643 (18.19)***
Adj-R^2	0.0575	0.0589	0.0627	0.0737
Obs	2436	3961	4884	4146
	Panel C: BDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0228 (2.38)**	.0347 (4.00)***	.0246 (2.23)**	.0363 (2.51)**
BDR_{t-1}	.7064 (9.80)***	.8127 (12.95)***	.8659 (14.26)***	.7766 (11.79)***
AR(1)	-5.41***	-6.72***	-3.00***	-3.86***
AR(2)	-1.22	1.69*	1.79*	-0.44
Hansen [P-value]	1.22 [0.269]	0.35 [0.555]	0.00 [0.947]	0.04 [0.842]
Inst	L1, L2	L1, L2	L1, L2	L1, L2
Inst No	10	10	10	10
Obs	4812	5763	5539	4406
	Panel D: MDR_t			
	1st quartile	2nd quartile	3rd quartile	4th quartile
Cons	.0060 (1.09)	.0260 (4.14)***	0433 (4.71)***	.0613 (4.44)***
MDR_{t-1}	.8347 (14.05)***	.7401 (14.02)***	.6996 (13.35)***	.7718 (17.04)***
AR(1)	-6.49***	-7.58***	-8.00***	-9.42***
AR(2)	0.11	0.89	1.44	0.27
Hansen [P-value]	0.15 [0.698]	0.11 [0.742]	3.06 [0.080]	0.77 [0.381]
Inst	L1, L2	L1, L2	L1, L2	L1, L2
Inst No	10	10	10	10
Obs	4796	5755	5521	4335

5.10 Country

Table A.5.61 Descriptive characteristics of different countries

The univariate comparison of means and medians of measures of firm characteristics is based on countries between 1989 and 2008.
Note, median values are in square brackets. AUS: Australia, CAN: Canada, UK: Britain, USA: United States of America, AUT: Austria, DEU: Germany, FRA: France, ITA: Italy, JPN: Japan, KOR: Korea, TWN: Taiwan. All variables are defined in Section 5.3.

country	BDR	MDR	netcash	Lnasset	tang	tax	capex	R&D	MB	profit	vol	bp	obs
AUS	0.1676 [0.0821]	0.1135 [0.0488]	1.0277 [0.1429]	3.3016 [2.9774]	0.2148 [0.1162]	0.1811 [0.0828]	0.0573 [0.025]	0.0689 [0.0008]	2.0997 [1.524]	-0.1799 [-0.008]	0.1487 [0.0828]	1.996 [2.0]	2178
CAN	0.2035 [0.1293]	0.1409 [0.0705]	1.1198 [0.1988]	4.1023 [3.998]	0.251 [0.1853]	0.2348 [0.1454]	0.0591 [0.0346]	.16614 [0.0821]	2.1099 [1.5115]	-0.1533 [0.0361]	0.1127 [0.0569]	1.969 [2.00]	1973
UK	0.11768 [0.1032]	0.1066 [0.0586]	0.7066 [0.1616]	4.3724 [4.048]	0.2204 [0.1328]	0.2553 [0.2656]	0.0616 [0.0324]	0.118 [0.0628]	2.1135 [1.5544]	-0.0401 [0.0577]	0.1068 [0.0498]	1.896 [2.00]	3405
USA	0.2373 [0.1304]	0.1353 [0.0627]	1.0916 [0.2196]	4.6063 [4.7394]	0.2106 [0.1306]	0.2392 [0.1609]	0.0601 [0.034]	0.1159 [0.0620]	2.3949 [1.7276]	-0.1167 [0.0344]	0.1215 [0.0652]	1.7239 [1.00]	18189
AUT	0.1794 [0.167]	0.1473 [0.1297]	0.4543 [0.1305]	5.0425 [4.8344]	0.2402 [0.2066]	0.2493 [0.1837]	0.0705 [0.0536]	0.1086 [0.0214]	1.4164 [1.1171]	-0.0278 [0.0091]	0.0785 [0.0299]	1.8171 [2.00]	288
DEU	0.1869 [0.1311]	0.1453 [0.0876]	0.4709 [0.1274]	4.5742 [4.1512]	0.2257 [0.1389]	0.3676 [0.304]	0.0764 [0.0437]	0.0669 [.0364]	1.6483 [1.2693]	-0.0522 [0.0071]	0.1016 [0.0597]	1.9209 [2.00]	2881

Table A.5.61 Continued

country	BDR	MDR	netcash	Lnasset	tang	tax	capex	R&D	MB	profit	vol	bp	obs
FRA	0.2041 [0.1642]	0.1542 [0.1146]	0.3371 [0.1345]	4.9964 [4.5974]	0.1512 [0.0897]	0.3119 [0.3260]	0.0608 [0.0362]	0.0859 [0.0435]	1.6975 [1.3323]	0.0218 [0.0448]	0.0647 [0.0361]	1.9421 [2.00]	2766
ITA	0.233 [0.2241]	0.1954 [0.1652]	0.3169 [0.1312]	5.7606 [5.478]	0.1828 [0.126]	0.4817 [0.3732]	0.0519 [0.0281]	0.0377 [0.0187]	1.4499 [1.1992]	-0.0108 [0.0134]	0.0577 [0.0346]	1.986 [2.00]	680
JPN	0.2452 [0.2153]	0.2117 [0.1817]	0.3396 [0.1814]	5.879 [5.7505]	0.2864 [0.2652]	0.5353 [0.4654]	0.0374 [0.0223]	0.0165 [0.0062]	1.353 [1.1149]	0.0506 [0.0423]	0.0283 [0.0156]	1.7401 [1.00]	13719
KOR	0.2644 [0.2524]	0.2691 [0.2571]	0.2591 [0.1159]	5.4418 [5.2165]	0.3181 [0.3056]	0.2699 [0.2513]	0.0665 [0.0378]	0.0118 [0.0024]	1.1904 [0.9678]	0.0516 [0.0540]	0.0541 [0.0337]	1.8346 [2.00]	3027
TWN	0.2104 [0.1897]	0.1947 [0.1521]	0.3531 [0.1779]	4.8865 [4.6619]	0.2895 [0.2435]	0.1996 [0.1377]	0.0596 [0.0268]	0.0481 [0.0275]	1.5013 [1.1804]	0.0530 [0.0492]	0.0544 [0.0395]	1.474 [1.00]	4192

Table A.5.62 Debt ratio changes based on different countries, using the Baker and Wurgler model (2002)

Note, ΔMDR: market-based debt ratio change, ΔBDR: book-based debt ratio change, A: total asset, RE: retained earnings, e: equity, -(e/A): equity issue, -(RE/A): increased retained earnings, -(E_{t-1}(1/A_t-1/A_{t-1}): the residual change in leverage. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level. AUS: Australia, CAN: Canada, UK: Britain, USA: United States of America, AUT: Austria, DEU: Germany, FRA: France, ITA: Italy, JPN: Japan, KOR: Korea, TWN: Taiwan.

	Panel A: ΔBDR_t										
OLS	AUS	CAN	UK	USA	AUT	DEU	FRA	ITA	JPN	KOR	TWN
Cons	.008 (2.10)**	.0011 (0.31)	.0069 (2.54)**	-.0019 (-1.43)	.0099 (1.12)	.0088 (2.73)***	.0015 (0.66)	.0092 (2.26)**	-.0059 (-6.84)***	-.0063 (-1.83)*	-.0041 (-2.08)**
$-\left(\frac{e}{A}\right)_t$	.1633 (9.74)***	.2019 (11.27)***	.1984 (13.98)***	.2359 (33.69)***	.2933 (4.52)***	.216 (8.20)***	.2705 (9.85)***	.1602 (5.20)***	.4059 (24.77)***	.3927 (11.06)***	.3721 (10.32)***
$-\left(\frac{\Delta RE}{A}\right)_t$	.0730 (9.81)***	.1354 (13.56)***	.1142 (15.86)***	.1519 (43.68)***	.0904 (2.49)**	.0766 (8.91)***	.0884 (7.92)***	.1487 (5.48)***	.3195 (29.80)***	.3051 (14.49)***	.1479 (11.07)***
$-\left[E_{t-1}\left(\frac{1}{A_t}-\frac{1}{A_{t-1}}\right)\right]$	.1003 (8.38)***	.1362 (8.86)***	.1508 (14.18)***	.1566 (32.07)***	.0941 (1.43)	.0785 (5.19)***	.1802 (9.39)***	.1993 (6.83)***	.2842 (24.49)***	.1803 (8.31)***	.1479 (10.96)***
Adj-R^2	0.0811	0.1445	0.1216	0.1423	0.1278	0.1044	0.1101	0.1333	0.2155	0.2327	0.1326
Obs	1624	1246	2905	14656	120	1175	1379	454	4666	1099	1701

Table A.5.62 Continued

	Panel B: ΔMDR_t										
OLS	AUS	CAN	UK	USA	AUT	DEU	FRA	ITA	JPN	KOR	TWN
Cons	.006 (2.35)**	.0033 (1.20)	.0105 (6.91)***	.0056 (6.71)***	.0113 (1.81)*	.012 (4.70)***	.0075 (3.63)***	.0185 (4.78)***	-.0027 (-2.86)***	-.0119 (-3.49)***	.0043 (1.74)*
$-\left(\frac{e}{A}\right)_t$	.0561 (4.71)***	.0936 (6.02)***	.0552 (6.22)***	.0678 (14.59)***	.1504 (2.09)**	.0467 (1.40)	.1455 (5.20)***	.0951 (2.16)**	.2209 (10.55)***	.3840 (7.83)***	.3722 (7.68)***
$-\left(\frac{\Delta RE}{A}\right)_t$	.0239 (5.65)***	.0585 (7.34)***	.0224 (5.36)***	.0351 (17.24)***	.0628 (2.38)**	.0227 (3.20)***	.0575 (5.74)***	.095 (3.80)***	.1624 (13.94)***	.1658 (7.40)***	.1553 (9.21)***
$-\left[E_{t-1}\left(\frac{1}{A_t}-\frac{1}{A_{t-1}}\right)\right]$	.0513 (6.22)***	.0655 (5.08)***	.0324 (5.46)***	.0349 (12.33)***	.0789 (1.51)	.0181 (1.38)	.1277 (7.50)***	.1334 (4.91)***	.1692 (13.01)***	.1534 (6.74)***	.1303 (7.34)***
Adj-R^2	0.0279	0.0500	0.0222	0.028	0.0407	0.0084	0.0590	0.0663	0.058	0.1261	0.0887
Obs	1540	1138	2647	13752	100	1094	1282	389	4486	956	1555

Table A.5.63 Debt ratio changes and financial deficit components, based on different countries

Note, ΔMDR: market-based debt ratio change, ΔBDR: book-based debt ratio change, Net equity issuance/asset =(sale stock-repurchase stock)/total asset, Net long-term debt issuance/asset=('long-term debt issue'-'long-term debt retirement')/total asset, $DEF1=DIV_t+I_t+\Delta WC_t-C_t$, DEF1: financial deficit defined by Frank and Goyal (2003), DIV: dividend, I: investment (capital expenditure), WC: working capital, C: cash-flow after interest and taxes (=internal cash-flow or net income+depreciation). All items are scaled by total asset. AUS: Australia, CAN: Canada, UK: Britain, USA: United State of America, AUT: Austria, DEU: Germany, FRA: France, ITA: Italy, JPN: Japan, KOR: Korea, TWN: Taiwan. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	Panel A: ΔBDR_t										
OLS	AUS	CAN	UK	USA	AUT	DEU	FRA	ITA	JPN	KOR	TWN
Cons	-.005 (-0.93)	.0053 (-1.11)	-.003 (-0.71)	-.0035 (-1.89)*	-.0213 (-2.30)**	-.0003 (-0.06)	-.0042 (-1.51)	-.0034 (-0.65)	-.0136 (-11.70)***	-.0179 (-5.42)***	-.0093 (-4.23)***
DIV_t	.0279 (1.45)	.0465 (1.55)	.0132 (0.92)	.01169 (0.68)	.0295 (1.03)	.0061 (0.35)	.0301 (2.73)***	.0123 (0.43)	.0235 (5.73)***	.0452 (2.95)***	.0186 (2.51)**
I_t	.0421 (0.95)	.0067 (0.15)	-.0322 (-0.82)	.0737 (4.00)***	.2087 (2.63)***	.0308 (0.92)	.1189 (4.40)***	.0559 (0.97)	.1574 (9.37)***	.2712 (8.86)***	.1469 (7.18)***
ΔWC_t	-.0979 (-7.33)***	-.1244 (-9.94)***	-.2129 (-16.4)***	-.1617 (-30.25)***	-.1951 (-6.18)***	-.1479 (-11.24)***	-.0871 (-6.67)***	-.2791 (-12.30)***	-.155 (-21.70)***	-.1374 (-9.30)***	-.1293 (-10.65)***
C_t	-.0278 (-3.44)***	-.0437 (-5.38)***	.0154 (1.62)	-.0172 (-5.32)***	.0314 (1.05)	-.0422 (-3.29)***	0.1009 (-7.13)***	.1176 (4.40)***	-.0829 (-9.85)***	-.1288 (-9.11)***	-.0109 (-0.88)
Adj-R^2	0.0541	-.1074	0.0976	0.0757	0.1816	0.0802	0.0737	0.236	0.0983	0.1154	0.0593
Obs	1524	1479	2530	14322	198	2008	2132	488	7940	2343	3165

Table A.5.63 Continued

	Panel B: ΔMDR_t										
OLS	AUS	CAN	UK	USA	AUT	DEU	FRA	ITA	JPN	KOR	TWN
Cons	-.0041 (-1.27)	-.0088 (-2.50)**	.0011 (0.54)	-.0034 (-3.24)***	.0033 (0.47)	.0035 (1.25)	.0018 (0.78)	.0051 (1.05)	-.0141 (-12.76)***	-.0175 (-5.14)***	-.0088 (-3.37)***
DIV_t	.0119 (1.03)	.006 (0.30)	.0021 (0.31)	-.0043 (-0.45)	.0084 (0.40)	-.0071 (-0.58)	.0067 (0.75)	-.0104 (-0.38)	.0254 (6.48)***	.0421 (2.68)***	.0219 (2.51)**
I_t	.1189 (4.29)***	.1459 (3.84)***	.0916 (4.33)***	.1488 (13.94)***	.0529 (0.80)	.0892 (3.30)***	.1345 (5.74)***	.2018 (3.55)***	.2192 (12.89)***	.2879 (8.50)***	.1874 (8.0)***
ΔWC_t	-.0541 (-6.53)***	-.0439 (-4.67)***	-.05 (-7.47)***	-.047 (-15.54)***	-.0648 (-2.23)**	-.0734 (-6.55)***	-.0282 (-2.37)**	-.1525 (-6.07)***	-.0905 (-12.19)***	-.1323 (-7.97)***	-.1259 (-8.15)***
C_t	-.0075 (-1.56)	-.017 (-2.99)***	-.0049 (-1.05)	-.0066 (-3.78)***	-.0308 (-1.27)	-.0165 (-1.86)*	-.0547 (-4.48)***	.0348 (1.26)	-.014 (-1.76)*	-.0403 (-2.79)***	-.0215 (-1.40)
Adj-R^2	0.0456	0.0395	0.0333	0.0346	0.0458	0.0372	0.0356	0.1052	0.0516	0.0799	0.0567
Obs	1424	1322	2308	13361	172	1765	1852	403	7348	2058	2699

Table A.5.63 Continued

	Panel C: Net long-term debt issue / $asset_t$										
OLS	AUS	CAN	UK	USA	AUT	DEU	FRA	ITA	JPN	KOR	TWN
Cons	-.0025	-.0046	-.0055	-.0042	-.0039	.0009	-.0055	-.0054	-.0145	.0021	-.0135
	(-0.71)	(-1.17)	(-2.31)**	(-3.79)***	(-0.43)	(0.26)	(-2.18)**	(-1.11)	(-11.34)***	(0.80)	(-6.46)***
DIV_t	.0127	.0251	-.0141	-.0055	-.0092	-.0044	.0155	-.0143	.0506	-.0086	.0378
	(1.05)	(1.11)	(-1.77)*	(-0.54)	(-0.15)	(-0.25)	(1.37)	(-0.38)	(7.17)***	(-0.70)	(3.81)***
I_t	.2066	.176	.1758	.2294	.1329	.1329	.284	.2402	.3137	.2424	.3333
	(6.9)***	(4.58)***	(8.05)***	(20.79)***	(1.98)*	(4.27)***	(10.72)***	(4.59)***	(16.94)***	(9.97)***	(20.02)***
ΔWC_t	-.0111	-.0017	-.0006	.0028	.0015	.0174	.0704	-.0234	.0958	.0485	.1478
	(-1.25)	(-0.16)	(-.09)	(0.90)	(0.03)	(1.37)	(4.83)***	(-1.14)	(11.07)***	(4.26)***	(11.75)***
C_t	-.0009	-.0341	-.0036	-.0224	.0022	-.0365	-.1028	.0233	-.1043	-.0637	-.0857
	(-0.17)	(-4.48)***	(-0.68)	(-11.68)***	(0.08)	(-3.05)***	(-7.58)***	(1.01)	(-7.96)***	(-4.83)***	(-6.52)***
Adj-R^2	0.0329	0.0333	0.0245	0.0367	0.0025	0.0210	0.0845	0.0497	0.0873	0.0541	0.2119
Obs	1389	1161	2517	14216	95	1004	1530	371	4049	1929	1836

	Panel D: Net equity debt issue / $asset_t$										
OLS	AUS	CAN	UK	USA	AUT	DEU	FRA	ITA	JPN	KOR	TWN
Cons	.0887	.0542	.0611	.0337	.0405	.0175	.0264	.0399	.0072	.0218	.0065
	(12.15)***	(8.48)***	(14.59)***	(17.78)***	(3.06)***	(4.00)***	(9.30)***	(5.60)***	(5.69)***	(7.66)***	(4.00)***
DIV_t	-.0729	-.0479	-.0569	-.0759	.1295	-.0074	-.0243	-.0792	-.0041	.0017	-.0137
	(-2.85)***	(-1.31)	(-4.10)***	(-4.34)***	(2.19)**	(-0.34)	(-1.94)*	(-1.44)	(-0.59)	(0.13)	(-1.78)*
I_t	.3102	.3064	.3566	.2243	.1936	.3761	.1938	.1696	.2311	.2165	.1175
	(4.84)***	(4.72)***	(8.99)***	(11.88)***	(1.97)*	(9.17)***	(6.59)***	(2.11)**	(12.55)***	(8.15)***	(9.13)***
ΔWC_t	.3417	.5193	.4042	.2912	.6609	.2921	.2791	.3417	.3316	.3421	.1799
	(16.58)***	(26.54)***	(29.57)***	(52.24)***	(10.36)***	(17.38)***	(17.65)***	(9.60)***	(39.04)***	(26.58)***	(19.01)***
C_t	-.2765	-.4287	-.2971	-.2466	-.5535	-.2291	-.2491	-.2249	-.2342	-.2644	-.1086
	(-20.77)***	(-30.35)***	(-28.80)***	(-68.02)***	(-14.81)***	(-12.32)***	(-14.15)***	(-5.53)***	(-18.05)***	(-17.49)***	(-10.87)***
Adj-R^2	0.2863	0.5163	0.3500	0.2809	0.7622	0.2831	0.2192	0.2105	0.285	0.2892	0.1873
Obs	1371	1141	2485	14164	101	1064	1316	388	4035	1955	1832

Table A.5.64 Debt ratio changes and financial deficits (DEF1), based on different countries

Note, ΔMDR: market-based debt ratio change, ΔBDR: book-based debt ratio change, Net equity issuance/asset =(sale stock-repurchase stock)/total asset, Net long-term debt issuance/asset=('long-term debt issue'-'long-term debt retirement')/total asset, DEF1=$DIV_t+I_t+\Delta WC_t-C_t$, DEF1: financial deficit defined by Frank and Goyal (2003), DIV: dividend, I: investment (capital expenditure), WC: working capital, C: cash-flow after interest and taxes (=internal cash-flow or net income+depreciation). All items are scaled by total asset. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level. AUS: Australia, CAN: Canada, UK: Britain, USA: United States of America, AUT: Austria, DEU: Germany, FRA: France, ITA: Italy, JPN: Japan, KOR: Korea, TWN: Taiwan.

	Panel A: ΔBDR_t										
OLS	AUS	CAN	UK	USA	AUT	DEU	FRA	ITA	JPN	KOR	TWN
Cons	.0044 (0.94)	-.0001 (-0.03)	.0065 (1.78) *	.0045 (2.90) ***	.0023 (0.32)	.0058 (1.73) *	-.0029 (-1.29)	.0121 (2.56) **	-.0118 (-12.35) ***	-.0093 (-3.37) ***	-.0027 (-1.35)
$DEF1_t$	.0058 (0.74)	.0065 (0.82)	-.0612 (-7.68) ***	-.0134 (-4.22) ***	-.0419 (-2.00) **	-.0401 (-4.31) ***	.0092 (1.11)	-.1346 (-7.90) ***	-.0054 (-1.43)	.0292 (2.84)***	-.0075 (-1.16)
Adj-R^2	0.00	0.00	0.0224	0.0012	0.0151	0.0087	0.0001	0.112	0.0001	0.003	0.0001
Obs	1524	1479	2530	14322	198	2008	2132	488	7940	2343	3165
	Panel B: ΔMDR_t										
Cons	.0062 (2.19) **	.0006 (0.31)	.008 (4.76) ***	.0061 (7.12)***	.0058 (1.22)	.0111 (4.86) ***	.006 (3.46) ***	.0199 (4.97) ***	-.0058 (-6.69) ***	-.0001 (-0.05)	.0006 (0.27)
$DEF1_t$	-.0003 (-0.06)	.0073 (1.31)	-.0064 (-1.65) *	.0009 (0.55)	0.0081 (0.50)	-.0102 (-1.46)	.0101 (1.44)	-.0494 (-2.87) ***	.0056 (1.58)	.0081 (0.76)	.0008 (0.1)
Adj-R^2	0.00	0.0005	0.0012	0.00	0.00	0.001	0.001	0.0177	0.0002	0.00	0.00
Obs	1424	1322	2308	13361	172	1765	1852	403	7348	2058	2699

Table A.5.64 Continued

	Panel C: Net long-term debt issue / $asset_t$										
Cons	.0104 (3.51)***	.0043 (1.36)	.003 (1.52)	.0077 (8.43)***	.0063 (0.98)	.0063 (2.47)**	.0024 (1.24)	.0069 (1.73)*	-.0075 (-8.27)***	.0109 (5.31)***	.0003 (0.19)
$DEF1_t$	.0029 (0.56)	.03 (4.23)***	.00457 (1.06)	.0234 (12.74)***	0.147 (0.64)	.027 (3.07)***	.0595 (6.85)***	.0006 (0.04)	.0757 (13.64)***	.0432 (5.20)***	.1051 (12.34)***
Adj-R^2	0.00	0.0152	0.0001	0.0112	0.00	0.01	0.0292	0.00	0.0437	0.0134	0.0762
Obs	1389	1161	2517	14216	95	1004	1530	371	4049	1929	1836
	Panel D: Net equity issue / $asset_t$										
Cons	.0715 (10.87)***	.0275 (5.03)***	.0401 (10.42)***	.0276 (17.75)***	-.0041 (-0.33)	.0157 (4.45)***	.0145 (6.28)***	.0266 (4.50)***	.0014 (1.41)	.0097 (3.98)***	.0033 (2.44)**
$DEF1_t$	.2331 (17.92)***	.4147 (29.38)***	.2201 (23.56)***	.2465 (70.54)***	.4723 (11.98)***	.2040 (15.71)***	.1045 (10.10)***	.2082 (7.64)***	.1349 (22.68)***	.1866 (18.63)***	.0678 (10.49)***
Adj-R^2	0.1895	0.4307	0.1823	0.2599	0.5875	0.1878	0.0714	0.1291	0.1129	0.1504	0.0562
Obs	1371	1141	2485	14164	101	1064	1316	388	4035	1955	1832

Table A.5.65 Debt ratio change and stock price effect, based on different countries

The table shows that debt ratios are affected by stock price effect. Generally speaking, debt ratios in Taiwan, the U.S, Korea and Germany are heavily affected by stock price. Table also indicates that debt ratio change is negatively associated stock price across countries. Panel C implies that firms issue equity all the time. As we know that last two decades, firms across countries gradually reduces debt ratio, Panel C is also reflected by the debt reducing.

Note, MDR: market-based debt ratio, BDR: book-based debt ratio, Net equity issuance/asset =(sale stock-repurchase stock)/total asset, IDR: Implied debt ratio, $IDR_{t-1,t} \equiv D_{t-1}/(E_{t-1}(1+\text{stock return}_{t-1,t})+D_{t-1})$, SR: stock return, log(1+annual stock return). $SPE_{t-1,t}=IDR_{t-1,t}-MDR_{t-1}$, $Speed2_t$: $target2_t-MDR_{t-1}$, target2: 'market-based target debt ratio' calculated using OLS. AUS: Australia, CAN: Canada, UK: Britain, USA: United States of America, AUT: Austria, DEU: Germany, FRA: France, ITA: Italy, JPN: Japan, KOR: Korea, TWN: Taiwan. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	Panel A: MDR_t										
OLS	AUS	CAN	UK	USA	AUT	DEU	FRA	ITA	JPN	KOR	TWN
Cons	.0247 (9.20)***	.0189 (7.07)***	.0165 (9.22)***	.0177 (19.89)***	.0167 (3.32)***	.0224 (9.14)***	.0189 (8.43)***	.0309 (5.57)***	.0132 (13.84)***	.0382 (10.27)***	.0219 (9.28)***
MDR_{t-1}	.6008 (21.19)***	.5094 (18.32)***	.6268 (30.46)***	.4626 (52.85)***	.5579 (10.03)***	.4385 (16.17)***	.6683 (32.10)***	.6896 (15.18)***	.8767 (110.3)***	.4554 (20.06)***	.2723 (13.88)***
$IDR_{t,t+1}$	.1605 (8.75)***	.2772 (14.34)***	.1781 (14.75)***	.3151 (53.73)***	.2396 (7.18)***	.3037 (17.27)***	.1602 (12.67)***	.1503 (5.54)***	.0509 (9.35)***	.2699 (18.08)***	.4837 (32.82)***
Adj-R^2	0.632	0.7666	0.7041	0.7460	0.8713	0.7321	0.7746	0.7759	0.8728	0.7189	0.7685
Obs	1761	1481	2667	14439	200	2207	2127	492	11597	2334	3032
	Panel B: ΔMDR_t										
OLS	AUS	CAN	UK	USA	AUT	DEU	FRA	ITA	JPN	KOR	TWN
Cons	-.0029 (-0.65)	.0107 (2.20)**	.0029 (0.96)	.0025 (1.90)*	.0035 (0.28)	-.0021 (-0.51)	.0099 (1.94)*	.0227 (1.97)*	-.0002 (-0.14)	.0081 (2.03)**	.00005 (0.02)
Speed2	.2355 (7.42)***	.2123 (6.54)***	.2615 (9.24)***	.2511 (31.02)***	.3426 (3.89)***	.2838 (9.75)***	.2573 (7.82)***	.1870 (2.83)***	.1231 (17.40)***	.2535 (15.75)***	.3348 (22.57)***
$SPE_{t,t+1}$	.3521 (8.40)***	.1824 (5.57)***	.1583 (7.34)***	.3243 (35.22)***	.3998 (4.58)***	.3044 (10.29)***	.2460 (7.82)***	.1253 (2.47)**	.0582 (7.11)***	.2251 (13.01)***	.5348 (28.34)***
Adj-R^2	0.1791	0.1253	0.1514	0.2420	0.4847	0.2218	0.1966	0.0718	0.0649	0.1796	0.3760
Obs	406	380	590	5272	44	495	350	102	4350	1433	1699

Table A.5.65 Continued

	Panel C: ΔMDR_t										
OLS	AUS	CAN	UK	USA	AUT	DEU	FRA	ITA	JPN	KOR	TWN
Cons	.0032 (1.41)	-.0002 (-0.08)	.0031 (2.18)**	-.0002 (-0.24)	.0061 (1.69)*	.0047 (2.52)**	.0053 (3.58)***	.0114 (3.28)***	.0012 (2.03)**	-.0023 (-1.04)	-.0042 (-2.56)**
$SR_{t,t+1}$	-.024 (-8.08)***	-.0374 (-12.39)***	-.0300 (-15.33)***	-.0516 (-55.21)***	-.0463 (-6.59)***	-.0538 (-18.15)***	-.0469 (-18.32)***	-.0631 (-9.96)***	-.0275 (-20.77)***	-.0689 (-21.57)***	-.0981 (-33.88)***
Adj-R^2	0.0354	0.0934	0.0809	0.1746	0.1758	0.1296	0.1360	0.1668	0.0358	0.166	0.2745
Obs	1756	1480	2659	14409	200	2207	2127	492	11597	2334	3032
	Panel D: ΔBDR_t										
Cons	.008 (2.01)**	.0023 (0.56)	-.0024 (-0.83)	.0028 (1.88)*	.0066 (1.10)	.0055 (2.09)	.0042 (2.09)**	.0147 (3.70)***	-.0047 (-7.34)***	-.0035 (-1.30)	-.0043 (-2.63)***
$SR_{t,t+1}$	-.0099 (-1.85)*	-.0321 (-5.73)***	-.017 (-4.38)***	-.0283 (-14.23)***	-.0075 (-0.66)	-.0271 (-6.60)***	-.0179 (-5.11)***	-.0209 (-2.87)***	-.0069 (-5.03)***	-.0296 (-8.18)***	-.0306 (-10.65)***
Adj-R^2	0.0013	0.02	0.0067	0.0139	0.00	0.0186	0.01	0.0143	0.002	0.0259	0.0349
Obs	1816	1562	2716	14320	203	2245	2165	498	11918	2474	3109
	Panel E: Net equity issue / $asset_t$										
Cons	.1138 (20.37)***	.09 (14.78)***	.0633 (18.15)***	.0582 (35.66)***	.0259 (1.99)**	.0159 (6.54)***	.0155 (7.95)***	.0214 (4.82)***	.0061 (7.94)***	0.197 (9.39)***	.0089 (7.21)***
$SR_{t,t+1}$	-.0512 (-6.62)***	.0025 (0.28)	-.0208 (-4.34)***	-.0088 (-4.26)***	-.0271 (-1.13)	-.0096 (-2.55)**	-.0083 (-2.35)**	-.0074 (-0.89)	-.0102 (-5.92)***	-.0114 (4.11)***	.0094 (4.36)***
Adj-R^2	0.0239	0.0001	0.0066	0.0012	0.0031	0.0049	0.003	0.00	0.0073	0.0075	0.009
Obs	1751	1218	2707	14579	92	1120	1320	385	4623	2114	1973

Table A.5.66 Capital structure adjustment speed comparison, based on different countries

Note, BDR: book-based debt ratio, MDR: market-based debt ratio, speed1= target1$_t$-BDR$_{t-1}$, speed2= target2$_t$-MDR$_{t-1}$, target1: book-based target debt ratio calculated using OLS, target2: market-based target debt ratio calculated using OLS. The coefficient values are λ (capital structure adjustment speed) in Panels A and B. The coefficient values of 'capital structure adjustment speed' in Panels C and D are (1-λ). Thus, the adjustment speed λ is (1-coefficient). In calculating Panels C and D, we use all 7 capital structure determinants though we do not report those coefficients here. BDR$_{t-1}$ and MDR$_{t-1}$ are used as instrument in Panels C and D respectively. Panels C and D use System GMM and use options of small, robust and twostep for options of xtabond2, the suboptions of eq(level) lag(1 2) collapsed for gmm-style and of eq(level) for iv-style. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level. AUS: Australia, CAN: Canada, UK: Britain, USA: United States of America, AUT: Austria, DEU: Germany, FRA: France, ITA: Italy, JPN: Japan, KOR: Korea, TWN: Taiwan.

	Panel A: ΔBDR_t										
OLS	AUS	CAN	UK	USA	AUT	DEU	FRA	ITA	JPN	KOR	TWN
Cons	.0052 (1.02)	.0268 (3.97)***	.0101 (2.85)***	.0203 (11.18)***	.0197 (2.30)**	.0103 (2.54)**	.0179 (4.09)***	.0143 (2.13)**	-0.0017 (-1.72)*	.0221 (6.28)***	.0075 (3.51)***
Speed1	.2181 (6.95)***	.1529 (4.68)***	.1471 (7.1)***	.1654 (23.09)***	.2324 (3.75)***	.1216 (4.68)***	.1273 (4.94)***	.0486 (1.29)	.0879 (15.65)***	.2214 (13.71)***	.1663 (11.42)***
Adj-R^2	0.0811	0.0352	0.0539	0.0662	0.2006	0.0347	0.0495	0.0062	0.0497	0.1072	0.0603
Obs	537	575	866	7504	53	581	450	107	4665	1557	2017
	Panel B: ΔMDR_t										
Cons	.0095 (2.16)**	.0195 (3.89)***	.0118 (4.07)***	.0167 (11.93)***	.0336 (2.73)***	.0187 (4.68)***	.0256 (4.95)***	.0366 (3.56)***	.0045 (4.09)***	.0309 (8.18)***	.0245 (8.99)***
Speed2	.1266 (4.07)***	.1755 (5.51)***	.2097 (7.53)***	.1656 (19.68)***	.4115 (3.90)***	.1587 (5.51)***	.1519 (4.58)***	.1143 (1.88)*	.0996 (15.78)***	.1818 (11.41)***	.2209 (13.14)***
Adj-R^2	0.0365	0.0664	0.0857	0.0666	0.236	0.055	0.0532	0.0246	0.0539	0.0822	0.0872
Obs	412	414	595	5417	47	505	356	102	4354	1443	1798

Table A.5.66 Continued

	Panel C: BDR_t										
Sys GMM	AUS	CAN	UK	USA	AUT	DEU	FRA	ITA	JPN	KOR	TWN
Cons	.0256 (1.61)	.0238 (0.85)	.0075 (0.75)	.0217 (2.42)**	-.0512 (-1.01)	.0148 (1.23)	.0057 (0.37)	.0560 (1.95)*	.0041 (0.80)	.0393 (2.13)**	.0446 (3.05)***
BDR_{t-1}	.6959 (4.32)***	.8647 (6.84)***	.8655 (6.21)***	.7304 (13.60)***	1.1616 (1.54)	.8250 (4.54)***	.8998 (7.36)***	.9479 (7.90)***	.8866 (20.32)***	.7966 (6.15)***	.7995 (14.24)***
AR(1)	-2.23***	-3.06***	-2.40**	-6.18***	-0.28	-3.01***	-3.08***	-2.35***	-6.26***	-3.43***	-7.24***
AR(2)	0.06	1.43	1.42	0.81	-1.79	0.50	-0.81	0.38	0.59	-0.28	0.59
Hansen [P-value]	0.05 [0.829]	1.40 [0.236]	0.10 [0.752]	0.35 [0.555]	0.00 [1.00]	1.99 [0.159]	2.22 [0.137]	0.85 [0.358]	1.07 [0.301]	0.28 [0.599]	0.48 [0.490]
Inst	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2
Inst No	10	10	10	10	10	10	10	10	10	10	10
Obs	586	652	996	8685	57	616	478	109	4710	1566	2086
	Panel D: MDR_t										
Cons	.0036 (0.20)	-.0030 (-0.24)	.4999 (2.65)*	.0168 (2.86)***	.0979 (0.63)	.0171 (1.27)	.004 (0.32)	.099 (2.30)	.0102 (1.77)*	.0195 (0.96)	.0607 (3.06)***
MDR_{t-1}	.9560 (4.82)***	.9472 (6.26)***	.0189 (1.72)***	.7276 (17.30)***	.0899 (0.15)	.6883 (6.67)***	.7979 (6.03)***	1.0174 (11.76)***	.8373 (21.28)***	.8697 (9.39)***	.6711 (9.46)***
AR(1)	-2.67***	-2.93***	-2.71***	-9.98***	0.82	-3.00***	-3.10***	-1.95*	-9.04***	-4.48***	-6.02***
AR(2)	0.56	2.17**	-0.48	0.74	-0.75	0.69	0.11	-1.34	-0.27	0.75	0.89
Hansen [P-value]	2.91 [0.088]	1.34 [0.247]	0.27 [0.606]	0.10 [0.757]	0.00 [1.000]	0.19 [0.660]	0.73 [0.393]	1.77 [0.183]	1.43 [0.232]	0.41 [0.524]	0.86 [0.354]
Inst	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2
Inst No	10	10	10	10	10	10	10	10	10	10	10
Obs	586	651	997	8654	56	612	477	108	4691	1515	2082

5.11 Industry

Table A.5.67 Descriptive characteristics by industry

Univariate comparison of means and medians of measures of firm characteristics based on industry between 1989 and 2008.
Note, median values are in square brackets. All variables are defined in Section 5.3. Icbsub: the codes of ICB industry subsector classification are defined in Table A.1.1 in Appendix 1.

Icbsub	BDR	MDR	netcash	logasset	tang	taxrate	capex	R&D	MB	profit	earn-vol	bparea	Obs
1753	0.3485 [0.3453]	0.3112 [0.2925]	0.1779 [0.0499]	6.1401 [6.2032]	0.4127 [0.4406]	0.4212 [0.2665]	0.0581 [0.0384]	0.0047 [0.0036]	1.2526 [1.1122]	0.0011 [0.0366]	0.0451 [0.0293]	1.9489 [2.00]	319
1757	0.2905 [0.2777]	0.2717 [0.2519]	0.2876 [0.0821]	6.046 [6.0551]	0.3761 [0.3821]	0.3659 [0.3393]	0.0545 [0.0361]	0.0054 [0.0032]	1.2349 [1.0408]	0.057 [0.0469]	0.04262 [0.0269]	1.7637 [2.00]	2535
2357	0.2061 [0.1678]	0.1914 [0.1531]	0.2374 [0.1601]	6.0144 [6.0273]	0.1991 [0.1779]	0.5000 [0.4465]	0.0292 [0.0139]	0.0042 [0.0022]	1.1480 [1.0128]	0.0351 [0.0356]	0.0253 [0.0152]	1.7814 [2.00]	4917
2771	0.2193 [0.1792]	0.1832 [0.1387]	0.1758 [0.1513]	6.0235 [5.8268]	0.3728 [0.3617]	0.3546 [0.3732]	0.0936 [0.0668]	0.0002 [0.00]	1.9341 [1.4498]	0.0758 [0.0802]	0.0480 [0.0205]	1.7336 [2.00]	319
2773	0.4053 [0.4088]	0.3487 [0.3457]	0.1700 [0.1075]	6.0429 [6.0592]	0.5576 [0.5883]	0.3665 [0.3491]	0.0877 [0.0594]	0.0013 [0.00]	1.2130 [1.1082]	0.0533 [0.0466]	0.0266 [0.0181]	2.1658 [2.00]	849
3353	0.3246 [0.3148]	0.2824 [0.2795]	0.1566 [0.1167]	8.7005 [8.9925]	0.3319 [0.3284]	0.3831 [0.3550]	0.0842 [0.0723]	0.0360 [0.0309]	1.2603 [1.1034]	0.0319 [0.0362]	0.0323 [0.0197]	2.1268 [2.00]	688
3533	0.2216 [0.2100]	0.1758 [0.1384]	0.1631 [0.0637]	5.4754 [5.0433]	0.3881 [0.3648]	0.3652 [0.3642]	0.0892 [0.0522]	0.0069 [0.0060]	1.5292 [1.3337]	0.0124 [0.0225]	0.0353 [0.0249]	2.0140 [2.00]	468
3535	0.2892 [0.2872]	0.2343 [0.2300]	0.2588 [0.0473]	5.1185 [5.0901]	0.2071 [0.1910]	0.3210 [0.3362]	0.0366 [0.0261]	0.0051 [0.0010]	1.4523 [1.2234]	0.0338 [0.0604]	0.0379 [0.0204]	1.6195 [1.00]	602
3537	0.2214 [0.1607]	0.1399 [0.0751]	0.2274 [0.1056]	5.0406 [5.1923]	0.3445 [0.3420]	0.3110 [0.3364]	0.0613 [0.0491]	0.0128 [0.0022]	1.8524 [1.4123]	0.0216 [0.0679]	0.0448 [0.0190]	1.6601 [1.00]	672

Table A.5.67 Continued

Icbsub	BDR	MDR	netcash	logasset	tang	taxrate	capex	R&D	MB	profit	earn-vol	bparea	Obs
3577	0.2497 [0.2201]	0.2056 [0.1709]	0.2561 [0.1141]	5.3380 [5.4165]	0.3392 [0.3427]	0.4133 [0.3801]	0.0552 [0.0412]	0.0194 [0.0064]	1.4801 [1.1673]	0.0291 [0.0497]	0.0405 [0.0182]	1.6635 [1.00]	5357
3728	.2961 [.2883]	.2606 [.2348]	.225 [.1032]	6.0277 [6.1251]	.1527 [.0886]	.3643 [.3623]	.0198 [.0072]	.0027 [00]	1.2046 [1.0539]	.0590 [.0635]	.0427 [.0248]	1.616 [1]	1200
4533	.2872 [.2406]	.1836 [.1281]	.5144 [.1067]	4.7234 [4.7446]	.258 [.1728]	.3513 [.3484]	.0693 [.0452]	.0135 [00]	1.9543 [1.543]	.0094 [.0676]	.0783 [.0373]	1.8098 [2]	2125
4573	0.1634 [0.0290]	0.0619 [0.0078]	3.6736 [1.5258]	3.2204 [3.3548]	0.1329 [0.0792]	0.0517 [0.00]	0.0428 [0.0193]	0.2648 [0.1965]	3.3776 [2.8636]	-0.4459 [-0.3047]	0.2015 [0.1495]	1.8520 [1.00]	3384
5333	0.2132 [0.1712]	0.1342 [0.0833]	0.3094 [0.1121]	5.7548 [5.7815]	0.2049 [0.1922]	0.4125 [0.3899]	0.0540 [0.0368]	0.0073 [0.00]	1.8651 [1.5046]	0.0217 [0.0685]	0.0530 [0.0194]	1.6063 [1.00]	489
5373	0.2842 [0.2861]	0.2396 [0.2224]	0.1542 [0.0881]	6.6922 [6.3327]	0.3705 [0.3533]	0.4405 [0.3828]	0.0678 [0.0509]	0.0006 [0.00]	1.4371 [1.1945]	0.0578 [0.0530]	0.0274 [0.0156]	1.9148 [2.00]	1432
5553	0.3078 [0.2447]	0.1986 [0.1658]	0.3221 [0.0863]	4.8614 [5.1242]	0.2174 [0.1467]	0.3269 [0.2616]	0.0581 [0.0248]	0.0227 [0.00]	1.8763 [1.3866]	-0.0606 [0.0392]	0.0935 [0.0368]	2.1258 [2.00]	2637
5751	0.3788 [0.3527]	0.3017 [0.2968]	0.2809 [0.1471]	7.4187 [8.1441]	0.5557 [0.6093]	0.3568 [0.3435]	0.1229 [0.0986]	0.0002 [0.00]	1.3822 [1.1645]	0.0018 [0.0345]	0.0512 [0.0300]	2.3568 [3.00]	495
5752	0.3121 [0.2415]	0.1911 [0.1332]	0.5008 [0.1660]	4.6897 [5.0573]	0.3523 [0.2851]	0.2927 [0.2555]	0.0806 [0.0437]	0.0344 [0.0127]	2.1189 [1.4845]	-0.0250 [0.0562]	0.1018 [0.0501]	1.9787 [2.00]	1142
5753	0.3687 [0.3644]	0.2921 [0.2803]	0.1514 [0.0676]	5.6723 [5.5626]	0.5171 [0.5492]	0.3299 [0.2882]	0.0620 [0.0378]	0.0053 [0.00]	1.3615 [1.1454]	0.0416 [0.0364]	0.0244 [0.0150]	2.1678 [2.00]	839
5759	0.3650 [0.4087]	0.2904 [0.2892]	0.5180 [0.1024]	6.3836 [6.6354]	0.4655 [0.5739]	0.4634 [0.3916]	0.0700 [0.0501]	0.0177 [0.00]	1.5849 [1.2545]	0.0007 [0.0346]	0.0424 [0.0136]	2.5210 [3.00]	1069
6535	0.3570 [0.3180]	0.2109 [0.1750]	0.4021 [0.0792]	5.9825 [6.5062]	0.3912 [0.4257]	0.2599 [0.2350]	0.0943 [0.0790]	0.0187 [0.0008]	1.9873 [1.5398]	-0.1001 [0.0451]	0.0971 [0.0371]	2.2018 [2.00]	1018

Table A.5.67 Continued

Icbsub	BDR	MDR	netcash	logasset	tang	taxrate	capex	R&D	MB	profit	earn-vol	bparea	Obs
6575	0.2574 [0.1970]	0.1536 [0.1094]	0.4034 [0.1479]	5.3342 [5.2746]	0.2896 [0.2604]	0.3142 [0.2927]	0.0989 [0.0719]	0.0316 [0.0040]	2.0659 [1.5089]	-0.0337 [0.0483]	0.1107 [0.0584]	1.9588 [2.00]	634
9533	0.1563 [0.0810]	0.1030 [0.0494]	0.5003 [0.2052]	3.8899 [3.8516]	0.1209 [0.0698]	0.3397 [0.3130]	0.0459 [0.0210]	0.0443 [0.0122]	1.9237 [1.4133]	-0.0238 [0.0470]	0.0926 [0.0531]	1.7008 [1.00]	3493
9535	0.1668 [0.0400]	0.0845 [0.0198]	1.1511 [0.4889]	3.1387 [3.2581]	0.1397 [0.0702]	0.2094 [0.0195]	0.0619 [0.0297]	0.0726 [0.0230]	2.5221 [1.8469]	-0.1743 [-0.0107]	0.1817 [0.1281]	1.9310 [2.00]	1555
9537	0.1447 [0.0723]	0.0749 [0.0103]	0.9992 [0.4287]	3.3772 [3.4345]	0.1083 [0.0637]	0.2619 [0.1602]	0.0435 [0.0204]	0.1427 [0.0942]	2.5278 [1.8575]	-0.1219 [0.0237]	0.1450 [0.0862]	1.7161 [1.00]	6734
9572	0.1746 [0.1304]	0.1372 [0.0856]	0.4617 [0.2131]	4.9051 [4.6995]	0.1825 [0.1406]	0.2848 [0.2066]	0.0511 [0.0286]	0.0693 [0.0469]	1.7150 [1.3013]	0.0008 [0.0447]	0.0752 [0.0481]	1.4718 [1.00]	3382
9576	0.1574 [0.0965]	0.1186 [0.0547]	0.6473 [0.3230]	5.0860 [4.9711]	0.2299 [0.1759]	0.2780 [0.2337]	0.0758 [0.0416]	0.0947 [0.0702]	2.0323 [1.5139]	0.0330 [0.0573]	0.0850 [0.0604]	1.3509 [1.00]	4944

Table A.5.68 Debt ratio changes based on different industries, using the Baker and Wurgler model (2002)

Note, ΔMDR: market-based debt ratio change, ΔBDR: book-based debt ratio change, A: total asset, RE: retained earnings, e: equity, -(e/A): equity issue, -(RE/A): increased retained earnings, -(E_{t-1}(1/A_t-1/A_{t-1})): the residual change in leverage. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level. The full industry names are defined in Table A.1.1 in Appendix 1.

	Panel A: ΔBDR_t								
OLS	Aluminium	Steel	Heavy-cons	Delivery	M-transport	Auto	Brewers	Distil & vin	So-drink
Cons	.0026 (0.32)	-.0057 (-2.25)**	-.0029 (-1.88)*	-.0104 (-1.76)*	-.0105 (-2.76)***	.0054 (1.52)	-.0019 (-0.34)	-.0025 (-0.5)	-.0066 (-1.40)
$-\left(\frac{e}{A}\right)_t$	-.0221 (-0.17)	.3554 (13.04)***	.5285 (19.12)***	.4667 (5.47)***	.6639 (10.22)***	.6387 (7.11)***	.3074 (2.89)***	.4937 (9.16)***	.4999 (9.91)***
$-\left(\frac{\Delta RE}{A}\right)_t$	-.0301 (-0.39)	.3114 (18.91)***	.1884 (17.15)***	.4105 (5.61)***	.4387 (8.99)***	.4619 (10.63)***	.3523 (10.39)***	.3379 (13.08)***	.1881 (8.79)***
$-\left[E_{t-1}\left(\frac{1}{A_t}-\frac{1}{A_{t-1}}\right)\right]$	.0712 (1.77)*	.3186 (14.06)***	.1819 (12.05)***	.41 (5.48)***	.6247 (13.33)***	.2724 (7.16)***	.2017 (3.16)***	.3687 (9.60)***	.3607 (8.64)***
Adj-R^2	0.0083	0.2686	0.2011	0.1968	0.3541	0.2567	0.3027	0.3432	0.2779
Obs	167	1251	2315	206	385	452	246	371	402

Table A.5.68 Continued

	Panel A: ΔBDR_t								
	Food prod	Home-cons	Health	Biotech	Drug retail	BR-retail	Bro & Ent	Airlines	Gmable
Cons	-.0038 (-1.74)*	-.0011 (-0.32)	-.0117 (-2.88)***	.0111 (2.04)**	.0078 (1.02)	-.0039 (-1.49)	.01337 (3.46)***	.0175 (2.63)***	.0041 (0.59)
$-\left(\frac{e}{A}\right)_t$	.3358 (15.59)***	.3477 (6.46)***	.3233 (10.88)***	.1806 (13.64)***	1.0272 (12.11)***	.3445 (9.37)***	.2949 (12.24)***	.3462 (5.07)***	.2914 (5.86)***
$-\left(\frac{\Delta RE}{A}\right)_t$	.1405 (14.23)***	.1701 (8.25)***	.2642 (19.31)***	.1296 (16.01)***	.2429 (7.54)***	.2878 (11.19)***	.1182 (12.97)***	.2415 (9.02)**	.1024 (5.14)***
$-\left[E_{t-1}\left(\frac{1}{A_t}-\frac{1}{A_{t-1}}\right)\right]$	.1363 (11.01)***	.1387 (5.59)***	.3287 (14.86)***	.1377 (12.08)***	.32961 (6.20)***	.2917 (11.43)***	.1227 (9.61)***	-.1401 (-2.05)***	.2007 (5.93)***
Adj-R^2	0.1245	0.1257	0.2249	0.1302	0.3201	0.1899	0.1363	0.1853	0.0599
Obs	2626	800	1592	2252	313	891	1692	399	869
	Panel A: ΔBDR_t								
	Hotels	Travel	Fixed tel	Mobil tel	Com-serv	Internet	Software	Com-hard	Semicon
Cons	-.0012 (-0.28)	-.0066 (-1.89)*	.0079 (1.24)	-.0024 (-0.24)	.0022 (0.68)	.0001 (0.01)	-.0004 (-0.15)	-.0021 (-0.87)	-.0058 (-3.29)***
$-\left(\frac{e}{A}\right)_t$	.4424 (8.79)***	.2244 (6.05)***	.2964 (7.53)***	.4091 (7.28)***	.2523 (12.29)***	.2018 (7.10)***	.1994 (16.81)***	.1788 (9.61)***	.2192 (15.35)***
$-\left(\frac{\Delta RE}{A}\right)_t$	.1175 (4.34)***	.1342 (7.96)***	.1357 (10.85)***	.2005 (7.66)***	.1297 (16.94)***	.1327 (10.41)***	.1123 (20.43)***	.0843 (9.92)***	.1588 (17.91)***
$-\left[E_{t-1}\left(\frac{1}{A_t}-\frac{1}{A_{t-1}}\right)\right]$	.2969 (7.81)***	.2982 (11.40)***	.1329 (6.13)***	.2702 (7.16)***	.1565 (13.03)***	.1503 (7.88)***	.1300 (16.70)***	.0573 (5.18)***	.1367 (13.45)***
Adj-R^2	0.1799	0.2133	0.1710	0.1909	0.18	0.1507	0.1351	0.0655	0.1254
Obs	520	541	757	408	1904	768	3852	2026	3020

Table A.5.68 Continued

	Panel B: ΔMDR_t								
OLS	Aluminium	Steel	Heavy-cons	Delivery	M-transport	Auto	Brewers	Distil & vin	So-drink
Cons	.0056 (0.87)	-.0044 (-1.64)	-.0035 (-2.39) **	-.0106 (-1.56)	-.005 (-0.87)	.0051 (1.53)	-.0026 (-0.57)	.0033 (0.69)	.0004 (0.1)
$-\left(\frac{e}{A}\right)_t$	-.1505 (-1.50)	.1981 (5.77) ***	.3253 (11.18) ***	.2992 (2.95) ***	.4601 (3.12) ***	.7216 (6.99) ***	.1322 (1.01)	.2897 (5.13) ***	.1241 (2.53) **
$-\left(\frac{\Delta RE}{A}\right)_t$	.0255 (0.40)	.1573 (9.11) ***	.1049 (9.91) ***	.4616 (4.55) ***	.3675 (4.97) ***	.1423 (3.00) ***	.1802 (6.82) ***	.1087 (4.21) ***	.0282 (1.78) *
$-\left[E_{t-1}\left(\frac{1}{A_t}-\frac{1}{A_{t-1}}\right)\right]$	.1129 (3.50) ***	.1546 (6.15) ***	.1653 (11.72) ***	.5374 (6.11) ***	.4586 (6.04) ***	.1546 (2.51) **	.2177 (4.23) ***	.2309 (5.94) ***	.0479 (1.97) **
Adj-R^2	0.0786	0.0766	0.1046	0.1829	0.1094	0.1094	0.1650	0.0956	0.0139
Obs	162	1167	2222	181	359	438	236	357	383
	Panel B: ΔMDR_t								
	Food prod	Home-cons	Health	Biotech	Drug retail	BR-retail	Bro & Ent	Airlines	Gmable
Cons	-.0004 (-0.26)	.0041 (1.04)	.0024 (0.82)	.0095 (3.73) ***	.0076 (1.70) ***	-.0018 (-0.73)	.0155 (5.44) ***	.0147 (2.98) ***	.0123 (2.86) ***
$-\left(\frac{e}{A}\right)_t$	.0774 (4.72) ***	.3141 (5.35) ***	.1139 (4.82) ***	.0514 (8.01) ***	.2358 (4.28) ***	.2327 (4.95) ***	.1180 (6.13) ***	.0051 (0.07)	.0969 (3.25) ***
$-\left(\frac{\Delta RE}{A}\right)_t$	.0309 (5.01) ***	.1638 (5.74) ***	.0722 (8.31) ***	.0266 (6.97) ***	.0616 (3.06) **	.1874 (7.21) ***	.0265 (4.10) ***	.0088 (0.42)	.0388 (3.39) ***
$-\left[E_{t-1}\left(\frac{1}{A_t}-\frac{1}{A_{t-1}}\right)\right]$	.0328 (4.44) ***	.1289 (4.48) ***	.1184 (8.47) ***	.0229 (4.29) ***	.0699 (2.45) *	.2414 (9.44) ***	.0359 (3.91) ***	-.0786 (-1.51)	.0815 (4.37) ***
Adj-R^2	0.0185	0.0805	0.0707	0.0374	0.0506	0.1139	0.0296	0.00	0.0303
Obs	2532	736	1460	2053	300	855	1526	370	780

Table A.5.68 Continued

	Panel B: ΔMDR_t								
	Hotels	Travel	Fixed tel	Mobil tel	Com-serv	Internet	Software	Com-hard	Semicon
Cons	.0001 (0.02)	.0062 (2.05)**	.0153 (3.71)***	.0139 (2.17)**	.008 (3.62)***	.0128 (3.11)***	.0044 (3.58)***	.0047 (2.50)**	.0024 (1.55)
$-\left(\frac{e}{A}\right)_t$	.1471 (2.71)***	.05 (1.47)	.0566 (2.13)**	.1180 (2.53)**	.0632 (3.89)***	.0521 (2.59)**	.0483 (7.34)***	.1038 (6.10)***	.1320 (9.4)***
$-\left(\frac{\Delta RE}{A}\right)_t$	.0655 (2.39)**	.0701 (3.98)***	.0091 (1.09)	.0811 (4.27)***	.0268 (5.26)***	.0251 (3.48)***	.0265 (10.41)***	.0407 (5.79)***	.0866 (11.65)***
$-\left[E_{t-1}\left(\frac{1}{A_t}-\frac{1}{A_{t-1}}\right)\right]$	.2339 (6.04)***	.1008 (3.78)***	.0066 (0.50)	.0945 (3.44)***	.0419 (5.45)***	.0315 (2.80)***	.027 (7.47)***	.0225 (2.51)**	.0836 (8.87)***
Adj-R^2	0.0733	0.0348	0.0027	0.0479	0.0254	0.0192	0.0351	0.0243	0.06
Obs	461	495	675	345	1773	672	3620	1922	2859

Table A.5.69 Debt ratio changes and financial deficit components, based on different industries

Note, ΔMDR: market-based debt ratio change, ΔBDR: book-based debt ratio change, Net equity issuance/asset =(sale stock-repurchase stock)/total asset, Net long-term debt issuance/asset=('long-term debt issue'-'long-term debt retirement')/total asset, DEF1=$DIV_t+I_t+\Delta WC_t-C_t$, DEF1: financial deficit defined by Frank and Goyal (2003), DIV: dividend, I: investment (capital expenditure), WC: working capital, C: cash-flow after interest and taxes (=internal cash-flow or net income+depreciation). All items are scaled by total asset. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level. The full industry names are defined in Table A.1.1 in Appendix 1.

	Panel A: ΔBDR_t								
OLS	Aluminium	Steel	Heavy-cons	Delivery	M-transport	Auto	Brewers	Distil & vin	So-drink
Cons	-.0191 (-2.22)**	-.0155 (-4.58)***	-.0127 (-6.78)***	-.0056 (-0.62)	-.0022 (-0.37)	.001 (0.16)	.0013 (0.26)	-.0091 (-1.23)	-.0118 (-1.23)
DIV_t	.0134 (0.25)	.0555 (2.93)***	.0159 (2.10)**	.0255 (1.02)	.0283 (1.54)	.1044 (3.41)***	.0089 (0.35)	.0286 (1.26)	.0264 (0.89)
I_t	.2249 (2.46)**	.3063 (8.68)***	.2207 (6.65)***	.0852 (1.26)	.2623 (6.78)***	.3057 (4.94)***	.2077 (4.36)***	.3727 (2.84)***	-.0449 (-0.38)
ΔWC_t	-.1389 (-3.26)***	-.1265 (-6.68)***	-.1408 (-11.56)***	-.1307 (-2.48)**	-.046 (-1.09)	-.2413 (-6.33)***	-.0951 (-3.08)***	-.1754 (-5.38)***	-.3316 (-8.85)***
C_t	.0465 (1.74)*	-.1747 (-11.04)***	-.0513 (-4.19)***	-.1228 (-2.42)**	-.3357 (-6.44)***	-.3227 (-8.17)***	-.2574 (-6.40)***	-.0766 (-3.36)***	.0348 (1.51)
Adj-R^2	0.0612	0.1400	0.0700	0.0677	0.1348	0.2603	0.1891	0.0969	0.1486
Obs	230	1682	3058	261	548	504	319	464	449

Table A.5.69 Continued

	Panel A: ΔBDR_t								
	Food prod	Home-cons	Health	Biotech	Drug retail	BR-retail	Bro & Ent	Airlines	Gmable
Cons	-.0071 (-2.69)***	-.0045 (-1.04)	-.0131 (-2.27)**	-.0046 (-0.80)	-.0046 (-0.44)	-.0108 (-2.37)**	.0015 (0.34)	-.0099 (-1.01)	-.0007 (-0.08)
DIV_t	.0046 (0.45)	.0128 (0.53)	.036 (1.13)	-.0318 (-0.37)	.0181 (0.41)	.0492 (3.12)***	.0084 (0.26)	.0044 (0.08)	-.0079 (-0.13)
I_t	.0957 (3.23)***	.1537 (1.18)	.1767 (3.24)***	.0533 (0.86)	.055 (0.46)	.2808 (6.89)***	.0014 (0.04)	.1314 (2.15)**	.0692 (1.04)
ΔWC_t	-.2537 (-19.38)***	-.0673 (-3.14)***	-.2455 (-12.93)***	-.1266 (-12.82)***	-.2557 (-6.58)***	-.0628 (-2.47)**	-.2267 (-14.03)***	-.2428 (-6.88)***	-.2044 (-6.70)***
C_t	-.0062 (-0.73)	-.0406 (-2.30)**	-.0281 (-2.1)**	-.0159 (-2.07)**	-.0420 (-1.96)**	-.2275 (-5.49)***	.0011 (0.11)	-.0882 (-3.65)***	-.0196 (-1.00)
Adj-R^2	0.1055	0.019	0.1226	0.0725	0.1364	0.0723	0.015	0.1552	0.0548
Obs	3532	890	1544	2654	378	1020	1915	375	854
	Panel A: ΔBDR_t								
	Hotels	Travel	Fixed tel	Mobil tel	Com-serv	Internet	Software	Com-hard	Semicon
Cons	-.0043 (-0.76)	-.0097 (-2.19)**	.004 (0.35)	-.0059 (-0.48)	-.0047 (-1.37)	-.0049 (-0.68)	-.0014 (-0.50)	-.0119 (-4.17)***	-.0099 (-4.35)***
DIV_t	.0041 (0.21)	.0286 (1.43)	.0467 (1.07)	.0111 (0.18)	.0119 (0.93)	.0554 (1.39)	.0049 (0.40)	.0133 (1.15)	.0221 (2.18)**
I_t	.1753 (3.19)***	.0744 (1.95)*	-.0977 (-1.19)	.0101 (0.12)	.0753 (2.01)**	.0369 (0.61)	-.0622 (-1.78)*	.1688 (5.40)***	.1225 (6.82)***
ΔWC_t	-.1213 (-3.65)***	-.1141 (-5.61)***	-.2531 (-9.35)***	-.2074 (-6.23)***	-.175 (-13.93)***	-.1551 (-9.98)***	-.1267 (-15.47)***	-.1468 (-12.03)***	-.1017 (-10.72)***
C_t	-.1486 (-3.17)***	-.0055 (-0.44)	-.0529 (-3.19)***	-.0259 (-1.08)	-.0404 (-4.41)***	-.0146 (-1.23)	-.0214 (-4.46)***	-.0046 (-0.52)	-.0306 (-3.84)***
Adj-R^2	0.0569	0.0508	0.1729	0.0827	0.0985	0.0866	0.0694	0.0697	0.0540
Obs	564	665	710	481	2537	1088	4925	2607	3875

Table A.5.69 Continued

	Panel B: ΔMDR_t								
OLS	Aluminium	Steel	Heavy-cons	Delivery	M-transport	Auto	Brewers	Distil & vin	So-drink
Cons	-.0262 (-3.12)***	-.0194 (-5.63)***	-.0109 (-6.21)***	.0019 (0.21)	-.0061 (-0.79)	-.0045 (-0.76)	-.0042 (-0.78)	-.0074 (-1.2)	-.0172 (-3.01)***
DIV_t	.1500 (2.45)**	.0410 (2.20)**	.0109 (1.53)	.0221 (1.10)	-.0047 (-0.19)	.0599 (1.88)*	-.0093 (-0.36)	.0092 (0.50)	.0011 (0.07)
I_t	.4118 (4.00)***	.3110 (8.63)***	.2344 (7.23)***	.2238 (3.98)***	.3138 (6.08)***	.1715 (3.11)***	.1729 (3.55)***	.3762 (3.46)***	.2652 (3.68)***
ΔWC_t	-.0656 (-1.48)	-.1283 (-6.25)***	-.1149 (-9.85)***	-.0528 (-0.81)	-.1474 (-2.49)**	-.1073 (-2.91)***	-.0819 (-2.48)**	-.1090 (-3.61)***	-.0633 (-2.80)***
C_t	-.0230 (-0.77)	-.0758 (-4.29)***	.0033 (0.29)	-.2634 (-3.74)***	-.2549 (-3.73)***	-.0685 (-1.54)	-.1178 (-2.86)***	.0022 (0.12)	-.0448 (-3.54)***
Adj-R^2	0.1158	0.0906	0.0522	0.0965	0.1080	0.0466	0.0828	0.0521	0.0655
Obs	202	1566	2932	227	502	472	310	436	430
	Panel B: ΔMDR_t								
	Food prod	Home-cons	Health	Biotech	Drug retail	BR-retail	Bro & Ent	Airlines	Gmable
Cons	-.0106 (-5.49)***	-.0057 (-1.16)	-.0054 (-1.33)	-.0001 (-0.04)	-.0099 (-1.74)*	-.0033 (-0.76)	.0015 (0.47)	-.0113 (-1.51)	-.0042 (-0.75)
DIV_t	.0018 (0.23)	.0137 (0.52)	.0085 (0.38)	-.0516 (-1.10)	.0272 (1.09)	.0577 (3.92)***	-.0097 (-0.42)	-.0141 (-0.34)	-.0221 (-0.64)
I_t	.1978 (8.76)***	.1102 (0.78)	.1769 (4.29)***	.1157 (3.87)***	.2644 (4.03)***	.2855 (7.39)***	.1316 (4.43)***	.1745 (3.74)***	.1742 (4.47)***
ΔWC_t	-.0737 (-7.79)***	-.0047 (-0.15)	-.0944 (-7.09)***	-.0345 (-7.75)***	.0044 (0.19)	-.0376 (-1.37)	-.0818 (-6.83)***	-.1437 (-5.19)***	-.0609 (-3.22)***
C_t	-.0167 (-2.70)***	.0181 (0.87)	-.0096 (-1.15)	-.0039 (-1.18)	-.0077 (-0.67)	-.2471 (-5.83)***	.0035 (0.51)	.0205 (1.12)	-.0030 (-0.28)
Adj-R^2	0.0444	0.0000	0.0528	0.0329	0.0357	0.0825	0.0364	0.1042	0.0368
Obs	3382	804	1400	2338	347	959	1699	347	759

Table A.5.69 Continued

	Panel B: ΔMDR_t								
	Hotels	Travel	Fixed tel	Mobil tel	Com-serv	Internet	Software	Com-hard	Semicon
Cons	-.0100 (-1.66)*	-.0022 (-0.61)	-.0125 (-1.99)**	.0001 (0.01)	.0018 (0.80)	-.0011 (-0.28)	.0015 (1.03)	-.0083 (-3.56)***	-.0068 (-3.53)***
DIV_t	.0034 (0.18)	.0133 (0.80)	.0237 (1.02)	.0137 (0.30)	.0019 (0.22)	.0157 (0.71)	.0027 (0.43)	.0179 (1.90)*	.0244 (2.81)***
I_t	.2335 (4.11)***	.0818 (2.51)**	.1768 (3.82)***	.1311 (2.16)**	.1368 (4.70)***	.1607 (3.60)***	.0426 (2.18)**	.2034 (7.51)***	.1640 (10.36)***
ΔWC_t	-.0656 (-1.84)*	-.0407 (-2.18)**	-.0622 (-4.57)***	-.0798 (-3.16)***	-.0812 (-9.05)***	-.0389 (-3.99)***	-.0413 (-10.06)***	-.0826 (-8.16)***	-.0542 (-6.37)***
C_t	-.0675 (-1.4)	-.0093 (-0.80)	-.0042 (-0.50)	-.0358 (-2.19)**	-.0073 (-1.26)	-.0144 (-2.45)**	-.0054 (-2.37)**	-.0020 (-0.27)	-.0319 (-4.79)***
Adj-R^2	0.0412	0.0171	0.0568	0.0459	0.0501	0.0426	0.0307	0.0518	0.0511
Obs	501	590	620	403	2250	891	4477	2414	3454

Table A.5.69 Continued

	Panel C: Net long-term debt issue / $asset_t$								
OLS	Aluminium	Steel	Heavy-cons	Delivery	M-transport	Auto	Brewers	Distil & vin	So-drink
Cons	-.0180 (-2.81)***	-.0162 (-6.14)***	-.0057 (-3.12)***	-.0228 (-3.31)***	-.0235 (-3.22)***	-.0011 (-0.24)	-.0190 (-3.50)***	-.0086 (-1.33)	-.0172 (-3.03)***
DIV_t	.0615 (1.08)	.0180 (1.13)	-.0051 (-0.58)	-.0064 (-0.37)	.0270 (0.39)	.0241 (0.76)	-.0653 (-1.37)	.0278 (1.25)	-.0085 (-0.46)
I_t	.2926 (3.87)***	.3753 (13.18)***	.2842 (9.11)***	.3144 (7.07)***	.5004 (10.53)***	.2785 (6.04)***	.3169 (5.15)***	.4340 (3.68)***	.3119 (4.63)***
ΔWC_t	-.0543 (-1.45)	.0407 (2.79)***	.0194 (1.68)*	-.0047 (-0.15)	.1001 (1.99)**	.0664 (2.29)**	-.0047 (-0.16)	.0291 (0.92)	-.0090 (-0.43)
C_t	.1047 (3.15)***	-.0443 (-3.51)***	-.0069 (-0.59)	-.0525 (-1.80)*	-.2825 (-4.53)***	-.1411 (-5.06)***	-.0165 (-0.43)	-.0612 (-2.30)**	-.0345 (-2.90)***
Adj-R^2	0.1792	0.1234	0.0370	0.1899	0.2199	0.0917	0.0946	0.0415	0.0672
Obs	149	1237	2145	207	400	447	230	367	362
	Panel C: Net long-term debt issue / $asset_t$								
	Food prod	Home-cons	Health	Biotech	Drug retail	BR-retail	Bro & Ent	Airlines	Gmable
Cons	-.0069 (-3.28)***	-.0067 (-1.93)*	-.0102 (-2.38)**	.0038 (1.21)	-.0018 (-0.31)	-.0137 (-3.02)***	.0035 (1.00)	-.0405 (-7.34)***	-.0058 (-0.99)
DIV_t	-.0096 (-0.90)	-.0093 (-0.37)	.0444 (1.53)	-.0467 (-0.79)	.0726 (0.87)	.0441 (2.62)***	-.0691 (-2.38)**	.0208 (0.64)	-.0347 (-0.90)
I_t	.2706 (11.66)***	.2523 (2.23)**	.3206 (7.86)***	.1536 (4.35)***	.2039 (2.96)***	.4325 (10.69)***	.2016 (6.28)***	.3727 (10.79)***	.3435 (8.25)***
ΔWC_t	.0174 (1.87)*	.1264 (7.12)***	.0015 (0.11)	.0153 (2.82)***	.0111 (0.55)	.1590 (5.48)***	-.0065 (-0.53)	-.0009 (-0.05)	-.0193 (-1.01)
C_t	-.0328 (-5.61)***	-.0017 (-0.09)	-.0317 (-3.35)***	-.0170 (-4.05)***	-.0107 (-0.86)	-.1567 (-4.02)***	-.0123 (-1.72)*	-.0518 (-3.71)***	-.0241 (-1.75)*
Adj-R^2	0.0574	0.0732	0.0497	0.0150	0.0192	0.1362	0.0262	0.2441	0.0815
Obs	2544	718	1370	2399	296	837	1614	371	792

Table A.5.69 Continued

	Panel C: Net long-term debt issue / asset$_t$								
	Hotels	Travel	Fixed tel	Mobil tel	Com-serv	Internet	Software	Com-hard	Semicon
Cons	-.0158 (-2.73)***	.0016 (0.39)	-.0191 (-2.76)***	-.0020 (-0.21)	-.0051 (-2.05)**	.0008 (0.16)	.0017 (0.85)	-.0123 (-5.51)***	-.0117 (-6.25)***
DIV$_t$	-.0054 (-0.25)	-.0124 (-0.66)	.0033 (0.12)	-.0058 (-0.10)	.0032 (0.26)	.0285 (0.97)	.0015 (0.15)	.0058 (0.45)	.0267 (2.51)**
I$_t$	.4622 (8.39)***	.0207 (0.61)	.3551 (6.99)***	.2194 (3.55)***	.2153 (7.40)***	.1183 (2.93)***	.0777 (3.21)***	.2928 (11.84)***	.2203 (14.95)***
ΔWC$_t$	.0861 (2.56)**	-.0170 (-1.01)	.0060 (0.38)	-.0040 (-0.17)	.0011 (0.13)	.0066 (0.58)	-.0025 (-0.47)	.0231 (2.46)**	.0342 (4.42)***
C$_t$	-.1150 (-2.59)**	.0068 (0.61)	-.0335 (-3.52)***	-.0078 (-0.45)	-.0142 (-2.58)**	-.0241 (-3.04)***	-.0189 (-6.15)***	-.0258 (-4.10)***	-.0359 (-5.32)***
Adj-R^2	0.1349	0.0000	0.0711	0.0217	0.0298	0.0181	0.0139	0.0705	0.0729
Obs	456	473	678	404	1869	796	3874	1966	3096

Table A.5.69 Continued

	Panel D: Net equity issue / $asset_t$								
OLS	Aluminium	Steel	Heavy-cons	Delivery	M-transport	Auto	Brewers	Distil & vin	So-drink
Cons	.0177 (2.30)**	.0191 (6.04)***	.0079 (5.17)***	.0029 (0.42)	.0030 (0.73)	.0103 (3.17)***	-.0016 (-0.31)	.0260 (3.59)***	.0181 (2.68)***
DIV_t	-.0385 (-0.54)	-.0316 (-1.64)	.0052 (0.70)	.0179 (1.03)	-.0217 (-0.57)	.0050 (0.26)	.0212 (0.53)	.0066 (0.26)	.0040 (0.18)
I_t	.0002 (0.00)	.1942 (5.72)***	.1868 (7.23)***	.0758 (1.62)	.0901 (3.49)***	.0263 (0.82)	.1698 (2.93)***	.0917 (0.70)	.4849 (5.92)***
ΔWC_t	-.0177 (-0.26)	.2679 (14.65)***	.1703 (16.9)***	.2714 (7.19)***	-.0223 (-0.81)	.0857 (4.37)***	.1902 (6.70)***	.2939 (8.48)***	.3333 (10.00)***
C_t	-.1282 (-3.29)***	-.2781 (-15.33)***	-.1775 (-17.9)***	-.1440 (-3.83)***	-.0598 (-1.77)*	-.1329 (-7.00)***	-.1433 (-3.93)***	-.2392 (-11.04)***	-.4682 (-20.19)***
Adj-R^2	0.0513	0.2187	0.1816	0.1993	0.0334	0.1045	0.1749	0.3125	0.5409
Obs	146	1230	2165	200	392	446	225	350	362
	Panel D: Net equity issue / $asset_t$								
	Food prod	Home-cons	Health	Biotech	Drug retail	BR-retail	Bro & Ent	Airlines	Gmable
Cons	.0095 (3.58)***	.0031 (1.03)	.0154 (3.36)***	.1431 (17.55)***	.01753 (2.04)**	.0090 (2.17)**	.0425 (9.65)***	.0153 (2.02)**	.0228 (3.57)***
DIV_t	-.0077 (-0.57)	.0273 (1.30)	.0568 (1.79)*	-.2137 (-1.53)	.0260 (0.20)	.0141 (0.91)	-.0554 (-1.53)	.0095 (0.22)	-.0109 (-0.26)
I_t	.2261 (7.71)***	.0339 (0.35)	.2663 (5.94)***	.0578 (0.62)	.1837 (1.84)*	.1497 (4.09)***	.2383 (5.92)***	.0818 (1.73)*	.1888 (4.21)***
ΔWC_t	.2687 (22.11)***	.1010 (7.18)***	.1286 (8.59)***	.4831 (33.27)***	.2410 (8.34)***	.1851 (7.97)***	.2317 (14.50)***	.1582 (5.46)***	.2298 (11.09)***
C_t	-.2434 (-30.82)***	-.0988 (-6.21)***	-.1890 (-16.70)***	-.3248 (-26.43)***	-.1495 (-9.03)***	-.1527 (-4.32)***	-.1940 (-20.60)***	-.1539 (-7.09)***	-.1878 (-12.85)***
Adj-R^2	0.3069	0.0851	0.1764	0.3655	0.2697	0.0843	0.2429	0.1482	0.2367
Obs	2513	733	1385	2295	298	848	1598	367	793

Table A.5.69 Continued

	Panel D: Net equity issue / $asset_t$								
	Hotels	Travel	Fixed tel	Mobil tel	Com-serv	Internet	Software	Com-hard	Semicon
Cons	.0052 (0.91)	.0144 (2.34)**	.0168 (1.84)*	.0416 (3.53)***	.0324 (7.60)***	.0423 (4.52)***	.0360 (9.78)***	.0237 (7.04)***	.0128 (4.90)***
DIV_t	-.0019 (-0.09)	.0294 (1.03)	-.0204 (-0.56)	-.1180 (-1.63)	-.0366 (-1.77)*	-.0855 (-1.59)	-.0431 (-2.29)**	-.0127 (-0.66)	-.0053 (-0.36)
I_t	.2590 (4.76)***	.1058 (2.10)**	.3817 (5.17)***	.1606 (2.09)**	.4174 (7.99)***	.4968 (6.19)***	.6470 (14.09)***	.1649 (4.46)***	.2890 (13.91)***
ΔWC_t	.1202 (3.60)***	.2121 (8.42)***	.2019 (9.09)***	.1933 (6.30)***	.1876 (12.25)***	.2437 (10.60)***	.3066 (29.26)***	.2867 (20.00)***	.3451 (30.91)***
C_t	-.3401 (-7.65)***	-.1675 (-9.88)***	-.2011 (-14.81)***	-.1333 (-6.37)***	-.1404 (-14.22)***	-.1575 (-10.00)***	-.2250 (-33.93)***	-.2634 (-24.54)***	-.2823 (-27.12)***
Adj-R^2	0.1501	0.2560	0.2636	0.1306	0.1500	0.2057	0.3152	0.2667	0.2935
Obs	447	469	665	412	1837	768	3823	1977	3108

Table A.5.70 Debt ratio changes and financial deficits (DEF1), based on different industries

Note, ΔMDR: market-based debt ratio change, ΔBDR: book-based debt ratio change, Net equity issuance/asset =(sale stock-repurchase stock)/total asset, Net long-term debt issuance/asset=('long-term debt issue'-'long-term debt retirement')/total asset, DEF1=$DIV_t+I_t+\Delta WC_t-C_t$, DEF1: financial deficit defined by Frank and Goyal (2003), DIV: dividend, I: investment (capital expenditure), WC: working capital, C: cash-flow after interest and taxes (=internal cash-flow or net income+depreciation). All items are scaled by total asset. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level. The full industry names are defined in Table A.1.1 in Appendix 1.

	Panel A: ΔBDR_t								
OLS	Aluminium	Steel	Heavy-cons	Delivery	M-transport	Auto	Brewers	Distil & vin	So-drink
Cons	-.0017 (-0.25)	-.0133 (-4.93)***	-.0076 (-4.67)***	-.0108 (-1.68)*	-.0123 (-3.43)***	.0002 (0.04)	-.0026 (-0.60)	.0027 (0.45)	-.0051 (-0.76)
$DEF1_t$	-.0206 (-0.86)	.0697 (5.94)***	-.0059 (-0.92)	.0165 (0.72)	.0559 (3.20)***	.0413 (1.57)	.0127 (0.62)	.0106 (0.66)	-.0075 (-4.09)***
Adj-R^2	0.0000	0.0200	0.0000	0.0000	0.0166	0.0029	0.0000	0.0000	0.0338
Obs	230	1682	3058	261	548	504	319	464	449
	Panel A: ΔBDR_t								
	Food prod	Home-cons	Health	Biotech	Drug retail	BR-retail	Bro & Ent	Airlines	Gmable
Cons	-.0008 (-0.39)	-.0056 (-1.49)	.0016 (0.33)	.0200 (3.98)***	-.0034 (-0.43)	-.0086 (-3.03)***	.0087 (2.24)**	.0019 (0.27)	.0094 (1.23)
$DEF1_t$	-.0310 (-4.57)***	.0046 (0.35)	-.0276 (-2.33)**	-.0316 (-4.45)***	.0054 (0.26)	.0458 (3.47)***	-.0472 (-4.77)***	-.0004 (-0.02)	-.0283 (-1.58)
Adj-R^2	0.0056	0.0000	0.0026	0.0071	0.0000	0.0107	0.0113	0.0000	0.0017
Obs	3532	890	1544	2654	378	1020	1915	375	854
	Panel A: ΔBDR_t								
	Hotels	Travel	Fixed tel	Mobil tel	Com-serv	Internet	Software	Com-hard	Semicon
Cons	-.0012 (-0.28)	-.0035 (-1.00)	.0044 (0.51)	-.0001 (-0.01)	.0002 (0.05)	.0058 (0.91)	-.0011 (-0.45)	-.0024 (-0.96)	-.0046 (-2.44)**
$DEF1_t$	-.0038 (-0.23)	-.0087 (-0.83)	.0082 (0.48)	-.0393 (-1.80)*	-.0161 (-2.10)**	-.0234 (-2.08)**	-.0055 (-1.19)	-.0166 (-2.26)**	-.0017 (-0.27)
Adj-R^2	0.0000	0.0000	0.0000	0.0047	0.0013	0.0031	0.0001	0.0016	0.0000
Obs	564	665	710	481	2537	1088	4925	2607	3875

Table A.5.70 Continued

	Panel B: ΔMDR_t								
OLS	Aluminium	Steel	Heavy-cons	Delivery	M-transport	Auto	Brewers	Distil & vin	So-drink
Cons	.0005 (0.07)	-.0088 (-3.3)***	-.0033 (-2.18)**	-.0069 (-1.25)	-.0061 (-1.31)	.0046 (1.47)	-.0012 (-0.29)	.0079 (1.65)	-.0054 (-1.41)
$DEF1_t$	.0393 (1.47)	.0317 (2.52)**	-.0120 (-1.98)**	.0289 (1.49)	.0368 (1.54)	.0117 (0.51)	-.0001 (-0.01)	-.0095 (-0.73)	.0193 (1.87)*
Adj-R^2	0.0057	0.0034	0.0010	0.0053	0.0027	0.0000	0.0000	0.0000	0.0057
Obs	202	1566	2932	227	502	472	310	436	430
	Panel B: ΔMDR_t								
	Food prod	Home-cons	Health	Biotech	Drug retail	BR-retail	Bro & Ent	Airlines	Gmable
Cons	-.0011 (-0.79)	-.0019 (-0.48)	.0069 (2.23)**	.0099 (4.58)***	.0048 (1.13)	-.0025 (-0.98)	.0114 (4.15)***	.0142 (2.73)***	.0096 (2.15)**
$DEF1_t$	.0033 (0.67)	-.0026 (-0.17)	-.0052 (-0.67)	-.0065 (-2.14)**	.0127 (1.17)	.0610 (4.71)***	-.0123 (-1.91)*	-.0357 (-2.26)**	.0002 (0.02)
Adj-R^2	0.0000	0.0000	0.0000	0.0015	0.0011	0.0216	0.0016	0.0117	0.0000
Obs	3382	804	1400	2338	347	959	1699	347	759
	Panel B: ΔMDR_t								
	Hotels	Travel	Fixed tel	Mobil tel	Com-serv	Internet	Software	Com-hard	Semicon
Cons	-.0002 (-0.04)	.0031 (1.09)	.0094 (2.15)**	.0132 (2.11)**	.0088 (4.46)***	.0095 (2.81)***	.0046 (3.78)***	.0027 (1.36)	.0021 (1.32)
$DEF1_t$	.0109 (0.66)	.0082 (0.84)	-.0035 (-0.43)	.0105 (0.69)	-.0074 (-1.48)	.0078 (1.36)	.0003 (0.16)	-.0021 (-0.35)	.0175 (3.28)***
Adj-R^2	0.00	0.0000	0.0000	0.0000	0.0005	0.0010	0.0000	0.0000	0.0028
Obs	501	590	620	403	2250	891	4477	2414	3454

Table A.5.70 Continued

	Panel C: Net long-term debt issue / $asset_t$								
OLS	Aluminium	Steel	Heavy-cons	Delivery	M-transport	Auto	Brewers	Distil & vin	So-drink
Cons	.0076 (1.50)	.0011 (0.54)	.0022 (1.45)	-.0009 (-0.18)	-.0112 (-2.57)**	.0094 (3.55)***	-.0035 (-0.83)	.0023 (0.44)	-.0019 (-0.53)
$DEF1_t$	-.0378 (-1.39)	.0553 (5.70)***	.0125 (1.87)*	.0369 (2.55)**	.2738 (7.65)***	.0864 (4.39)***	.0185 (0.77)	.0488 (2.91)***	.0268 (2.71)***
Adj-R^2	0.0063	0.0248	0.0012	0.0260	0.1259	0.0394	0.0000	0.0200	0.0172
Obs	149	1237	2145	207	400	447	230	367	362
	Panel C: Net long-term debt issue / $asset_t$								
	Food prod	Home-cons	Health	Biotech	Drug retail	BR-retail	Bro & Ent	Airlines	Gmable
Cons	.0052 (3.28)***	-.0007 (-0.23)	.0097 (2.92)***	.0086 (3.18)***	.0098 (2.32)**	.0031 (1.16)	.0125 (4.19) ***	-.0029 (-0.69)	.0188 (3.90)***
$DEF1_t$	.0323 (6.28)***	.0532 (3.93)***	.0372 (4.3)***	.0184 (4.92)***	.0135 (1.12)	.1002 (6.89)***	.0139 (2.06)**	.0579 (4.63)***	.0306 (2.58)**
Adj-R^2	0.0149	0.0198	0.0126	0.0096	0.0008	0.0526	0.0020	0.0523	0.0071
Obs	2544	718	1370	2399	296	837	1614	371	792
	Panel C: Net long-term debt issue / $asset_t$								
	Hotels	Travel	Fixed tel	Mobil tel	Com-serv	Internet	Software	Com-hard	Semicon
Cons	.0028 (0.64)	.0034 (1.07)	.0140 (2.95)***	.0212 (3.12)***	.0031 (1.47)	.0071 (1.72)*	.0041 (2.39)**	.0004 (0.22)	.0011 (0.74)
$DEF1_t$	.0626 (3.40)***	-.0083 (-0.97)	.0295 (3.15)***	.0072 (0.45)	.0169 (3.40)***	.0247 (3.39)***	.0168 (5.81)***	.0323 (5.60)***	.0500 (9.19)***
Adj-R^2	0.0227	0.0000	0.0130	0.0000	0.0056	0.0131	0.0084	0.0152	0.0262
Obs	456	473	678	404	1869	796	3874	1966	3096

Table A.5.70 Continued

	Panel D: Net equity issue/ $asset_t$								
OLS	Aluminium	Steel	Heavy-cons	Delivery	M-transport	Auto	Brewers	Distil & vin	So-drink
Cons	.0081 (1.41)	.0074 (2.96)***	.0041 (3.09)***	-.0052 (-1.01)	.0038 (1.68)*	.0008 (0.43)	-.0049 (-1.26)	.0067 (1.09)	-.0007 (-0.13)
$DEF1_t$	.0612 (1.95)*	.1612 (12.36)***	.0837 (14.07)***	.0541 (3.27)**	.0341 (1.82)*	.0651 (5.02)***	.1367 (6.15)***	.1551 (8.60)***	.2123 (9.85)***
Adj-R^2	0.0191	0.1099	0.0835	0.0465	0.0059	0.0517	0.1411	0.1728	0.2102
Obs	146	1230	2165	200	392	446	225	350	362
	Panel D: Net equity issue/ $asset_t$								
	Food prod	Home-cons	Health	Biotech	Drug retail	BR-retail	Bro & Ent	Airlines	Gmable
Cons	-.0017 (-0.82)	-.0001 (-0.05)	.0191 (5.47)***	.1049 (14.89)***	.01663 (2.66)***	.0058 (2.40)**	.0381 (10.18)***	.0063 (1.22)	.01604 (3.15)***
$DEF1_t$	.1938 (27.00)***	0.828 (7.80)***	.1652 (16.15)***	.3797 (33.67)***	.1619 (9.90)***	.0760 (6.11)***	.1911 (21.15)***	.1290 (7.47)***	.1865 (14.69)***
Adj-R^2	0.2246	0.0756	0.1581	0.3305	0.2462	0.0411	0.2185	0.1303	0.2134
Obs	2513	733	1385	2295	298	848	1598	367	793
	Panel D: Net equity issue/ $asset_t$								
	Hotels	Travel	Fixed tel	Mobil tel	Com-serv	Internet	Software	Com-hard	Semicon
Cons	-.0033 (-0.76)	.0042 (0.87)	.0289 (4.62)***	.0374 (4.45)***	.0355 (9.74)***	.0502 (6.17)***	.0407 (12.51)***	.0119 (4.16)***	.0077 (3.46)***
$DEF1_t$	.0735 (4.02)***	.1530 (11.37)***	.1826 (13.73)***	.1349 (6.87)***	.1313 (14.35)***	.1767 (11.54)***	.2301 (35.17)***	.2140 (22.07)***	.2389 (28.31)***
Adj-R^2	0.0330	0.2150	0.2201	0.1012	0.1004	0.1470	0.2443	0.1974	0.2049
Obs	447	469	665	412	1837	768	3823	1977	3108

Table A.5.71 Debt ratio change and stock price effect, based on different industries

Note, MDR: market-based debt ratio, BDR: book-based debt ratio, Net equity issuance/asset =(sale stock-repurchase stock)/total asset, IDR: Implied debt ratio, $IDR_{t-1,t} \equiv D_{t-1}/(E_{t-1}$ (1+stock $return_{t-1,t})+D_{t-1})$, SR: stock return, log(1+annual stock return), $SPE_{t-1,t}=IDR_{t-1,t}-MDR_{t-1}$, $speed2_t$: $target2_t-MDR_{t-1}$, target2: 'market-based target debt ratio' calculated using OLS. The full industry names are defined in Table A.1.1 in Appendix 1. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	Panel A: MDR_t								
OLS	Aluminium	Steel	Heavy-cons	Delivery	M-transport	Auto	Brewers	Distil & vin	So-drink
Cons	.0326 (3.10)***	.0249 (7.69)***	.0131 (7.70)***	.0122 (1.74)*	.0349 (5.01)***	.0227 (4.23)***	.0180 (3.74)***	.0381 (5.82)***	.01299 (3.34)***
MDR_{t-1}	.5664 (9.41)***	.5470 (26.23)***	.7726 (56.63)***	.6617 (10.05)***	.6473 (20.56)***	.6602 (15.88)***	.5908 (8.06)***	.6024 (12.58)***	.5448 (12.28)***
$IDR_{t,t+1}$	.2625 (6.19)***	.2578 (17.49)***	.0895 (11.31)***	.1783 (4.02)***	.2087 (8.64)***	.1800 (6.79)***	.2171 (4.33)***	.1843 (5.86)***	.2718 (8.56)***
Adj-R^2	0.8206	0.7930	0.8228	0.8003	0.7922	0.8479	0.8252	0.7317	0.7983
Obs	239	2159	4302	242	713	567	395	519	570

Table A.5.71 Continued

	Panel A: MDR_t								
	Food prod	Home-cons	Health	Biotech	Drug retail	BR-retail	Bro & Ent	Airlines	Gmable
Cons	.0171 (10.37)***	.0267 (5.17)***	.0271 (8.33)***	.0162 (9.67)***	.0125 (2.53)**	.0236 (6.31 ***	.0317 (9.19)***	.0244 (2.92)***	.0299 (6.52)***
MDR_{t-1}	.6082 (39.82)***	.5188 (16.03)***	.4560 (16.62)***	.2633 (10.67)***	.5171 (9.76)***	.7016 (22.61)***	.5489 (22.86)***	.7212 (17.28)***	.3656 (10.08)***
$IDR_{t,t+1}$	.2334 (21.50)***	.2744 (11.77)***	.3118 (16.57)***	.3902 (24.95) ***	.2938 (8.69)***	.1527 (7.44)***	.2359 (14.63)***	.1608 (5.74)***	.4146 (15.20)***
Adj-R^2	0.8292	0.7579	0.7369	0.5697	0.7309	0.8205	0.6867	0.8194	0.7468
Obs	4629	983	1625	2484	378	1163	1947	360	878
	Panel A: MDR_t								
	Hotels	Travel	Fixed tel	Mobil tel	Com-serv	Internet	Software	Com-hard	Semicon
Cons	.0144 (2.54)**	.0159 (4.39)***	.0324 (5.75)***	.0417 (5.94)***	.0235 (11.72)***	.0234 (7.31)***	.0152 (12.67)***	.0208 (9.95)***	.0171 (11.10)***
MDR_{t-1}	.5522 (15.00)***	.7965 (29.12)***	.7223 (22.03)***	.3248 (5.46)***	.3963 (16.12)***	.4050 (10.75)***	.4073 (23.66)***	.4564 (20.48)***	.2518 (13.35)***
$IDR_{t,t+1}$	.3222 (11.21)***	.1368 (6.43)***	.1206 (5.58)***	.3470 (8.53)***	.2668 (18.82)***	.2564 (12.85)***	.2912 (27.55)***	.2756 (19.80)***	.4816 (36.72)***
Adj-R^2	0.8485	0.9176	0.6977	0.5727	0.6209	0.5833	0.6438	0.718	0.7531
Obs	624	884	747	445	2659	1041	5244	2749	3791

Table A.5.71 Continued

	Panel B: ΔMDR$_t$								
OLS	Aluminium	Steel	Heavy-cons	Delivery	M-transport	Auto	Brewers	Distil & vin	So-drink
Cons	-.0072 (-0.65)	-.007 (-1.70)*	-.0065 (-2.69)***	-.0088 (-0.65)	.0093 (0.57)	-.0029 (-0.51)	.0025 (0.29)	.0112 (1.15)	-.0057 (-0.98)
Speed2	.1459 (3.77)***	.2111 (11.95)***	.1642 (13.53)***	.2171 (3.18)***	.1755 (3.00)***	.1323 (5.18)***	.2557 (4.24)***	.1929 (2.96)***	.1421 (3.95)***
$SPE_{t,t+1}$	.3898 (5.79)***	.2488 (11.26)***	.0954 (8.21)***	.4635 (4.92)***	.0797 (1.44)	.1483 (5.29)***	.2144 (2.30)**	.1034 (1.86)*	.2842 (4.50)***
Adj-R^2	0.2216	0.1934	0.0959	0.3476	0.0838	0.0883	0.1614	0.0594	0.1232
Obs	125	860	1714	46	94	373	84	121	165
	Panel B: ΔMDR$_t$								
	Food prod	Home-cons	Health	Biotech	Drug retail	BR-retail	Bro & Ent	Airlines	Gmable
Cons	-.005 (-2.56)**	.0106 (1.43)	.0089 (1.29)	.0038 (0.94)	-.0067 (-1.29)	-.0020 (-0.34)	.0079 (1.23)	-.0142 (-1.00)	.0041 (0.62)
Speed2	.1407 (13.44)***	.1489 (5.75)***	.2488 (7.78)***	.2965 (10.10)***	.1670 (3.00)***	.1624 (4.45)***	.2261 (7.17)***	.1445 (2.32)**	.2593 (7.94)***
$SPE_{t,t+1}$	.2320 (14.01)***	.1494 (4.43)***	.3373 (8.73)***	.3963 (13.57)***	.5159 (7.53)***	.1739 (3.90)***	.3067 (9.36)***	.227 (4.61)***	.3878 (9.39)***
Adj-R^2	0.1246	0.1039	0.2190	0.2958	0.3263	0.0732	0.2152	0.2353	0.2894
Obs	1860	370	372	617	114	272	413	85	318
	Panel B: ΔMDR$_t$								
	Hotels	Travel	Fixed tel	Mobil tel	Com-serv	Internet	Software	Com-hard	Semicon
Cons	-.0237 (-1.84)*	.0050 (0.47)	.0039 (0.54)	-.0015 (-0.14)	.0048 (1.58)	.0054 (0.93)	.0029 (1.42)	.0047 (1.96)**	.0002 (0.10)
Speed2	.1078 (2.49)**	.1193 (2.31)**	.2472 (6.78)***	.4462 (6.40)***	.3093 (13.11)***	.3705 (7.72)***	.3193 (19.51)***	.3161 (19.25)***	.3248 (24.14)***
$SPE_{t,t+1}$	.5689 (8.02)***	.1047 (1.30)	.2502 (6.02)***	.4834 (5.91)***	.2545 (11.58)***	.2165 (4.99)***	.2463 (13.65)***	.3037 (17.63)***	.5081 (32.21)***
Adj-R^2	0.3865	0.0456	0.2191	0.3634	0.1826	0.1877	0.2022	0.2352	0.3740
Obs	108	79	242	106	943	262	1650	1590	2138

Table A.5.71 Continued

	Panel C: ΔMDR$_t$								
OLS	Aluminium	Steel	Heavy-cons	Delivery	M-transport	Auto	Brewers	Distil & vin	So-drink
Cons	.0067 (1.25)	.0000 (0.01)	-.0009 (-0.82)	-.0023 (-0.50)	.0046 (1.50)	.0048 (1.77)*	-.0003 (-0.08)	.0053 (1.32)	-.0040 (-1.39)
$SR_{t,t+1}$	-0.734 (-7.53)***	-.0721 (-21.52)***	-.0382 (-18.83)***	-.0504 (-5.57)***	-.1016 (-15.00)***	-.0571 (-9.37)***	-.0617 (-6.68)***	-.0315 (-4.08)***	-.0557 (-10.75)***
Adj-R^2	0.1895	0.1763	0.0760	0.1109	0.2392	0.1329	0.0997	0.0294	0.1677
Obs	239	2159	4302	242	713	567	395	518	570
	Panel C: ΔMDR$_t$								
	Food prod	Home-cons	Health	Biotech	Drug retail	BR-retail	Bro & Ent	Airlines	Gmable
Cons	.0012 (1.12)	.0006 (0.21)	.0037 (1.61)	-.0019 (-1.11)	.0066 (1.78)*	.0039 (1.84)*	.0012 (0.53)	.0074 (1.97)**	.0052 (1.53)
$SR_{t,t+1}$	-.0631 (-28.23)***	-0706 (-13.55)***	-.0693 (-19.67)***	-.0383 (-19.19)***	-.0400 (-6.48)***	-.0435 (-10.29)***	-.0567 (-18.39)***	-.0672 (-10.83)***	-.0724 (-15.08)***
Adj-R^2	0.1468	0.1569	0.1922	0.1289	0.0980	0.0828	0.1478	0.2447	0.2053
Obs	4625	983	1622	2482	378	1163	1944	360	877
	Panel C: ΔMDR$_t$								
	Hotels	Travel	Fixed tel	Mobil tel	Com-serv	Internet	Software	Com-hard	Semicon
Cons	.0026 (0.84)	.0085 (4.09)***	.0036 (1.01)	.0013 (0.23)	.0017 (0.99)	.0049 (1.63)	-.0008 (-0.70)	-.0023 (-1.48)	.0004 (0.35)
$SR_{t,t+1}$	-.0908 (-13.53)***	-.0297 (-8.13)***	-.0458 (-9.73)***	-.0618 (-9.06)***	-.0388 (-16.99)***	-.0266 (-8.90)***	-.0346 (-24.59)***	-.0520 (-21.62)***	-.0608 (-30.76)***
Adj-R^2	0.2260	0.0687	0.1123	0.1546	0.0978	0.0703	0.1034	0.1452	0.1997
Obs	624	883	742	444	2656	1036	5232	2746	3791

Table A.5.71 Continued

	Panel D: ΔBDR$_t$								
OLS	Aluminium	Steel	Heavy-cons	Delivery	M-transport	Auto	Brewers	Distil & vin	So-drink
Cons	.0048 (0.74)	-.0029 (-1.31)	-.0034 (-2.92)***	-.0119 (-2.04)**	-.0030 (-1.05)	-.0000 (-0.00)	-.0034 (-0.60)	.0041 (0.80)	-.0075 (-1.54)
$SR_{t,t+1}$	-.0145 (-1.19)	-.0206 (5.20)***	-.0127 (-5.75)***	-.0218 (-1.97)**	-.0192 (-3.04)***	-.0261 (-3.54)***	-.0019 (-0.12)	.0085 (0.88)	-.0453 (-5.01)***
Adj-R^2	0.0016	0.0114	0.0073	0.0116	0.0109	0.0194	0.0000	0.0000	0.0408
Obs	260	2254	4383	246	750	583	406	526	568
	Panel D: ΔBDR$_t$								
	Food prod	Home-cons	Health	Biotech	Drug retail	BR-retail	Bro & Ent	Airlines	Gmable
Cons	-.0010 (-0.73)	-.0034 (-1.06)	.0011 (0.29)	.0076 (1.67)*	.0037 (0.47)	-.0017 (-0.79)	.0044 (1.18)	.0046 (0.88)	.0062 (1.02)
$SR_{t,t+1}$	-.0267 (-8.56)***	-.0273 (-5.61)***	-.0243 (-4.31)***	-.0240 (-4.23)***	-.0345 (-2.72)***	-.0098 (-2.26)**	-.0291 (-6.06)***	-.0562 (-6.12)***	-.0152 (-1.86)*
Adj-R^2	0.0153	0.0283	0.0104	0.0068	0.0161	0.0034	0.0178	0.0909	0.0027
Obs	4659	1050	1672	2476	390	1191	1969	366	917
	Panel D: ΔBDR$_t$								
	Hotels	Travel	Fixed tel	Mobil tel	Com-serv	Internet	Software	Com-hard	Semicon
Cons	.0027 (0.75)	.0035 (1.16)	.0046 (0.60)	-.0008 (-0.09)	.0016 (0.62)	.0081 (1.19)	-.0005 (-0.20)	-.0049 (-2.25)**	-.0016 (-0.99)
$SR_{t,t+1}$	-.0241 (-3.42)***	-.0118 (-2.00)**	-.0145 (-1.47)	-.0315 (-2.85)***	-.0245 (-6.96)***	-.0143 (-2.07)**	-.0305 (-9.31)***	-.0192 (-5.79)***	-.0208 (-8.41)***
Adj-R^2	0.0152	0.0033	0.0016	0.0149	0.0173	0.0031	0.0162	0.0116	0.0180
Obs	694	902	750	470	2700	1056	5203	2768	3817

Table A.5.71 Continued

	Panel E: Net equity issue / asset$_t$								
OLS	Aluminium	Steel	Heavy-cons	Delivery	M-transport	Auto	Brewers	Distil & vin	So-drink
Cons	.0090 (1.77)*	.0199 (7.66)***	.0103 (8.46)****	-.0008 (-0.18)	.0055 (2.70)***	.0024 (1.64)	-.0028 (-1.00)	.0205 (4.17)***	.0204 (3.74)***
$SR_{t,t+1}$	-.0341 (-3.33)***	.0006 (0.13)	-.0132 (-6.25)***	.0022 (0.21)	-.0011 (-0.27)	-.0070 (-2.38)**	-.0175 (-2.49)**	-.0264 (-2.75)***	-.0317 (-3.16)***
Adj-R^2	0.0581	0.0000	0.0151	0.0000	0.0000	0.0097	0.0221	0.0168	0.0212
Obs	165	1451	2486	184	436	473	232	384	416
	Panel E: Net equity issue / asset$_t$								
	Food prod	Home-cons	Health	Biotech	Drug retail	BR-retail	Bro & Ent	Airlines	Gmable
Cons	.0144 (6.77)***	.0044 (1.86)*	.0302 (8.70)***	.2470 (35.90)***	.0260 (4.27)***	.0067 (3.55)***	.0507 (12.10)***	.0131 (3.88)***	.0386 (6.87)***
$SR_{t,t+1}$	-.0185 (-4.45)***	-.0002 (-0.06)	-.0037 (-0.75)	.0410 (4.97)***	-.0039 (-0.44)	-.0019 (-0.53)	-.0205 (-3.93)***	.0043 (0.79)	-.0076 (-1.01)
Adj-R^2	0.0067	0.0000	0.0000	0.0106	0.0000	0.0000	0.0088	0.0000	0.0000
Obs	2805	856	1535	2216	313	885	1634	353	867
	Panel E: Net equity issue / asset$_t$								
	Hotels	Travel	Fixed tel	Mobil tel	Com-serv	Internet	Software	Com-hard	Semicon
Cons	.0019 (0.50)	.0151 (3.39)***	.0498 (7.63)***	.0453 (-5.39)***	.0447 (12.71)***	.0752 (9.29)***	.0696 (20.89)***	.03200 (11.38)***	.0260 (12.41)***
$SR_{t,t+1}$	-.0048 (-0.67)	.0101 (1.48)	-.0356 (-4.26)***	-.0280 (-2.59)**	-.0165 (-3.79)***	-.0163 (-2.07)**	-.0198 (-4.91)***	-.0014 (-0.33)	.0094 (2.96)***
Adj-R^2	0.0000	0.0021	0.0234	0.0136	0.0068	0.0041	0.0057	0.0000	0.0025
Obs	511	552	716	414	1962	797	4033	2086	3120

Table A.5.72 Capital structure adjustment speed comparison, based on different industries

Note, BDR: book-based debt ratio, MDR: market-based debt ratio, speed1= $target1_t-BDR_{t-1}$, speed2= $target2_t-MDR_{t-1}$, target1: book-based target debt ratio calculated using OLS, target2: market-based target debt ratio calculated using OLS. The coefficient values are λ (capital structure adjustment speed) in Panels A and B. The coefficient values of 'capital structure adjustment speed' in Panels C and D are (1-λ). Thus, the adjustment speed λ is (1-coefficient). In calculating Panels C and D, we use all 7 capital structure determinants though we do not report those coefficients here. The full industry names are defined in Table A.1.1 in Appendix 1. *** significance at 0.01 level, ** significance at 0.05 level, * significance at 0.1 level

	Panel A: ΔBDR_t								
OLS	Aluminium	Steel	Heavy-cons	Delivery	M-transport	Auto	Brewers	Distil & vin	So-drink
Cons	.0089 (1.24)	.0125 (3.24)***	.0002 (0.09)	.0049 (0.50)	.0209 (1.57)	.0138 (2.69)***	.0107 (1.58)	.0137 (1.58)	.0012 (0.25)
Speed1	.0662 (2.18)**	.1846 (9.76)***	.1247 (12.66)***	.1444 (2.60)**	.2154 (3.44)***	.1143 (4.74)***	.1563 (3.62)***	.0828 (1.58)	.0409 (1.57)
Adj-R^2	0.0265	0.0934	0.0835	0.0931	0.1031	0.0504	0.1150	0.0119	0.0085
Obs	139	916	1748	57	95	406	94	125	171
	Panel A: ΔBDR_t								
	Food prod	Home-cons	Health	Biotech	Drug retail	BR-retail	Bro & Ent	Airlines	Gmable
Cons	.0057 (2.52)**	.0160 (2.56)**	.0206 (2.48)**	.0270 (4.71)***	.0072 (0.65)	.0025 (0.54)	.0203 (3.28)***	.0186 (1.92)*	.0266 (2.79)***
Speed1	.0926 (8.65)***	.1114 (5.01)***	.0909 (3.26)***	.1738 (7.94)***	.2793 (4.17)***	.0926 (3.30)***	.0506 (2.60)**	.2144 (5.36)***	.1522 (5.08)***
Adj-R^2	0.0360	0.00574	0.0202	0.0520	0.1141	0.0296	0.0112	0.2338	0.0591
Obs	1982	396	469	1131	128	324	511	92	396
	Panel A: ΔBDR_t								
	Hotels	Travel	Fixed tel	Mobil tel	Com-serv	Internet	Software	Com-hard	Semicon
Cons	.0120 (1.27)	.0331 (2.16)**	.0383 (3.46)***	.0229 (1.26)	.0146 (4.36)***	.0101 (1.39)	.0149 (5.37)***	.0097 (4.29)***	.0068 (3.63)***
Speed1	.0232 (0.78)	.2614 (3.64)	.2061 (5.17)***	.5116 (6.90)***	.1880 (9.68)***	.3713 (11.29)***	.1857 (13.75)***	.2219 (15.77)***	.1551 (13.99)***
Adj-R^2	0.0000	0.1153	0.0866	0.2637	0.0746	0.2264	0.0626	0.1149	.0652
Obs	134	95	272	131	1151	433	2814	1909	2793

Table A.5.72 Continued

	Panel B: ΔMDR$_t$								
OLS	Aluminium	Steel	Heavy-cons	Delivery	M-transport	Auto	Brewers	Distil & vin	So-drink
Cons	.0187 (1.84)*	.0153 (3.97)***	.0059 (3.05)***	.0125 (0.80)	.0209 (1.46)	.0169 (3.50)***	.0146 (2.06)**	.0168 (1.79)*	.0037 (0.65)
Speed2	.0583 (1.49)	.1485 (8.32)***	.1110 (10.72)***	.0852 (1.17)	.1692 (2.89)***	.0793 (3.35)***	.1397 (2.83)***	.1522 (2.45)**	.0707 (2.07)**
Adj-R^2	0.0091	0.0725	0.0621	0.0073	0.0732	0.0254	0.0715	0.0400	0.0196
Obs	135	874	1719	50	94	393	92	121	165
	Panel B: ΔMDR$_t$								
	Food prod	Home-cons	Healthe	Biotech	Drug retail	BR-retail	Bro & Ent	Airlines	Gmable
Cons	.0071 (3.74)***	.0246 (3.57)***	.0284 (3.86)***	.0204 (4.76)***	.0083 (1.39)	.0099 (1.99)**	.0313 (4.73)***	.0278 (2.33)**	.0263 (3.71)***
Speed2	.0811 (8.05)***	.1341 (5.18)***	.1710 (5.04)***	.2530 (7.75)***	-.0102 (-0.19)	.0896 (3.02)***	.1975 (6.00)***	.1673 (2.42)**	.2258 (6.28)***
Adj-R^2	0.0329	0.0649	0.0613	0.0859	0.0000	0.0257	0.0741	0.0519	0.1068
Obs	1877	373	374	630	120	310	438	90	322
	Panel B: ΔMDR$_t$								
	Hotels	Travel	Fixed tel	Mobil tel	Com-serv	Internet	Software	Com-hard	Semicon
Cons	.0270 (1.95)*	.01331 (1.52)	.0245 (3.60)***	.0223 (1.91)*	.0165 (5.37)***	.0158 (2.77)***	.0113 (5.47)***	.0194 (7.85)***	.0187 (8.69)***
Speed2	.0974 (1.84)*	.0991 (2.00)**	.1981 (5.19)***	.3033 (3.81)***	.1855 (8.26)***	.2876 (6.38)***	.2249 (14.23)***	.2129 (13.02)***	.2029 (13.09)***
Adj-R^2	0.0206	0.0369	0.0964	0.1122	0.0665	0.1261	0.1083	0.0934	0.0719
Obs	115	79	244	108	946	276	1660	1637	2201

Table A.5.72 Continued

Note, BDR_{t-1} is instrumented in Panel C. The options of small robust small and twostep are used for xtabond2 command, and the sub-options of eq(level) and laglimits(1 2) for gmm-style, and of eq(level) for iv-style.

	Panel C: BDR_t								
Sys-GMM	Aluminium	Steel	Heavy-cons	Delivery	M-transport	Auto	Brewers	Distil & vin	So-drink
Cons	.0336 (0.85)	.0212 (0.94)	-.0051 (-0.61)	.1780 (0.29)	-.0704 (-0.15)	.1118 (1.33)	.1201 (0.81)	.0091 (0.20)	.0405 (1.32)
BDR_{t-1}	.9526 (21.30)***	.7025 (6.50)***	.8907 (21.35)***	1.271 (1.82)	.5421 (2.23)**	.5376 (3.98)***	.4284 (1.13)	.8513 (4.40)***	.9930 (14.48)***
AR(1)	-2.93***	-2.40**	-3.00***	-0.63	-1.39	-2.01**	-2.03**	-1.54	-2.14**
AR(2)	0.65	0.44	1.50	-0.58	-1.26	-1.79*	0.30	-2.04**	1.24
Hansen [P-value]	12.47 [0.999]	41.86 [0.114]	34.56 [0.346]	2.80 [1.00]	12.25 [0.998]	27.22 [0.707]	0.60 [1.000]	9.64 [1.000]	17.92 [0.979]
Inst	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2
Inst No	41	41	41	40	39	41	41	41	41
Obs	139	923	1759	58	95	410	94	130	172
	Panel C: BDR_t								
	Food prod	Home-cons	Health	Biotech	Drug retail	BR-retail	Bro & Ent	Airlines	Gmable
Cons	-.0045 (-0.27)	.0911 (2.20)**	.0377 (1.13)	-.0336 (-1.61)	.1195 (1.15)	.0084 (0.22)	.0372 (2.02)**	-.0208 (-0.23)	-.035 (-0.94)
BDR_{t-1}	.7641 (7.40)***	.7885 (13.10)***	.8072 (5.22)***	.8271 (10.77)***	.7002 (3.49)***	.8344 (11.81)***	.9063 (14.87)***	.7359 (4.49)***	.8582 (11.53)***
AR(1)	-2.19**	-2.70***	-3.37***	-3.27***	-2.15**	-2.49**	-3.74***	-1.68*	-2.20**
AR(2)	1.07	0.64	-1.59	-0.24	-0.69	1.42	1.17	0.27	0.10
Hansen [P-value]	32.93 [0.421]	31.25 [0.504]	32.17 [0.458]	22.95 [0.880]	12.02 [0.999]	33.72 [0.384]	27.97 [0.671]	5.48 [1.000]	33.79 [0.381]
Inst	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2
Inst No	41	41	41	41	41	41	41	40	41
Obs	2020	406	491	1416	132	328	527	93	409

Table A.5.72 Continued

Note, BDR_{t-1} is instrumented in Panel C. The options of small robust small and twostep are used for xtabond2 command, and the sub-options of eq(level) and laglimits(1 2) for gmm-style, and eq(level) for iv-style.

	Panel C: BDR_t								
	Hotels	Travel	Fixed tel	Mobil tel	Com-serv	Internet	Software	Com-hard	Semicon
Cons	.0748 (0.37)	.0455 (0.36)	.1552 (2.16)**	.1275 (2.96)	.0176 (1.09)	.0187 (0.46)	.0315 (2.73)***	.0173 (1.26)	.0237 (2.41)**
BDR_{t-1}	.9425 (2.80)**	.7010 (1.98)*	.5934 (5.29)***	.5590 (2.98)***	.6217 (4.80)***	.8241 (4.62)***	.8044 (11.34)***	.7038 (7.38)***	.8409 (18.21)***
AR(1)	-1.72*	-1.04	-1.64	-1.07	-3.46***	-3.09***	-4.92***	-5.85***	-6.20***
AR(2)	-1.43	0.99	-0.70	0.92	0.57	-1.08	1.31	0.31	0.89
Hansen [P-value]	10.93 [0.999]	9.53 [1.000]	27.00 [0.718]	21.24 [0.850]	25.24 [0.796]	17.53 [0.733]	33.12 [0.412]	24.32 [0.833]	30.83 [0.526]
Inst	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2
Inst No	39	40	41	38	41	31	41	41	41
Obs	134	106	274	137	1207	454	3408	2075	3144

Table A.5.72 Continued

Note, MDR_{t-1} is instrumented in Panel D. The options of small robust and twostep are used for xtabond2 command, and the sub-options of eq(level) and laglimits(1 2) for gmm-style, and of eq(level) for iv-style.

	Panel D: MDR_t								
Sys-GMM	Aluminium	Steel	Heavy-cons	Delivery	M-transport	Auto	Brewers	Distil & vin	So-drink
Cons	.0295 (0.33)	-.0261 (-1.00)	-.0046 (-0.51)	1.4774 (0.19)	-.1569 (-0.98)	.0668 (1.81)*	.0017 (0.01)	.0302 (0.54)	.1096 (4.98)***
MDR_{t-1}	1.0399 (13.83)***	1.0618 (13.87)***	.9736 (22.41)***	-1.7298 (-0.14)	.8847 (3.12)***	.7990 (9.87)***	.9053 (3.05)**	.6473 (2.40)**	.8272 (10.34)***
AR(1)	-3.00***	-3.68***	-3.05***	.	-1.31	-3.33***	-2.37**	-1.67*	-2.47**
AR(2)	0.68	-0.00	0.96	.	-0.96	-1.77*	-0.17	0.12	0.22
Hansen [P-value]	9.02 [1.000]	42.01 [0.111]	51.59 [0.016]	1.56 [1.000]	13.68 [0.993]	28.21 [0.659]	0.25 [1.000]	11.33 [1.000]	13.15 [0.999]
Inst	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2
Inst No	41	41	41	40	38	41	41	41	41
Obs	136	896	1745	58	94	400	94	130	170
	Panel D: MDR_t								
	Food prod	Home-cons	Healthe	Biotech	Drug retail	BR-retail	Bro & Ent	Airlines	Gmable
Cons	.0207 (1.38)	.0191 (0.41)	.0268 (1.06)	-.0051 (-0.41)	.0096 (0.19)	-.0133 (-0.32)	.0834 (2.68)***	-.0195 (-0.19)	-.0398 (-1.42)
MDR_{t-1}	.8572 (13.02)***	.9320 (9.99)***	.7619 (6.25)***	.7931 (7.28)***	1.080 (8.20)***	.9599 (15.60)***	.5978 (5.38)***	.7291 (1.64)	.7883 (8.52)***
AR(1)	-6.18***	-3.33***	-3.56***	-4.32***	-2.02**	-2.81***	-3.15***	-1.51	-3.39***
AR(2)	-0.92	1.33	-2.77***	-0.56	-0.96	-0.89	0.72	-0.53	0.08
Hansen [P-value]	39.61 [0.167]	32.05 [0.464]	31.31 [0.502]	35.92 [0.290]	11.62 [1.000]	32.56 [0.439]	28.73 [0.633]	1.81 [1.000]	27.71 [0.683]
Inst	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2
Inst No	41	41	41	41	41	41	41	40	41
Obs	2010	391	490	1420	132	322	513	93	389

Table A.5.72 Continued

Note, MDR_{t-1} is instrumented in Panel D. The options of small robust small and twostep are used for xtabond2 command, and the sub-options of eq(level) and laglimits(1 2) for gmm-style, and eq(level) for iv-style.

	Panel D: MDR_t								
	Hotels	Travel	Fixed tel	Mobil tel	Com-serv	Internet	Software	Com-hard	Semicon
Cons	.0644 (0.52)	-.0084 (-0.98)	.0054 (0.18)	.0929 (2.36)**	.0259 (2.42)**	.0477 (2.46)**	.0328 (4.63)***	.0112 (1.12)	.0524 (4.13)***
MDR_{t-1}	.9532 (5.26)***	.7837 (7.70)***	.8155 (11.40)***	.5659 (7.30)***	.7564 (10.40)***	.4080 (3.30)***	.6808 (11.51)***	.7347 (9.84)***	.6620 (9.48)***
AR(1)	-1.80*	-1.54	-2.39**	-1.30	-3.97***	-2.21**	-6.29***	-6.46***	-7.08***
AR(2)	-0.06	1.06	-0.92	-0.81	1.1	-0.77	1.50	0.52	3.15***
Hansen [P-value]	9.85 [1.000]	9.89 [1.000]	25.33 [0.792]	17.29 [0.957]	31.37 [0.498]	14.77 [0.872]	32.35 [0.449]	48.72 [0.029]	58.94 [0.003]
Inst	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2
Inst No	38	40	41	38	41	31	41	41	41
Obs	120	106	273	135	1209	457	3430	2073	3143