UNIVERSITY OF SOUTHAMPTON

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Capital structure, asset redeployability, top-management compensation and credit risk measurements: The impact of the on and off-balance sheet financing

by

Quyen Do Nguyen

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ABSTRACT

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CAPITAL STRUCTURE, ASSET REDEPLOYABILITY, TOP-MANAGEMENT COMPENSATION AND CREDIT RISK MEASUREMENTS: THE IMPACT OF THE ON AND OFF-BALANCE SHEET FINANCING

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With the existence of loopholes in the accounting rules, firms have been able to keep many assets and their corresponding debt off the balance sheets, thus, hiding the true value of debt and firm financial risk (Ketz (2003), Franzen et al. (2009) and Koller et al. (2010)). Graham and Leary (2011) point out that one of the noticeable gaps in the capital structure research area is the mis-measurement of leverage when off-balance sheet financing is excluded. Therefore, this thesis bridges the mis-measurement gap by adjusting leverage for three important off-balance sheet debt equivalents and two on-balance sheet ones. Moreover, this study investigates the relationships between asset redeployability, top-management compensation and both adjusted and non-adjusted leverage as well as examines whether these on and off-balance sheet debt equivalents are reflected in credit risk measurements. Focusing on large US firms from 1996 to 2010, my results show that the off-balance sheet debt equivalents account for significant amounts over total reported debt. Also, there is a considerable gap between reported debt and adjusted debt for debt equivalents, and this gap seems to increase sharply over time. I suggest that these debt equivalents should be considered carefully; otherwise, firms' financial health can be misinterpreted. In addition, I document different results for adjusted and non-adjusted leverage which indicates that existing theories related to the conventional capital structure might not be able to give the same explanations to the adjusted one. Moreover, credit risk measurements do not incorporate all of these debt equivalents in their credit risk assessments; which implies that the market may not be fully aware of the importance of these debt equivalents.

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Declaration of Authorship

I, Quyen Do Nguyen , declare that the thesis entitled:
Capital structure, asset redeployability, top-management compensation and credit risk measurements: The impact of the on and off-balance sheet financing
and the work presented in the thesis are both my own, and have been generated by me as the result of my own original research. I confirm that:

- this work was done wholly or mainly while in candidature for a research degree at this University;
- where any part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution, this has been clearly stated;
- where I have consulted the published work of others, this is always clearly attributed;
- where I have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work;
- I have acknowledged all main sources of help;
- where the thesis is based on work done by myself jointly with others, I have made clear exactly what was done by others and what I have contributed myself;
- none of this work has been published before submission

Signed: Quyen Do Nguyen

Date: November 2014

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Chapter 1

Introduction

Since the seminal work of Modigliani and Miller (1958) about the relevance of capital structure, much research has focused on testing the implication of the three main theories: the trade-off theory, the pecking order theory and the agency theory. The trade-off theory states that firms choose their leverage that optimally balances between costs (such as financial distress costs, shareholder-bondholder agency conflicts) and benefits (such as tax savings, mitigated manager-shareholder agency costs). Whilst, the pecking order theory of Myers and Majluf (1984) states that firms follow a financing hierarchy in their capital structure choice so as to minimise the adverse selection costs of security issuance. The agency theory stems from the fact that the interests of firms' managers and its shareholders are not perfectly aligned. Jensen and Meckling (1976) argue that corporate managers will act in their economic self-interests and tend to seek higher-than-market salaries, perquisites and job security. As a result, the choice of capital structure is also dependent on the agency problem.

Although capital structure has received much attention in research over the last few decades, there still remain some shortcomings. Graham and Leary (2011) review the extant empirical research on capital structure and report a list of distinctive shortcomings. The very important shortcoming that comes first in the list is the mis-measurement of capital structure itself. Standard measures of leverage usually exclude non-debt liabilities from the numerator; as a result, firms with more non-debt liabilities appear to be less levered (see Welch (2011)).

In fact, this mis-measurement is caused by the loopholes in the existing accounting rules, which have allowed for firms to keep many assets and their corresponding debts off the balance sheets, making the true value of debt hidden (Ketz (2003)). Instead of recognizing these assets and their corresponding debts, firms may record just the rental and transaction fees in the statement of income and may only realize the values when transactions are exercised. Indeed, the real nature of these transactions is merely disclosed in the companies' financial reports' footnotes (Koller et al. (2010)). Lander and Auger (2008) find that companies may take advantage of rules-based accounting to accomplish off-balance sheet financing in many ways. They suggest that regulatory bodies need to ensure more transparency by closing these loopholes and exercising better enforcement of accounting standards.

Managers have certain incentives to hide firms' true value of debt from the balance sheets that are publicly available to the investors. The reason is that they know that investors and creditors investigate firms' debt when evaluating the capital structure on the balance sheets. In addition, not everyone is fully aware of off-balance sheet financing. According to Ketz (2003), if investors and creditors perceive that firms' debt level is too high, they will require higher cost of capital that compensates for the higher risk that they are bearing. As a result, firms might have difficulty in raising capital. Therefore, to obtain the needed capital at a lower cost, managers are tempted to distort the accounting numbers in their balance sheets.

According to the estimation by the Securities and Exchange Commission, the total undiscounted non-cancellable future cash flow obligations related to operating leases for US companies are roughly about \$1.25 trillion (SEC (2005)). Franzen et al. (2009) report the pronounced trend from 1980 to 2007 (over the last 27 years) that shows the mean value of off-balance sheet operating leases (as a percentage of total debt) increases by 775%. Apparently, off-balance sheet financing has been increasingly used over the last decades, and it can be ascertained that companies' financial health and risk can be deliberately understated if we do not consider these debt equivalents carefully.

Firms can hide their debt in several ways. Ketz (2003) documents that corporate managers can hide debt using the equity method, lease accounting, pension accounting and special-purpose entities. Rampini and Viswanathan (2010) and Rauh and Sufi (2010) propose to include the capitalised value of operating leases in debt measurement. Cronaggia et al. (2012) report that the role of leases has increased over time, and these increased operating leases appear to substitute for debt usage. Koller et al. (2010) analyse operating leases, pension liability and securitised receivables as the off-balance sheet debt equivalents and suggest including them in firms' debt to avoid omission biases in calculating financial ratios. However, the choice of debt equivalents to add up to debt in order to truly measure financial gearing remains quite controversial. In this study, I focus on the three main off-balance sheet financing items such as operating leases, stock options and pension liability. Moreover, two on-balance sheet items such as preferred equity and minority interest are also taken into account.

The first objective of this thesis is to bridge the mis-measurement gap of financial leverage. This is done by taking into account the above-mentioned on and off-balance sheet debt equivalents in the numerator of the leverage ratio (measured by total debt over total assets) to reflect the true value of debt. This adjustment is not only the main contribution throughout my thesis but also serves as a new contribution to the capital structure research area.

In addition to the shortcomings in leverage mis-measurement, the collateral role of asset redeployability in helping firms to access finance remains quite controversial. It is argued that the more deployable the assets are, the easier the creditors can repossess the assets in case of default and, as a result, firms can increase their borrowing capacity. Tangible assets are believed to be more desirable from the perspective of creditors since they have alternative uses and are easier to be redeployed in the event of financial distress (Williamson (1988)). However, the question is which component of the tangible assets contributes to the collateral role if tangible assets act as a core determinant of financial leverage. The recent study by Campello and Giambona (2010) is the first study that attempts to examine the impact of each component in the overall tangible assets on capital structure. Their findings show that land & building have consistently significant positive partial impact on leverage (using different estimators).

Contrarily, intangible assets, which are unique assets such as brand names, resources, skills, know-how, relationships and investments, are argued to be less desirable for creditors because they are less redeployable and are only redeployed in the likelihood of bankruptcy. Shleifer and Vishny (1991) point out that even unique assets can be liquid. They take brand names as an example and argue that these intangible assets are good collaterals as they can be easily resold despite their unique use. I also argue that intangible assets are an important driver of capital structure and that intangible assets have a certain impact on creditor's financing decision.

Therefore, the second objective of this thesis is to examine the collateral roles of corporate assets (both tangible and intangible) in granting firms' access to finance. Besides, to the best of my knowledge, there is no research that examines these collateral roles of assets with adjusted leverage for the on and off-balance sheet debt financing items. Therefore, these findings also make new contributions to the capital research area.

The third objective of this thesis is to investigate some core managerial compensation packages to see whether they play an active role in monitoring managers not to deviate from firm value-maximizing goals. Jensen and Meckling (1976) argue that some managers are likely to entrench themselves against corporate governance and control mechanisms including active monitoring and compensation incentives and pursue their interests. Managers, who are involved in the leverage decision-making process, are unable to diversify their human capital. As a consequence, in order to reduce their human capital risk, they tend to reduce firms' risk by lowering leverage under its optimal point (Fama (1980)).

Agency theory also suggests that managerial incentives, equity ownership and active monitoring from the board contribute to the alignment of interest between managers and shareholders. Although the relationships between compensation schemes, equity ownership, active monitoring and capital structure have long been established in theory, few empirical research has been done, and most of the investigation periods are not up-to-date (Mehran (1992), Berger et al. (1997) and Brailsford et al. (2002)). Moreover, none of these studies has considered the on and off-balance sheet debt equivalents in their leverage measurement. Thus, this thesis also aims at fulfilling this research gap.

The last but not least objective of this thesis is to find out whether and how much the public in general and the credit rating agencies in particular are aware of these hidden debt equivalents. Except for expert financial analysts, not everyone else bothers to recalculate all the accounting numbers to achieve the true value of debt even if some of them might be aware of these debt equivalents' existence. Instead, most of the investors or creditors may either rely on the corporate credit risk assessment provided credit rating agencies, bond ratings or credit default swaps (CDS). Some of them may opt for the traditional way, such as Merton distance to default risk or a user-friendly way, such as Altman's Z-score to measure corporate default risk. However, regardless of their popularity, the market has become more sceptical about the validity of these credit risk measurements due to the existence of accounting scandals and especially the occurrence of the financial crisis in 2007. Companies such as Eron, WorldCom, Global Crossing, Adelphia were involved in the scandals related to the under-reporting of corporate liabilities. Obviously, if these credit risk measurements were trustworthy enough, these accounting scandals and the financial crisis would have been predicted and prevented.

This thesis focuses on the top 50 large US listed companies with highest revenues each year from 1996 to 2010 (according to the Fortune 500 ranking system), excluding inactive, financial institutions and insurance companies. The final total number of companies in this research is 103 large firms, making 750 firm year observations. The reason for choosing this sample size is that the off-balance sheet debt equivalent items and some other key variables in this study are manually collected from the companies' footnotes of the financial statements (aka form 10-K in sec filings) and their proxy statements (aka form DEF 14 in sec filings). These hand-collected variables are either unavailable on sources like Bloomberg or Datastream or are available for only a few years with a lot of missing data. Therefore, this thesis possesses a unique data set that is not available elsewhere, and the quality of the data set is significantly improved since the problem of missing data is controlled. The rest of the variables (that are not hand collected) are extracted from Bloomberg. The final dataset used in this study is the unbalanced panel data with gaps. In addition, it can be acknowledged that the survivorship bias is controlled in this study since the list of the firms is not narrowed down to the survivors in 2010 to collect the data backwards to 1996. Instead, this list was regularly updated from 1996 onwards, based on two criteria as the top 50 highest revenue and the availability of data.

Bates et al. (2009) argue that US firms can pay back their debt. However, my result shows that the reality is not that optimistic. I document that the off-balance sheet debt equivalents account for a substantial amount in comparison with reported debt. Among the debt equivalents, capitalised operating leases, stock options and pension liability account for large proportions over total debt (on average 64%, 43% and 27%, respectively). After adjusting for debt equivalents, my thesis reports a significant increase in leverage by 24% for market value and 23% for book value of leverage. Thus, I strongly suggest that off-balance sheet debt should be taken into thorough consideration to truly reflect financial conditions of firms.

From the second chapter which investigates the relationship between asset redeployability and capital structure, my findings show that overall tangible assets are important collateral for firms to get access to adjusted debt. In contrast, as for conventional debt, the collateral role of these assets is statistically insignificant. Contradicting with a recent study by Campello and Giambona (2010), the decomposition of assets fails to explain their partial impacts on both firms' adjusted and non-adjusted leverage. In fact, other tangibles (including net plant and equipment in progress and other miscellaneous tangible assets) is found to have a negative impact on firms' adjusted debt. Nonetheless, my results indicate the fact that large firms may exploit their reputation, brand names, relationships and other intangible assets to increase their debt capacity. Put differently, along with the standard financial assessment procedures, which are based on financial ratios and credit ratings, creditors may also rely on other factors such as long time relationship with firms, corporate brand names and reputation to decide whether or not to finance them.

The third chapter which examines the impact of top-management compensation on corporate capital structure, shows that as for non-adjusted leverage, cash bonuses and equity-based bonuses are important factors for the board of directors (BOD) when considering non-adjusted leverage while, for CEO, equity-based bonuses have a stronger impact in their decision-making process. The consistent negative relationships between top-management compensation and non-adjusted leverage indicate that managers seem to entrench themselves against non-diversifiable human capital risk. Moreover, I also document the alignment of interest between managers and shareholders. In addition, this chapter shows that active monitoring helps prevent managers from deviating from value-maximizing financing decision. Also, managers tend to increase conventional debt when they face the threat of takeover.

Nonetheless, when adjusted leverage for the on and off-balance sheet debt equivalents are taken into consideration, these compensation packages fail to explain both the BOD's and CEO's choice of adjusted leverage. After controlling for serial correlation and endogeneity problems, BOD's equity-based bonuses and CEO's cash bonuses have more explanatory power over adjusted leverage. These findings show that for adjusted leverage, managerial entrenchment and non-diversifiable human capital risk hypotheses help to explain the BOD and CEO's decisions in adjusted capital structure.

Moreover, in this chapter, I also developed the new agency proxies of which I take into account the ratios of off-balance sheet debt equivalents over total assets (in both MV and BV) under hidden agency cost 1 (for MV) and hidden agency cost 2 (for BV), respectively. I document consistent negative relationships between hidden agency cost 1 and 2 with both MV and BV of conventional leverage although only hidden agency cost 2 has statistical explanatory power over non-adjusted leverage. These findings indicate that apart from other prominent determinants of leverage, hidden agency costs also act as crucial determinants of firms' financial gearing. The higher amount of off-balance sheet debt, the lower firms' conventional leverage and vice versa; which implies the fact that managers might have their ways of shifting debt around, making firms less levered. Obviously, firms' financial health can be seriously misinterpreted if these debt equivalents are ignored. As a result, information asymmetry exists among managers and shareholders, which makes the agency problem worse.

The fourth chapter investigates whether the on and off-balance sheet debt financing items are reflected in the credit risk measurements. My results show that not all of the debt equivalents are reflected in the credit default swaps (CDS) and credit ratings. In fact, CDS spreads incorporate minority interest, capitalised operating leases and stock options in their credit risk assessment yet leave out preferred equity and more importantly pension liability. Credit ratings seem to be worse in reflecting these debt equivalents since only capitalised operating leases are incorporated in their credit risk assessment. Nonetheless, this is not a surprising result because credit ratings are documented to be a poor predictor of corporate failure (Hilscher and Wilson (2013)). Additionally, in this chapter, I also adjusted two credit risk measurements such as Merton distance to default risk and Altman's Z-score to better reflect the on and off-balance sheet financing. My results document a minor difference between conventional and adjusted Merton distance to default, whilst, adjusted Altman's Z-score is significantly different from the conventional one.

This thesis follows a three paper-based approach. Chapter 2 analyses the impact of overall tangible assets as well as intangible assets on capital structure (both conventional and adjusted leverage). In addition, it also looks into the decomposition of tangible assets and examines the collateral role of each component in granting firms' access to finance. Chapter 3 studies the impact of top-management compensation on managers' choices of both non-adjusted and adjusted leverage. Chapter 4 investigates whether the credit risk measurements incorporate the on and off-balance sheet debt equivalents in their credit risk assessment. Finally, Chapter 5 summarises the research results and the contributions of the whole thesis. It also presents the limitations of this thesis and suggests the directions for future research.

Chapter 2

Asset redeployability and capital structure: The impact of the on and off-balance sheet financing

Abstract

Focusing on large US firms, this research examines the redeployability of both tangible and intangible assets in facilitating firms' access to finance. I first look into overall tangible assets and then decompose them into categories such as land & building, machinery & equipment and other miscellaneous tangible assets to test whether these assets have same propensity to generate collaterals for firms' financing. Furthermore, I adjusted capital structure for the on and off-balance sheet debt equivalents (i.e., preferred equity, minority interest, pension liability, capitalised operating leases and stock options) to fully reflect the value of debt. Besides, these debt equivalents were manually collected and carefully processed to improve the quality of data. I document a noticeable gap between firms' adjusted and non-adjusted (conventional) leverage and suggest that ignoring these debt equivalents can be seriously misleading. Overall tangible asset redeployability is found to serve as a collateral only for adjusted leverage. Moreover, my research findings show that intangible assets have significant impacts on large firms' gearing as they possess comparative advantages such as reputation, brand names and relationships over small firms.

2.1 Introduction

Companies' assets can be used as collaterals to lenders and thus help facilitate firms' access to finance (Hart and Moore (1998), Rajan and Winton (1995) and Inderst and Mueller (2007)). It is argued that the more deployable the assets are, the easier the creditors can repossess the assets in case of default and as a result, firms can increase their borrowing capacity (Williamson (1988) and Hart and Moore (1998)). Tangible assets are believed to be more desirable from the perspective of creditors since they have alternative use and are easier to be redeployed in the event of financial distress (Williamson (1988)). The ability of an asset to create debt capacity varies depending on its redeployability, which is reckoned to be higher for less firm-specific assets (for instance "hard" tangible assets such as land and building) (Williamson (1988), Shleifer and Vishny (1992)). The recent study by Campello and Giambona (2010) documents that the redeployability of tangible assets is the core determinant of corporate capital structure. On the contrary, intangible assets, which are unique assets (such as brand names, relationships, resources, skills, know-how and investments), are argued to be less desirable for creditors because they are less redeployable, and only redeployed in the likelihood of bankruptcy. However, Shleifer and Vishny (1991) state that even unique assets can be liquid when high valuation buyers are willing to pay the prices. As a result, intangible assets also have collateral role in corporate financial gearing.

Recently, the mis-measurement of leverage has become an outstanding shortcoming in empirical research (Graham and Leary (2011)). This mis-measurement of debt can be caused by excluding certain debt equivalents, which involve both the on and off the balance sheet financing items. According to Koller et al. (2010), over the past 20 years, the existing accounting rules has allowed firms to keep many assets and their corresponding debt off the balance sheets, thus, hiding the true value of debt. Instead of recognizing these assets and their corresponding debts, firms may record just the rental and transaction fees in the statement of income and may only realize the values when transactions are exercised (Koller et al. (2010)). Indeed, the real nature of these transactions is merely disclosed in the financial reports' footnotes.

Welch (2011) points out that standard measures of leverage usually exclude non-debt liabilities from the numerator, therefore, ceteris pirabus, firms with more non-debt liabilities appear to be less levered. However, the choice of debt equivalents to add up to debt in order to truly reflect the value of financial gearing remains quite controversial. Rampini and Viswanathan (2010) and Rauh and Sufi (2010) propose to include the capitalised value of operating leases in debt measurement. Cronaggia et al. (2012) show evidence that the role of leases has increased over time and these increased operating leases appear to be a substitute for debt usage. Koller et al. (2010) consider operating leases, pension liability and securitized receivables as the off-balance sheet items. They suggest including these debt equivalents in firms' total debt to avoid omission biases in calculating financial ratios.

In this chapter, I focus on examining the role of asset redeployability (both tangible and intangible assets) in determining large US firms' borrowing capacity from 1996 to 2010. Particularly, due to the increasing concern about leverage mis-measurement, I developed a new measurement for leverage (adjusted leverage, hereafter) which adjusts for the on and off-balance sheet items (aka debt equivalents). These debt equivalents are identified as preferred equity, minority interest, pension liability, capitalised operating leases and stock options. Pension liability, capitalised operating leases and stock options were only disclosed in the footnotes of the companies' financial statements and were not available during the research period 1996 to 2010 (partly or wholly) through secondary data sources such as Bloomberg or Datastream. Therefore, to carry out these adjustments, I manually collected certain numbers of key variables from companies' financial statements. By doing this, I created a unique data set for this thesis. Furthermore, the quality of the data set was significantly improved through manual data collection because the problem of missing data was controlled.

Among the debt equivalents, capitalised operating leases, stock options and pension liability account for large proportions of total reported debt. On average, capitalised operating leases, stock options and pension liability account for 64%, 43% and 27% over total debt, respectively. After adjusting for debt equivalents, my findings report a significant increase by 24% for the market value of leverage and 23% for the book value of leverage. In this chapter, I examine the relationships between asset redeployability and both non-adjusted as well as adjusted leverage.

It is commonly argued that assets that are less firm-specific allow firms to borrow more as it is easier to resell these assets, especially to the other firms in the same industry (Shleifer and Vishny (1992)). However, Acharya et al. (2007) document that tangible assets often lose value when they are liquidated. Also, most of empirical studies merely focus on the redeployability of overall tangible assets which are measured by plant, property and equipment (PP&E) (Rajan and Zingales (1995), Mackay and Gordon (2005), Faulkender and Petersen (2006), Kale and Husayn (2007) and Lemmon et al. (2008)). This poses a question of whether each category in the tangible assets has the same collateral role as the whole tangible assets in helping firms get access to finance. Motivated by the recent study of Campello and Giambona (2010), I decomposed tangible assets into categories such as land and building (L&B), machinery and equipments (M&E) and other miscellaneous tangible assets (Other Tangibles).

My research findings show that the redeployability of tangible assets has no explanatory power for non-adjusted leverage while there is a positive relationship between tangible assets and adjusted leverage. Put differently, the redeployability of tangible assets is an important factor in facilitating firms' access to adjusted debt. In terms of assets decomposition, I only document the negative partial impact of other miscellaneous tangible assets on adjusted leverage. The overall tangibility and the decomposed assets do not have explanatory power for non-adjusted leverage. These results contradict the study by Campello and Giambona (2010), however, their research period differs from mine in the way that they look into two periods as 1984-1996 and 1971-2006 and they include firms of different sizes in their sample.

Although intangible assets might be more firm-specific and less redeployable (Williamson (1988) and Shleifer and Vishny (1992)), they help position firms in the market and promote their image and reputation, especially for large firms. I would argue that in addition to evaluating firms' financial health by their financial ratios, credit ratings and tangible assets collaterals, creditors sometimes rely on their intuition, which is based on firms' intangible assets (such as long time business relationships between the creditors and firms, firms' brand names and firms' reputation) to make lending decisions. In some cases, creditors even rely on their intuition more than other credit assessment procedures. In other words, intangible assets may have indirect impacts on creditor's decision making process whether to finance firm.

Shleifer and Vishny (1991) argue that even unique assets can be liquid. They take firms' brand names as an example and suggest that these intangible assets are good collaterals as they can be easily resold despite their unique use. Thus, it can be said that intangible assets contribute to firms' borrowing capacity. In fact, my study shows that intangible assets have significant positive impact on both non-adjusted and adjusted leverage (both market and book value). These results indicate that not only "hard" and more redeployable assets such as tangible assets can improve firms' debt capacity but also "soft" assets and less redeployable such as intangible assets can serve as firms' collaterals for finance.

I use fixed effects regression for my main models. Besides, in terms of the robustness check, I compare fixed effect results with ordinary least square regressions (OLS) and generalized methods of moment by Arellano and Bond (1991) (system one-step and two-step estimators, denoted GMM1 and GMM2, respectively). In general, I document that OLS tend to provide more statistically significant results and these findings are in line with theories. However, when I hold firm and time effects fixed, the results tend to lose their explanatory power and in some cases the fixed effect regression results contradict with OLS results. After controlling for serial correlation and endogeneity using GMM1 and GMM2, I conclude that overall our fixed effects regression results are consistent with GMM1's and GMM2's results with minor biases. Therefore, my findings are robust to problems such as omitted variables, heteroskedasticity, multicollinearity, serial correlation and endogeneity.

The structure of this research is presented as follows. Section 2.2 summarises some prominent theories of capital structure, identifies debt equivalent financing, synthesizes literature on the impact of asset redeployability on capital structure and analyses major empirical determinants of capital structure. Section 2.3 reports the data collection process in details. Section 2.4 describes the empirical models used in this research. Section 2.5 reports the findings for the on and off-balance sheet financing. Section 2.6 analyses the research results and provides the result robustness. The final section 2.7 concludes the research.

2.2 Literature review

2.2.1 A recap on some prominent capital structure theories

2.2.1.1 The Modigliani and Miller theorem

Capital structure choice and its impact on firm value can be explained by many theories. The first and foremost one is the Modigliani and Miller theorem with two famous propositions. These propositions are based on certain assumptions that have been thoroughly explained by Copeland et al. (2005) as follows: (1) Capital markets are frictionless; (2) Individuals can borrow and lend at the risk-free rate; (3) There are no bankruptcy costs; (4) Firms only issue risk-free debt and equity; (5) All firms are assumed to have the same class of operating risk; (6) Corporate taxes are the only taxes levied by the government. There are no wealth taxes on corporations and there are no personal taxes; (7) All cash flows are perpetuities with no growth; (8) Corporate insiders and outsiders can access to the same source of information. Put differently, there is no signalling opportunities; (9) Managers always maximise shareholders' wealth, hence, there are no agency costs; (10) Operating cash flows are completely unaffected by changes in capital structure.

Modigliani and Miller (1958) define the total value of a firm (V) as the market values of the firm's debt (D) and equity (E). Proposition 1 states that capital structure does not matter in perfect capital markets. Their assumption is that all bonds (regardless of the issuers) yield a constant income per unit of time. Additionally, bonds and stocks are perfect substitutes for one another, which means they must sell at the same price. These assumptions imply that all bonds and stocks are perfect substitutes up to a scale factor and that all traders (households and firms) can borrow and earn at the same rate of return.

Modigliani and Miller (1958) Proposition 1 (no taxes) states that the firm value is constant regardless of changes in the proportions of D and E. Thus, financial leverage (debt financing) is irrelevant. This means whatever debt components (short-term or long-term) are used, they do not affect firm value. Moreover, the cost of capital of each firm is a constant, regardless of the debt ratio. The investors' expected rates of return in the firm's debt and equity securities are denoted as r_D and r_E , respectively. The weighted average cost of capital r_{WACC} is the expected return on a portfolio of firms' all outstanding securities (aka the discount rate or the hurdle rate for capital investment) and is calculated as follows:

$$r_{WACC} = \frac{r_D D}{V} + \frac{r_E E}{V} \tag{2.1}$$

According to Modigliani and Miller, the weighted average cost of capital (WACC) is a constant. Additionally, in case of financial distress, debt has a prior claim on firms' assets and earnings, thus, the cost of debt is always less than the cost of equity. Suppose we solve the equation 2.1 to get the cost of equity (r_E), we achieve:

$$r_E = r_{WACC} + (r_{WACC} - r_D)\frac{D}{E} \tag{2.2}$$

Equation 2.2 is Modigliani and Miller Proposition 2. It shows us the fact that the cost of equity increases with the market value of D/E ratio. The spread between r_{WACC} and r_D will decide how much r_E will increase. Modigliani and Miller Proposition 2 try to prove that "there is no magic in financial leverage". Any substitution of "cheap" debt for "expensive" equity fails to reduce the WACC because this substitution makes the equity just more expensive enough to compensate the cheap debt, thus, the WACC remains constant. Proposition 1 and 2 are further extended in the context of corporate taxation. Although this extension direction has no effect on Proposition 1, it reveals the tax shield advantage of debt on Proposition 2. The WACC in equation 1.2 after accounting for corporate tax, T_c, becomes:

$$r_{WACC} = r_D(1 - T_c)\frac{D}{V} + r_E\frac{E}{V} \tag{2.3}$$

Modigliani and Miller's propositions are now widely accepted as a theory. However, only when their assumptions hold, do firms' values remain the same. Otherwise, capital structure does matter and is affected by many determinants such as firms' assets, cash flows and growth opportunities and so on. Myers (2001) and Titman (2002) document that corporate taxes, financial innovation, information asymmetries and agency costs significantly affect firms' financial policies. Since the market perfection assumption does not hold in reality, alternative theories have come into existence to give better explanations of corporate capital structure. These theories will be discussed shortly in the following sections.

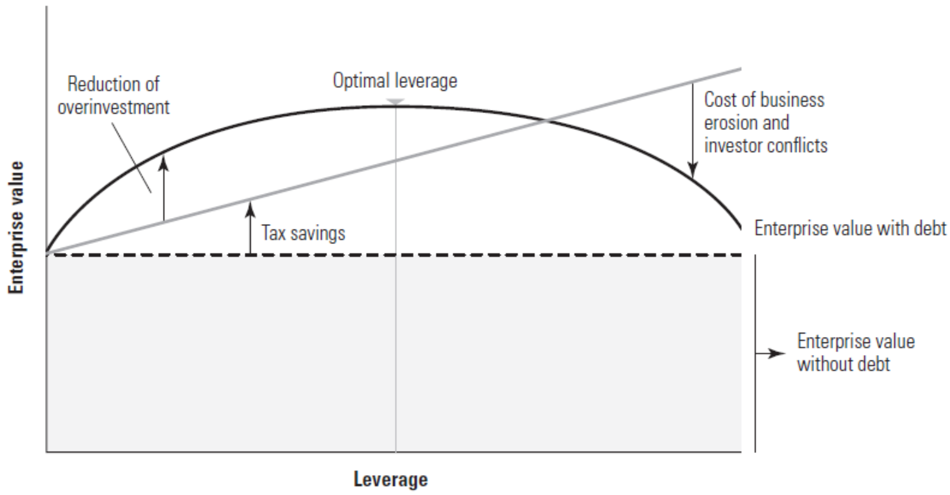
2.2.1.2 Trade-off theory

The trade-off theory can be viewed from both static and dynamic angles. From the static trade-off theory angle, Myers (1984) states that when firms determine debt ratio, they consider a trade-off between costs and benefits of borrowing. The costs of borrowing consist of the financial distress costs (Modigliani and Miller (1963)) and the agency costs (arising from the conflicts between bondholders and stockholders) (Jensen and Meckling (1976)). Whilst, the benefit of borrowing includes the value of interest tax shields (Modigliani and Miller (1963) - Proposition 2). Given these costs and benefit, firms have to balance their debt and equity structure so that the values of their firms are maximized. Firms therefore will borrow up to the level at which the marginal value of tax shields on additional debt is offset by the increase in the present value of possible costs of financial distress.

Bradley et al. (1984) document that the static trade-off theory stipulates firms to increase debt up to the level at which the utility of additional unit of debt equals the costs of debt. Firms try to reach this static optimal level of capital structure (aka target capital structure). In addition, the balance between the costs and benefits of borrowing are determined by the conflict between debt and equity holders. According to Jensen and Meckling (1976) and Jensen (1986), corporate debt has a disciplining impact on managers since it mitigates the free cash flow problems. As a result, debt also helps control managers' discretionary actions and prevents them from deviating from value-maximizing financing decision.

The static trade-off theory supports the view that optimal capital structure does exist. Myers (1984) states that a firm's optimal debt ratio is usually determined by a trade-off between the costs and benefits of borrowing, holding the firm's assets and investment plans constant. In this scenario, the firm balances the value of interest tax shields against the costs of financial distress. However, optimal capital structure is only defined as the level at which the value of the firm is maximised (Myers (1984)). He adds that there is a controversy about how to determine this optimal level.

Koller et al. (2010) suggest that the optimal capital structure can be achieved through a concave curve (see Figure 2.1). Basically, along with the increase of leverage, firm value also increases while it still captures the benefit of tax savings from interest payments and gains value from managers' discipline in avoiding overinvestment. However, when leverage continues to go up to the optimal level, firms begin to encounter the costs of business erosion and bankruptcy as well as the conflicts of interest among investors. In other words, beyond this optimal level, these costs start to outweigh the benefits which leads to the decrease in firm value.



Source: Koller et al. (2010)

Figure 2.1: Optimal capital structure

According to Koller et al. (2010), the optimal capital structure differs between companies, depending on their characteristics. They reason that the higher a firm's returns, the lower its growth and business risk, and the more redeployable its assets and capabilities, the more highly the firm should be levered. It is thus more likely for these firms to benefit from tax savings, because they have stable profits. Koller et al. (2010) also highlight that imposing discipline on their management is more important because for low-growth firms, the cost of over-investing is likely to be high. At the same time, the expected costs of business erosion are lower, because the firm's assets and capabilities have alternative uses; even after bankruptcy, the assets and capabilities would have significant value to the new owners.

On the contrary, Koller et al. (2010) argue that leverage should be lower for firms with lower returns, higher growth potential and risk, and less redeployable assets and capabilities. For these firms, the potential tax savings are small since their taxable profits are low in the short term. Management needs more financial freedom because investments are essential for these firms to capture future growth. Besides, due to the high growth, the uniqueness of their assets and capabilities, the expected costs of eroding business through high leverage are also high. In the case when such firms go into liquidation, they lose valuable growth opportunities, thus, any remaining assets and capabilities have very little value to the third parties. Examples of the most highly levered industries are steel, paper and cement while examples of the industries with the lowest leverage are software, biotechnology and high-tech start-ups.

From the dynamic trade-off theory angle, it is implied that the optimal target capital structure of companies adjusts over time and is a function of various changing endogenous and exogenous factors. Fisher et al. (1989) are the pioneers in developing a dynamic model of the trade-off theory. They formulate this theory of dynamic capital structure choice in the presence of transaction costs and document the relationships between firm leverage level ranges and firm specific effects. Ju et al. (2002) employ a dynamic capital structure model based on the contingent claims method and show that firms' actual leverage levels are consistent with the trade-off theory. Hennessy et al. (2005) analyse a dynamic trade-off model with endogenous choice of leverage, distributions and real investment in the context of taxes, financial distress costs and equity flotation costs. However, they document no target leverage ratio. They also find that leverage is decreasing in lagged liquidity and that leverage is path dependent.

Frank and Goyal (2009) show that the dynamic trade-off theory has a good explanatory power for the relationships between different capital structure determinants and leverage. Their findings indicate that there are positive links between leverage and firm size, asset tangibility, expected inflation and industry median. Moreover, positive shocks to firms' profitability lead to an increase in equity and a decrease in debt. Besides, Frank and Goyal (2009) document that due to the transaction costs, firms do not adjust capital structure immediately; as a result, profitability and leverage are negatively related. Clark et al. (2009) also find the evidence of the dynamic trade-off theory. They document that firms partially adjust towards the target capital structures. Their sample consists of 26,395 firms from 40 different countries. Their findings show that legal, institutional and other country-level factors have significantly different impacts in the developed and developing countries. In particular, both strong creditors and shareholder rights are related with faster adjustment speed in the developing countries while they have no explanatory power in the developed countries. Additionally, financial market development and higher tax rates are also positively related with adjustment speed in the developing countries but have the negative relationship with adjustment speed in the developed countries.

2.2.1.3 Pecking order theory

Pecking order theory is initiated by Myers and Majluf (1984) and Myers (1984). Their assumptions include: (1) Financial markets are perfect except that investors do not have information related to the true value of existing assets and investment opportunity, thus, they cannot value the securities issued to finance new investment. In other words, asymmetric information exits in the perfect financial markets; (2) Managers act in the interest of existing shareholders by issuing new shares when the shares are overpriced, therefore benefiting existing shareholders. However, new shareholders, being aware of this possibility, also demand a discount on the new issued shares. Consequently, Myers and Majluf (1984) suggest that firms seeking to reduce information asymmetry costs have a preference of funding resources. Their decisions on their capital structure are actually based on the financing pecking order.

According to the pecking order theory, firms always prefer to use internal finance (i.e. retained earnings and depreciation) because internal financing does not include any information asymmetries. However, this internal finance is also used for dividends payout to shareholders and reinvestment in potential projects that can increase shareholder value as well. Firms gradually adapt their target dividend payout ratios to their potential investment opportunities. Simultaneously, dividend policies are “sticky” which means firms cannot cut dividends to finance other investment opportunities in the short run. Thus, when the internal cash flow is not enough, they have to resort to external source of finance. If external finance is required, firms issue debt first, then possibly hybrid securities such as convertible bonds. Equity is the firms’ last resort. The level of safe securities decelerates with this order of external finance.

The pecking order theory is very useful in explaining how different factors affect firms' choice in capital structure. For example many studies document that profitable firms seem to borrow less because their retained earnings are enough to cover their financial need (Bradley et al. (1984), Titman and Wessels (1988) and Hovakimian et al. (2001)). Besides, the pecking order theory can also explain the positive association between growth opportunities and leverage from the view of information asymmetry (Kester (1986)). Since managers act in the best interest of existing shareholders (Myers and Majluf (1984)), they tend to issue new equity when the share price is overvalued, which benefits the old shareholders. However, the new shareholders become alert with this signal and demand a discount on share prices to acquire new shares, which leads to very high costs of new share issue. To reduce this information asymmetry, Myers (1984) suggests that firms should follow the pecking order of financing. Therefore, firms with high growth opportunities (positive investment opportunities) will be prone to use debt more than equity.

2.2.1.4 Agency theory

The agency theory stems from the fact that the interests of firms' managers and its shareholders are not perfectly aligned. Jensen and Meckling (1976) argue that corporate managers (i.e. the agents) will act in their own economic self-interests and tend to seek higher-than-market salaries, perquisites and job security. In some extreme cases, they will look for direct capture of firms' assets or cash flows. Therefore, agency costs are inevitable in corporate finance. Jensen and Meckling (1976) argue that firms' executive compensation, ownership structure and corporate control mechanisms are interrelated. They suggest that managerial equity ownership can reduce managers' desire in pursuing perquisites, expropriating shareholders' wealth and engaging in other non-maximizing activities. However, managers' control increases together with the increase in managerial equity ownership. At some levels, managers' entrenchment occurs and the control of external shareholders on managers' performance becomes weak. As a result, managers' opportunism to pursue their own interests increase. However, this pursuit of self-interest is limited to certain points as managers are exposed to substantial risk when their share ownership also increases significantly. Thus, they have incentives to decrease firm leverage as the result of their convergence of interest with shareholders.

Although investors can monitor and control those problems by including supervision of independent directors or offering managers compensation schemes, perfect alignment between their interests is out of the question in both theory and practice. Shleifer and Vishny (1989) add that managers favour "entrenching investments" which adapt firms' assets and operation to managers' skills and knowledge and increase their bargaining power against investors. Jensen (1986) highlights the context of the agency problem in the presence of free cash flows where managers invest cash below the cost of capital or waste it on organizational inefficiencies. To solve this problem, he proposes debt as an important tool to force managers to generate and pay cash out. In other words, debt issuance prevents managers from diverting free cash flow to pursue personal interests at the expense of shareholders.

Berger et al. (1997) present evidence that leverage only increases in the aftermath of entrenchment-reducing shocks to managerial securities such as unsuccessful tender offers, involuntary CEO replacements and the addition to the board of major stockholders. Contrarily, the studies by Harris and Artur (1988) and Stulz (1988) document that entrenchment may stipulate managers increase leverage beyond the optimal point so as to increase the voting power of their equity ownership significantly and reduce the possibility of takeover attempts. In addition, another possible explanation for an increase in leverage is that entrenched managers sometimes use excessive financial gearing as a defensive device that signals a commitment to increase firm value in the case of corporate restructuring.

The agency conflict between managers and shareholders can also be explained from the perspective of risk exposure. Since shareholders can diversify their investment portfolios, they may only concern about firms' systematic risk. In contrast, corporate managers may be more worried about firms' total risk because a substantial proportion of managers' wealth is derived from firms' specific human capital, in which their positions are non-diversifiable (Fama (1980) and Amihud and Lev (1981)). Thus, the managerial self-interest hypothesis highlights that managers, who have non-diversifiable human capital in the firm, have incentives to reduce their non-diversifiable employment risk by ensuring the continued viability of the firm.

Friend and Lang (1988) suggest that one of the ways to reduce managers' non-diversifiable human capital risk is to reduce firms' debt holdings. Put differently, the high level of debt increases the risk of financial distress which results in managers' loss of employment, lower earnings capacity, intensive cut in performance based compensation and damage in managers' professional reputation (see Eliot (1972) and Fama (1980)). According to the study by Gilson (1989), when firms face financial distress, top executives have high probability of losing their jobs. Moreover, none of these managers is placed in top positions at other publicly traded firms within three years after being fired. In addition, his study documents the cost of financial distress for managers' non-diversifiable human capital.

Agency theory can also be viewed from the conflicts between debt holders and equity investors. These conflicts arise only when there is a risk of default. If debt is totally free from the risk of default, debt holders are neither interested in firm income nor firm value. However, if there is a feasibility of default, shareholders gain when the value of existing debt falls, even when firm value is constant because equity is a residual claim (see Myers (2001)).

Suppose that managers acts in the interest of stockholders and there is a risk of default, the managers will be tempted to transfer value from firms' creditors to their stockholders. Myers (2001) suggests this can be done in several ways: (1) Managers can shift to investing in riskier assets. Higher risk brings higher return for stockholders, yet higher risk of default to creditors; (2) Manager may continue to increase borrowings and pay out cash to shareholders. Although the market value of the existing debt declines, the cash received by shareholders is more than the decline in their shares value; (3) Managers can cut back equity-financed investments. They only invest up to a certain point where the expected return is equal to the cost of capital to deter the shifting of additional positive net present value of investments to the existing creditors. Myers (1977) addresses these problems as "underinvestment" or "debt overhang" problems; (4) Managers may conceal the risk of default to prevent creditors from taking immediate actions of speeding firm bankruptcy or reorganizing firms. Being aware of these matters, debt investors try to protest by creating debt covenants. These contracts can restrict additional borrowings, limit dividend payouts or other distributions to stockholders. Furthermore, in case of debt covenant violation, firms are required to pay back immediately.

The conflicts of interest between debt holders and stockholders contribute significantly to the trade-off theory in the way that they expand other possible agency costs rather than bankruptcy costs or transaction costs. Other costs are associated with certain above-said agency problems such as risk-shifting from shareholders to debt holders, underinvestment or debt hanging problems. After all, these agency problems make a great contribution in explaining firms' choice of capital structure.

2.2.2 Capital structure and debt equivalent financing

Firms' off-balance sheet financing can take various forms. In this study, I include the main off-balance sheet items such as capitalised operating leases, stock options and pensions liability. I also include on-balance sheet financing items as preferred equity and minority interest and treat them as debt equivalents together with the above-mentioned off-balance sheet financing.

2.2.2.1 Preferred Equity

Ross et al. (2003) define preferred equity as a share that is issued by corporations, and that provides the holder with fixed dividend in perpetuity. They argue that preferred stock has the features of both debt and equity. On the one hand, preferred shares pay a fixed, periodic preferred dividend to shareholders, which represents the similar characteristic of fixed income securities. Preferred shareholders receive a stated dividend only, and in case of corporate liquidation, preferred shareholders get a stated share value. On the other hand, similar to equity, preferred share also represents the ownership investment. For all these reasons, Ross et al. (2003) imply that preferred stocks seem like debt; however, unlike debt, preferred stock dividends cannot be deducted as interest expense when determining taxable corporate income. Put differently, interest expense is tax deductible for debt while dividend expense is paid with after-tax profit. As a result, tax savings on interest expense makes debt financing less expensive than preferred equity financing. In addition, the interest of debt holders is paid first; then the preferred dividend holders are paid, followed by any profits for common equity holders. Therefore, preferred equity is more expensive than debt financing in terms of tax savings. It can be said that preferred equity is riskier than debt but less risky than equity.

Preferred equity is recorded in the mezzanine section for financial statement purposes. There are different arguments about whether to treat preferred equity as debt or equity of firms since preferred equity is hybrid financing which possesses the characteristics of both debt and equity. In the recent study by Ericsson et al. (2009), they consider preferred equity as a debt equivalent. They adjust leverage ratio (measured by total book value of debt over total market value of assets) by adding preferred equity to both the numerator and the denominator of the formula. Their result shows that adjusted leverage is a significant determinant of credit default swaps spreads both statistically and economically. Koller et al. (2010) argue that despite the fact that the name denotes equity, preferred equity in well-established companies resembles unsecured debt more closely. They indeed categorise preferred equity as one of the non-equity claims. Thus, I suggest that preferred equity serves as a component of debt and I treat preferred equity as one of the debt equivalents in this study.

2.2.2.2 Minority Interest

According to the statement of financial accounting standard No. 160, minority interest is the portion of equity ownership which belongs to non-controlling shareholders or subsidiaries and is not attributable directly or indirectly to the parent companies (Morgan et al. (2010)). A minority interest is also known as a non-controlling interest. These subsidiaries or shareholders generally own less than 50% of parents' outstanding shares and have the right to claim their profits in the firms. Under the US accounting rules, the parent company has to consolidate the minority interest in its consolidated balance sheet to reflect the claim on assets that belong to the non-controlling shareholders. In addition, minority interest must be reported on the consolidated income statement as a share of profit that belongs to the minority shareholders.

International Financial Reporting Standards (IFRS) require firms to report minority interest in the equity section of the consolidated balance sheet. Contrarily, before 2007, the US Generally Accepted Accounting Principles (US GAAP) allow minority interest to be reported in the liability section, the equity section or the mezzanine section of the balance sheet. From 2007, under the statement of financial accounting standards No.160 and 141R, the Financial Accounting Standards Board (FASB) requires companies to classify minority interest under shareholder equity and not liabilities, or mezzanine sections (see FASB-N160 (2007) and FASB-N141R (2007) for evidence). Although minority interest is reported in the equity section, it does not belong to the parent company. It is indeed the debt equivalent that the parent company owes to the non-controlling shareholders. Koller et al. (2010) also categorise minority interest as one of non-equity claims. Therefore, in this study, I treat minority interest as one component of the debt equivalents.

2.2.2.3 Pension Liability

So as to build up employees' loyalty and goodwill, companies set up pension plans to provide benefits to employees after their retirement. Pension plans are agreements between the employers and the employees of which, under pre-specified conditions, the employers provide cash payments for the employees when they retire (Ketz (2003)). In addition to pensions, companies also promise other postretirement benefits such as health plans to their employees. To protect the workers' rights of receiving pensions, the Congress passed the Employee Retirement Income Security Act (ERISA) in 1974. The ERISA then created the Pension Benefit Guaranty Corporation (PBGC). This PBGC's responsibility is to make sure that companies contribute at least certain minimum amounts (specified by the PBGC and ERISA) to their different types of pension plans (Ketz (2003)).

There are two types of pension plans: (1) defined contribution plan and (2) defined benefit plan. SEC (2005) reports that the accounting treatment for defined contribution plans is straightforward and does not have off-balance sheet implications. Once the employer contributes a predetermined amount to the pension plan, the employees will incur any future risk or reward generated by this plan. In contrast, the accounting treatment for defined benefit plans is quite complicated and requires a considerable number of estimations and assumptions. The employer has an obligation to make sure that the employees receive their predetermined benefits after retirement. Therefore, companies frequently set up separate legal entities, such as trusts, to manage and invest pension funds (for example in stocks, bonds and other investments). The ERISA requires these investments to be placed into low-risk assets so that the employee pension funds are protected (Ketz (2003)). The employer has control over these trusts but simultaneously has an obligation to fund the pension benefits. Put differently, the employer bears the risk when these trusts' assets under-perform but gains the profits when these assets outperform (SEC (2005)).

Before 2006, under FIN No. 46(R) (FASB (2003)), companies are not required to consolidate employees' benefit plans. Instead, defined benefit pension plans and other post-retirement benefits plans are merely reported off the balance sheet. As a result, the company that has an overfunded plan in the past but is currently experiencing a shortfall may continue to show overfunded pension assets for many years, even though, in reality, a large liability may exist (Koller et al. (2010)). However, since the issuance of the new accounting standard - SFAS No. 158 (effective after 15 December 2006, FASB (2006)), companies are required to report either net recognized accumulated plan assets (if overfunded) or liability (if unfunded) on the balance sheet. This information can be found in the mezzanine section of the balance sheet. The remaining information of pension benefits plans is still disclosed in the financial statement footnotes. Koller et al. (2010) report that despite this change in the accounting standards, the idiosyncrasies of pension accounting still distort operating profitability and might be manipulated by managers to enhance margins artificially.

In the footnotes of the financial statements, pension obligation is presented in two types of measures (SFAS No. 87 – FASB (1985)): (1) Accumulated benefit obligation (ABO) which is the present value of the amounts expected to be paid to employees during retirement based on accumulated service and current salary and (2) Projected benefit obligation (PBO) which is the present value of the amounts expected to be paid to employees on retirement based on accumulated service to date, but using the level of salary expected to serve as a basis for computing pension benefits. In other words, ABO bases on the assumption that the salary stays constant over time while PBO assumes that salary increases along with the employee's years of service with the company.

The report of SEC (2005) states the cost of funding future benefit payments is determined by employee's age, length of service, retirement date, expected mortality, the trends in medical costs, interest and inflation rate. Once assumptions are made about these determinants; the estimated cost of future payments is then discounted to the present value and used as a starting point. It can be acknowledged that these assumptions are not constant over time, and the actual employee's length of service in the company also changes over time. However, SFAS No. 87 does not require companies to recognise changes in pension obligation estimates on the balance sheet or the income statement until the obligation becomes due (FASB (1985)). As a result, companies may have "unrecognised" gains or losses from its pension obligations. Since companies can decide when to recognise their gains and losses at their discretion, they may smooth their earnings. SFAS No. 158 addresses the issues of changes in assumptions and requires companies to report periodic changes (gains and losses) in the value of their benefit obligations or plan assets in the "other comprehensive income" section of the financial statement (FASB (2006)).

According to Ketz (2003), debt does matter, and that includes pension liabilities. Given the large amounts of money that are involved in pension plans, he suggests that the investment community should have the right understanding of what pension accounting is really about and how business enterprises hide these financial commitments off their balance sheets. However, pension obligations have not received sufficient attention. As a matter of fact, there are quite a few studies that investigate unfunded pension liabilities. Dhaliwal (1986) finds that unfunded vested pension obligations are viewed as a form of debt by the capital market participants when assessing firm risk. He also adjusts leverage by adding pension liabilities to both the numerator and the denominator of the leverage ratio (measured by the ratio of total debt to total equity) and concludes that this adjustment improves the explanatory power of the model. Thomas and Niehaus (1998) examine the relationship between defined benefit pension plans and corporate debt ratings. They document that unfunded pension liabilities reduce debt ratings more than an equivalent amount of excess pension assets increase debt ratings. In addition, they suggest that unfunded pension liabilities are corporate liabilities that compete with debt claims. Koller et al. (2010) demonstrate the ways to treat pensions and other postretirement benefits properly. They suggest that excess pension assets should be treated as non-operating assets and unfunded pension liabilities should be treated as a debt equivalent.

SEC (2005) estimates that 16% of US companies sponsor defined benefit pension plans are having plan assets of approximately $1.12 trillion and plan obligations of $1.32 trillion, which suggests that the pension plans of these companies are unfunded by a net amount of approximate $201 billion. The PBGC reports that within only one year from 2000 to 2001, unfunded pension liabilities increased four times, from $26 billion to $111 billion (Chen (2002)). This significant increase in pension obligations foreshadows some potential problems in US firms. It will be misleading if we ignore this amount of pension liability. Therefore, in this study, I look into the firms' pension benefit plans (both defined benefit pension plans and postretirement benefit pension plans) and treat their pension liabilities (unfunded pension plans) as one of the core debt equivalents. In addition, since my research period is from 1996-2010 with major changes in accounting standard related to reporting and adjusting pension costs, thus, to be consistent over time, I do not take pension costs into account when calculating pension liabilities.

2.2.2.4 Capitalised Operating Leases

Among the off-balance sheet items, operating leases have received the most attention as a predominant component of debt in leverage ratio (Walker (1992), Lim et al. (2003), Ge (2006), Lander and Auger (2008) and Franzen et al. (2009)). As a matter of fact, operating leases serve as the prevalent item of off-balance sheet financing and as one of the largest sources of corporate financing (Ge (2006)). The report of the Securities and Exchange Commission - SEC (2005) estimates that the total undiscounted non-cancellable future cash flow obligations due to operating leases for US companies are about $1.25 trillion. The recent study by Franzen et al. (2009) show the pronounced increase of the mean of off-balance sheet operating leases (as a percentage of total debt) over the last 27 years (from 1980 to 2007); which increased by 775%.

Operating leases differ from capital leases in the way that the lessor maintains the ownership of the assets while as for capital leases, there is a transfer of assets ownership just like assets financed by conventional debt (Franzen et al. (2009)). In terms of capital leases, both lease liabilities and assets are recognised on the balance sheet. On the contrary, for operating leases, debt is not reported on the balance sheet but only the periodic rent expense is recorded on the income statement (Ketz (2003) and Ge (2006)).

In addition, the payments of operating leases are recorded as rental expenses and minimum rental expenses due within five years are disclosed in the footnotes of financial statements (Lim et al. (2003)). Graham et al. (1998) document that operating leases account for a much larger part of corporate capital structure in comparison to capital leases. The reason for this is because since the implementation of SFAS No. 13[1] on leases, firms structure the terms of most operating leases to avoid balance sheet recognition (Imhoff and Thomas (1988)). According to Franzen et al. (2009), if lease assets were brought onto the balance sheet, average debt-to-capital ratios would increase by 50-75% over their sample period of 27 years from 1980 to 2007. They imply that there seems to be a significant benefit for managers to keep these non-cancellable obligations off the balance sheet.

There are different opinions about whether operating leases should be brought on to the balance sheet from the footnotes of the financial statements. The first reason for their staying off the balance sheet is that limited attention is paid to operating leases

[1] Statement of Financial Accounting Standards No. 13 (FASB-N13 (1976))

as people are not fully aware of their importance (Hirshleifer and Teoh (2003)). Ge (2006) documents that investors seem to underestimate the implications of off-balance sheet operating leases for firms' future earnings. As a result, a long-short investment strategy that exploits this mis-estimation of the investors generates significant future abnormal stock returns. Besides, it is quite costly for firms to process the information, and there might be discrepancies in the reliability of the recognised (on the balance sheet) and disclosed information (in the footnotes) related to operating leases (Aboody (1996), Davis-Friday et al. (1999) and Barth et al. (2003)). Furthermore, firms also enjoy tax benefits from operating leases; as these tax shields are transferred from lessors to lessees (Graham et al. (1998)). In fact, Miller and Bahnson (2008) document that reputable accounting firms help their clients to structure lease arrangements specifically to remain off their balance sheets intentionally.

Recent studies have been looking at operating leases from different perspectives. Graham et al. (1998) investigate the relationship between operating leases and costs of bankruptcy. They document that operating leases are positively related to the costs of bankruptcy. They also report a negative relationship between operating leases and pre-financing marginal tax rates, which indicates that operating leases transfer tax shields. In other words, the higher the companies' propensity to lease assets, the less tax they have to pay. Lim et al. (2003) document that firms may be able to manage credit ratings by using off-balance sheet debt. Put differently, moving debt off the balance sheet might be useful in maintaining higher debt ratings. However, they highlight that the market cannot be fooled by off-balance sheet debt, as it is reflected in bond yields despite its limited disclosure. In addition, their study suggests that operating leases obligations are of comparable magnitude to on-balance sheet debt.

Ge (2006) shows that after he controls for current earnings, greater off-balance sheet operating leases lead to lower future earnings. The study also documents a negative relationship between operating lease activities and stock returns. Franzen et al. (2009) report that the benefit of the accounting treatment for off-balance sheet operating leases is a significant determinant of corporate capital structure. They show that conventional debt ratios decrease with an increase of operating leases. Moreover, the increase in off-balance sheet leases is largely in addition to, not in lieu of, on-balance sheet debt. They highlight that due to the long-term and non-cancellable obligations of operating leases, risk metrics such as conventional debt and coverage ratios, conventional levered equity beta, Z-scores and adjusted Z-scores (which ignore the off-balance sheet obligations) can no longer capture financial risk fully.

To reflect the present value of operating leases, operating leases must be capitalised (Koller et al. (2010)). There are different ways to do it. The most common approach is to compute the present value of the required lease payments, which are disclosed in companies' footnotes. Although this approach is suggested by Standard and Poors (S&P), it systematically undervalues assets as this approach ignores the residual value at the end of the lease contract (Lim et al. (2003)). Graham et al. (1998) apply the truncated S&P approach and compute the present value of non-cancellable operating leases (OPLEASE) according to the following formula.

$$OPLEASE = RentExp_0 + \sum_{t=1}^{5} \frac{MLP_t}{(1+K_d)^t} \tag{2.4}$$

where $RentExp_0$ is the current year rental expense, MLP_t is the minimum lease payments (t=1,...,5 years) and K_d is the cost of debt capital.

With the Formula 2.4, Graham et al. (1998) set the cost of capital equal to 10%. Lim et al. (2003) report that this measurement underestimates the non-cancellable operating leases liability because it ignores the commitments beyond five years which is disclosed in the financial statement footnotes as a sum of "thereafter" commitments only from fiscal year 2000. Ge (2006) includes these "thereafter" commitments and recomputes the present value of operating leases after fiscal year 2000 according to the following formula.

$$OPLEASE = RentExp_0 + \sum_{t=1}^{5} \frac{MLP_t}{(1+K_d)^t} + \sum_{t=6}^{6+Addyrs} \frac{EMPL_t}{(1+K_d)^t} \tag{2.5}$$

where Addyrs is thereafter minimum lease payments/MLP_5 and $EMPL$ is thereafter minimum lease payments/Addyrs. Nevertheless, Ge (2006) documents similar results compared with the Formula 2.4 of Graham et al. (1998).

The second approach to calculate the asset value of non-cancellable operating leases is the perpetuity method (see Lim et al. (2003) for more details). In this method, the rental expense is divided by the cost of debt. However, it is said that this method overvalues leased assets as it assumes assets have infinite lifetime. As a result, the perpetuity method understates the denominator and overstates the asset value. In addition, many companies in the investment banking sector use the method of multiplying rental expense by a certain capitalisation rate (Koller et al. (2010)). A "rule of thumb" for this capitalisation rate multiplier is 8, which is based on the assumptions of the depreciation adjusted perpetuity with a cost of debt of 6% and an asset life of 15 years. Nonetheless, the cost of debt and asset life deviate in reality, therefore, this method should be carefully considered if used.

Koller et al. (2010) recommends the estimation process using rental expense, the cost of secured debt and estimated asset life. This method is widely used in the industry. Koller et al. (2010) presents this process with the argument that to compensate the lessor properly, the rental expense includes compensation for the cost of financing the asset (at the cost of secured debt–k_d) and the periodic depreciation of the asset (straight-line depreciation is assumed). The periodic rental expense is calculated based on the following formula.

$$Rental\ Expense_t = Asset\ Value_{t-1}(k_d + \frac{1}{Asset\ Life}) \tag{2.6}$$

To estimate asset's value, Koller et al. (2010) rearrange the equation 2.6 as follows:

$$Asset\ Value_{t-1} = \frac{Rental\ Expense_t}{k_d + \frac{1}{Asset\ Life}} \tag{2.7}$$

Lim et al. (2003) propose estimating asset life using property, plant and equipment (PP&E) divided by annual depreciation. They examined 7,000 firms of all sizes over 20 years and computed the median asset life at 10.9 years. To be in line with the industry capitalisation method, I used the method suggested by Koller et al. (2010) to capitalise operating leases in this study.

2.2.2.5 Stock Options

An option is a contract giving its owner the right to buy or sell an asset at a fixed price on or before a given date (Ross et al. (2003)). As for firms, stock options give firms the obligations to sell stocks to option holders at an agreed-upon price within a certain period or on a specific date (put options). On the contrary, option owners have the right, not the obligation to buy firm's stocks (call options). Option holders exercise the options only if it is advantageous to do so; otherwise the options can be forgone. There are two scenarios: (1) If the exercise/strike price is lower than the market price, option holders will obviously exercise their call options; (2) If the exercise/strike price exceeds the market price, option holders have the right to forgo their call options. In either case, firms have to fulfill their financial obligations with the option holders.

In fact, stock options possess debt features. Most stock options have relatively long maturity. Moreover, they contain the time value; thus, the exercise prices remain lower than the market price at expiry date. As a result, option holders will opt for exercising their options. Robert (1980) argues that the presence of stock options outstanding affects the measurement of the denominator of the leverage variable, regardless the form of the variable used. He also adds that stock options are potentially significant sources of leverage measurement error. I also believe that stock options are corporate debt equivalents and must be considered in the measurement of firms' leverage.

Stock options can be valued over time using Black-Scholes and the binomial option pricing models ((Black and Scholes (1973) and (Cox et al. (1979))). Black and Scholes (1973) develop the formula to price firms' options over time based on the following assumptions: (i) options exercising is assumed to occur at a single point in time, (ii) stock price volatility, dividends and risk-free interest rates are assumed to remain constant over the term of the option. They carry out empirical test of this valuation model and conclude that the actual prices at which options are bought and sold deviate in certain systematic ways from the values predicted using the Black-Scholes pricing model. Option buyers pay consistently higher prices compared to predicted values. Nevertheless, option writers receive the same price as the predicted price using the pricing model. They explain the transaction costs in the market are large and covered by option buyers, so the remaining portion is about the same as the predicted value.

Unlike the Black-Scholes option pricing model, the binomial model proposed by Cox et al. (1979) allows firms to adjust for stock volatility, black-out periods and forfeiture rate over time, which reflects particular situations of firms. The model is based on the performance of the underlying instrument over a period of time rather than at a single point. During my research period, large US firms apply both valuation methods although the Black-Scholes pricing model is utilised more often than the binomial model.

2.2.3 Capital structure and asset redeployability

The redeployability of assets affects the value of collaterals, which in turn affects a firm's access to finance (Williamson (1988), Titman and Wessels (1988), Rajan and Winton (1995), Braun (2002), Hege and Mella-Barral (2005), Inderst and Mueller (2007)). It is said that the redeployability of assets is an important factor in helping firms to get access to finance. The redeployability of assets depends on many factors such as the nature of assets, transaction costs, the industries, and information available for buyers and sellers (Shleifer and Vishny (1992), Kiyotaki and Moore (1997) and so on). On the one hand, tangible assets are argued to be easier to repossess in the likelihood of bankruptcy (Hart and Moore (1994)); thus, tangible assets are more desirable collaterals for creditors. On the other hand, intangible assets (including brand names, know-how and so on) are believed to be more difficult to be redeployed (Klein et al. (1978) and Williamson (1988)). However, Shleifer and Vishny (1991) argue that despite their uniqueness, intangible assets can be liquid when they are traded by interested buyers. Therefore, intangible assets also serve as good collaterals.

A lot of tangible assets are sold by financially healthy firms to raise cash to either invest or acquire some assets while many other tangible assets are redeployed by firms in financial troubles. Redeploying tangible assets is one of the alternative ways of financial restructuring. Others include debt rescheduling, equity issuing to the public or obtaining fresh loans. These forms of financial restructuring are costly to corporations. For example, rescheduling debt may create a free rider problem (Gertner et al. (1990)). In this situation, some bondholders hold on to their bonds and wait for better deals from firms as they believe it takes time to get unanimous consent to firms' rescheduling offers from all bondholders. Thus, this situation causes difficulties for firms in completing their debt rescheduling. This problem can be mitigated by offering more senior security to bondholders in exchange for public debt (with shorter maturity or if available, with cash). Nonetheless, even when these offers help firms restructure debt profitably, they do not generally result in efficient investment. As a result, rescheduling debt is very costly for firms. Equity issuing to the public also faces asymmetric information problems, whereas stockholders believe that only overvalued firms issue equity (Myers (1984)). Ultimately, this equity issuance also results in high costs to firms.

Among the financial restructuring forms, asset redeployability seems to be the most outstanding one. The first reason is that buyers of the assets are better-informed of the assets' true value than buyers of new public equity. This is especially applied to buyers and sellers in the same industry. Obviously, both sides can solve the problem of asymmetric information as they both have the advantage of their expertise in the industry. The second reason is that since buyers have sufficient information about the assets, they possess excessive control over the assets. Thus, the agency costs can be reduced. It can be seen from these features of assets sales that asset redeployability is a significant tool in financial restructuring in particular and capital structure allocating in general.

Recent studies have contributed greatly to the insight of the relationship between tangible and intangible assets and borrowing constraints. For instance, Hart and Moore (1994) document that the changes in asset tangibility over time can explain the maturity structure of debt. In their later research, they argue that to some extent, financiers do rely on the liquidation of assets when evaluating borrowing capacity of borrowers (Hart and Moore (1998)). Kiyotaki and Moore (1997) exploit the dynamic interaction between asset prices and credit constraints to study persistence, amplification and spillover effects of macroeconomic shocks.

In a theoretical framework, Shleifer and Vishny (1992) examine the asset redeployability and endogeneity of asset liquidation value in the context of industry equilibrium. They document that if the assets are industry-specific their values become endogenously determined because asset liquidation may strike a lot of firms in the same industry at the same time. This causes limits in the redeployability of assets and therefore, reduces the liquidation value of assets. According to Rajan and Winton (1995), assets that slowly depreciate in value serve as collaterals that reduce the supervision need of lenders to borrowers. This is because different collateral differentiates different favourable priority structure for the collateralised loan.

Moreover, Inderst and Mueller (2007) develop a theoretical framework in which collateral may enhance arm's-length financing. They highlight that collaterals mitigate inefficient credit decisions when soft information is critical since they make debt less sensitive to the variations of cash flow. These authors also stress that greater competition from lenders may increase loan requirements for borrowers. Consistent with previous studies, Hege and Mella-Barral (2005) document the availability of collateralisable assets may also affect the debt structure, especially when firms possess strong bargaining power against banks. These results highlight how collateral affects financial decisions of firms.

However, these studies do not differentiate tangible assets and do not clarify the role of financial constraints on the importance of collateral.

A lot of other studies, when testing different capital structure theories, incidentally present evidence for a positive relationship between asset tangibility and firm leverage (for example Rajan and Zingales (1995), Shyam-Sunder and Myers (1999), Fama and French (2002), Frank and Goyal (2003) and Lemmon et al. (2008)). Braun (2002) argues that tangible assets play an important part in countries with weak financial systems since incomplete financial contractibility limits firms' access to financing sources. His research mainly focuses on legal elements, uses industry-level and cross-country data. Other studies consider institutional factors and highlight that when agency risk is present, non-specific assets should be carefully considered (see Liberti and Mian (2005) and Qian and Strahan (2007) for evidence).

Many other researchers have highlighted the importance of unique assets, resources, skills, relations and investments as the primary sources of a firm's competitive advantage (Barney (2007), Lippman and Rumelt (1982), Montgomery and Wernerfelt (1988) and Rumelt (1999)). Assets specially attached to the firm's strategy and technology can reduce costs, improve quality and enable one firm to differentiate its products and services from those of its competitors. Such firm-specific assets, especially intangible assets like R&D, brand name and other reputational investments may be difficult for outsiders to monitor and evaluate because they are less redeployable to other uses than tangible assets. According to Klein et al. (1978), Williamson (1975) and Williamson (1988), secondary markets for such assets may not value them as much as the firm and sometimes these markets may not even exist. Besides, intangible assets are usually redeployed in the occurrence of, or an increase in the likelihood of financial distress.

However, in the decision making process, creditors sometimes rely on their relationships with firms or base their decisions on factors such as firms' reputation, brand names rather than purely rely on credit assessment procedures. In some cases, these intangible factors even outweigh other criteria; this is true for large firms. Shleifer and Vishny (1991) argue that even unique assets can be liquid when they are traded by investors who are willing to pay for prices close to the values of the unique assets. Examples are fashion and food brand names such as Gucci or Moet-Chandon; these brand names are very liquid as they have many potential buyers. Shleifer and Vishny (1991) highlight that in the 1980s, some intangible assets were extremely liquid due to a large number of interested buyers. As a result, these assets serve as good collaterals despite their unique use. It can be said that intangible assets may also help facilitate firms to access finance.

All in all, asset tangibility has been widely studied as the overall independent variable. However, hardly any of these studies separate the components of tangible assets to test their ability to grant firms' access to finance. Therefore, in this study, tangible assets will be firstly investigated as the overall tangibility; then, they will be decomposed into components (such as land & building, machinery & equipment and other tangibles) to examine the impact of each asset component on leverage ultimately. Furthermore, to reaffirm the intangible assets' impact on capital structure, the relationship between intangible assets and leverage is also taken into account.

2.2.4 Other empirical determinants of capital structure

2.2.4.1 Firm size

Firm size is measured by the natural logarithm of sales. The relationship between firm size and leverage is quite controversial. The trade-off theory and the pecking order theory provide two opposite arguments that support this relationship. According to the trade-off theory, firm size is expected to be positively related with leverage. The rationale behind this is that as a function of the size, large firms are prone to greater debt capacity. Additionally, due to size, large firms have certain advantages over small ones. For example, Titman and Wessels (1988) document that small firms face higher transaction costs when issuing long-term financial instruments while large firms can approach capital markets more easily at the lower costs. Byoun (2008) argues that larger firms, which are generally more transparent, have greater debt capacity, therefore, can spread the issuing costs.

Moreover, large firms might be more diversified; thus, the bankruptcy risk and the financial distress costs for large firms are less than small firms (Titman and Wessels (1988)). Ozkan (1996) proposes that small firms use less leverage because they are more likely to be liquidated in case of financial distress. Marsh (1982) indicates that large firms use more long-term debt in their capital structure while small firms prefer short-term debt. He also adds that large firms enjoy the economies of scale and creditworthiness in issuing long-term debt and have more bargaining power over creditors in comparison with small firms. Hence, large firms can get access to borrowings at more favourable interest rates (Ferri and Jones (1979)).

On the contrary, the pecking order theory suggests a negative relationship between firm size and financial leverage due to the problem of information asymmetry. Rajan and Zingales (1995) argue that large firms operate under less information asymmetry circumstances and tend to disclose more information to the capital markets. Thus, large firms are more capable of issuing equity and as a result, they should have lower debt in their capital structure. However, in their research, they fail to document the negative relationship between firm size and leverage in most of countries in the G7 group. Additionally, they fail to show evidence that large firms issue more equity than debt. Kester (1986) also documents a negative association between gearing and firm size although this result is not statistically significant. Nevertheless, the recent study of Campello and Giambona (2010) shows a significant negative link between firm size and leverage. Therefore, my hypothesis is as follows:

H6: Leverage is positively related with firm size(supported by the trade-off theory) and is negatively related with firm size (supported by the pecking order theory).

2.2.4.2 Growth opportunity

The pecking order theory predicts a positive relationship between growth opportunity and leverage. This positive relationship can be indirectly explained from the asymmetric information between managers and investors. Myers and Majluf (1984) state that since managers act in the best interest of existing shareholders, they have a tendency of issuing new equity when the share price is overvalued, which benefits the old shareholders. However, this tendency becomes so familiar with new shareholders that they take shares issuance as a signal of overpriced shares automatically. Consequently, they demand a discount on share prices to acquire new shares, causing the very high costs of share issuance as a result of asymmetric information. Therefore, managers avoid issuing new equity even if this means they have to forgo profitable investments.

To reduce this information asymmetry, Myers (1984) suggests that firms should follow the pecking order of financing. In this order, firms would resort to internal funding such as retained earnings or depreciation first. When this resource becomes unavailable, firms should turn to debt as the second choice. Firms only take new equity as a last resort in the financing preference. Therefore, firms with high growth opportunity (positive investment opportunities) will be prone to use debt more than equity; thus, their leverage should be positively related with growth opportunity. This positive relationship is documented in the study by Kester (1986).

Contrarily, agency theory assumes that managers are opportunistic and try to maximise their value at the shareholders' expense. In this scenario, firms with few investment opportunities and excess cash flows would increase debt to discipline opportunistic managers' behaviours (Jensen (1986) and Stulz (1990)). Myers (1977) argues that firms with growth opportunity should use less debt in order to mitigate agency problems. Therefore, an inverse relationship between growth opportunity and leverage is expected. In fact, most of the studies document the negative link between growth opportunity and leverage (Myers (1977), Titman and Wessels (1988), Chung (1993), Lasfer (1995), Rajan and Zingales (1995), Barclay and Smith (1996) and Chen et al. (1997)).

There are different proxies for growth opportunity, for example capital investment over total assets or research and development scaled by sales (Titman and Wessels (1988)), 5-year average of sales growth (Wald (1999)) and Tobin's Q (market-to-book ratio of total assets) (Rajan and Zingales (1995)). It can be said that sales growth is the past experience while Tobin's Q is a better proxy for future growth opportunity. Thus, I use Tobin's Q to measure growth opportunity in this study. My hypothesis is as follows:

H7: Leverage can be positively related with growth opportunity (supported by the pecking order theory) and can be negatively related with growth opportunity (supported by the agency theory).

2.2.4.3 Earnings volatility

Earnings volatility is calculated as the ratio of standard deviation of EBITDA over the book value of total assets. According to the pecking order theory, to reduce the probability of issuing new risky securities or foregoing profitable investments when net cash flows are low, firms with high earning volatility are likely to have less debt in their capital structure. Similarly, the trade-off theory suggests firms should balance between costs and benefits of debt to maximize firm value. Firms with high earnings volatility may face the risk of getting fewer earnings to compensate financing commitments, eventually, face the risk of financial distress. As a consequence, an inverse relationship between earnings volatility and financial leverage is predicted by both theories.

Although earnings volatility can be explained by theories, empirical research usually fails to find strong evidence for this relationship. Most of the studies document insignificant mixed results (Antoniou et al. (2002), Antoniou et al. (2008), Taub (1975) and Titman and Wessels (1988)). Due to the nature of my data (unbalanced with gaps), I measured the earnings volatility of the industry instead. I took the standard deviation of EBITDA of 10 firms with largest market capitalisation in the industry using five consecutive years of observation divided by the book value of total assets of same firms in the same industry over the same time horizon. I hypothesise:

H8: Leverage is negatively related with earnings volatility (supported by both the pecking order theory and the trade-off theory).

2.2.4.4 Profitability

The impact of profitability on leverage receives no consensus and can be predicted based on different theories. According to the pecking order of financing by Myers and Majluf (1984) and Myers (1984), retained earnings are always the first resources that firms mobilise. Titman and Wessels (1988) propose profitability as a significant capital structure determinant because it reflects firms' possible amount of retained earnings. Fama and French (2002) suggest that profitability has a negative partial impact on leverage. At a certain level of investment, firms will first use their retained earnings to finance their projects. Only when investment needs exceed retained earnings, do firms issue debt. This negative relationship is also documented in the studies by Toy et al. (1974), Kester (1986), Bennett and Donnelley (1993), Ozkan (2000) and Bevan and Danbolt (2001).

However, the trade-off theory suggests a positive relationship because when profitability declines, the risk of financial distress increases and the threat of bankruptcy costs may force less profitable firms to lower their leverage targets (Fama and French (2002)). In addition, due to the disciplinary role of debt and the advantage of interest tax shield, profitable firms should be more levered (Jensen (1986), Frank and Goyal (2003), Wu and Yue (2009)). I measure profitability as the ratio of EBITDA over the book value of total assets. My hypothesis is as follows:

H9: Leverage is positively related to profitability (in accordance with the trade-off theory) and is negatively related to profitability (in accordance with the pecking order theory).

2.2.4.5 Payout ratio

Payout ratio is defined as total distributions (dividend + repurchases) over EBIT[2]. From agency theory viewpoint, the interests of managers are not in line with those of shareholders (Jensen (1986), Jensen and Meckling (1976)). In this scenario, managers have a tendency to waste free cash flows on perquisites and bad investments. Dividends and especially debt act as prominent roles in controlling these agency problems by forcing managers to pay out more firms' excess cash. However, dividends and debt do not align together but rather substitute for one another in controlling the agency problems. Therefore, the predicted association between payout ratio and leverage is negative.

From the pecking order theory point of view, the pecking order of financing should affect dividend decisions. Since it is expensive to finance investments with new equity issues, firms with large investment opportunities tend to use higher leverage. Dividends become less attractive to firms with few profitable assets, large investment opportunities and high leverage. Fama and French (2001) document that dividend payers tend to be firms with high earnings relative to investments. On the contrary, firms that do not pay dividends typically have large investments relative to earnings. Consistent with the agency theory, the pecking order theory predicts an inverse relationship between leverage and payout ratio. I hypothesise as follows:

H10: Leverage can be negatively related to payout ratio (according to both the agency and the pecking order theory).

[2]There are different procedures for estimating share repurchases. However, these estimations have some problems that may lead to the mis-measurement of payout ratio (Banyi et al. (2008) and Andriosopoulos et al. (2014)). To mitigate these measurement problems, share repurchases were hand-collected from the annual reports (form 10-K in SEC filings) of large US firms. Section 2.3.2.5 will provide more details.

2.2.4.6 Effective tax rate

The impact of effective tax rate on leverage also can be explained from different angles. On the one hand, the tax deductibility from corporate interest payments creates an incentive for firms with high tax liability to use more target leverage. Therefore, the relationship between effective tax rate and leverage should be positive (Modigliani and Miller (1963) and Haugen and Senbet (1986)). However, this positive relationship holds if and only if firms have sufficient amount of taxable income. On the other hand, Kremp et al. (1999) suggest the higher corporate tax rates are, the lower the internal funds become and the higher the cost of capital is. Consequently, internal capital and the demand for external financing decrease. This implies a negative link between debt and effective tax rate. Nevertheless, Titman and Wessels (1988) find no significant impact of effective tax rate on financial gearing. Based on the tax deductibility incentive for firms to use more debt, my hypothesis is:

H11: Leverage is positively related with effective tax rate.

2.2.4.7 Non-debt tax shield

Non-debt tax shield is computed as the ratio of annual depreciation expense to total assets (Titman and Wessels (1988)). Some investments might generate non-debt tax benefits for firms such as depreciation and R&D expenditures. These benefits are unrelated to the way firms finance their investments. However, they are tax deductible in the same way as interest on debt. Thus, they have an indirect impact on leverage. A large amount of non-debt tax shields reduces the expected value of interest tax shields, therefore, lessens the advantage of debt financing. De Angelo and Masulis (1980) construct a capital structure model where tax deduction for depreciation and investment tax credits serve as substitutes for the tax deduction for interest of debt financing. In other words, the larger the non-debt tax shields are, the smaller the taxable income is. As a result, these findings suggest leverage is negatively associated with non-debt tax shield. Hence, my hypothesis is:

H12: Leverage is negatively related with non-debt tax shield.

2.3 Data collection approaches

The data used in this research are secondary data collected from two main sources. The first source is the annual reports of the selective companies (manual/hand collection), and the second one is Bloomberg. The objective of combining these two sources of data is to enhance the quality of data and create a unique data set because the data extracted from Bloomberg are either not available or contain too many missing values. In this section, the process of manual data collection is briefly summarised. After that, the hand collection process of some key variables is described in details. Finally, data collection from Bloomberg is also reported. As manual data collection is very time-consuming and requires intensive work, the total number of observations in this study remains at 750 firm-year observations of 103 large US listed firms. These data are unbalanced panel data with gaps.

2.3.1 The process of manual data collection

The manual data collection is carried out due to wholly or partly the unavailability of the data. Some of the key variables in this study are either unavailable in sources such as Bloomberg or Datastream or partly available for some years only (with a lot of missing values). The reason for the unavailability of data is that these variables are merely disclosed in the footnotes to financial statements. As a result, to avoid missing data biases and to be able to have a sufficiently long research period of 15 years (from 1996 to 2010), I manually collected these key variables for my study. The manual data collection is executed in five steps as follows: (1) Variable identifying, (2) Company filtering, (3) Company report collecting, (4) Company report scanning and (5) Variables hand-collecting.

2.3.1.1 Variable identifying

Identifying variables is the first step in the manual data collection process. This step involves the availability of variables in sources such as Bloomberg or Datastream. After checking from those sources, if the variables are unavailable or if the variables are available with many missing values, those variables are put into a list for hand collection for each Chapter. For example, the data related to pension plans are available in

Bloomberg but only from 1999 and onwards; at the same time, many missing values are found. As a result, information related to pension plans is collected manually from the notes appended to firms' financial statements.

Another example is that information related to property, plant and equipment (PP&E) is available in Bloomberg for the research period from 1996 to 2010. Nonetheless, the decomposition of assets (including land and building, machine and equipment, other tangible assets in progress) is not available. Thus, these tangible assets components are hand collected. In addition, the data related to CEO's compensation are only available in Bloomberg from approximately 2000 and onwards. Whilst, the data related to board of directors' compensation, are merely available from 2006 and onwards. Nevertheless, these compensations are recorded as total compensations, without dividing them into packages. Therefore, these variables are also hand collected.

In total, as for Chapter 2, there are eight key variables that are manually collected for this Chapter, including operating leases, stock options, pension liability, PP&E, land and building, machine and equipment, other tangible assets in progress and equity repurchases. In terms of Chapter 3, another ten additional key variables are manually collected, including board of directors' (BOD) salaries, cash bonuses and equity-based bonuses (I hand collected these compensation packages of BOD as a whole and CEO in particular), CEO's tenure, BOD's stock ownership, management board size and management board composition. Chapter 4 again employs three manually-collected off-balance sheet financing items as operating leases, stock options, pension liability.

2.3.1.2 Company filtering

The second step of the manual data collection process is filtering the companies selected for this research. Due to the complexity and time-consuming features of manual data collection, the top 50 large US listed companies with highest revenues within a year are included in the sample of this study. The criteria of the highest revenue are based the Fortune 500 ranking list. I excluded financial institutions and insurance companies in this study. A list of 50 top listed large firms was filtered and updated continuously over the research window of 15 years from 1996 to 2010. This is because during the research period, some of these top 50 firms in the ranking list had either merger and acquisition (M&A) activities or went into liquidation. Besides, some firms' annual reports (for unknown reasons) were missing partly or wholly and are nowhere to be found. Some examples can be taken as follows: (1) due to missing information, Motorola was replaced by Fleming in 1997; Motorola was replaced by Dow Chemical in 1999; JC Penney was replaced by Delphi in 2002; (2) due to M&A activities, Chrysler was replaced by The Coca Cola Company and Mobil was replaced by Columbia Healthcare in 1998; Texaco was replaced by Dow Chemical in 2001; (3) due to bankruptcy, Enron was replaced by ConAgra Foods in 2001; Enron was replaced by International Paper in 2002.

As a consequence, the list of firms was updated regularly along with the manual data collection process and was only finalised when all information needed was available. The changes to the list were recorded in the excel files to keep full track of the manual data collection process. It can be acknowledged that the survivorship bias is controlled in this study since the list of the firms is not narrowed down to the survivors in 2010 to collect the data backwards to 1996. Instead, this list was regularly updated from 1996 onwards, based on the top 50 highest revenue and the availability of data. The final total number of firms is 103 listed firms, making 750 firm year observations for 15 years from 1996 to 2010. Table A.3 in Appendix A reports the list of US large firms and the years included in this study.

2.3.1.3 Company report collecting

Company report collecting is conducted together with the company filtering and company report scanning steps. This is because if these reports or the information related to key variables are not available, the list of companies must be readjusted and updated. There are two kinds of companies' reports that are used for this thesis: the annual reports and the proxy statements. As for Chapter 2 and 4, firms' annual reports are used while for Chapter 3, both firms' annual reports and proxy statements are mobilised. These reports are mainly collected from the U.S. Security and Exchange Commission website (www.sec.gov) for each company in every single year within 15 years from 1996 to 2010. Under SEC filings, companies' annual reports are marked as form 10-K and the proxy statements are marked as form DEF 14.

However, for unknown reasons, some of these reports do not fully contain all needed information; in fact, some of the reports from SEC filings merely reveal part of the statements. For instance, some annual reports only show information related to the consolidated financial statements and do not contain the notes of the financial statements. Thus, other sources such as companies' websites, Thomson Reuters are also exploited to collect these annual reports and proxy statements. The number of processed annual reports and proxy statements for the whole thesis totals up to 1500 reports.

2.3.1.4 Company report scanning

Company report scanning is carried out in conjunction with the companies filtering and companies' reports collecting steps. After collecting companies' reports, they are scanned to check whether the needed variables are disclosed in detail. If the information related to any variable is missing, I downloaded the reports from other sources and rechecked. At this stage, there are two scenarios. In the first scenario where the information is missing for the year of reporting but available in next year report (as annual reports show the current year of reporting and the two previous consecutive years), then the information is collected from the following year's report for that needed year. In the second scenario where the information is nowhere to be found, the company is replaced by another company. Again, this replacement company is chosen based on the Fortune 500 revenue ranking.

2.3.1.5 Variables hand-collecting

Variables hand-collecting is the last step in the process of manual data collection. In this step, each report is examined carefully to filter and find the necessary information. Although the availability of variables is checked in the companies' reports scanning step, when it comes to the hand collection stage, this problem can be re-encountered. I applied the same solution as described in Section 2.3.1.4 to deal with missing information problem. In addition, some other problems might also arise. For instance, the accounting rules change throughout the years, and the report disclosure styles alter during the research periods, etc. As a result, quick decisions and assumptions should be made continuously to ensure the conformity and consistency of the data throughout the research period. Details of how the variables are hand collected are described in Section 2.3.2. Each variable is collected from the notes appended to the financial statements and the proxy statement and recorded in the excel files for each chapter of the thesis. Where variables are discovered, the relevant pages are recorded for later checking; notes related to the decision making process are also taken for reference.

2.3.2 Demonstration of key variables hand collection

In this section, I will demonstrate how I manually collected the key variables for my thesis. I take General Electric Corporation as an example for consistency. Table 2.1 summarises the method the hand-collected variables were developed including the formula components and the formula used for variables calculation.

Table 2.1: A summary of hand-collected variables formulation

Off-balance sheet items	Formula components	Formula
Pension liability (PL)		$PL = DBPP + PBPP$
Defined benefit pension plans (DBPP)	PBO Fair value of assets (FVOA)	$DBPP = FVOA - PBO$
Postretirement benefit pension plans (PBPP)	APBO Fair value of assets (FVOA)	$PBPP = FVOA - APBO$
Capitalised operating leases (COL)		$COL = MNYR/[APTI + (1/20)]$
	Minimum next-year rental (MNYR)	
Average pre-tax interest rate (APTI)	Current interest expenses Current & previous year total debt	Current interest expenses/ Average total debt
Stock options (SO)		$SO = SO\ outstanding \times FV$
	SO outstanding (Year-end) FV per option (Black-Scholes/ Pro forma weighted average price)	
Property, plant and equipment (PPE)	Net PPE	$NetPPE$
Land and building (LB)		$NetLB = LB - (LB \times FAOD)$
	LB Fixed assets rate of depreciation (FAOD)	
Machine and equipment (ME)		$NetME = ME - (ME \times FAOD)$
Other tangibles (OT)		$NetOT = OT - (OT \times FAOD)$
Equity repurchases	Equity repurchases	Common stock decreases while treasury stock increases

Note: ME and OTs' formula components and calculation are the same as of LB's. The process of how the data are manually collected and how the variables are constructed is carefully demonstrated in Section 2.3.2.1, 2.3.2.2, 2.3.2.3, 2.3.2.4 and 2.3.2.5.

The hand-collected variables in this chapter are pension liability, operating leases, stock options, PP&E, land and building, machine and equipment, other tangible assets (in progress or miscellaneous assets) and equity repurchases. The process of collecting these variables is explained in details in the following Section 2.3.2.1, 2.3.2.2, 2.3.2.3, 2.3.2.4 and 2.3.2.5.

2.3.2.1 Pension liability

Pension plans, regulated by Generally Accepted Accounting Principles (GAAP), are important indicators in the measurement and interpretation of corporate earnings. These earnings are crucial to both firms and investors in the way that they signal firms' general economic health. In particular, corporate earnings determine asset prices, guide firms' decision-making about financial saving and investing and affect firms' willingness to increase their capacity, employ labour and shape the future of firms in the industry and in the economy. Firms may have a variety of pension plans and the funding schemes also vary among firms. In each fiscal year, firms readjust their plans in accordance with their plans' assumptions about the weighted average discount rate, annual salary increases and expected long-term rate of returns on assets.

Overfunded firms (of which pension assets exceed pension liabilities) add up their pension assets to firms' assets. Whilst, unfunded firms (of which liabilities exceed pension assets) add up their liabilities to firms' debt. Overfunded or unfunded pension plans used to be excluded from the balance sheet, however, since end-2006, FASB has required publicly traded companies to state the unfunded or overfunded status of their pension and benefit plans on their financial statements. Normally, firms have two main pension plans, of which firms bear risk and possess liability, as follows: (1) Defined benefit pension plans and (2) Postretirement benefits pension plans. Other pension plans such as multi-employer defined-benefit plans are excluded due to the accounting requirements of SFAS 87 since SFAS 87 argues about the uncertainty of the legal obligations of an employer to a multi-employer plan and the potential for one employer to negatively affect other employers participating in the plan. Defined-contribution plans are also excluded because the employers' primary commitments in those plans are to make current contributions, not to pay defined future benefits (Fortune (2005)).

Table 2.2 represents defined benefit pension plans of General Electric Company (GE). GE is randomly taken as a representative sample company to illustrate how the data were manually collected. The fiscal year 2002 was also randomly chosen as a sample year in the research period under review. The pension obligation is reported in two forms projected benefit obligation (PBO) and accumulated benefit obligation (ABO). The difference is that ABO assumes current salaries and wages are constant over time while PBO assumes that salaries and wages increase over time. However, as accounting rules change over time, ABO has only been reported in recent years. Therefore, to be consistent over 15 years of the research period, PBOs have been collected.

The first section (section A) in Table 2.2 shows the determination of the year-end values of GE's PBOs and plan assets in 2002 and 2001. At the year-end of 2002, the

Table 2.2: Defined benefit pension plans – General Electric Corporation (USD millions)

	Year	
	2002	**2001**
A. PROJECTED BENEFIT OBLIGATION (PBO)		
Balance at January 1	$30,423	$28,535
Service cost for benefits earned	1,107	884
Interest cost on benefit obligation	2,116	2,065
Participant contributions	158	141
Plan amendments	9	– –
Actuarial loss	1,650	889
Benefits paid	(2,197)	(2,091)
Balance at December 31	***$33,266***	*$30,423*
B. FAIR VALUE OF ASSETS		
Balance at January 1	$45,006	$49,757
Actual loss on plan assets	(5,251)	(2,876)
Employer contributions	95	95
Participant contributions	158	141
Benefits paid	(2197)	(2,091)
Balance at December 31	***$37,811***	*$45,006*
C. PREPAID PENSION ASSET/(LIABILITY)		
Funded status (= B - A)	**$4,545**	$14,583
Unrecognized prior service cost	1,165	1,373
Unrecognized net actuarial loss (gain)	8,356	(3,541)
Net asset recognized	*$14,066*	$12,415
Amounts recorded in the Statement of the Financial Position:		
Prepaid pension assets	$15,611	$13,740
Supplementary Pension Plan Liability	(1,545)	(1,325)
Net asset recognized	*$14,066*	*$12,415*

Source: General Electric 2002 Annual Reports. Notes to consolidated financial statements. Note 6. Numbers in parentheses are negative.

company had a projected benefit obligation of $33,266 million. Thus, $33,266 million was collected. Section B of Table 2.2 derives the year-end fair value of the pension plan assets as the year-beginning fair value minus the actual loss on pension plan assets plus the employer contributions, the participant contributions, then deduct the benefits actually paid. The balance of fair value of assets at December 31 of $37,811 million was, therefore, collected. Section C reflects the difference between the fair value of pension plan assets and the PBO, which was positive $4,545 million. This difference, called the funded status, indicates that GE's defined benefit plans were overfunded by $4,545.

Financial Accounting Standards Board (FASB) does not require firms to report pension plans' assets and liabilities on firms' balance sheets. Moreover, firms are not required to report the net assets (the funded status) at market value; the information is placed in the notes of the consolidated financial statements. The balance sheet reports a very different value for net assets (book value derived from SFAS 87). Particularly, GE's funded status of positive $4,545 million actual assets rose up to $14,066 net assets.

This adjustment can be done using one of the two approaches (see section C of Table

2.2). In the first approach, the net asset recognized is achieved by adding the funded status by the unrecognised prior service cost (from prior service amendments) and the unrecognised net actuarial loss (gain) (losses or gains in fair value of pension assets due to differences between actual and expected returns). During the fiscal year, when actual returns are low, book value will exceed the fair value and the balance sheets will enjoy an upward adjustment of net assets (see GE's 2002 fiscal year) and vice versa (see GE's 2001 fiscal year).

An alternative approach is taking the prepaid pension assets (the excess of cumulative employer contributions and expected returns over cumulative net periodic pension costs for those plans with positive values) of $15,611 million deducted by the supplementary pension plan liability (minimum pension liability required by ERISA[3]) of $1,545 million, then the net asset recognized of $14,066 million is achieved on the balance sheet. It can be seen that the net pension plan asset is $9,521 million greater than the actual net value (the funded status). Obviously, these adjustments are the accounting smoothing and deferral by SFAS 87. Therefore, to avoid these problems, only the funded status is collected to reflect the actual net value of defined pension plans.

Table 2.3 reports the postretirement benefit pension plans of General Electric Company. The postretirement benefit pension plans of GE consist of retiree health and life insurance benefit plans. Basically, the information related to postretirement benefit pension plans is presented similarly to the information related to defined benefit pension plans. At 2002 year-end, accumulated postretirement benefit obligation (APBO) of $7,435 and fair value of assets of $1,426 million were collected. The funded status of negative $6,009 million was recorded as underfunded postretirement benefit pension plans. After information of both defined benefit and postretirement benefit pension plans is collected, the net values of both plans are added up to see whether the plans are overfunded or underfunded. If pension plans are overfunded, this net positive value is recognized as firms' assets and vice versa if pension plans are underfunded, the final net negative value is recognized as a component of firms' debt. In this GE case, the final funded status of both plans was -$1,464 million ($4,545 - $6,009) (see Table 2.1 for the calculation formula).

[3]Employee Retirement Income Security Act (ERISA) was passed by the US Congress in 1974.

Table 2.3: Postretirement benefit pension plans – General Electric Corporation (USD millions)

	Year	
	2002	**2001**
A. ACCUMULATED POSTRETIREMENT BENEFIT OBLIGATION (APBO)		
Balance at January 1	$6,796	$6,422
Service cost for benefits earned	277	191
Interest cost on benefit obligation	469	459
Participant contributions	32	30
Plan amendments	(60)	– –
Actuarial loss	567	287
Benefits paid	(687)	(593)
Other	41	– –
Balance at December 31	***$7,435***	*$6,796*
B. FAIR VALUE OF ASSETS		
Balance at January 1	$1,771	$2,031
Actual loss on plan assets	(225)	(163)
Employer contributions	535	466
Participant contributions	32	30
Benefits paid	(687)	(593)
Balance at December 31	***$1,426***	*$1,771*
C. PREPAID PENSION ASSET/(LIABILITY)		
Funded status (= B - A)	**$(6,009)**	$(5,025)
Unrecognized prior service cost	753	909
Unrecognized net actuarial loss	2,277	1,393
Net liability recognized	*$(2,979)*	$(2,723)
Amounts recorded in the Statement of the Financial Position:		
Prepaid pension assets	$87	$66
Supplementary Pension Plan Liability	(3,066)	(2,789)
Net liability recognized	*$(2,979)*	*$(2,723)*

Source: General Electric 2002 Annual Reports. Notes to consolidated financial statements. Note 5. Numbers in parentheses are negative.

2.3.2.2 Capitalised operating leases

When firms borrow money to purchase assets, the assets and debt are recorded on the firms' balance sheets and the interests are deducted from operating profits to determine net income. However, firms may choose to lease those assets from lessors instead of buying them. The underlying reason is that leases offer more flexibility in terms of adjusting to changes in technology and capacity needs. There are two kinds of assets leases: capital leases and operating leases. As for operating leases, the lessor (the owner) transfers only the right to use the property to the lessee (the firm) as long as the lease meets certain criteria regulated by the lessor. At the end of the lease period, the lessee returns the leased property to the lessor. With this type of lease, the firm does not bear the risk of ownership; therefore, the firm treats the lease expense as an operating expense in the income statement. In terms of capital leases, the lessee bears the risk of ownership since the property belongs to the lessee in the end. As a result, the lease is reported both as an asset and liability on the balance sheet.

Table 2.4: Operating leases – General Electric Corporation (USD millions)

(In millions)	2002	2001	2000
GE	$773	$694	$648
GECS	977	1,006	1,176

At December 31, 2002, minimum rental commitments under noncancellable operating leases aggregated $2,635 million and $4,449 million for GE and GECS, respectively.
Amounts payable over the next five years are as follows:

(In millions)	2003	2004	2005	2006	2007
GE	$511	$412	$367	$287	$252
GECS	738	674	533	457	556

Source: General Electric 2002 Annual Reports. Notes to consolidated financial statements. Note 4.

Only the periodic rental expense of the operating leases is reported in company's income statement. The remaining rental commitments in the following years of the lease contract period are kept off the balance sheet and only presented in the footnotes of the financial statements. This balance sheet omission causes the mis-evaluation of the total debt of the company. One study conducted by the US Securities and Exchange Commission shows that 77% of US traded public firms have operating leases and these total $1.25 trillion in undiscounted future cash obligations. In fact, in response to this research's result, FASB[4] and IASB[5] formed a joint task force to examine whether firms should capitalise operating leases on the balance sheet (Koller et al. (2010)).

Therefore, in order to truly reflect the amount of debt incurred to firms, the minimum rental commitments under noncancellable operating leases of the following fiscal year in the lease contract should be taken into account as one of the debt components. Table 2.4 reports both rental expense under operating leases and minimum rental commitments under noncancellable operating leases over the next five years of GE and GECS. Since GECS is the financial branch of General Electric Company, it is excluded. The final off-balance sheet debt associated with operating leases of $511 million was collected for fiscal year 2002.

In order to capitalise this off-balance sheet debt, I firstly based our assumptions on firms' operating as going concerns and assume that the general terms for US larger firms' lease contracts are 20 years. Secondly, I followed the method by Koller et al. (2010) and

[4]FASB: Financial Accounting Standards Boad.
[5]IASB: International Accounting Standards Board.

calculated capitalised operating leases as follows:

$$Capitalised\ operating\ leases = \frac{The\ following\ year\ rental\ payment}{Average\ pre-tax\ cost\ of\ debt + \frac{1}{20\ years}} \tag{2.8}$$

The average pre-tax of cost of debt was calculated by the fraction of the current year interest expense over the average total debt (of the current and the previous year). The final amount of off-balance sheet capitalised operating leases of 2002 for GE was $9343.55 million (refer to Table 2.1 for the calculation formula).

2.3.2.3 Stock options

In June 1993, FASB issued proposed SFAS 123[6] in an attempt to recognize the real value of stock options. SFAS 123 requires that measuring the option value should be based on factors that reflect its underlying value. In particular, total compensation expense is based upon the fair value of the options that are expected to vest on the grant date. No adjustments would be made after the grant date in response to subsequent changes in the stock prices. Fair value is estimated using Black-Scholes or binominal option-pricing models. However, due to a disagreement in alignment of firms and members of Congress, in 1995, FASB did not require firms to include stock option expenses in the income statements but to disclose these expenses in the footnotes of the financial statements. The revision of SFAS 123 (SFAS 123 (R) was issued in December 2004 by FASB) does not specify which option pricing model firms should use although it does suggest using Black-Scholes or lattice models. Stock options are inherent expenses of firms and are reported off the balance sheet. In other words, these options are debt-equivalents since they are the obligations (to the seller of options). Therefore, they should be taken into account when considering debt components.

Table 2.5 reports stock options outstanding and option value of General Electric in the fiscal year 2002 using the Black-Scholes option pricing model. The stock options outstanding includes different stock option plans such as performance based units, performance share activity, restricted stock unit, restricted stock awards, share-based awards, stock settled awards, deferred options, broad-based employee stock options, executive continuity award plan, and other incentive shares (these plans vary from firm

[6] SFAS 123: Statement of Financial Accounting Standards 123. SFAS 123 (R): Revision of SFAS 123.

Table 2.5: Stock options outstanding and value information – General Electric Corporation

STOCK OPTION ACTIVITY			
		Average per share	
(Shares in thousands)	Shares subject to option	Exercise price	Market price
Balance at December 31, 1999	341,374	$16.01	$51.58
Options granted	46,278	47.84	47.84
Options exercised	(44,758)	8.82	53.00
Options terminated	(9,715)	28.47	– –
Balance at December 31, 2000	333,179	21.03	47.94
Options granted	60,946	41.15	41.15
Options exercised	(31,801)	10.04	43.95
Options terminated	(7,871)	39.02	– –
Balance at December 31, 2001	354,453	25.08	40.08
Options granted	46,928	27.37	27.30
Options exercised	(29,146)	9.45	31.86
Options terminated	(10,177)	38.14	– –
Balance at December 31, 2002	**362,058**	$26.26	$24.35

OPTION VALUE INFORMATION (a)			
(In dollars)	2002	2001	2000
Fair value per option (b)	**$7.73**	$12.15	$15.76
Valuation assumptions			
Expected option term (yrs)	6.0	6.0	6.4
Expected volatility	33.7%	30.5%	27.1%
Expected dividend yield	2.7%	1.6%	1.2%
Risk-free interest rate	3.5%	4.9%	6.4%

(a) Weighted averages of option grants during each period.
(b) Estimated using Black-Scholes option pricing model.

Source: General Electric 2002 Annual Reports. Notes to consolidated financial statements. Note 25. Numbers in parentheses are negative.

to firm). Stock options are calculated based on the number of stock options outstanding and the weighted average fair value per option granted.

Most of the firms included in this study use the Black-Scholes option pricing model to identify the weighted average fair value per option. However, in some fiscal years, firms do not use the Black-Scholes valuation model; thus, either the pro forma weighted average fair value or the weighted average price or the average exercise price is employed. From Table 2.5, we can see GE's number of stock options outstanding in 2002 of GE was 362,058 thousand. To be compatible with other units in million, the unit of a number of stock options outstanding was converted from thousand to million. The fair value per option (using the Black-Scholes pricing model) was $7.73 per option. Hence, General Electric's stock options expense of $2799 million ($362.058 \times 7.73$) was finally collected (see Table 2.1 for the calculation formula).

2.3.2.4 PP&E, land & building, machine & equipment and other tangibles

Table 2.6 reports the decomposition of property, plant and equipment of General Electric Corporation in 2002. Land and building usually consists of land, buildings, and leasehold improvements ($623+$8,398 million in GE case). Machinery and equipment include fixtures and equipment, machinery and equipment, distribution equipment, computer equipment and software ($22,264 million in GE case). Plant and equipment in progress and other miscellaneous tangible assets (other tangibles) consist of construction in progress, plant and equipment in progress, rental machines and other miscellaneous tangible assets ($1,964 million in GE case). The total PP&E was collected after deducting depreciation ($33,249 million-$19,506 million).

Table 2.6: Property, plant and equipment – General Electric Corporation (USD millions)

December 31	**2002**	2001
GE		
Land and improvements	**$623**	$577
Buildings, structures and related equipment	**8,398**	7,281
Machinery and equipment	**22,264**	21,414
Leasehold costs and manufacturing plant under construction	**1,964**	1,960
	31,232	31,232
GECS		
Buildings and equipment	4,731	3,600
Equipment leased to others		
Aircraft	20,053	16,173
Vehicles	10,859	10,779
Railroad rolling stock	3,376	3,439
Marine shipping containers	1,611	1,618
Mobile and modular structures	1,383	1,325
Information technology equipment	1,033	1,321
Construction and manufacturing equipment	1,239	799
Scientific, medical and other equipment	2,058	1,001
	46,343	40,055
	$79,592	$71,287
Accumulated depreciation and amortization		
GE	**$19,506**	$18,433
GESC		
Buildings and equipment	1,838	1,579
Equipment leased to others	11,044	9,135
	$32,388	$29,147

Source: General Electric 2002 Annual Reports. Notes to consolidated financial statements. Note 15 for property, plant and equipment.

As a result, $9021 million, $22,264 million, $1,964 million and $13,743 million were recorded for land & building, machinery & equipment and plant and equipment in progress and other miscellaneous tangible assets and PP&E, respectively. Among these figures, only the total PP&E is reported in a net figure as depreciation is presented as a final figure. In order to adjust the decompositions of PP&E to achieve the net figures, the US Bureau of Economic Analysis's fixed assets rates of depreciation and Hulten-Wykoff categories are utilized as the benchmarks for different industries' fixed assets depreciation rates in this study (refer to Table 2.1 for the calculation formula).

2.3.2.5 Equity repurchases

Equity (i.e. common stocks) is repurchased when a firm wants to reduce the dilution of control, or when the market price was undervalued, and the firm repurchases their stocks to raise the stocks' market value. Banyi et al. (2008) analyse the five most common ways that previous studies have utilised to estimate share repurchases as follows (1) CRSP decreases in shares outstanding (Stephens and Weisbach (1998) and Jagannathan et al. (2000)), (2) Compustat decreases in shares outstanding (Stephens and Weisbach (1998)), (3) Compustat purchases of common stock (Stephens and Weisbach (1998), Jagannathan et al. (2000) and Kahle (2002)), (4) changes in treasury stock from Compustat (Stephens and Weisbach (1998) and Fama and French (2001)) and (5) Fama and French (2001))and Fama-French changes in treasury stock (Fama and French (2001)).

Banyi et al. (2008) point out the potential biases associated with each measure. They indicate that among these measures, Compustat purchases of common stock measure overstates the repurchases of common stock while other measures understate share repurchases. The biases in estimating repurchases may lead to the mis-measurement in the payout ratio and subsequently create bias in the corresponding coefficients (Banyi et al. (2008) and Andriosopoulos et al. (2014)). Banyi et al. (2008) hand-collect actual 2004 share repurchases from quarterly and annual disclosures required under the revised Rule 10b-18 disclosures[7]. They compare their hand-collected data of share repurchases and the five above-mentioned measures and conclude that Compustat purchases of common stock is the best estimate of actual repurchases.

However, due to the inaccessibility to Compustat and insufficient data from Bloomberg related to equity repurchases, I hand-collected share repurchases from large US firms' annual reports form 10-K. In addition, my research period is 15 years from 1996-2010 with changes in disclosure rules of share repurchases, therefore, to be consistent along

[7]Until 2004, the revised Rule 10b-18 by SEC require US firms to disclose precise information about share repurchases in form 10-Q and 10-K.

the period, equity repurchases are estimated based on the total change in purchases of common stock and the changes in treasury stock.

Particularly, equity repurchases are recognized when the number of common stocks outstanding decreases and the treasury stocks increase, because firms repurchase common stocks outstanding and put them into treasury stocks to resell in the future. When the common stocks are repurchased and retired at the same time, they are not recognized as equity repurchases. Thus, equity repurchases exclude equity retired. I also excluded preferred stock repurchases in equity repurchases estimation since preferred stock was treated as one of the debt equivalents in this study.

**Table 2.7: Equity repurchases –
General Electric Corporation (USD millions)**

COMMON STOCK HELD IN TREASURY	2002	2001	2000
Balance at January 1	$26,916	$24,444	$22,567
Purchases (b)	**2,851**	**4,708**	**5,342**
Dispositions (b)	(3,140)	(2,236)	(3,456)
Balance at December 31	$26,627	$26,916	$24,444

(b) Total dividends and other transactions with share owners reduced equity by $6,382 million, $7,529 million and $3,044 million in 2002, 2001 and 2000, respectively.

Source:General Electric 2002 Annual Reports. Notes to consolidated financial statements. Note 24 for Share Owners' Equity.

Information related to equity repurchases can be found in the statement of cash flows, the statement of changes in share owners' equity, and the notes of the consolidated financial statements. Statement of cash flows only shows the transaction costs of equity repurchases, including broker's fees, taxes, etc. Whilst, in the statement of changes in stockholders' equity, information associated with equity repurchases, equity retired, common stocks, treasury stocks and total surplus/discount is presented in different sections. Therefore, equity repurchases are usually collected from the statement of changes in share owners' equity.

However, in some cases, the detailed amount of equity repurchases is rather disclosed in the notes to consolidated financial statements (for instance, GE in 2002). Furthermore, before 2004 when SEC mandated the disclosure of share repurchases, it was common in firms' annual reports that equity repurchases were not identified whether for the purpose of treasury stocks or stocks retired. Although these repurchases were recognized as equity repurchases for treasury stocks, equity repurchases could be biased for these cases.

Table 2.7, extracted from the notes for share owners' equity of General Electric in 2002 reports equity repurchases of General Electric from 2000 to 2002. A value of $2,815 million was collected as the equity repurchases of General Electric Company in fiscal year 2002.

2.3.3 Data collection from Bloomberg

The data were collected from 50 listed large firms with highest revenues (according to Fortune 500) each year from 1996 to 2010, which totals up to 103 listed firms in 15 years. These firms were identified in Bloomberg using the Bloomberg's ticker symbols (see Table A.3 in the Appendix A for details). An Excel template was designed with identification of all the firms, years, sub-industries, countries to extract all the necessary variables. Each variable was searched using Mnemonics symbols. The variables, provided by Bloomberg, are well defined. Therefore, before picking the variables, information related to the way variables were calculated by Bloomberg was carefully looked into to make sure all collected variables were relevant. In order to process the data, run the models and the post-regression tests, I used STATA in this research.

2.4 Variable measurement and model specification

2.4.1 The measurement of leverage

In this study, leverage will be calculated at both book value and market value. In addition, to reflect the true value of debt, I developed a new measurement of leverage in which I take into account some on and off-balance sheet debt equivalents such as preferred equity, minority interest, pension liability, capitalised operating leases and stock options.

I adjusted the normal components of conventional debt (short-term and long-term debt) by adding these on and off-balance sheet debt components. After that, leverage ratio (measured by total debt over total assets) was adjusted accordingly by adding these debt equivalents to the numerator of the ratio. The objective of this adjustment is to compare and contrast to see if there exist any differences in the final results using alternative measurements. Previous studies have rarely done these adjustments to reflect the true value of debt. Therefore, these adjustments are supposed to be a significant contribution of this study to the research area. This adjusted leverage is also modelled at both book value and market value.

The non-adjusted leverage is measured as follows:

$$MV of Leverage = \frac{STD + LTD}{BV\ of\ Debt + MV\ of\ Equity} \tag{2.9}$$

$$BV of Leverage = \frac{STD + LTD}{BV\ of\ Total\ Assets} \tag{2.10}$$

The adjusted leverage is measured as follows:

$$MV of Adjusted\ Leverage = \frac{STD + LTD + DE}{BV\ of\ Debt + MV\ of\ Equity} \tag{2.11}$$

$$BV of Adjusted\ Leverage = \frac{STD + LTD + DE}{BV\ of\ Total\ Assets} \tag{2.12}$$

where:
STD denotes short-term Debt; LTD denotes long-term Debt;
DE stands for debt equivalents and is calculated as formula 2.13 as follows:

$$\begin{aligned} DE = {} & Preferred\ Equity + Minority\ Interest + Pension\ Liability \\ & + Capitalised\ Operating\ Leases + Stock\ Options \end{aligned} \tag{2.13}$$

2.4.2 The measurement of control variables

This study mainly focuses on investigating the relationship between intangible assets, tangible assets (and its decomposed components) and non-adjusted as well as adjusted leverage. However, capital structure can be explained by many other determinants. Many empirical studies have been done to test the impacts of these determinants on capital structure (Myers (1977), Titman and Wessels (1988), Chung (1993), Lasfer (1995), Rajan and Zingales (1995), Barclay and Smith (1996) and Chen et al. (1997), Ozkan (2000) and Bevan and Danbolt (2001)). Therefore, I also employed other core determinants as control variables such as firm size, growth rate, earning volatility, profitability, payout ratio, effective tax rate and non-debt tax shield. Table 2.8 briefly summarises the construction of the explanatory variables, their expected relationship signs with leverage as well as the supported theories for those relationships.

Table 2.8: Explanatory variables formulation

Explanatory variables	Formula	Expected signs	Supported theories
Tangibility	Net PP&E /Total assets	+	Collateral view
Intangibles	Intangible assets /Total assets	+	–
L&B	Net land & building /Total assets	+	Collateral view
M&E	Net machine & equipment /Total assets	+	Collateral view
Other tangibles	Net plant & equipment in progress and other miscellaneous tangible assets/Total assets	+	Collateral view
Firm size	ln(Sales)	+	Trade-off theory
		−	Pecking order theory
Growth opportunity	ln(MV of total assets /BV of total assets)	+	Pecking order theory
		−	Agency theory
Earnings volatility	Standard deviation of EBITDA/Total assets	−	Pecking order & trade-off theory
Profitability	EBITDA /Total assets	+	Trade-off theory
		−	Pecking order theory
Payout ratio	(Dividends + repurchases)/EBIT	+	Pecking order theory
		−	Agency theory
Effective tax rate	(Income tax expense /pre-tax income)× 100	+	–
Non-debt tax shield	Depreciation/Total assets	−	–

2.4.3 Empirical models

The tradition OLS regression model is a popular method used to identify and test certain capital structure theories and the determinants of capital structure (Rajan and Zingales (1995)). However, recently, its validity have been put under suspicion since many biases related to modelling issues remain unresolved. Lemmon et al. (2008) document that traditional determinants of leverage become largely irrelevant once time-invariant firm effects are taken into account. Campello and Giambona (2010) highlight that the OLS estimates of the relationship between tangible assets and leverage can be affected by modelling issues such as reverse causality when debt allow firms to acquire more tangible assets and omitted variables when good firm fundamentals may lead to both external financing and asset acquisition. If these problems are not carefully addressed and resolved, our study may end up with spurious relationship between asset redeployability and leverage.

Recent studies have attempted to deal with these estimation problems by (1) analysing the changes in leverage over time (using first differences model); (2) examining leverage deviations from average benchmark (using fixed effects model); (3) including instrumental variables. The first approach using first differences (FD) takes the difference of variables between every two consecutive years in the regression. Thus, the observed and the unobserved variables that are individual-specific and constant over time are all eliminated. The FD estimator is used to address the problem of omitted variables with panel data. However, FD is not ideal in this research because FD approach causes the loss of observations. Since this research uses the manually-collected data, it already contains a relatively small sample size compared with other studies that extract data from other available standard sources. Also, it is possible that the problem of serial correlation does exist in capital structure modelling; therefore, the FD estimators are inefficient.

The second approach using fixed effects (FE) model assumes that the unobservable factors that might simultaneously affect the left and the right-hand side of the regression are time-invariant. Besides, FE regression exploits within-group variation over time. By including fixed effects (firm dummy and time dummy), the average differences across the firms in any observable or unobservable predictors are controlled. The fixed effects coefficients reflect all the across-firm action with invariant time. Put differently, it captures the effects of all variables that are individual-specific and constant over time. It can be said that FE regression is a powerful tool for removing omitted variables bias, especially for panel data. Besides, I also want to experiment whether our asset redeployability results pass these fixed effects and remain significant compared with the studies by Lemmon et al. (2008) and Campello and Giambona (2010). Therefore, FE regression model is employed as the main model in this study.

The third approach using instrumental variables (IV) is difficult to establish either due to the choice of IV at the authors' discretion or due to the availability of these variables. Also, the IV estimation does not necessarily lead to efficient estimates of the model parameters as it does not utilise all the available moment conditions, especially for dynamic capital structure, of which the leverage of the previous year might affect the leverage of the following year. Arellano and Bond (1991) develop the Generalised Method of Moments (GMM) estimation technique, which employs the additional instruments obtained by utilising the orthogonality conditions that exist between the lagged values of the dependent variables and disturbances. This estimator is called the Arellano and Bond (1991) "difference GMM" estimator. However, when the lagged levels of the regressors are poor instruments for the first-differenced regressors, the Blundell and Bond (1998) estimator, commonly known as "system GMM" estimator is recommended. System GMM estimator essentially combines in a system a regression in differences with a regression in levels. Roodman (2006) suggests that in the case of unbalanced data, it is better avoid difference GMM because it has the weakness of magnifying gaps. Therefore, this study exploits system GMM estimators in the robustness section and compare with the main model results so that the study can contribute more robust insights to existing empirical research about capital structure.

The fixed effects model for non-adjusted leverage is specified as follows:

$$\begin{aligned} Leverage_{it} =& \alpha_1 Tangibility_{it} + \alpha_2 Intangibles_{it} + \mathbf{X}_{it}\beta \\ &+ \sum_i \rho_i F_i + \sum_t \delta_t T_t + \varepsilon_{it} \end{aligned} \tag{2.14}$$

where:

The index i denotes a firm, t denotes a year; Tangibility is the overall tangible assets and is calculated as net PP&E/BV of total assets; Intangibles is calculated as net Intangible Assets/BV of total assets; $\mathbf{X}_{it}$ is a vector containing the standard control variables such as: Firm Size (ln (Sales)), Profitability (EBITDA/BV of total assets), Growth opportunities (ln (MV of total Assets/BV of total assets)) (MV of total assets = MV of equity + BV of debt), Earning Volatility (Earnings volatility of the Industry = Industry standard deviation of EBITDA (5 consecutive years of observation)/Industry BV of total assets), Payout ratio (Total distributions (dividends + repurchases)/EBIT), Effective Tax Rate ((Income tax expense/pre-tax income)$\times$100) and Non-debt tax shield (Depreciation/BV of total assets); F_i and T_t are dummy variables for firm- and time-fixed effects, respectively.

The fixed effects model for adjusted leverage is specified as follows:

$$\begin{aligned} Adjusted\ Leverage_{it} =& \alpha_1 Tangibility_{it} + \alpha_2 Intangibles_{it} + \mathbf{X}_{it}\beta \\ &+ \sum_i \rho_i F_i + \sum_t \delta_t T_t + \varepsilon_{it} \end{aligned} \tag{2.15}$$

Equations 2.14 and 2.15, however, only reflect the coefficient on the overall tangible assets and restrict other coefficients on the different components of tangible assets to a single estimate. In fact, the overall tangibility is composed of Land & Building, Machinery & Equipment and Other Tangible Assets. Therefore, in order to get a better reflection of these components' coefficients, alternative models (with and without off-balance sheet adjustments) are utilised as follows:

$$\begin{aligned} Leverage_{it} =& \alpha_1 L\&B_{it} + \alpha_2 M\&E_{it} + \alpha_3 Other\ Tangibles_{it} + \alpha_4 Intangibles_{it} \\ &+ \mathbf{X}_{it}\beta + \sum_i \rho_i F_i + \sum_t \delta_t T_t + \varepsilon_{it} \end{aligned} \tag{2.16}$$

$$Adjusted\ Leverage_{it} = \alpha_1 L\&B_{it} + \alpha_2 M\&E_{it} + \alpha_3 Other\ Tangibles_{it} + \alpha_4 Intangibles_{it}$$
$$\mathbf{X}_{it}\beta + \sum_i \rho_i F_i + \sum_t \delta_t T_t + \varepsilon_{it} \quad (2.17)$$

where:

The index i denotes a firm, t denotes a year; Intangibles and $\mathbf{X}_{it}$ are defined the same as equations 2.14 and 2.15; L&B denotes net land and building; M&E denotes net machinery and equipments; Other Tangibles denotes net plant and equipment in progress & other miscellaneous tangible assets; F_i and T_t are dummy variables for firm- and time-fixed effects, respectively.

2.5 Empirical findings for the on and off-balance sheet financing items

2.5.1 Reported debt versus adjusted debt

Figure 2.2 exhibits the means of reported debt/conventional debt in comparison with adjusted debt (after the adjustment for the on and off-balance sheet debt equivalents). In a recent study, Bates et al. (2009) report that over the research period from 1980 to 2006, US firms' cash holdings are increasing over time while leverage is low in the first half of the 1990s and then increases gradually before falling from 1998 to 2005. They highlight that with these excessive cash holdings, US firms can retire all their debt obligations. In fact, they recalculate the net leverage ratio by subtracting cash from debt and report that the average net debt ratio falls during 15 years and becomes negative in the last three years of the sample from 2004 to 2006. Put differently, US firms are totally capable of paying their debt.

However, if we look into Figure 2.2 when the on and off-balance sheet financing items (aka hidden debt) are taken into account, the reality is not that optimistic. Reported debt shows a very gradual increase over time. From 1996 to 2010, reported debt is almost doubled. However, the total amount of reported debt remains quite low in comparison with adjusted debt. In contrast, adjusted debt shows a significantly higher amount than

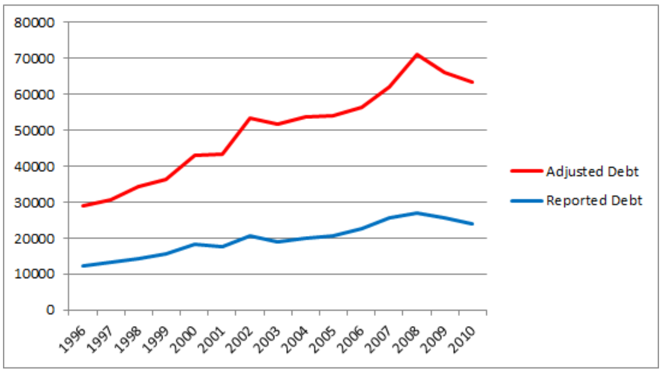


Figure 2.2: The mean values of reported debt and adjusted debt

the total reported debt. Also, there is a considerable increase in adjusted debt over the research period. Particularly, adjusted debt in 2010 is about 2.3 times higher than that in 1996. The gap between them is gradually extending over time and from 1999 it seems to be impossible to bridge this gap since it continues to extend considerably. While Bates et al. (2009) affirm that from 2004 to 2006, US firms can definitely cover their obligations; my graph shows that the US firms' adjusted debt is approximately 1.6 times higher than the US firms' reported debt on average. This finding raises questions about the true capacity of the US firms in their obligations fulfillment if all debt equivalents are considered. The similar gap between the US firms' reported and adjusted debt continues until 2010. Obviously, investors might be fooled with the reported debt and firms' financial health would be misjudged if these on and off-balance sheet financing items are not taken into account properly.

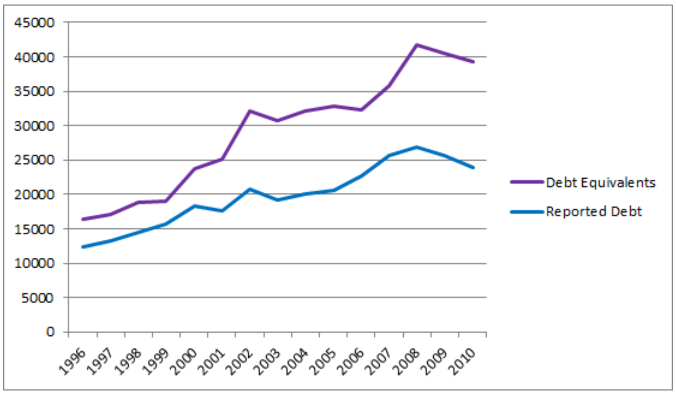


Figure 2.3: The mean values of reported debt and debt equivalents

Figure 2.3 illustrates the movements of reported debt and debt equivalents over the 15 years from 1996 to 2010 (using mean values). The graph shows a remarkable increasing trend of debt equivalents over these years, which is double from 1996 to 2001. Over 15 years, debt equivalents have almost tripled the amount. It seems that firms rely quite heavily on debt equivalents. Also, these debt equivalent items are used in addition to, not merely in lieu of, the reported debt.

2.5.2 Non-adjusted versus adjusted leverage

Figure 2.4 represents large US firms' mean MV values of non-adjusted leverage and MV of adjusted leverage on the yearly basis in 15 years (from 1996 to 2010). It can be seen that both non-adjusted and adjusted leverage show quite similar trends over time. However, the MV of adjusted leverage reflects more changes over 15 years. From 1996 to 1998, the tendency of MV of adjusted leverage declines over the period by 15%, and it starts to increase again, reaching the peak in 2001 (from 25% to 48%).

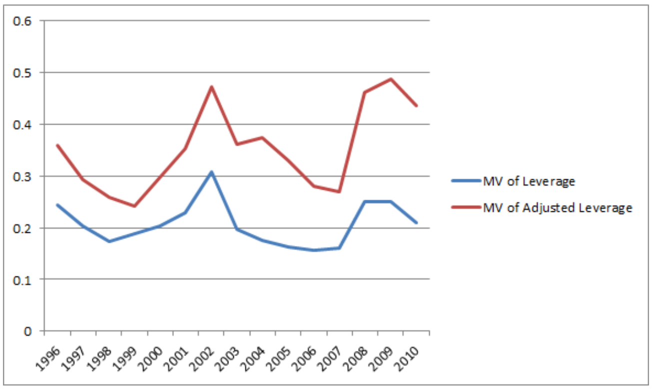


Figure 2.4: The mean MV values of non-adjusted leverage and adjusted leverage

The MV of non-adjusted leverage does not change as much as the MV of adjusted leverage. From 1996 to 1998, the MV of non adjusted leverage slightly decreases over time to 18% and gradually rises to the peak of 31% in 2001 (17% lower than the MV of adjusted leverage). From 2001 to 2006, there is a gradual decrease in MV of leverage. Nevertheless, the MV of adjusted leverage shows a sharper decrease with gaps in between reaching the bottom of 28% in 2007. The MV of leverage with and without adjustment increases again from 2006 to 2007 (sharper increase for MV of adjusted leverage by 21% in comparison to the 8% increase of the MV of non-adjusted leverage) and tends to fall slightly until 2010.

Figure 2.5 documents the mean BV values of non-adjusted leverage and adjusted leverage of large US firms over 15 years from 1996 to 2010. The mean BV of leverage without adjustment seems to be more stable while the mean BV of adjusted leverage seems to change more significantly over the research period. Although the change of BV of leverage is not as pronounced as MV of leverage, the figure shows the similar trend of BV of leverage over time compared with MV of leverage. However, the gaps between BV of non-adjusted leverage and BV of adjusted leverage are much bigger than those of both MV of non-adjusted leverage and adjusted leverage. From 1996 to 1999, the general trend is a decline in BV of non-adjusted leverage with a slight rise and fall in between.

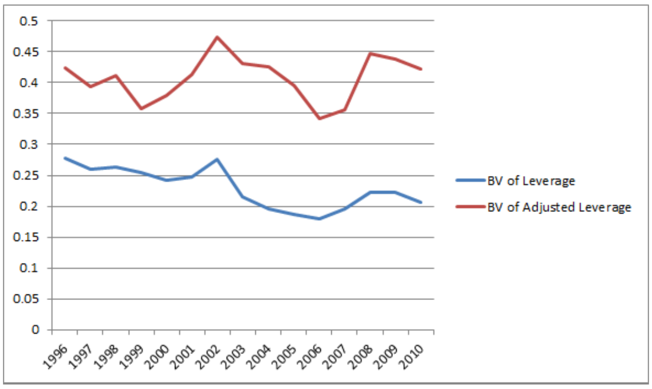


Figure 2.5: The mean BV values of non-adjusted leverage and adjusted leverage

Compared with the mean BV of non-adjusted leverage, the mean BV of adjusted leverage changes more significantly from 1996 to 1998 and starts to rise again reaching the peak of 47% in 2001. The mean BV of non-adjusted leverage also reaches the peak in 2002 but only to 27%. At this point of time, it can be noticed from the figure that the mean BV of adjusted leverage has a considerable change over time. The largest gap between the mean BV value of adjusted leverage and non-adjusted leverage is 20%. From 2001, there is a decrease in both BV of non-adjusted leverage and adjusted leverage. However, the fall in the mean BV of adjusted leverage follows a concave curve while the decrease in the mean BV of non-adjusted leverage tends to be a convex curve.

The mean BV of both non-adjusted and adjusted leverage bottom out in 2005 with the noticeable gap of 27%. From 2005 to 2007, the mean BV of adjusted leverage considerably rises back from 35% to 45% while the mean BV of non-adjusted leverage only shows a gradual increase from 18% to 23%. From 2007 to 2010, the BV of both non-adjusted and adjusted leverage slightly decrease over the period. Obviously, there are significant gaps between BV of unadjusted leverage and adjusted leverage from 1996 to 2010, and the mean BV of adjusted leverage seems to change more than the mean BV of unadjusted leverage over the research period.

2.5.3 Descriptive results of debt equivalents

2.5.3.1 Debt equivalents descriptive statistics

Table 2.9 summarises the descriptive statistics of debt equivalents. We report the fractions of both debt equivalents over total assets and debt equivalents over total debt. Preferred equity accounts for only 6% over total assets on average. However, the bottom 75% of the US large firms issue almost 0% preferred equity. Minority interest also accounts for an average of 1% over total assets with standard deviation of 3%. The mean value of capitalised operating leases over total assets is 9% with standard deviation of 12%. Both stock options and pension liability account for 3% over total assets on average. It can be acknowledged that debt equivalents do not appear to be large in comparison with firms' total assets.

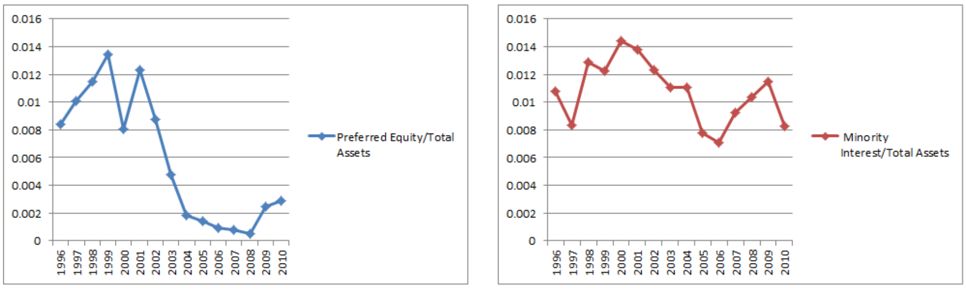
Table 2.9: Debt equivalents descriptive statistics

Variables	Obs.	Mean	S.D	p25	p50	p75
PE/TA	690	0.06	0.01	0.00	0.00	0.00
MI/TA	692	0.01	0.03	0.00	0.00	0.01
COL/TA	689	0.09	0.12	0.03	0.05	0.09
SO/TA	715	0.03	0.05	0.01	0.02	0.04
PL/TA	714	-0.03	0.07	-0.05	-0.02	0.00
PE/TD	676	0.03	0.10	0.00	0.00	0.01
MI/TD	678	0.06	0.14	0.00	0.00	0.04
COL/TD	684	0.64	1.64	0.16	0.33	0.61
SO/TD	701	0.43	1.55	0.04	0.08	0.24
PL/TD	701	-0.27	1.67	-0.29	-0.08	0.00

Note: TA: Total assets; TD: Total debt; PE: Preferred equity; MI: Minority interest; COL: Capitalised operating leases; SO: Stock options; PL: Pension liability. As pension liability is recorded as a function of "pension assets - pension liability", therefore, the negative sign represents liability while the positive sign represents assets.

However, when we compare debt equivalents with total debt, we can see a significant difference. Preferred equity and minority interest still accounts for small percentage over total debt (3% and 6%, respectively) with larger standard deviation of 10% and 14%, respectively. On average, capitalised operating leases accounts for 64% over total debt which is a remarkable amount. The bottom 50 percentile of firms have COL/TD of 33% and the bottom 75 percentile of firms have COL/TD of 61%. Stock options also accounts for a significant percentage of 43% over total debt on average while the mean value of pension liability is 27%. Nevertheless, the standard deviation of these debt equivalents components is also significant with 1.64 for COL/TD, 1.55 for SO/TD and 1.67 for PL/TD. It can be concluded that the mobilisation of stock options and pension liability among large US firms also varies remarkably (as we can see from the percentile and standard deviation figures).

2.5.3.2 Graph illustration of each debt equivalent item over total assets



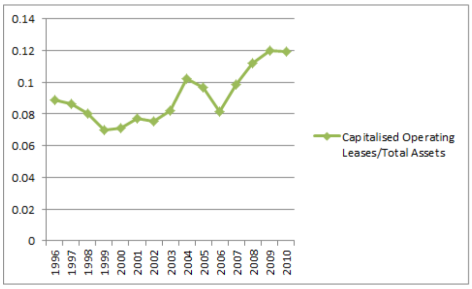
(a) Preferred equity/TA (b) Minority interest/TA

Figure 2.6: The mean values of preferred equity and minority interest over total assets

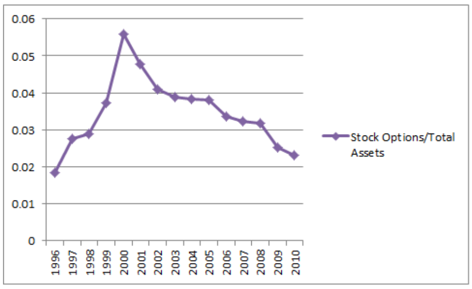
Figure 2.6 illustrates the means of preferred equity and minority interest for large US firms over total assets (PE/TA and MI/TA, hereafter) from 1996 to 2010. Among all the debt equivalents, PE/TA and MI/TA account for the smallest percentage (with the maximum of 1.4% for preferred equity and 1.5%). As we can see from Figure 2.6(a), from 1996 to 1999, PE/TA rises from 8% to the peak of 1.4%, and starts to drop by the same considerable amount from 1999 to 2000. For a short period of time from 2000 to 2001, it rises by about 0.4% again and from there PE/TA drops significantly to 0.2% in 2004. From 2004, PE/TA continues to decrease to almost 0% until 2008 and increases again slowly to 0.3% in 2010.

Although the changes in the means of MI/TA are quite considerable, it does not change as much as PE/TA over the period (see Figure 2.6(a)). From 1996 to 2000, the figure shows that MI/TA has significant ups and downs, reaching the peak of 1.5% by 2000. After that, it starts to decrease gradually over time, reaching the bottom of 0.7% in 2006 and then starts to rise again to nearly 1.2% in 2009. Within one year, MI/TA drops again by 0.4% from 2009 to 2010.

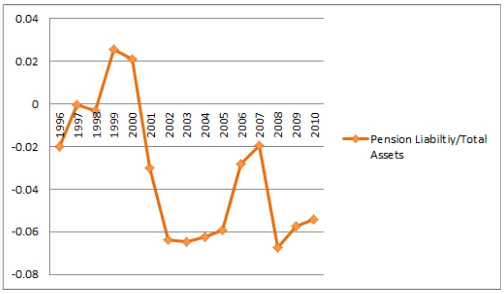
Figure 2.7 documents the changes in the mean values of capitalised operating leases, stock options and pension liability over total assets (denoted as COL/TA, SO/TA and PL/TA, respectively). As we can see from Figure 2.7(a), from 1996 to 1999, there is a downward trend for COL/TA, from 9% in 1996 to 7% (the bottom level of COL/TA over the research period). From 1999, COL/TA gradually increases to 10% in 2004, and from 2004 to 2006, it drops by 2%. From 2006, COL/TA rises up again, reaching the peak of 12% in 2010.



(a) Capitalised operating leases/TA



(b) Stock options/TA



(c) Pension liability/TA

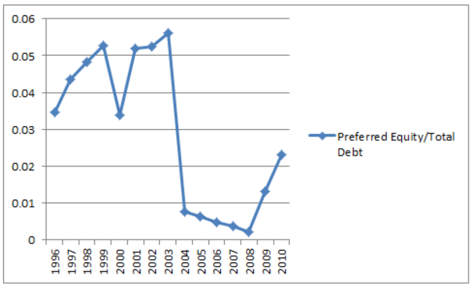
Figure 2.7: The mean values of capitalised operating leases, stock options and pension liability over total assets

Figure 2.7(b) shows the means of SO/TA over the research period. There are two noticeable trends: upward trend from 1996 to 2000 and downward trend from 2000 to 2010. The bottom level of SO/TA is about 1.9% in 1996. The peak level of SO/TA reaches 5.5% in 2000. Figure 2.6(a) reports the average trend of large US firms' pension liability. The negative figures show the average ratio pension liability over total assets. Whilst, the positive figures document firms' average ratio of pension assets over total assets. In 1996, PL/TA remains low at -2%. However, in 1997, it starts to increase to

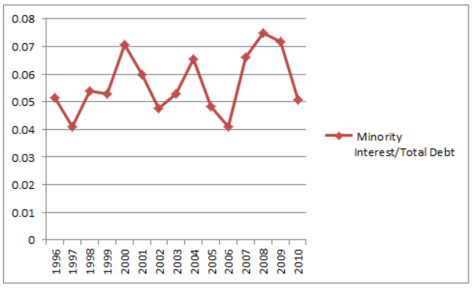
0%, and slightly falls in 1998. From 1998, PL/TA increases significantly to cover pension liability and gains pension assets of more than 2% over total assets in 1999.

Within the year 2000, PL/TA slowly drops down to 0%. From 2000 to 2002, PL/TA falls down considerably to more than -6%. From 2002 to 2005, it rises up slightly, and from 2005 to 2007, PL/TA rises to -2%. However, from 2007, it continues to drop sharply, reaching the bottom of -7% in 2008 and gradually rises to approximately -5% in 2010. It can be said that PL/TA changes significantly over the research period. In addition, it can be noticed that large US firms can pay off their pension schemes for only two years out of 15 years in the research. For the rest of the time, they incur a lot of pension liability.

2.5.3.3 Graph illustration of each debt equivalent item over total debt



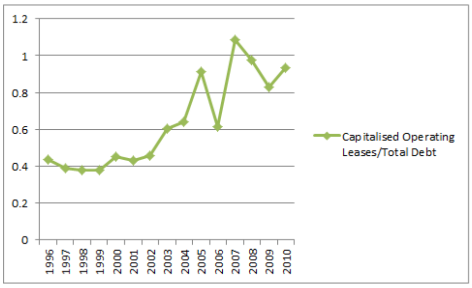
(a) Preferred equity/TD



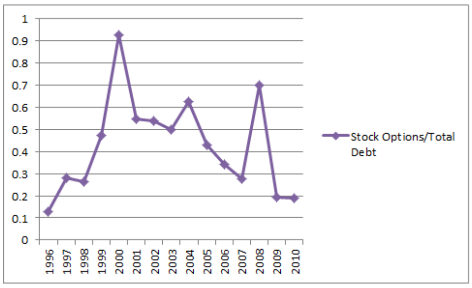
(b) Minority interest/TD

Figure 2.8: The mean values of preferred equity and minority interest over total debt

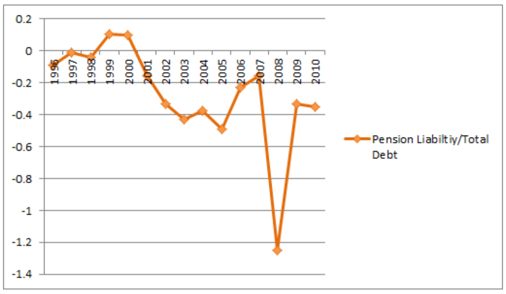
Compared with the ratio of debt equivalents over total assets (TA), the ratio of debt equivalents over total debts (TD) exhibits more changes over the research period. As we can see from figure 2.8(a), from 1996 to 1999, PE/TD increases from 3.5% to more than 5%. It suddenly drops by 2% within one year and increases back to almost the same percentage in the following year as in the previous year. From 2001 to 2003, there is a small change in PE/TD and it reaches the peak of nearly 6% in 2003. However, within one year from 2003 to 2004, PE/TD drops by 4%. From 2003 to 2008, it continues to decline to almost 0 and increases by 2% in 2010. Figure 2.8(b) shows the changes of MI/TD over time. Similar to preferred equity, minority interest only accounts for a small amount of total debt. The range of minority interest is between 4% to 7.5% over the research period.



(a) Capitalised operating leases/TD



(b) Stock options/TD



(c) Pension liability/TD

Figure 2.9: The mean values of capitalised operating leases, stock options and pension liability over total debt

Figure 2.9 reports the means of COL, SO and PL over TD over time. COL/TD starts from 41% in 1996 and gradually rises up to 90% in 2005. From 2005 to 2006, it declines by 30% and increases again by 41% in 2007. From 2007 to 2009, there is a decrease of 21%, and from 2009, it slightly increases again. Figure 2.9(b) exhibits the pronounced changes in the means of stock options over total debt (SO/TD) over 15 years. The range is from the bottom of 10% in 1996 to the peak of 91% in 2000. From 2000 to 2007, SO/TD declines from 91% to 29% with a slight rebound in 2004. From 2007, SO/TD increases sharply from 29% to 70% within a year, and starts to drop significantly to 20% in 1999 and remains the same level until 2010.

Figure 2.9(c) illustrates the means of pension liability over total debt (PL/TD) from 1996 to 2010. The positive sign implies that firms have pension assets while the negative sign indicates that firms incur pension liability. As we can see, from 1996 to 1998, PL/TD remains very small. From 1998 to 2000, firms have no pension liability despite the small proportion of pension assets (only 10% over total debt). Firms start to incur pension liability again from the end of 2000. Particularly, PL/TD ranges from 0% to 50% over five years (2000-2005). From 2005 to 2007, the liability reduces roughly by 20%.

However, from 2007, pension liability increases considerably, reaching approximately 130% over total debt in 2008. A year later in 2009, PL/TD reduces to 30% times and continues to reduce slightly in 2010. It can be seen from the figure that the firms are hardly able to cover their pension schemes. Most of the time, they incur pension liability off their balance sheet and the amount of this off-balance sheet pension liability is quite significant. Figure 4.4 in the Appendix A gives us an overview of all debt equivalents items over total debt for the research period of 15 years (from 1996 to 2010).

2.6 Research results

2.6.1 Descriptive findings

Table 2.10 presents descriptive statistics of the data. The average book value and market value of leverage without the adjustment are both at 23%. Our results are different from Faulkender and Petersen (2006) who report average book and market leverage of 26.1% and 19.9%, respectively. However, these average values of leverage change considerably after adjusting for the on and off-balance sheet items. Particularly, the average book value of adjusted leverage is now 46% (23% more than the book value of non-adjusted leverage). The average market value of leverage after the adjustment also changes to 47% (increases by 24%). These results show a significant difference between firms' conventional debt and firms' adjusted debt when we take into account off-balance sheet financing.

The average tangibility is 33%, which is comparable to the average 34% and 35.6% reported in Lemmon et al. (2008) and in Campello and Giambona (2010), respectively. The decomposed tangible assets are land and building (L&B), machinery and equipment (M&E) and other miscellaneous tangible assets. The average ratio of land & building to total assets of large firms is 33%. Machinery & equipment, however, account for a considerable average of 47% over the total assets. Other miscellaneous tangible assets over total assets only account for 6%. Interestingly, among total assets, intangible assets account for 22%. This can be explained by the size of the company in the sample. As these companies are large companies in the US, they possess plenty of intangible assets and they play an important role in getting firms' access to finance. In contrast, Campello and Giambona (2010) shows the mean ratios of land and building to total

Table 2.10: Descriptive statistics

Variables	Obs.	Mean	S.D	p25	p50	p75
BV of Leverage	715	0.23	0.14	0.12	0.22	0.30
MV of Leverage	750	0.23	0.19	0.09	0.17	0.35
BV of Adjusted Leverage	750	0.46	0.25	0.29	0.41	0.61
MV of Adjusted Leverage	750	0.47	0.37	0.18	0.36	0.69
Tangibility	750	0.35	0.21	0.15	0.33	0.56
L&B	750	0.33	0.31	0.09	0.16	0.62
M&E	750	0.47	0.40	0.17	0.28	0.76
Other Tangibles	750	0.06	0.04	0.02	0.05	0.08
Intangibles	750	0.22	0.20	0.05	0.16	0.36
Firm size	678	10.92	1.07	10.14	10.95	11.76
Growth opportunity	678	0.32	0.61	-0.10	0.24	0.68
Earnings volatility	750	0.15	0.07	0.10	0.13	0.18
Profitability	750	0.16	0.08	0.11	0.15	0.21
Payout ratio	750	0.53	0.40	0.24	0.45	0.76
Effective tax rate	750	36.69	12.09	30.18	36.07	40.00
Non-debt tax shield	750	0.06	0.04	0.03	0.05	0.09

Note: Book value of leverage (BV of Leverage) = Total debt/BV of total assets. Market value of leverage (MV of Leverage) = Total debt/MV of total assets. MV of total assets = MV of equity + BV of debt. BV of Adjusted Leverage = (Total debt + DE)/BV of total assets. MV of Adjusted Leverage = (Total debt + DE)/MV of total assets. DE = Preferred Equity + Minority Interest + Pension Liability + Capitalised Operating Leases + Stock Options. Tangibility = Net PP&E/BV of total assets. L&B (land and building) = Net land and building/BV of total assets. M&E (machine and equipment) = Net machine and equipment/BV of total assets. Other Tangibles (plant and equipment in progress and other miscellaneous tangible assets) = Net other tangible assets/BV of total assets. Intangibles = Intangible assets/BV of total assets. Firm Size = ln (Sales). Profitability = EBITDA/BV of total assets. Growth opportunity = ln (MV of total assets/BV of total assets). Earnings volatility = Earnings volatility of the industry = Standard deviation of EBITDA of 10 firms with largest market capitalization in the industry using 5 years of consecutive observations/BV of total assets of same firms in the same industry over the same time horizon. Payout ratio = Total distributions (dividends + repurchases)/EBIT. Effective Tax Rate = (Income tax expense/pre-tax income)×100. Non-debt tax shield = Depreciation/BV of total assets.

assets, machinery and equipment and other tangible assets are 11.8%, 18.9% and 1.5%, respectively. However, their sample includes US firms of different sizes.

2.6.2 Empirical results

2.6.2.1 Fixed effects regression results with non-adjusted leverage

Table 2.11 reports the results of fixed effects regressions for both market and book value of non-adjusted leverage. Both the MV and BV of leverage are negatively correlated with tangibility. However, since these results are not statistically significant, I can not make further conclusion. Consistent with the hypothesis, intangible assets have explanatory power over non-adjusted leverage (especially the market value of leverage). This positive relationship between intangibles assets and both MV of leverage and BV of leverage are significant at 1% and 10% level of significance, respectively. This result affirms the fact that large firms have a comparative advantage in intangible assets over small firms and these assets should allow firms for higher debt capacity. Also, this result implies that the traditional collateral (tangible assets) might not be desirable for large firms to access finance. Instead, from 1996-2010, intangible assets play an active role in helping firms get access to external financial sources despite their not-so-easy to be liquidated characteristic. This is possible since in some cases, the lending procedures do not strictly follow the rules. The creditors might base their lending decisions on the well-known brand named firms to decide whether to finance or not.

Firm size has negative associations with both MV and BV of leverage although these results are not statistically significant. Growth opportunity is found to have very strong statistical explanatory power over MV of leverage at 1% significant level. This inverse relationship supports agency theory, indicating that the higher the growth opportunity, the less debt firms will use. The rationale for this is either because they do not want to lose potential investment opportunities due to risky debt or because firms may have problems of underinvestment. A positive relationship between MV of leverage and earnings volatility is found at a significant level of 10%. This finding shows that the completely opposite result with the pecking order and the static trade-off theory, which suggests that firms with high earnings volatility are more careful when using debt due to the likelihood of financial distress. In fact, this result shows that large US firms tend to increase leverage when their earnings volatility is high. Firms' target leverage might be a reasonable explanation for this relationship.

Consistent with the pecking order theory, profitability is found to be negatively related with both MV and BV of leverage although only the negative relationship between the MV of leverage and profitability possess statistical explanatory power at 5%. This result is in line with the studies of Toy et al. (1974), Kester (1986), Bennett and Donnelley (1993), Ozkan (2000) and Bevan and Danbolt (2001). I also document the positive relationships between payout ratio and MV and BV of leverage which supports the pecking order theory. Nevertheless, these relationships are not statistically significant. Consistent with studies of Modigliani and Miller (1963) and Haugen and Senbet (1986), effective tax rate has a positive significant association with MV of leverage at 5% level of significance. The inverse relationship between non-debt tax shield and BV of leverage is consistent with my hypothesis. However, this result is not statistically significant so I cannot come to any further conclusion.

Table 2.11: Fixed effects regression with non-adjusted leverage – Overall tangibility

Variables	MV of Leverage	BV of Leverage
Tangibility	-0.003	-0.012
	(0.041)	(0.050)
Intangibles	0.050***	0.038*
	(0.016)	(0.020)
Firm size	-0.025	-0.010
	(0.018)	(0.019)
Growth opportunity	-0.095***	-0.000
	(0.025)	(0.025)
Earnings volatility	0.286*	0.339
	(0.157)	(0.210)
Profitability	-0.177**	-0.138
	(0.074)	(0.086)
Payout ratio	0.001	0.009
	(0.009)	(0.008)
Effective tax rate	0.001*	0.000
	(0.000)	(0.000)
NDTS	0.223	-0.125
	(0.216)	(0.208)
Observations	678	678
Number of firms	93	93
R-squared	0.46	0.15

Note: Robust standard errors in parentheses (using the Huber-White sandwich estimator), *** p<0.01, ** p<0.05 and * p<0.1 indicate statistical significance at the 1%, 5% and 10% test levels, respectively. Firm and year dummies are omitted in the result table.
This table reports fixed effects regression results (with tangible assets as the overall tangibility). Data are manually extracted from firms' annual reports 10-K and collected from Bloomberg. The sample includes 50 US listed large firms in every year (from 1996-2010) with highest revenues each year (Fortune 500 ranking list) which totals 103 firms, excluding financial institutions and insurance companies. Standard errors reported in parentheses are robust to heteroskedasticity using the Huber-White sandwich estimator. Market value of leverage (MV of Leverage) = Total debt/MV of total assets. MV of total assets = MV of equity + BV of debt. Book value of leverage (BV of Leverage) = Total debt/BV of total assets. Tangibility = Net PP&E/BV of total assets. Intangibles = Intangible assets/BV of total assets. Firm Size = ln (Sales). Profitability = EBITDA/BV of total assets. Growth opportunity = ln (MV of total assets/BV of total assets). Earnings volatility = Earnings volatility of the industry = Standard deviation of EBITDA of 10 firms with largest market capitalization in the industry using 5 years of consecutive observations/BV of total assets of same firms in the same industry over the same time horizon. Payout ratio = Total distributions (dividends + repurchases)/EBIT. Effective Tax Rate = (Income tax expense/pre-tax income)×100. Non-debt tax shield = Depreciation/BV of total assets.

The R-squared of the regressions with BV of leverage stays quite low at 15%, which means all the independent variables only explain 15% of the BV of leverage. However, the goodness of fit in the model increases to 46% when using MV of leverage. Both models are robust to heteroskedasticity using the Huber-White sandwich estimator.

Table 2.12 decomposes overall tangible assets into categories to detect more specific effects of these categories on non-adjusted leverage. In contrast with my hypothesis, land & building has the inverse relationships with both MV of leverage and BV of leverage. However, these relationships are not statistically significant. These results

Table 2.12: Fixed effects regression with non-adjusted leverage – Assets decomposition

Variables	MV of Leverage	BV of Leverage
L&B	-0.030	-0.037
	(0.018)	(0.025)
M&E	0.016	0.037
	(0.029)	(0.028)
Other Tangibles	-0.048	0.084
	(0.181)	(0.152)
Intangibles	0.051***	0.043**
	(0.016)	(0.020)
Firm size	-0.027	-0.006
	(0.018)	(0.018)
Growth opportunity	-0.094***	-0.003
	(0.026)	(0.025)
Earnings volatility	0.322*	0.380**
	(0.175)	(0.199)
Profitability	-0.178**	-0.148*
	(0.074)	(0.082)
Payout ratio	0.001	0.008
	(0.001)	(0.008)
Effective tax rate	0.001**	0.000
	(0.000)	(0.000)
NDTS	0.238	-0.133
	(0.214)	(0.204)
Observations	678	678
Number of firms	93	93
R-squared	0.46	0.16

Note: Robust standard errors in parentheses (using the Huber-White sandwich estimator), *** p<0.01, ** p<0.05 and * p<0.1 indicate statistical significance at the 1%, 5% and 10% test levels, respectively. Firm and year dummies are omitted in the result table.
This table reports fixed effects regression results (with tangible assets decomposed into land and building, machine and equipment and other tangible assets). Standard errors reported in parentheses are based on heteroskedasticity consistent errors using the Huber-White sandwich estimator.
L&B (land and building) = Net land and building/BV of total assets. M&E (machine and equipment) = Net machine and equipment/BV of total assets. Other Tangibles (plant and equipment in progress and other miscellaneous tangible assets) = Net other tangible assets/BV of total assets. For other sample information and variables' definitions, refer to Table 2.11.

are in contrast with the study by Campello and Giambona (2010) where they find land & building is the key collateral for firms to improve their debt capacity. Machine and equipment and other tangible assets have mixed insignificant impacts on both MV and BV of leverage. These results show evidence that the overall assets tangibility and the decomposed assets are not powerful determinants of large firms' conventional leverage from 1996 to 2010. Nevertheless, intangible assets once again show strong positive links with both MV and BV of leverage at 1% and 5% significant level.

Consistent with results in Table 2.11, firm size is inversely related to both MV and BV of leverage. Table 2.12 also reports strong negative relationship between MV of leverage and growth opportunity at 1% level of significance. These results are explained by the agency theory which states that firms with few investment opportunities and excess cash flows would increase financial gearing to discipline opportunistic managers' behaviours. Contrarily, firms with high growth opportunity tend to be more careful when considering using risky debts, as they do not want to either lose potential investment opportunities or invest in suboptimal projects. Earning volatility is significantly and positively related with both MV and BV of leverage at 10% level of significance, which is in line with the previous results. Consistent with the results in Table 2.11, effective tax rate is significantly and positively associated with MV of leverage at 5% level of significance.

The R-squared of the regression using MV of leverage has more explanatory power than the R-squared of the regression using BV of leverage (46% compared with 16%). Both regression models are robust to heteroskedasticity using the Huber-White sandwich estimator.

2.6.2.2 Fixed effects regression results with adjusted leverage

As we can see from Table 2.13, overall tangibility is positively related with both MV and BV of adjusted leverage. However, only the relationship between overall tangibility and BV of adjusted leverage is statistically significant at 10%. This result reports that unlike non-adjusted leverage, overall tangibility acts as the core determinants of adjusted leverage. Put differently, after considering the on and off-balance sheet debt equivalents, tangible assets are found to be good collaterals in granting finance for firms. The result is consistent with our hypothesis and supports the collateral viewpoint.

Moreover, intangibles have explanatory power over both MV and BV of adjusted leverage at 10% and 5% level of significance, respectively. These findings are consistent with the results in Table 2.11 and 2.12, which once again affirms the collateral role of intangible assets for large US firms. In other words, among firms' assets, intangible assets (e.g. brand names, know-how, relationships) are important determinants of firms' leverage.

Firm size is inversely related with both MV and BV of leverage at the level of significance of 1%. These results can be again explained by the information asymmetry. Since large firms operate under less information asymmetry and tend to disclose more information to the capital markets, they are more capable of issuing equity. As a consequence, they should have lower leverage. Growth opportunity is positively related with BV of

Table 2.13: Fixed effects regression with adjusted leverage – Overall tangibility

Variables	MV of Adjusted Leverage	BV of Adjusted Leverage
Tangibility	0.127	0.147*
	(0.139)	(0.074)
Intangibles	0.124*	0.122**
	(0.072)	(0.060)
Firm size	-0.137***	-0.153***
	(0.049)	(0.039)
Growth opportunity	-0.047	0.173***
	(0.047)	(0.039)
Earnings volatility	-0.292	0.138
	(0.750)	(0.546)
Profitability	-0.393	-0.361
	(0.373)	(0.237)
Payout ratio	0.076	0.054
	(0.051)	(0.037)
Effective tax rate	0.001	-0.000
	(0.001)	(0.001)
NDTS	0.174	-0.412
	(0.498)	(0.307)
Observations	678	678
Number of firms	93	93
R-squared	0.19	0.16

Note: Robust standard errors in parentheses (using the Huber-White sandwich estimator), *** p<0.01, ** p<0.05 and * p<0.1 indicate statistical significance at the 1%, 5% and 10% test levels, respectively. Firm and year dummies are omitted in the result table.
This table reports regression results for fixed effects regression model with leverage (both market value and book value) adjusting for the off-balance-sheet debt equivalents. Tangible assets are defined as the overall tangibility. Standard errors reported in parentheses are based on heteroskedasticity consistent errors using the Huber-White sandwich estimator. Off-balance-sheet debt equivalents consist of preferred equity, minority interest, capitalised operating leases, pensions and stock options. Refer to the notes of Table 2.11 and 2.12 for other sample information and variables' definitions.

adjusted leverage at 1% level of significance. This result is in line with the results of the models using non-adjusted leverage (refer to Table 2.11 and 2.12).

Earning volatility is documented to have insignificant mixed relationships with MV and BV of leverage. I find evidence for the negative relationships between profitability and both MV and BV of adjusted leverage (supported by the pecking theory). Nevertheless, I cannot go to further conclusion since the results are of no statistical significance. Additionally, payout ratio has insignificant positive impacts on MV and BV of adjusted leverage. Besides, effective tax rate and non-debt tax shield have insignificant mixed associations with MV and BV of leverage.

The model using MV of adjusted leverage has more explanatory power in comparison to the model using BV of adjusted leverage (19% compared with 16%). It can be said the explanatory power of the model using MV adjusted leverage is slightly lower compared with model using MV of non-adjusted leverage (19% compared with 46%). On the contrary, the BV of adjusted leverage model possesses similar goodness of fit in comparison to the model using BV of non-adjusted leverage (16% compared with 15%). This implies the fact that traditional explanatory variables fails to explain MV of adjusted leverage, but succeeds in providing similar explanation of BV of adjusted leverage. The regression results are robust to heteroskedasticity using the Huber-White sandwich estimator.

Table 2.14: Fixed effects regression with adjusted leverage – Assets decomposition

Variables	MV of Adjusted Leverage	BV of Adjusted Leverage
L&B	0.066	-0.031
	(0.094)	(0.061)
M&E	0.066	0.076
	(0.105)	(0.055)
Other Tangibles	-0.792*	-0.554*
	(0.474)	(0.321)
Intangibles	0.118*	0.116**
	(0.065)	(0.058)
Firm size	-0.140***	-0.156***
	(0.050)	(0.042)
Growth opportunity	-0.044	0.177***
	(0.047)	(0.042)
Earnings volatility	-0.332	0.131
	(0.771)	(0.568)
Profitability	-0.396	-0.360
	(0.372)	(0.237)
Payout ratio	0.071	0.051
	(0.051)	(0.037)
Effective tax rate	0.001	-0.000
	(0.001)	(0.001)
NDTS	0.160	-0.423
	(0.506)	(0.305)
Observations	678	678
Number of firms	93	93
R-squared	0.20	0.16

Note: Robust standard errors in parentheses (using the Huber-White sandwich estimator), *** p<0.01, ** p<0.05 and * p<0.1 indicate statistical significance at the 1%, 5% and 10% test levels, respectively. Firm and year dummies are omitted in the result table.
This table reports regression results for fixed effects regression model with leverage (both market value and book value) adjusting for the off-balance-sheet debt equivalents. Tangible assets are decomposed into land and building (L&B), machine and equipment (M&E) and other tangible assets (Other Tangibles). Standard errors reported in parentheses are based on heteroskedasticity consistent errors using the Huber-White sandwich estimator. Off-balance-sheet debt equivalents consist of preferred equity, minority interest, capitalised operating leases, pensions and stock options. Refer to the notes of Table 2.11 and 2.12 for other sample information and variables' definitions.

Table 2.14 decomposes overall tangibility into categories to test the relationships of these categories with adjusted leverage. Although I document a significant positive relationship between overall tangibility and BV of adjusted leverage, when I decompose the overall tangibility into land & building, machine & equipment and other tangibles, only other tangibles possess statistic power in explaining adjusted leverage. The negative relationship between other tangibles and adjusted leverage contradicts the result in the study by Campello and Giambona (2010). As a result, this finding shows that each asset category does not contribute as a significant collateral in increasing adjusted debt capacity for large firms. Nonetheless, only overall tangible assets are the significant determinant of adjusted leverage.

Intangible assets again are positively associated with both MV and BV of adjusted leverage at 10% and 5%, respectively. These results are consistent with the results shown in Table 2.13 and also in line with the regression results using non-adjusted leverage. Firm size and growth opportunity show similar significant results to those in Table 2.13.

Other results related to earnings volatility, profitability, effective tax rate and payout ratio remain consistently with the previous results in Table 2.13 despite their statistically insignificance. The models' goodness of fit (R-squared) with the decomposition of overall tangible assets remains about 20% for MV of adjusted leverage and 16% for BV of adjusted leverage. These results are all robust to heteroskedasticity using the Huber-White sandwich estimator.

2.6.3 Statistical Robustness

2.6.3.1 Robustness tests

First of all, all variables are tested to see whether they are normally distributed using skewness and kurtosis criteria. In order to mitigate extreme outliers to satisfy the linearity assumptions, winsorization is applied for some variables such as MV of leverage, MV of adjusted leverage, tangibility, M&E, Other Tangibles, profitability, payout ratio and effective tax rate at 5%; L&B, intangibles and NDTS at 1%.

Secondly, to detect multicollinearity among independent variables, a correlation matrix of all regressors is established. Empirical evidence shows that if the correlation between two independent variables is above 0.85, the problem of multicollinearity is present in the model. Moreover, in case of doubts, the variance inflation factor (VIF) is also constructed based on the following equation:

$$VIF_{Determinant} = \frac{1}{1 - R^2_{Determinant}} \tag{2.18}$$

where $R^2_{Determinant}$ is the coefficient of determination for the examined determinant (explanatory variable). $R^2_{Determinant}$ is generated with an auxiliary regression of one of the determinants on the remaining determinants. Empirical evidence shows that when VIF is larger than 5, multicollinearity is detected which affects the reliability of the estimators.

As for testing for heteroskedasticity, Breusch-Pagan/Cook-Weisberg test is used with the null hypothesis that the error variances are all equal against the alternative hypothesis that the error variances fluctuate along with the predicted values of Y. A large chi-square would indicate that heteroskedasticity is present. In addition, with a view to detecting omitted variable problems, Ramsey RESET test is applied in this research.

In terms of endogeneity problems, the redeployability of assets depends on supply and demand for these assets on the market. Therefore, endogeneity is probably present in the models. In fact, the study by Campello and Giambona (2010) presents similar problems of endogenous variables and construct some sets of instrumental variables to solve this problem. Therefore, it is believed that this study also has the endogeneity problem.

To detect serial correlation (autocorrelation), I refer to the test discussed by Wooldridge (2002). It is acknowledged that serial correlation exits in the idiosyncratic errors of a panel data model because the error in each time period contains a time-constant omitted factor. Wooldridge (2002)'s method uses the residuals from a regression in first-differences for $T > 2$ as follows:

$$\begin{aligned} y_{it} - y_{it-1} &= (X_{it} - X_{it-1})\beta + u_{it} - u_{it-1} \\ \Delta y_{it} &= \Delta X_{it}\beta + \Delta u_{it} \end{aligned} \tag{2.19}$$

where Δ is the first-difference operator.

Wooldridge (2002)'s procedure starts with the estimation of parameters β_1 by regressing Δy_{it} on ΔX_{it} to obtain the residuals $\Delta \hat{u}_{it}$. After that, Wooldridge suggests regressing the residuals $\Delta \hat{u}_{it}$ from the regression with first-differenced variables on their lagged residuals. He observes that if the coefficient on the lagged residuals is equal/close to -0.5, which means corr($\Delta u_{it}, \Delta u_{it-1}$)=-0.5, the u_{it} is not serially correlated. As a result, the model is free from autocorrelation. Moreover, the variance component estimator (VCE) is adjusted for clustering at the panel level so as to account for the within panel correlation in the regression of $\hat{u}_{it}$ on $\hat{u}_{it-1}$. This cluster implies robustness. Therefore, Wooldridge (2002)'s test of serial correlation is also robust to conditional heteroskedasticity.

2.6.3.2 Robustness results and solutions

Table A.1 and Table A.2 in the Appendix A show results of multicollinearity tests including correlation matrix and VIF tests. The results show no multicollinearity problems in the models as correlations between independent variables are under 0.85, and VIFs are also under 5.

I used Breusch-Pagan/Cook-Weisberg tests of heteroskedasticity, and the result shows that heteroskedasticity does exist in the models. The solution to this problem is to add the option "robust" to the end of the fixed effect regression commands in order to obtain heteroskedasticity consistent errors using the Huber-White sandwich estimator. This helps control for heteroskedasticity problem.

The p values of Ramsey RESET tests are all significant; thus, the study fails to reject the null hypotheses that the models have no omitted variables. However, by using fixed effects regression, the problem of omitted variables bias is no longer a concern.

Wooldridge (2002)'s tests for autocorrelation show that there exists serial correlation in the models. Arellano and Bond (1991) develop a method to solve the problem of autocorrelation, known as the generalised method of moments (GMM). They use a generalised method of moments framework to develop valid instruments. In particular, they remove the time-invariant fixed effects by taking the first difference of the panel data. Put differently, the GMM transforms the regressors by first differencing. Arellano and Bond (1991) show that the lagged values of dependent variables (aka levels) comprise instruments for the first-differenced variable, provided that the residuals are free from second-order serial correlation. This GMM estimator, based on the moment conditions, is called the Arellano and Bond (1991) "difference GMM" estimator.

Arellano and Bond's Monte Carlo simulations show that their difference GMM method outperforms OLS and FE estimators when the regression residuals are uncorrelated (Flannery and Hankins (2013). However, the lagged levels may provide little information about the first-differenced variable particularly if they are serially correlated (Arellano and Bover (1995), Blundell and Bond (1998)). In other words, when the lagged levels of the regressors are poor instruments for the first-differenced regressors, the alternative estimator by Blundell and Bond (1998), commonly known as "system GMM" estimator is recommended. In addition to the first difference used by Arellano and Bover (1995), Blundell and Bond (1998) utilise the lagged first differences as instruments in a level equation. Put differently, the system GMM estimator essentially combines in a system a regression in differences with a regression in levels.

In general, Baltagi (1995) argues that system GMM generally provides more efficient and precise estimates and also reduces the finite sample bias. Roodman (2006) reports that when difference GMM estimators are used, time invariant regressors will disappear due to the differencing of variables within groups. He highlights that in the case of unbalanced data, it is better avoid difference GMM since it has the weakness of magnifying gaps. The dataset of this thesis is unbalanced data with gaps, therefore, system GMM estimators provide more robust results.

Furthermore, this study employs system GMM because the lagged levels of the regressors in difference GMM are tested and documented to be poor instruments. Also, both system GMM–1 step (system GMM1) estimator and system GMM-2 steps (system GMM2) estimators are conducted to have an overall comparison of robustness among the results. Both system GMM1 and GMM2 estimates in this study are robust to heteroskedasticity using the finite sample correction by Windmeijer (2005).

In addition to controlling for serial correlation, both difference GMM by Arellano and Bond (1991) and system GMM by Blundell and Bond (1998) can handle endogeous regressors, using the first differences or the lagged levels of those variables as instruments. The lagged levels of the endogenous regressors make endogenous variables predetermined and, therefore, not correlated with the error term. Thus, these endogenous variables become exogenous. Furthermore, omitted variables bias is also taken into consideration when including the first differences or the lagged values of the dependent and independent variables as instrumental variables.

By default, Stata's xtabond2 command reports four additional tests: (i) the Arellano Bond tests for autocorrelation. Particularly, AR (1) is the test for first order correlation and AR (2) is the test for second order correlation with the null hypotheses of no autocorrelation. Both AR (1) and AR (2) are applied to the differenced residuals; (ii) Sargan test and Hansen J statistic for overidentifying restrictions with the null hypotheses that the instruments as a group are exogenous. Compared with AR (1), AR (2) provides more significant results because it detects autocorrelation in levels. Moreover, Arellano and Bond (1991) states that the GMM estimator requires that there is first order autocorrelation but there should be no second order correlation. Therefore, AR (2) results will be the research's final conclusions.

Roodman (2006) states that the Sargan statistic is the special case of Hansen J statistic under the assumption of homoscedasticity. As a consequence, for robust results, the Sargan test statistic is inconsistent. Moreover, in some cases of my sample, the number of instruments exceeds the number of firms, which causes the Sargan statistic to be weak. Therefore, the Hansen J statistic will be the research's final conclusion. The number of lags included for dependent variable is based on AR (2) and Hansen J statistic results to see whether the problems of autocorrelation and endogeneity are solved. Additionally, the number of lags for endogenous independent variables is adjusted accordingly with the dependent variables' number of lags to make sure they are not correlated with the error terms.

Tables 2.15, 2.16, 2.17 and 2.18 report the comparison between estimates using different approaches: fixed effect regressions (FE), ordinary least squared (OLS), system GMM1 and GMM2. The results of FE, OLS and system GMM1 are robust to heteroskedasticity using Huber-White sandwich estimator while system GMM2 is asymptotically robust to both heteroskedasticiy and serial correlation using the finite-sample correction proposed by Windmeijer (2005).

Table 2.15: Robustness results for non-adjusted leverage - Overall tangibility

Variables	FE Regression		OLS		System GMM-1 step		System GMM-2 steps	
	MV of Leverage	BV of Leverage	MV of Leverage	BV of Leverage	MV of Leverage	BV of Leverage	MV of Leverage	BV of Leverage
L1					0.225***	0.758***	0.206**	0.737***
					(0.072)	(0.074)	(0.081)	(0.085)
Tangibility	0.003	-0.012	0.114***	0.117***	-0.289	-0.151	-0.224	-0.188**
	(0.041)	(0.050)	(0.028)	(0.027)	(0.187)	(0.109)	(0.188)	(0.080)
Intangibles	0.050***	0.038*	-0.002	-0.012	-0.089	-0.043	-0.081	-0.056**
	(0.016)	(0.020)	(0.025)	(0.026)	(0.056)	(0.031)	(0.063)	(0.028)
Firm size	-0.025	-0.010	0.019***	0.032***	0.022***	0.008**	0.020***	0.008***
	(0.018)	(0.019)	(0.006)	(0.006)	(0.004)	(0.003)	(0.003)	(0.003)
Growth opportunity	-0.095***	-0.000	-0.131***	-0.032***	-0.133***	-0.012	-0.131***	-0.011
	(0.025)	(0.025)	(0.013)	(0.011)	(0.023)	(0.008)	(0.033)	(0.010)
Earnings volatility	0.286*	0.339	-0.346***	-0.406***	-0.175	-0.047	-0.184	-0.038
	(0.157)	(0.210)	(0.085)	(0.078)	(0.147)	(0.074)	(0.167)	(0.091)
Profitability	-0.177**	-0.138	-0.584***	-0.610***	0.039	0.020	0.075	0.046
	(0.074)	(0.085)	(0.111)	(0.103)	(0.186)	(0.125)	(0.226)	(0.096)
Payout ratio	0.001	0.009	-0.054***	-0.058***	-0.025**	0.011	-0.026*	0.009
	(0.009)	(0.008)	(0.013)	(0.014)	(0.012)	(0.009)	(0.014)	(0.009)
Effective tax rate	0.001*	0.0001	0.001**	0.001*	0.002***	0.001	0.002***	0.001
	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.000)
NDTS	0.223	-0.125	-0.091	-0.109	0.494	0.178	0.350	0.233
	(0.216)	(0.208)	(0.154)	(0.153)	(0.332)	(0.178)	(0.375)	(0.152)
Observations	678	678	678	678	572	570	572	570
R-squared	0.46	0.15	0.50	0.23				
AR (1) – P value					0.04	0.00	0.05	0.00
AR (2) – P value					0.17	0.18	0.21	0.15
Sargan – P value					0.00	0.01	0.00	0.12
Hansen J – P value					0.23	0.52	0.23	0.52

Note: *** p<0.01, ** p<0.05 and * p<0.1 indicate statistical significance at the 1%, 5% and 10% test levels, respectively. Robust standard errors in parentheses for FE and OLS are Huber-White sandwich estimator. For system GMM – 1 step estimates, Huber-White standard errors are reported while for system GMM – 2 step estimates, Windmeijer corrected standard errors are reported.

It can be seen from GMM1 and GMM2 in Table 2.15 that the first lags of both MV and BV of leverage have strong explanatory power over the current leverage. The first lags are positively correlated with the current leverage, which implies that firms might have target leverage. As for tangibility FE regression provides mixed result with no statistical significance while OLS documents positive relationship between tangibility and both MV and BV of leverage at 1% level of significance.

Nevertheless, after controlling for serial correlation and endogeneity problems, GMM1 and GMM2 in this case show consistent negative relationship between tangibility and both MV and BV of non-adjusted leverage. These results show the fact that as for large US firms, overall tangibility may not play an active collateral role in helping firms to get access to non-adjusted leverage. These findings contradict with those in the recent study by Campello and Giambona (2010) which affirms the collateral role of tangibility for firms of different sizes.

In terms of intangible assets, both GMM1 and GMM2 estimates and relationship signs are consistent with those OLS regressions while FE models show opposite results. It can be said that if firm and year effects are held fixed, there is no doubt for large US firms that they can take advantage of their intangible assets to get access to their conventional financial gearing. However, these results might be biased towards autocorrelation and endogeneity problems.

The p values of AR (2) and Hansen J statistics of GMM1 and GMM2 for both MV of leverage and BV of leverage show that the study fails to reject the null hypothesis of no autocorrelation, and the instruments as a group are exogenous, respectively. Therefore, the problems of autocorrelation and endogeneity are solved.

Table 2.16: Robustness results for adjusted leverage - Overall tangibility

Variables	FE Regression		OLS		System GMM-1 step		System GMM-2 steps	
	MV of Adjusted Leverage	BV of Adjusted Leverage	MV of Adjusted Leverage	BV of Adjusted Leverage	MV of Adjusted Leverage	BV of Adjusted Leverage	MV of Adjusted Leverage	BV of Adjusted Leverage
L1					0.280*** (0.105)	0.465*** (0.121)	0.267** (0.109)	0.479*** (0.129)
Tangibility	0.127 (0.139)	0.147* (0.074)	0.166** (0.075)	0.179*** (0.052)	-0.170 (0.565)	0.243 (0.351)	-0.171 (0.326)	0.324 (0.447)
Intangibles	0.124* (0.072)	0.122** (0.060)	-0.029 (0.063)	0.005 (0.047)	-0.064 (0.142)	0.065 (0.094)	-0.064 (0.101)	0.080 (0.117)
Firm size	-0.137*** (0.049)	-0.153*** (0.039)	-0.007 (0.013)	-0.004 (0.009)	0.028*** (0.009)	0.019** (0.009)	0.025*** (0.008)	0.018* (0.009)
Growth opportunity	-0.047 (0.047)	0.173*** (0.039)	-0.177*** (0.030)	0.014 (0.019)	-0.215*** (0.042)	-0.032* (0.018)	-0.215*** (0.048)	-0.025 (0.019)
Earnings volatility	-0.292 (0.750)	0.138 (0.546)	-0.676*** (0.157)	-0.811*** (0.125)	-0.397 (0.386)	-0.490** (0.234)	-0.531* (0.319)	-0.554** (0.266)
Profitability	-0.393 (0.373)	-0.361 (0.237)	-0.942*** (0.232)	-0.665*** (0.158)	0.001 (0.541)	-0.178 (0.288)	0.111 (0.261)	-0.209 (0.323)
Payout ratio	0.076 (0.051)	0.054 (0.037)	-0.018 (0.035)	-0.016 (0.032)	0.022 (0.045)	0.030 (0.039)	0.007 (0.041)	0.022 (0.032)
Effective tax rate	0.001 (0.001)	-0.000 (0.001)	0.002* (0.001)	0.001 (0.001)	0.004** (0.002)	0.001 (0.001)	0.004*** (0.001)	0.000 (0.001)
NDTS	0.174 (0.498)	-0.412 (0.307)	0.489 (0.400)	0.438 (0.279)	0.752 (0.851)	-0.101 (0.534)	0.694 (0.647)	-0.034 (0.625)
Observations	678	678	678	678	572	572	572	572
R-squared	0.19	0.16	0.29	0.10				
AR (1) – P value					0.01	0.0	0.01	0.02
AR (2) – P value					0.40	0.11	0.38	0.11
Sargan – P value					0.00	0.00	0.00	0.00
Hansen J – P value					0.13	0.23	0.13	0.23

Note: *** p<0.01, ** p<0.05 and * p<0.1 indicate statistical significance at the 1%, 5% and 10% test levels, respectively. Robust standard errors in parentheses for FE and OLS are Huber-White standard errors. For system GMM – 1 step estimates, Huber-White standard errors are reported while for system GMM – 2 step estimates, Windmeijer corrected standard errors are reported.

Compared with robustness results for non-adjusted leverage in Table 2.15, the results for adjusted leverage in Table 2.16 show consistent significant results for the relationship between tangibility and BV of adjusted leverage for the on and off-balance sheet items using FE, OLS and system GMM1 and GMM2. The results of FE and both system GMM1 and GMM2 show similar estimates and asymptotic standard errors with slightly upward bias of 2%. It can be seen from these results that overall tangibility has a collateral role in helping large firms to get access to adjusted debt.

FE regressions show robust results for a positive relationship between intangibles and BV of adjusted leverage with very minor downward biases in comparison with that of system GMM1 and GMM2. In addition, the asymptotic standard errors of GMM1 and GMM2 are similar to those of FE estimators for intangibles. The p values of AR (2) and Hansen J statistics of GMM1 and GMM2 for both MV of leverage and BV of leverage show insignificant results which indicate that the problems of autocorrelation and endogeneity are also solved using GMM1 and GMM2.

Table 2.17: Robustness results for non-adjusted leverage - Assets decomposition

Variables	FE Regression		OLS		System GMM-1 step		System GMM-2 steps	
	MV of Leverage	BV of Leverage	MV of Leverage	BV of Leverage	MV of Leverage	BV of Leverage	MV of Leverage	BV of Leverage
L1					0.235**	0.943***	0.420**	0.893***
					(0.104)	(0.130)	(0.172)	(0.096)
L2					-0.284***	-0.391**		
					(0.068)	(0.159)		
L&B	-0.030	-0.037	-0.014	-0.040**	-0.016	-0.016	-0.016	0.001
	(0.018)	(0.025)	(0.018)	(0.017)	(0.035)	(0.020)	(0.026)	(0.013)
M&E	0.016	0.037	0.035**	0.045***	0.022	0.013	0.010	0.012
	(0.029)	(0.028)	(0.015)	(0.015)	(0.0301)	(0.018)	(0.024)	(0.011)
Other Tangibles	-0.048	0.084	-0.180	-0.341***	-0.186	-0.227*	-0.084	-0.014
	(0.181)	(0.152)	(0.123)	(0.121)	(0.219)	(0.122)	(0.147)	(0.058)
Intangibles	0.051***	0.043**	-0.026	-0.040	-0.045	-0.025	-0.019	-0.011
	(0.016)	(0.020)	(0.024)	(0.025)	(0.040)	(0.028)	(0.029)	(0.016)
Firm size	-0.027	-0.006	0.013**	0.023***	0.031***	0.015**	0.014***	0.003
	(0.018)	(0.018)	(0.006)	(0.006)	(0.008)	(0.006)	(0.005)	(0.003)
Growth opportunity	-0.094***	-0.003	-0.125***	-0.024**	-0.152***	-0.014	-0.095***	-0.003
	(0.026)	(0.025)	(0.015)	(0.012)	(0.020)	(0.009)	(0.025)	(0.005)
Earnings volatility	0.322*	0.380*	-0.363***	-0.416***	-0.430***	-0.202**	-0.227*	-0.096
	(0.175)	(0.199)	(0.090)	(0.079)	(0.156)	(0.095)	(0.128)	(0.061)
Profitability	-0.178**	-0.148*	-0.515***	-0.524***	-0.272	-0.201*	-0.067	-0.051
	(0.074)	(0.082)	(0.122)	(0.105)	(0.181)	(0.120)	(0.118)	(0.054)
Payout ratio	0.001	0.008	-0.060***	-0.065***	-0.033**	0.002	-0.007	0.013
	(0.001)	(0.008)	(0.014)	(0.014)	(0.014)	(0.014)	(0.012)	(0.010)
Effective tax rate	0.001**	0.000	0.002***	0.001***	0.001*	0.000	0.001*	2.01e-05
	(0.000)	(0.000)	(0.001)	(0.001	(0.000)	(0.000)	(0.001)	(0.000)
NDTS	0.238	-0.133	-6.20e-05	0.001	0.119	-0.001	0.186	-0.020
	(0.214)	(0.204)	(0.153)	(0.156)	(0.249)	(0.137)	(0.189)	(0.085)
Observations	678	678	678	678	491	488	572	570
R-squared	0.46	0.16	0.49	0.22				
AR (1) – P value					0.02	0.00	0.06	0.00
AR (2) – P value					0.32	0.58	0.22	0.31
Sargan – P value					0.00	0.09	0.00	0.03

Note: *** p<0.01, ** p<0.05 and * p<0.1 indicate statistical significance at the 1%, 5% and 10% test levels, respectively. Robust standard errors in parentheses for FE and OLS are Huber-White standard errors. For system GMM – 1 step estimates, Huber-White standard errors are reported while for system GMM – 2 step estimates, Windmeijer corrected standard errors are reported.

Tables 2.17 and Table 2.18 report robustness results for non-adjusted and adjusted leverage with tangible assets decomposition, respectively. As we can see from Table 2.17, system GMM1 step documents the significant positive relationships between the first lags of both MV and BV of leverage with adjusted leverage and the inverse relationship between the second lags of both MV and BV of leverage with current leverage. System GMM 2 steps reports the significant positive associations with the current values of leverage, which implies that firms may use target leverage.

As for both FE and OLS regressions, L&B is found to be negatively related with non-adjusted leverage. However, when using system GMM1 and GMM2 to control for serial correlation and endogeneity, system GMM1 and GMM2 estimates show mixed results in terms of the relationship signs between MV of leverage and L&B. M&E has consistent positive relationships with non-adjusted leverage using OLS, system GMM1 and GMM2 with similar estimates and asymptotic standard errors. Contrarily, as for other tangibles, FE estimates are mixed while OLS, system GMM1 and GMM2 provide consistent negative relationships with conventional leverage with small biases and same asymptotic standard errors. Once again, FE provides opposite result for intangibles and conventional leverage in comparison with OLS, system GMM1 and GMM2.

It can be observed from Table 2.18 that compared with non-adjusted leverage, L&B and M&E serve as core collaterals for large firms while other tangibles (net plant and equipment in progress and other miscellaneous tangible assets) do not. The collateral role of intangibles seems to be more affirmative with the BV of adjusted leverage even after controlling for autocorrelation and endogeneity problems. Overall, AR (2) and Hansen J statistics' p values of system GMM1 and GMM2 for both conventional leverage and adjusted leverage are insignificant, which point out that the problems of autocorrelation and endogeneity no longer exist.

All in all, the estimates of FE, OLS and system GMM1 are robust to heteroskedasticity using Huber-White sandwich estimator while system GMM2's estimates are robust to both serial correlation and heteroskedasticiy using the Windmeijer's finite-sample correction.

Table 2.18: Robustness results for adjusted leverage - Assets decomposition

Variables	FE Regression		OLS		System GMM-1 step		System GMM-2 steps	
	MV of Adjusted Leverage	BV of Adjusted Leverage	MV of Adjusted Leverage	BV of Adjusted Leverage	MV of Adjusted Leverage	BV of Adjusted Leverage	MV of Adjusted Leverage	BV of Adjusted Leverage
L1					0.248	0.607***	0.366	0.663***
					(0.227)	(0.115)	(0.323)	(0.135)
L&B	0.066	0.031	-0.051	-0.039	0.010	0.0127	0.002	-0.027
	(0.094)	(0.061)	(0.054)	(0.035)	(0.069)	(0.035)	(0.084)	(0.037)
M&E	0.066	0.076	0.061	0.061**	0.019	0.034	0.023	0.016
	(0.105)	(0.055)	(0.043)	(0.028)	(0.055)	(0.021)	(0.069)	(0.025)
Other Tangibles	-0.792*	-0.554*	-0.695***	-0.627***	-0.055	-0.032	0.119	-0.033
	(0.474)	(0.321)	(0.269)	(0.205)	(0.290)	(0.156)	(0.308)	(0.159)
Intangibles	0.118*	0.116**	-0.066	-0.032	-0.040	0.029	-0.022	9.59e-05
	(0.065)	(0.058)	(0.063)	(0.046)	(0.074)	(0.052)	(0.074)	(0.057)
Firm size	-0.140***	-0.156***	-0.022*	-0.018*	0.029**	0.013*	0.024	0.010
	(0.050)	(0.042)	(0.013)	(0.009)	(0.012)	(0.008)	(0.016)	(0.008)
Growth opportunity	-0.044	0.177***	-0.165***	0.026	-0.228***	-0.030	-0.203**	-0.039*
	(0.047)	(0.042)	(0.034)	(0.022)	(0.063)	(0.018)	(0.096)	(0.020)
Earnings volatility	-0.332	0.131	-0.680***	-0.823***	-0.634***	-0.372**	-0.541*	-0.283*
	(0.771)	(0.568)	(0.170)	(0.136)	(0.233)	(0.146)	(0.288)	(0.147)
Profitability	-0.396	-0.360	-0.807***	-0.532***	-0.058	0.086	-0.066	0.187
	(0.372)	(0.237)	(0.251)	(0.174)	(0.269)	(0.141)	(0.291)	(0.145)
Payout ratio	0.071	0.051	-0.027	-0.026	0.018	0.031	-0.002	0.024
	(0.051)	(0.037)	(0.035)	(0.032)	(0.044)	(0.037)	(0.039)	(0.031)
Effective tax rate	0.001	-0.000	0.003***	0.001**	0.003***	0.001*	0.002**	0.001*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
NDTS	0.160	-0.423	0.660	0.608**	0.705	-0.023	0.332	0.177
	(0.506)	(0.305)	(0.429)	(0.298)	(0.457)	(0.287)	(0.418)	(0.315)
Observations	678	678	678	631	572	572	572	572
R-squared	0.20	0.16	0.29	0.10				
AR (1) – P value					0.07	0.00	0.11	0.01
AR (2) – P value					0.49	0.15	0.59	0.16
Sargan – P value					0.00	0.00	0.00	0.00
Hansen J – P value					0.22	0.19	0.22	0.19

Note: *** $p<0.01$, ** $p<0.05$ and * $p<0.1$ indicate statistical significance at the 1%, 5% and 10% test levels, respectively. Robust standard errors in parentheses for FE and OLS are Huber-White standard errors. For system GMM – 1 step estimates, Huber-White standard errors are reported while for system GMM – 2 step estimates, Windmeijer corrected standard errors are reported.

2.7 Summary and conclusions

The role of collateral in borrowing is important due to its implication for corporate gearing (Hart and Moore (1998), Rajan and Winton (1995), Hege and Mella-Barral (2005) and Inderst and Mueller (2007)). On the one hand, it is argued that assets which are more liquid or easier to be redeployed are more desirable for creditors to repossess in case of firms' bankruptcy (Williamson (1988) and Hart and Moore (1998)). On the contrary, intangible assets are argued to be less desirable for creditors because they are less redeployable; however, they can be resold despite their unique use (Shleifer and Vishny (1991)).

This study presents evidence that the redeployability of overall tangibility does not contribute in boosting large US firms' conventional debt. However, overall tangible asset redeployability is found to be the core determinant in facilitating firms to increase their adjusted debt capacity. Besides, the decomposition of assets does not tell much of the story with conventional leverage. Whilst, for adjusted leverage, other tangibles (including net plant and equipment in progress and other miscellaneous tangible assets) are found to have negative partial impact on large firms' adjusted debt. These findings contradict with the recent study by Campello and Giambona (2010) in which they document the collateral roles of each decomposed tangible asset.

More importantly, the study also shows the positive partial impact of intangible assets on firm leverage (both adjusted and non-adjusted leverage). My results indicate the fact that large firms may exploit their reputations, relationships and other intangible assets to increase their debt capacity. Beside the standard financial assessment procedures, which are based on financial ratios and credit rating, creditors may also rely on other factors such as corporate brand names and reputation and long time relationship with firms to decide whether to finance firms or not.

Apart from asset redeployability variables, this research documents the consistent inverse relationships between firm size and both MV and BV of adjusted leverage, which support the pecking order theory. Besides, the strong negative associations between growth opportunity and MV of conventional leverage and both MV and BV of adjusted leverage support the agency theory and confirm the disciplinary role of debt. In contrast to the pecking order theory and the static trade-off theory, earning volatility is found to be positively related with both MV and BV of non-adjusted leverage. These results imply the fact that firms may have target capital structure. However, when adjusting for the off-balance sheet debt equivalents, these relationships are not statistically significant.

This study employs fixed effect regressions as the main models. Consistent with the findings by Lemmon et al. (2008), I also document that traditional determinants of conventional leverage become largely irrelevant once time-invariant firm effects are taken into account (e.g. firm size, payout ratio and NDTS). On the contrary, OLS models provide more significant results. Our main results are robust to heteroskedasticity and omitted variables problems using Huber-White sandwich estimator and FE regressions, respectively. However, autocorrelation and endogeneity problems still remain in the models. Therefore, to improve the robustness of the estimates, system GMM1 and GMM2 estimators for dynamic panel data are exploited to solve these problems. Also, OLS estimators are also used for a comparison. The results show that OLS estimates yield more favourable results in comparison with FE estimates. However, system GMM1 and GMM2 document similar estimates compared with FE estimates for those regressors with strong explanatory power. Also, system GMM1 and GMM2 estimates are robust to autocorrelation and endogeneity. Therefore, the robustness of the chosen models and their final results is increased.

This study makes a great contribution in a way that it reflects the true value of debt by adjusting for the on and off-balance sheet debts such as preferred equity, minority interest, capitalised operating leases, pensions and stock options. Moreover, the quality of data set is improved as certain key variables associated with the on and off-balance sheet adjustment are manually collected and processed in a careful way. I document a noticeable percentage of leverage after the adjustment as 23% for BV of conventional leverage and 24% for MV of conventional leverage. Among the debt equivalent items, on average, capitalised operating leases account for 64% over total debt, stock options account for 43% over total debt and pension liability account for 27% over total debt. It is obvious that firms' financial health can be misinterpreted if these debt equivalents are not examined carefully.

Chapter 3

Top-management compensation and capital structure: The impact of the on and off-balance sheet financing

Abstract

My study provides empirical evidence on the relationships between top-management compensation packages and financial leverage (conventional and adjusted) of large US firms from 1996 to 2010. I develop a new measurement for financial leverage by taking into account some crucial on and off-balance sheet debt equivalents. The negative associations between top-management compensation (cash and equity-based bonuses) and conventional leverage indicate the fact that managers tend to protect themselves against non-diversifiable human capital risk; as a result, managers use less debt. I also document that there is an alignment of interest between managers and shareholders and active monitoring does prevent managers from deviating from value-maximization goal. In addition, managers tend to increase conventional debt when the companies face the threat of takeover. Nonetheless, the agency theory seems to lose explanatory power in justifying managerial choices in adjusted leverage. After controlling for serial correlation and endogeneity, managerial entrenchment and non-diversifiable human capital risk are the only two hypotheses that explain managers' decisions in adjusted capital structure. Moreover, I developed a new measurement of hidden agency costs using debt equivalents and documented a negative link between these hidden costs and non-adjusted leverage. This result indicates firms might shift debt around to hide its true value and firms' financial health can be significantly misjudged if these on and off-balance sheet debt equivalents are ignored.

3.1 Introduction

The agency theory has proposed various hypotheses to explain the circumstance in which managers may deviate from value-maximizing financing decisions. Some managers are likely to entrench themselves against corporate governance and control mechanisms including active monitoring and compensation incentive schemes to pursue their interests (Jensen and Meckling (1976)). Fama (1980) argues that managers, who involve in the decision-making process of capital structure, are unable to diversify their human capital. As a consequence, in order to reduce their human capital risk, they tend to reduce firms' risk by lowering leverage below its optimal point. The agency theory also suggests that managerial incentives, equity ownership and active monitoring from the board contribute to the alignment of interest between managers and shareholders.

Although the relationships between compensation schemes, equity ownership, active monitoring and capital structure have long been theoretically established, the robustness of the findings has rarely been tested against the modelling biases. Also, most of the investigation periods are not up-to-date (see Mehran (1992), Berger et al. (1997) and Brailsford et al. (2002) for more details). To be in line with other previous studies, I used OLS estimators in my main models. Besides, I contrasted the main models against other more robust models which control for the modelling biases such as omitted variables, autocorrelation and endogeneity. In addition, the compensation schemes, equity ownership and active monitoring have never been investigated in association with adjusted leverage for the on and off-balance sheet debt equivalents. Ignoring these debt equivalents causes the mis-measurement of leverage that has become an outstanding shortcoming in empirical research. This also raises questions about the biases in extant research results and firms' unexplained debt policies.

Koller et al. (2010) highlight that the existing accounting rules have allowed firms to keep many assets and their corresponding debts off the balance sheets, making the value of true debt hidden. Instead of recognizing these assets and their corresponding debts, firms record just the rental and transaction fees in the statement of income. Besides, they may only realize the values when transactions are exercised. Indeed, the real nature of these transactions is merely disclosed in the footnotes appended to the financial statements. Welch (2011) points out that standard measures of leverage usually exclude non-debt liabilities from the numerator; as a result, firms with more non-debt liabilities appear to be less levered. Cronaggia et al. (2012) document that the role of leases has increased over time and these increased operating leases appear to substitute for debt usage. In addition, Rampini and Viswanathan (2010) and Rauh and Sufi (2010) propose to include the capitalised value of operating leases in the debt measurement. Koller et al. (2010) analyse operating leases, pension liability and securitised receivables as off-balance sheet debt equivalents. They suggest including these items in firms' debt to avoid omission biases in calculating financial ratios. However, the choice of debt equivalents to add up to debt in order to truly measure the value of financial gearing remains controversial.

With an attempt to contribute more extant empirical evidence to linkage between top management compensation and capital structure, my study aims at the following goals: (1) categorising compensation schemes into three main packages: salaries, cash bonuses and equity-based bonuses to investigate the relationship between each compensation package and both non-adjusted leverage and adjusted leverage; (2) exploring the link between top management (board of directors) equity ownership and both non-adjusted leverage and adjusted leverage; (3) finding out how active monitoring measured by the percentage of independent directors helps in controlling managerial discretion at financing choice, (4) comparing the relationships between these variables with leverage before and after adjusting for off-balance sheet debt to see whether the adjustment affects the relationships; (5) constructing new proxies for agency costs by taking into consideration the hidden debt (aka off-balance sheet debt equivalents) and find out the links between them and conventional leverage (6) increasing the robustness for the findings by using more reliable estimators.

This research focuses on the top 50 US listed companies with highest revenues each year from 1996 to 2010 (according to the Fortune 500 ranking system). I exclude inactive and financial institutions and insurance companies because capital structure makes little sense in this industry. The final total number of companies in this research is 103 large US firms. After controlling for three main groups of non-agency determinants of leverage, I first document negative partial impacts of two compensation packages (cash bonuses and equity-based bonuses) on non-adjusted leverage. These results indicate managerial entrenchment and that managers protect themselves against non-diversifiable human capital risk; as a result, managers have a tendency of reducing leverage.

I also document other features of managerial entrenchment and active monitoring as my evidence shows that CEOs, who have long tenure in the office and do not face strong monitoring when the firm has low fraction of independent directors, seek to reduce leverage. Moreover, there is an alignment of interest between managers and shareholders and managers tend to increase conventional leverage when they face the threat of takeover. However, when leverage is adjusted for the on and off-balance sheet items, fewer the traditional agency hypotheses can properly explain the managers' choice of adjusted leverage.

Moreover, this study documents the off-balance sheet debt equivalents account for a substantial amount in comparison with reported debt. Among the debt equivalents, capitalised operating lease, stock options and pension liability account for 64%, 43% and 27% over total debt on average, respectively. After adjusting for debt equivalents, I report a significant increase by 24% for market value of leverage and 23% for book value of leverage. Also, I document that the hidden debt also acts as a crucial determinant of firms' financial gearing. In fact, these debt equivalents have negative partial impacts on conventional leverage. This implies that firms might shift debt around and hide their true value of debt, which may cause information asymmetry among managers and shareholders. I strongly suggest that off-balance sheet debt should be taken into thorough consideration to reflect financial conditions of firms truly.

The structure of this research is presented as follows. Section 3.2 summarises some prominent hypotheses of agency theory in explaining managerial choice of corporate capital structure. Section 3.3 reports the data collection process in details. Section 3.4 describes variable measurement and identifies empirical model specification. Section 3.5 analyses research results and reports the robustness tests and results. The final section 3.6 summarises and concludes the research.

3.2 Top management compensation and capital structure

3.2.1 Managerial self-interest and the alignment of interest

Top management compensation has been perceived as a mechanism to reduce agency conflicts and align interests between managers and shareholders. Firms provide various performance-based compensation incentives such as salaries, cash bonuses, equity-based bonuses to motivate managers in maintaining the discipline in maximizing firm value. However, despite these incentives, some managers tend to entrench themselves against both internal and external corporate governance mechanisms (Berger et al. (1997)).

Much research has looked into the impacts of managerial compensation on capital structure in an attempt to explain firms' choice in leverage from different perspectives (e.g. Barton and Gordon (1988), Mehran (1992) and Brailsford et al. (2002)). From a managerial viewpoint, capital structure determinants not only consist of those that are related to corporate risk, performance and controls but also those that are related to managers' desire, targets and values. In other words, corporate financing decisions can be affected by managers' opportunistic preferences towards their compensation incentives and their equity ownership structure (Demsetz (1983), Shleifer and Vishny (1986), Agrawal and Nagarajan (1990) and Brailsford et al. (2002)).

According to Jensen and Meckling (1976), firms' executive compensation, ownership structure and corporate control mechanisms are interrelated. They argue that managerial equity ownership can reduce managers' desire in pursuing perquisites, expropriating shareholders' wealth and engaging in other non-maximizing activities. Nevertheless, managers' control increases along with an increase in managerial equity ownership. At some levels, managers' entrenchment occurs and the control of external shareholders on managers' performance becomes weak. As a result, managers' opportunism to pursue their own interests increases. However, this pursuit of self-interest is limited to certain points as managers are exposed to the substantial risk when their share ownership also increases significantly. Thus, they have incentives to decrease firm leverage as the result of their convergence of interest with shareholders. Therefore, my hypothesis is as follows:

H1: Managers can entrench themselves and pursue their self-interest as their equity ownership increases to a certain level at which managers gain more power and are less controlled by external shareholders. However, at the same time, their substantial increase in share ownership make them exposed to the same risk as shareholders. As a result of the alignment of interest with shareholders, managers tend to use less leverage (Jensen and Meckling (1976)). Hence, my first hypothesis is that the relationship between managers' stock ownership and capital structure should be negative as the result of the convergence of interest between managers and shareholders.

3.2.2 Managerial entrenchment

Managerial entrenchment is defined as a circumstance in which managers fail to follow corporate governance and control mechanisms strictly (Berger et al. (1997)). These mechanisms involve stock ownership or compensation-based performance incentives, active monitoring by the board and the threat of dismissal or takeover. They add that entrenched managers have discretion at firms' financing decisions and that entrenched managers seek to avoid debts. Their study point out that leverage is low when CEOs do not face pressure from either compensation incentives or ownership or active monitoring. Additionally, entrenched managers may opt for less leverage than optimal level because they want to reduce firm risk to protect the non-diversified human capital (Fama (1980)) or they do not want to keep their commitments to disgorge large amount of cash to shareholders (Jensen (1986)). Jensen (1986) also argues in his free cash flow hypothesis that the issuance of debt prevents managers from diverting free cash flow to pursue personal interests at the expense of shareholders.

Consistent with previous studies, Berger et al. (1997) present evidence that leverage only increases in the aftermath of entrenchment-reducing shocks to managerial securities such as unsuccessful tender offers, involuntary CEO replacements and the addition to the board of major stockholders. On the contrary, the studies by Harris and Artur (1988) and Stulz (1988) document that entrenchment may stipulate managers increase leverage beyond the optimal point so as to excessively increase the voting power of their equity ownership and reduce the possibility of takeover attempts. Besides, another possible explanation for an increase in leverage is that entrenched managers sometimes use excessive financial gearing as a defensive device that signals a commitment to increase firm value in case of firms' restructuring. This action of managers is to pre-empt takeover attempts by outsiders. Therefore, my hypothesis is as follows:

H2: Entrenched managers tend to reduce firm risk to protect the non-diversified human capital and adopt excessive debts to increase their voting power against outsiders take over attempts (Berger et al. (1997)). Thus, according to the entrenchment hypothesis, compensation schemes have negative partial impact on capital structure to protect managers' non-diversified human capital. Nonetheless, when the risk of takeover is present, these compensation schemes might become irrelevant to capital structure as entrenched managers will adjust leverage to get the most benefits for themselves.

3.2.3 Non-diversifiable human capital risk

The agency conflict between managers and shareholders due to leverage choice may also stem from different risk exposure. Since shareholders can diversify their investment portfolios, they may only care about firm systematic risk. On the contrary, corporate managers may be more worried about firms' total risk because a substantial proportion of managers' wealth is derived from firms' specific human capital, which makes their positions undiversifiable (see Fama (1980) and Amihud and Lev (1981)). Managerial self-interest hypothesis stresses that managers who have non-diversifiable human capital in the firm have incentives to reduce their non-diversifiable employment risk by ensuring the continued viability of the firm. Friend and Lang (1988) suggest one of the ways to reduce managers' non-diversifiable human capital risk is to reduce firms' debt holdings.

In addition, high level of debt increases the risk of financial distress, which results in managers' loss of employment, lower earnings capacity, intensive cut in performance based compensation and damage in managers' professional reputation (Eliot (1972) and Fama (1980)). According to the study by Gilson (1989), when firms face financial distress, top executives have a high probability of losing their jobs. Moreover, none of these managers in his sample is placed in top positions at other publicly traded firms within three years after being fired. His study also documents the cost of financial distress for managers' non-diversifiable human capital.

Moreover, it can be argued that when facing high takeover risk, managers tend to use excessive leverage to increase their voting power of their equity ownership and to reduce the takeover attempts. In fact, Berger et al. (1997) report that firm leverage increases as the consequence of entrenchment-reducing shocks to managerial security which include unsuccessful tender offers, involuntary CEO replacements and the addition to the board of major stockholders. Following the non-diversifiable human capital explanation, I come up with the following hypothesis:

H3: In order to maintain managers' wealth in non-diversifiable human capital (i.e. their jobs, earning capacity, performance-based incentives, reputation etc.), managers have a tendency to reduce firms' debt when financial risk is high and increase debt when the takeover risk is high. Hence, managers' compensation schemes (such as salaries, cash bonuses and equity-based bonuses) can be negatively related with capital structure in the likelihood of financial distress and positively related to capital structure in the likelihood of a takeover threat.

3.2.4 High risk high return

Apart from salaries and cash bonuses, equity-based compensation plays as one of the very important compensation schemes in motivating managers' to maximize firms' value. Equity-based compensation can come into various forms such as stock options, stock appreciation rights, restricted stock plans and so on. In accordance with the studies by Haugen and Senbet (1981), Smith and Watts (1982) and Smith and Watts (1986), stock options motivate managers increase firms' risk, including increasing leverage and undertaking riskier investment decisions. As a reward for taking higher risk, Lambert and Larcker (1985) and DeFusco et al. (1990) document an increase in equity returns after allocating stock options compensation to managers. Nevertheless, there are some cases when managers are rewarded with stock options as the results of their performance in general. From this "high risk high return" viewpoint, my hypothesis is as follows:

H4: The fact that high risk yields high return and that managers will be awarded the higher equity-based compensation due to value-added firms' performance leads managers to increase leverage to an optimal point. Thus, equity-based compensation can be positively related with capital structure.

3.2.5 Managerial active monitoring

One of the key corporate control mechanisms for managers' performance is monitoring by the board (Berger et al. (1997)). Basically, monitoring mechanisms assure firm value maximisation when managers do not play their active role in maximising shareholders' value. Monitoring mechanisms are carried out through the appointments of non-employee managers to work independently in the management board. Since they do not work under control of CEOs, they monitor CEOs' performance to ensure the alignment of interest between managers and shareholders. NYSE and NASDAQ listing standards define independent managers as those who have no relationship whether directly or indirectly with the firms, their subsidiaries, their partners and their employee directors (SEC (2008)). Morck et al. (1988) and Weisbach (1988) document in their research that monitoring by outside board members enhances firms' leverage. In fact, debt reduces the agency costs of free cash flow (Jensen (1986)), therefore, benefit firms. It can be said that despite the compensation schemes, managers' decision on leverage is also affected by active monitoring from the independent directors. Based on this active monitoring hypothesis, I come up with the following hypothesis:

H5: The higher number of outside/independent managers are included in management board composition, the higher level of active monitoring will take place. This increases the firm leverage. Hence, there exists a positive relationship between the number of outside managers (aka management board composition in this study) and capital structure.

3.3 Data collection approaches

This research uses the secondary data extracted from the annual reports of the selected companies (manually collected) and Bloomberg. The reasons for employing the two sources are to enhance the quality of data and to create a unique data set (which is not available elsewhere) because the data extracted from Bloomberg contain too many missing values. Moreover, some key variables in this research are not available in Bloomberg. Examples are the top management compensation packages and some off-balance sheet debt equivalents.

3.3.1 Manual data collection

The process of manual data collection has been carefully discussed in Section 2.3.1 of Chapter 2. Basically, this chapter use the same hand-collected data set for the off-balance sheet debt equivalents as of Chapter 2 (refer to Section 2.3.2.1, 2.3.2.2 and 2.3.2.3 in Chapter 2). However, for Chapter 3, I manually collected more variables related to the top-management compensation packages from the proxy statements (form DEF 14 in sec filings). These additional hand-collected variables are as follows: Board of Directors' (BOD) salaries, cash bonuses and equity-based bonuses (I collected these compensation packages of BOD as a whole and CEO in particular), CEO's tenure, BOD's stock ownership, management board size and management board composition. The process of collecting and constructing these variables is summarised in Table 3.1 and will be explained in more details shortly.

The variables that are manually collected in this chapter again are those which cannot be collected from Bloomberg or Datastream. Normally, the information related to these variables is either unavailable or available for a few years only with a lot of missing data. Therefore, to avoid the missing data, these variables are manually collected from companies' annual reports and the proxy statements from 1996 to 2010. Companies' annual reports (aka form 10-K in sec filings) and the proxy statements (form DEF 14) are mainly downloaded from the U.S. Security and Exchange Commission website (www.sec.gov) for each company in every single year within 15 years. However, for unknown reasons, some of these reports do not fully provide all needed information; therefore, other sources such as the companies' websites, Thomson Reuters are also exploited to achieve the missing annual reports and proxy statements. Up to this chapter,

Table 3.1: The formulation of manually collected variables

Off-balance sheet items	Formula components	Formula
Pension Liability (PL)		$PL = DBPP + PBPP$
Defined Benefit Pension Plans (DBPP)	PBO Fair value of assets (FVOA)	$DBPP = FVOA - PBO$
Postretirement Benefit Pension Plans (PBPP)	APBO Fair value of assets (FVOA)	$PBPP = FVOA - APBO$
Capitalised Operating Leases (COL)		$COL = MNYR/[APTI + (1/20)]$
	Minum next-year rental (MNYR)	
Average pre-tax interest rate (APTI)	Current interest expenses Current & previous year total debt	Current interest expenses/ Average total debt
Stock Options (SO)		$SO = SO\ outstanding \times FV$
	SO outstanding (Year-end) FV per option (Black-Scholes/ Pro forma weighted average price)	
BOD's stock ownership	No of shares owned by BOD (A) No of shares outstanding (B)	BOD's stock ownership=A/B
BOD's salaries	BOD's salaries	BOD's salaries
BOD's cash bonuses	BOD's cash bonuses	BOD's cash bonuses
BOD's equity-based bonuses (BOD EBB)	RSUs Stock Options	BOD EBB=RSUs+Stock Options
CEO's tenure	No of years CEO in position	=(year of election-current fiscal year)+1
Management Board Size	No of directors in the company	No of directors in the company
Management Board Composition	No of outside directors (a) No of executive officers (b)	Management Board Composition=a/(a+b)

Note: The process of how the data are manually collected and how the variables are constructed is demonstrated in details in Section 3.3.1.

the number of the annual reports and the proxy statements, that has been processed manually, totals up to 1500 reports.

Due to the nature of manual collection approach which is complex and time-consuming, the top 50 large US-listed companies with highest revenues within a fiscal year (according to the Fortune 500 ranking list) are the sample of this study. This sample excludes financial institution and insurance companies. The list of 50 large firms is filtered and updated continuously over the research window of 15 years from 1996 to 2010. The reason is that, during the research period, some of these top 50 firms in the ranking list had either M&A activities or went into liquidation. In addition, some firms' annual reports (for unknown reasons) are missing partly or as a whole and are nowhere to be found. Therefore, the list of firms is regularly updated along the data collection process and only finalized when all information needed is available. The final number of firms totals up to 103 listed firms. Table A.3 in Appendix A reports the list of firms and years in this study. It can be acknowledged that the survivorship bias is controlled in this study since the list of the firms is not narrowed down to the survivors in 2010 to collect the data backwards to 1996. Instead, this list was regularly updated from 1996 onwards, based on the top 50 highest revenue and the availability of data.

3.3.1.1 Board of directors' stock ownership

The board of directors' (BOD) stock ownership is measured by the ratio of the number of shares directly owned by BOD over the number of shares outstanding. The number of shares directly owned by board of directors is collected manually from DEF 14 under the section of "Common stock and total stock-based holding" at the end of fiscal year. In this section, the Table "Share beneficially owned" provides the information related to the number of shares that are owned by all directors (both of executive officers and non-executive officers) by the end of the fiscal year. However, in this study, I take into account the shares of executive officers (often five officers including one CEO and four subordinates). Therefore, I collected the information of executive officers specifically from the "Summary of compensation table". In this table, the names of directors, their positions and salaries are disclosed clearly.

**Table 3.2: BOD's stock ownership –
General Electric Corporation**

Name of executives	**Total /2/ (shares)**
Dennis D. Dammerman	6,028,747
Benjamin W. Heineman, Jr.	2,984,043
Jeffrey R. Immelt	5,202,180
Gary L. Rogers	4,627,953
Robert C. Wright	6,592,726
Total shares owned by executives	**25,435,649**

/2/ This column shows the individual's total GE stock-based holdings, including the voting securities shown in the Stock column (as described in note 1) plus non-voting interest, including, as appropriate, the individual's holding of stock appreciation rights, restricted stock units, deferred compensation accounted for as units of GE stock, and stock options which will not become exercisable within 60 days.

Source: General Electric 2002 Proxy Statement DEF 14. Table of common stock and total stock-based holding.

Table 3.2 indicates the number of shares owned by the five executive officers of General Electric in 2002. As described in Note 2 below the Table 3.2, the number of shares owned by managers includes the voting and non-voting interest, restricted stock units, deferred stocks and stock options which will not become exercisable within 60 days. Summary of individual's stocks (24,435,649 shares) was recorded as the number of shares directly owned by the BOD. After that, I collected the number of shares outstanding from Bloomberg and finally constructed the variable BOD's stock ownership (denoted as BOD SOWN) of General Electric in 2002.

3.3.1.2 Board of directors' salaries

Table 3.3 is extracted from General Electric's proxy statement DEF 14 under the section "Summary of compensation table". It provides information about the salaries of each member of the BOD in three years. From this table, CEO's salaries and subordinate directors' salaries are gathered. From this table, we collect information related to BOD's salaries as well as CEO's salaries. As for CEO's salaries, if the company in one fiscal year has a co-CEO, both of their salaries are taken into account. If a CEO retires before the first two quarters of the fiscal year, the next CEO's salary is recorded for that same fiscal year.

As you can see from Table 3.3, in 2002, Mr. Jeffrey R. Immelt is in the position of the Chairman of the Board and Chief Executive Officer of General Electric. The amount of $3,000,000 salary may be paid for both positions that he is holding. However, the GE does not report these salaries separately. Therefore, the final amount of $3 million (=$3,000,000) was recorded as GE's CEO's salary (denoted as CEO SAL) in 2002.

Table 3.3: BOD's salaries – General Electric Corporation (USD)

Name and Principal Position	Year	Salary
Jeffrey R. Immelt	**2002**	**$3,000,000**
Chairman of the Board and Chief Executive Officer	2001	$2,750,000
	2000	$1,000,000
Dennis D. Dammerman	**2002**	**$2,100,000**
Vice chairman of the Board and Executive Officer	2001	$1,900,000
	2000	$1,733,333
Robert C. Wright	**2002**	**$2,229,167**
Vice Chairman of the Board and Executive Officer	2001	$2,000,000
	2000	$1,766,667
Bejamin W. Heineman, Jr.	**2002**	**$1,350,000**
Senior Vice President, General Counsel and Secretary	2001	$1,250,000
	2000	$1,175,000
Gary L. Rogers	**2002**	**$1,533,333**
Vice Chairman of the Board and Executive Officer	2001	$1,391,304
	2000	$1,116,777

Source: General Electric 2002 Proxy Statement DEF 14. Table of Summary of Compensation.

So as to formulate BOD's salaries, I added up CEO's salaries and the executive officers within the board of directors. The variable "executive officers' salaries" reflects the total salaries that the executive officers receive within the fiscal year. Similarly, for those executive officers who retire before the first two quarters of the fiscal year, the data related to newly appointed executive officers' salaries is collected. From Table 3.3, four executive officers of GE are Dennis D. Dammerman, Robert C. Wright, Bejamin W. Heineman, Jr and Gary L. Rogers. Their salaries are $2,100,000, $2,229,167, $1,350,000 and $1,533,333, respectively. Hence, the total amount of $7.2125 million (=$7,212,500) was recorded in fiscal year 2002 as the value of "executive officers' salaries". The final BOD's salaries were $10.2125 million (=$3 million+$7.2125 million) in 2002.

3.3.1.3 Board of directors' cash bonuses

Table 3.4: BOD's cash bonuses – General Electric Corporation (USD)

Name and Principal Position	Year	Bonus (US$)
Jeffrey R. Immelt	**2002**	**$3,900,000**
Chairman of the Board and Chief Executive Officer	2001	$3,500,000
	2000	$2,500,000
Dennis D. Dammerman	**2002**	**$4,650,000**
Vice chairman of the Board and Executive Officer	2001	$4,200,000
	2000	$3,500,000
Robert C. Wright	**2002**	**$4,300,000**
Vice Chairman of the Board and Executive Officer	2001	$3,725,000
	2000	$3,100,000
Bejamin W. Heineman, Jr.	**2002**	**$2,580,000**
Senior Vice President, General Counsel and Secretary	2001	$2,225,000
	2000	$1,900,000
Gary L. Rogers	**2002**	**$2,000,000**
Vice Chairman of the Board and Executive Officer	2001	$1,800,000
	2000	$1,500,000

Source: General Electric 2002 Proxy Statement DEF 14. Table of Summary of Compensation.

Information related to BOD's cash bonuses is also extracted from the proxy statement DEF 14 under the same section "Summary of compensation table". In some companies' statements, the "bonus" section in the table of compensation refers to equity-based bonuses instead of cash bonuses. Therefore, during the data collection process, the notes below the compensation table that explain the type of bonus in details are scanned thoroughly so as to avoid the mistakes of picking the wrong information for each bonus. BOD's cash bonuses are collected using the same method as for BOD's salaries. Table 3.4 reports General Electric's BOD's cash bonuses from 2000 to 2002. CEO's cash bonuses (denoted as CEO CB) in 2002 is $3,900,000. To conform with other variables' unit (in millions), the final value of $3.9 million was recorded. Similarly, GE's executive officers' cash bonuses add up to $13,530,000 ($13.53 million). Therefore, I recorded the final BOD's cash bonuses (denoted as BOD CB) of $17.43 million ($3.9 million+$13.53 million) for fiscal year 2002.

3.3.1.4 Board of directors' equity-based bonuses

The summary of compensation table in DEF 14 provides information related to BOD's equity-based bonuses (including one CEO and four executive officers) as well as other firms' compensation plans such as employee saving plans, supplemental life insurance, etc. However, this study only takes into consideration equity-based compensation such as stock options, restricted stock units, stock appreciation rights. Usually, restricted stock units are provided in US$ and stock options are provided in the number of stock options. Therefore, the number of stock options must be transformed to a value to be in conformity with restricted stock units.

Table 3.5: BOD's equity-based bonuses – General Electric Corporation (USD)

Name and Principal Position	Year	RSUs	No of stock options
Jeffrey R. Immelt	**2002**	**$525,000**	**1,000,000**
Chairman of the Board and Chief Executive Officer	2001	– –	1,200,000
	2000	$15,000,000	550,000
Dennis D. Dammerman	**2002**	– –	**850,000**
Vice chairman of the Board and Executive Officer	2001	– –	1,012,500
	2000	$13,093,750	550,000
Robert C. Wright	**2002**	– –	**$625,000**
Vice Chairman of the Board and Executive Officer	2001	– –	750,000
	2000	$10,475,000	400,000
Bejamin W. Heineman, Jr.	**2002**	– –	**$210,000**
Senior Vice President, General Counsel and Secretary	2001	– –	262,500
	2000	$2,095,000	150,000
Gary L. Rogers	**2002**	– –	**$450,000**
Vice Chairman of the Board and Executive Officer	2001	– –	525,000
	2000	$3,928,125	225,000

Source: General Electric 2002 Proxy Statement DEF 14. Table of Summary of Compensation.

Moreover, to be consistent throughout the research, the fair value of stock options (using Black and Scholes evaluation method) is applied. This fair value is taken from companies' annual reports under the section "Stock option outstanding and value information" (see Table 2.5 in Chapter 2 for more details). Table 3.5 reports BOD's equity-based bonuses (including one CEO and four executive officers) of General Electric from 2000 to 2002. CEO's equity-based bonuses (denoted as CEO EQTYBB) in 2002 were equal to $\$525,000+(1,000,000\times 7.73)$=$8,255,000=$8.255 million. Thus, the final $8.255 million was recorded for CEO's equity-based bonuses. Similarly, executive officers' equity-based bonuses $=(850,000+625,000+210,000+450,000)\times 7.73$=$16,503,550=$16.50355 million. Thus, the BOD's equity-based bonuses (denoted as BOD EQTYBB) of $24.75855 million (=$8.255 million+$16.50355 million) were recorded for the fiscal year 2002.

3.3.1.5 CEO's tenure

This variable is collected based on the number of years that the CEO of the company has been in his position up to the end of the fiscal year. For example, if, in 1991, the CEO was appointed to his position, at the end of the fiscal year 2000 his tenure was 10 years in total. Most of the information related to the CEO's tenure is found in either firms' annual reports 10-K or proxy statements DEF 14, and the information is provided on the same fiscal year or the previous/followings years. The first step to collect this variable is to identify the name of the CEO. Related information about the CEO is found either in form 10-K under the section *Executive Officers* or in form DEF 14 under the section *The nominees* or *Election of Directors*, etc. The second step is to search for a specific year the CEO was elected. Finally, the variable is calculated as follows:

$$CEO's\ tenure = (The\ year\ of\ election - the\ current\ fiscal\ year) + 1 \tag{3.1}$$

**Table 3.6: CEO's tenure –
General Electric Company**

Jeffrey R. Immelt, 47, Chairman of the Board and Chief Executive Officer, General Electric Company. Director since 2000.
. . . Mr. Immelt became GE's president and chairman-elect in 2000, and chairman and **chief executive officer in 2001** . . .

Source: General Electric 2002 Proxy Statement DEF 14 - p9. Election of Directors.

Table 3.6 represents part of the content extracted from the section of Election of Directors in the proxy statement of General Electric in 2002. The background information and all information related to the CEO - Jeffrey R. Immelt is provided in details in the proxy statement. At the end of the fiscal year 2002, the CEO's tenure (denoted as CEO tenure) finally collected was: (2002-2001)+1= 2 years. For some other firms, there are co-CEOs in the same company. For example, the case of Bell Atlantic in 2000, Lee and Seigenberg are two co-CEOs of the company. For these cases, the number of years in the position of both CEOs is summed up to achieve the final tenure. The difficulty of collecting this variable lies in the way that information is spread between annual reports and proxy statement of the same year or of different years. It takes time to look carefully into different reports to find needed information.

3.3.1.6 Management board size and management board composition

The management board size (denoted as MGMT BSIZE) is constructed based on the number of directors that consists of all the directors of registrant of the firms excluding non-employee directors. Most of the directors information can be found either in annual reports 10-K or proxy statements DEF 14. It is a bit challenging to collect this variable as the information may not lie in the reports of the wanted fiscal year, but in the reports of the several following years or previous years. Under the section "Executive Officers", information was gathered, and the number of directors was collected.

Management board composition (denoted as MGMT BCOMPO) is constructed based on the percentage of outside directors in the company. Outside directors are non-employee directors. It is common that large US firms include non-employee (aka independent directors) in the management board composition. These non-employee directors form a separate committee in the firms. They play an important role in advising and monitoring the performance and decision making of employee directors. Independent directors must have "no material relationship" with the listed firms and their subsidiaries either directly or indirectly as a partner, shareholder, family members with one of the firm's employee directors or officers of an organization that has a business relationship with the company (SEC (2008)). Also, independent directors may carry out their responsibilities by interfering with the exercise of independent judgements.

The information related to non-employee/independent directors are disclosed in DEF 14 under the Section of "Committees of the board of directors". In order to find the independent directors, the background of each director is scanned throughout the proxy statement carefully. The management board composition, which is the percentage of outside directors, is calculated as follows:

$$MGMT\ BCOMPO = \frac{No.\ of\ outside\ directors}{(No.\ of\ Executive\ Officers + No.\ of\ outside\ directors)} \tag{3.2}$$

Take General Electric Corporation as an example. Section *Directors and Executive Officers of Registrant* page 24 of 2002 annual reports 10-K provide the information related to the employee directors of the company in details. Therefore, the total number of 29 directors was finally collected. General Electric 2002 proxy statement reported that the total number of independent directors was 11. Thus, management board composition in 2002 was 27.5% (=11/(11+29)).

3.3.2 Data collection from Bloomberg

The data were collected from the same 50 listed large firms with highest revenues (according to Fortune 500) each year from 1996 to 2010, which added up to 103 listed firms in 15 years. These firms were identified in Bloomberg using the Bloomberg's ticker symbols (see Table A.3 in the Appendix A for details). An Excel template was designed with identification of all the firms, years, sub-industries, countries to extract all the necessary variables. Each variable was searched using Mnemonics symbols. The variables, provided by Bloomberg, are well defined. Therefore, before picking the variables, information related to the way variables were calculated by Bloomberg was carefully looked into to make sure all collected variables were relevant. The data, used in this study, are unbalanced panel data with gaps. In addition, I used STATA in this research to process the data, run the models and the post-regression tests.

3.4 Variable measurement and model specification

3.4.1 Variables for leverage analysis

3.4.1.1 Non-adjusted leverage and adjusted leverage

This research looks into leverage from two perspectives: (1) the leverage that is commonly used in many prior studies (non-adjusted leverage); (2) the leverage that is adjusted for debt equivalents (including the on and off-balance sheet financing items, aka adjusted leverage). The non-adjusted and adjusted leverage are measured in both market value (MV) and book value (BV). In particular, non-adjusted or conventional leverage is measured according to the following formulas.

$$MV of Leverage = \frac{STD + LTD}{BV\ of\ Debt + MV\ of\ Equity} \tag{3.3}$$

$$BV of Leverage = \frac{STD + LTD}{BV\ of\ Total\ Assets} \tag{3.4}$$

Adjusted leverage for the on and off-balance sheet debt equivalents is measured as follows:

$$MV of Adjusted\ Leverage = \frac{STD + LTD + DE}{BV\ of\ Debt + MV\ of\ Equity} \tag{3.5}$$

$$BV of Adjusted\ Leverage = \frac{STD + LTD + DE}{BV\ of\ Total\ Assets} \tag{3.6}$$

where:

STD denotes short-term debt; LTD denotes long-term debt;

DE stands for debt equivalents and is calculated as Formula 3.7 as follows:

$$\begin{aligned} DE = &\ Preferred\ Equity + Minority\ Interest + Pension\ Liability \\ &+ Capitalised\ Operating\ Leases + Stock\ Options \end{aligned} \tag{3.7}$$

3.4.2 Variables for top-management compensation

In this chapter, I take into account the top-management compensation packages and their impacts on capital structure. The top management includes the board of directors (BOD) and the chief executive officer (CEO). The compensation schemes for both the BOD and CEO are investigated. In particular, this study focuses on three main packages of compensation for top managers as salaries, cash bonuses and equity-based bonuses. In the equity-based bonuses, I focus on the main categories as stock options, stock appreciation rights (SARs) and restricted stock units (RSUs).

BOD's and CEO's compensation are categorised into three main compensation variables such as salaries, cash bonuses and equity-based bonuses. As for BOD's compensation variables, they are in turn calculated by taking the natural log of each variable. By doing so, these variables are also transformed so as to satisfy the skewness and kurtosis requirements of a normal distribution. CEO's cash bonuses and equity-based bonuses are also transformed by natural log of cash bonuses and equity-based bonuses. CEO's salaries are transformed by winsorization at 5% because the natural log of CEO's salaries does not satisfy the skewness and kurtosis requirement of the normal distribution.

In addition to the above-mentioned top management compensation variables, I also consider other variables related to corporate management such as BOD's stock ownership, management board composition, management board size and CEO's tenure. These variables are measured in the same ways as the study by Berger et al. (1997). For example, BOD's stock ownership is measured by the ratio of the number of shares directly owned by the BOD over the number of shares outstanding. Management board composition is measured as the percentage of outside directors (independent directors). Management board size is calculated as the natural log of the number of directors. CEO's tenure is the natural log of the number of years the CEO holds the position.

3.4.3 Other control variables

Capital structure is not only affected by top-management compensation but also by many other determinants. Therefore, in order to account for other factors, I included other control variables in the empirical models. These variables are categorised into three groups, which control for asset specificity, risk and agency cost.

The group of variables to control for asset specificity consists of four variables: three variables to control for the uniqueness of assets (asset uniqueness 1 and asset uniqueness 2 and intangibles) and asset collateral.

Asset uniqueness 1 is calculated by the ratio of research and development (R&D) over sales (Formula 3.8). Asset uniqueness 2 is measured by the ratio of selling, general and administrative (SGA) expenses over sales (Formula 3.9). Intangibles is the fraction of intangible assets over total assets (Formula 3.10). Firms' asset specificity is defined as specific intangible assets of firms such as good will, brand names, know-how, R&D expenditures, SGA expenses, etc. It is argued that the collateral feature of assets plays a crucial role in enhancing firms' debt capacity. However, secondary markets for such assets may not value them as much as the firms and sometimes these markets may not even exist (Williamson (1975), Klein et al. (1978) and Williamson (1988)). Besides, intangible assets are usually redeployed in the occurrence of, or an increase in the likelihood of financial distress. Due to the not-so-easy or sometimes non-redeployability of these specific assets, they do not play an active role as firms' collateral for external financial sources (Balakrishnan and Fox (1993)). Therefore, my hypotheses for these variables are as follows:

H8: The relationship between asset uniqueness 1 and capital structure is negative.

H9: The relationship between asset uniqueness 2 and capital structure is negative.

H10: The relationship between intangible and capital structure is negative.

$$Asset\ uniqueness\ 1 = \frac{R\&D\ expenses}{Sales} \tag{3.8}$$

$$Asset\ uniqueness\ 2 = \frac{SAG}{Sales} \tag{3.9}$$

$$Intangibles = \frac{Intangible\ Assets}{Total\ Assets} \tag{3.10}$$

Asset collateral is measured by the ratio of net property, plant and equipment plus inventory over total assets (see Formula 3.11). According the trade-off theory, tangible assets serve as collaterals to provide lenders with securities in the event of firms' financial distress. Williamson (1988) suggest that firms' financial gearing is dependent on their assets tangibility and that assets tangibility decreases lenders' risk in case of firms' bankruptcy. Jensen and Meckling (1976) also add that asset collateral protects lenders from the moral hazard problem resulting from the conflict between shareholders and debt holders. Titman and Wessels (1988) and Rajan and Zingales (1995) document a significant positive relationship between firms' leverage and asset tangibility. Therefore, my hypothesis is as follows:

H11: Asset collateral is positively related with capital structure.

$$Asset\ Collateral = \frac{(Net\ PP\&E + Inventory)}{Total\ Assets} \tag{3.11}$$

The group of variables to control for risk consists of three variables: firm size, earnings volatility and Altman's Z-score.

Firm size is measured by the natural log of total assets (Formula 3.12). Both theories and empirical studies provide no unanimous conclusions about the impact of firm size on leverage. The trade-off theory suggests that large firms should borrow more because they are more diversified and less prone to bankruptcy, thus, have relatively low bankruptcy costs. Furthermore, large firms can easily get access to the capital markets as they have lower monitoring costs due to less volatile cash flows. Therefore, the relationship between firm size and leverage should be positive. This positive link is documented in the studies by Rajan and Zingales (1995), Wald (1999), Deesomsak and Pescetto (2004), Eriotis et al. (2007) and Serrasqueiro and Rogão (2009). On the contrary, the pecking order theory suggests a negative association between firm size and leverage due to the problem of information asymmetry. Large firms experience less severe information asymmetry than small firms. Hence, large firms should borrow less as they are more capable of issuing equity. This negative relationship is documented in the recent study by Campello and Giambona (2010). Therefore, I hypothesise:

H12: Firm size can be either positively related with leverage (supported by the trade-off theory) or negatively related (supported by the pecking order theory).

$$Firm\ Size = \ln\left(TotalAssets\right) \tag{3.12}$$

Earnings volatility is calculated as the standard deviation of EBITDA (in five consecutive years) over BV of total assets (Formula 3.13). Due to the nature of my data (unbalanced with gaps), I measured the earnings volatility of the industry instead. I took the standard deviation of EBITDA of 10 firms with largest market capitalisation in the industry using five consecutive years of observation divided by the book value of total assets of same firms in the same industry over the same time horizon. Both the pecking order theory and the static trade-off theory state that higher earnings volatility indicates a greater probability of firms' being unable to meet its financing contracts when these are due. Firms with high earnings volatility are more conservative when using leverage to prevent potential financial distress due to the inability to meet their financial obligations. The trade-off theory suggests that firms make leverage decision based on the benefits and the potential costs of debt in an effort of maximizing shareholder wealth. Whilst, the pecking order theory predicts that firms with more volatile earnings will preserve debt capacity so as not to issue costly debt later. Bradley et al. (1984), Booth et al. (2001), Fama and French (2002) and Jong et al. (2008) document a significant negative relationship between earnings volatility and leverage. Hence, I hypothesise:

H13: Earnings volatility has an inverse relationship with corporate capital structure.

$$Volatility = \frac{sd(EBITDA)}{BV\ of\ Total\ Assets} \tag{3.13}$$

Altman's Z-score is calculated based on the Formula 3.14. Altman's Z-score indicates the probability of firms' financial distress. If the Z-scores are above 3, firms are supposed to be safe based on the financial figures. If the Z-scores are between 2.9 and 2.99, firms are on alert and should be cautious about their financial situations. If the Z-scores range between 1.8 and 2.7, firms are likely to go into liquidation within two years of operations from the date of released financial figures. If the Z-scores are below 1.8, the probability of firms' financial distress is still very high. The trade-off theory predicts a negative relationship between firms' distance from bankruptcy and leverage. Put differently, financially healthy firms are likely to use less debt. Using Altman's Z-score as a proxy for firms' distance from bankruptcy, Byoun (2008) documents the higher the Z-score, the lower the firm leverage. Therefore, my hypothesis is as follows:

H14: Firms with high Altman's Z-score (high credit rating) tend to use less leverage.

$$\begin{aligned} Altman's\ Z-score = 1.2 \times \frac{Working\ Capital}{Tangible\ Assets} + 1.4 \times \frac{Retained\ Earnings}{Tangible\ Assets} \\ + 3.3 \times \frac{EBIT}{Tangible\ Assets} + 0.6 \times \frac{MV\ of\ Equity}{BV\ of\ Total\ Assets} \\ + 1 \times \frac{Sales}{Tangible\ Assets} \end{aligned} \tag{3.14}$$

The group of variables to control for agency costs includes four main variables as growth opportunity, free cash flow (FCF), profitability, payout ratio and industry merger and acquisition (M&A). Moreover, two other variables related to firms' hidden debts are also formulated as the hidden agency cost 1 and 2 to capture the specific agency costs of information. These two variables are the unique contribution of this study.

Growth opportunity is calculated as the fraction of market value of total assets over the book value of total assets (Formula 3.15). Since firms with growth opportunity prefer to use debt to mitigate the problems of information asymmetry, growth opportunity should be positively linked with leverage (the pecking order theory). However, the agency theory argues that managers are opportunistic and try to maximize their utility at the expense of shareholders. Thus, firms with few investment opportunities and excess cash flows would increase debt to discipline opportunistic managers' behaviours. Various empirical studies by Myers (1977), Titman and Wessels (1988), Chung (1993), Rajan and Zingales (1995), Barclay et al. (1995), Chen et al. (1997) all document a negative relationship between growth opportunity and leverage. As a result, my hypothesis is as follows:

H15: Leverage is negatively related with growth opportunity.

$$Growth\ opportunity = \frac{MV\ of\ Total\ Assets}{BV\ of\ Total\ Assets} \tag{3.15}$$

Free cash flow (FCF) is calculated accordingly with the study by Brailsford et al. (2002) (Formula 3.16). Jensen (1986) suggests the free cash flow hypothesis which indicates that issuing debt help alleviate the agency costs of free cash flows. Managers with substantial free cash flows can increase dividends or repurchase stocks, thereby, pay out free cash flows that could be otherwise wasted or invested in low-profit projects. However, this is not always the case. Jensen (1986) argues that debt makes managers keep their promises to pay out future free cash flows. Zwiebel (1996) suggests that due to the probability of bankruptcy, debt restricts managers in spending free cash flows at their discretion as they don't want to lose their entrenchment. In fact, managers find debt a useful voluntary self-constraint that allows them to avoid being controlled. Therefore, my hypothesis is:

H16: Firms with substantial free cash flows may exploit debt to alleviate the agency costs of free cash flows (free cash flow hypothesis). Hence, FCF is positively related to leverage.

$$FCF = \frac{(OIBT + DEP + AMO - TAXPAID - DIVPAID)}{Total\ Assets} \tag{3.16}$$

where:

OIBT stands for operating income before income tax; DEP stands for depreciation expense; AMO stands for amortisation; TAXPAID stands for total tax paid; DIVPAID stands for total dividends paid.

Profitability is measured by ROA and is calculated as the ratio of net income over total assets (Formula 3.17). The pecking order theory proposes that firms prefer to finance internally, therefore, the higher the profitability, the lower the leverage. In contrast, the trade off theory suggests that low profitability results in higher risk of bankruptcy; thus, less profitable firms are forced to reduce their leverage. Much research supports the pecking order theory with their empirical findings of a negative relationship between profitability and leverage (Kester (1986), Titman and Wessels (1988), Bennett and Donnelley (1993), Berger et al. (1997), Michaelas et al. (1999), Ozkan (2000) and Bevan and Danbolt (2001)). Therefore, I hypothesise:

H17: A positive relationship between profitability and leverage is consistent with the trade-off theory. On the contrary, a negative relationship between profitability and leverage is supported by the pecking order theory.

$$ROA = \frac{Net\ income}{Total\ Assets} \tag{3.17}$$

Payout ratio is defined as total distributions (dividends + repurchases) over EBIT (Formula 3.18). The agency theory argues that since managers tend to waste free cash flows on perquisites and bad investments, dividends and debts act as substitutes for controlling free cash flows problems by forcing managers to allocate excess cash more. The pecking order theory states that firms prefer financing investment with debt to equity. Also, dividend payers are firms with high earnings in comparison to investments and debt. The relationship between payout ratio and leverage is argued to be negative since dividend payments signal a firm's future performance; therefore, high-dividend paying firms can benefit from lower equity cost of capital. As a result, equity is more favoured than debt. Hence, my hypothesis is:

H18: There is an inverse relationship between payout ratio and payout ratio.

$$Payout\ ratio = \frac{Dividends + Repurchases}{EBIT} \tag{3.18}$$

Industry M&A is measured by the total volume of M&A deals of each industry in each year from 1996 to 2010. These data were extracted from Bloomberg and filtered according to the three following criteria: (1) industry, (2) year and (3) deal status (only complete M&A deals in each year were selected). According to managerial entrenchment hypothesis, entrenched managers may increase leverage beyond the optimal point so that they can excessively increase the voting power of their equity ownership and reduce the possibility of takeover attempts (Harris and Artur (1988) and Stulz (1988)). Thus, in the presence of managerial entrenchment, industry M&A should have a positive relationship with leverage. As a result, my hypothesis is as follows:

H19: There is positive relationship between industry M&A and leverage.

Hidden agency cost 1 and 2 are measured by the ratios of debt equivalents over total assets (either the MV or the BV) (see Formula 3.19 and 3.20). These two variables are expected to bring new insights to the existing studies of capital structure in terms of the on and off-balance sheet financing.

$$Hidden\ agency\ cost\ 1 = \frac{DE}{MV\ of\ Total\ Assets} \tag{3.19}$$

$$Hidden\ agency\ cost\ 2 = \frac{DE}{BV\ of\ Total\ Assets} \tag{3.20}$$

where:

DE is defined accordingly with the Formula 3.7;

MV of Total Assets = MV of Equity + BV of Debt.

3.4.4 Empirical model specification

Many studies have focused on the impact of managers' compensation on corporate capital structure (Mehran (1992), Berger et al. (1997) and Brailsford et al. (2002)). The choice of capital structure depends on how managers entrench themselves in firms; their pursuit of self-interest; how they give decision on capital structure either under the active monitoring of shareholders; or in accordance with their risk aversion. However, many other studies have looked at this relationship in an reverse causal association, which is the impact of leverage on management compensation (Yermack (1995), Hernan (2007) and Lin et al. (2012)). This possible endogeneity problem of ownership may bring difficulties in establishing causal relationships among various factors in the model. Also, endogeneity may come in the form of omitted variable bias since we can not include all the possible determinants of leverage in one model either due to multicollinearity problems or data unavailability.

There are several ways to deal with these post-estimation problems in modelling such as using first differences estimator, fixed effects estimator or using instrumental variables. The first approach using first differences (FD) analyses the changes of variables over time. Put differently, this approach takes the differences of the variables between every two consecutive years in the regression. Thus, the observed as well as the unobserved variables that are individual-specific and constant over time are eliminated. The FD estimator is used to address the problem of omitted variables with panel data. However, the FD approach causes the loss of observations when taking the differences of the variables. In addition, since this study employs the hand-collected data, it already contains a relatively small sample size compared with other studies that extract data from standard sources. As a result, the FD is not an ideal approach for this research. Also, it is likely that the problem of serial correlation exists in the empirical models; therefore, the FD estimator might be inefficient.

The second approach examining leverage deviations from average benchmark is known as the fixed effects (FE) estimator. This approach assumes that the unobservable factors that simultaneously affect the left and the right-hand side of the regression are time-invariant. Additionally, the FE estimator exploits within-group variation over time. By including firm and time fixed effects, the average differences across the firms and across the time in any observable or unobservable predictors are controlled. The fixed effects coefficients reflect all the across-firm action with invariant time. In other words, it captures the effects of all variables that are individual-specific and constant over time. The FE estimator is acknowledged to be a powerful tool for removing omitted variables bias, especially for panel data.

Thirdly, to solve the omitted variable problem, the instrumental variables (IV) offers one good option, provided one can identify reliable instruments. However, it is difficult to find reliable intruments due to the unavailability of data. Furthermore, the IV estimation does not necessarily lead to efficient estimates of the model parameters because it does not utilise all the available moment conditions for dynamic capital structure, of which the leverage of the previous year might affect the leverage of the following year. The system generalised method of moments (system GMM) estimator, developed by Blundell and Bond (1998), generally provides more efficient and precise estimates and also reduces the finite sample bias (Baltagi (1995)). Also, this approach is more suitable and efficient for unbalanced data (Roodman (2006)). Therefore, my study exploits system GMM estimators in the robustness section to bring about robust results for the research.

Obviously, the traditional OLS model that has long been used in capital structure research does not resolve all the above-mentioned estimation problems. Nevertheless, most of the prominent studies about capital structure and management compensation simply use OLS regression to examine this relationship. Therefore, my study will also employ OLS regression in the main models. In addition, FE regression and GMM estimators are also employed in the robustness section to compare and contrast with the main model results to achieve the robust findings.

The OLS regression models for leverage (non-adjusted) are specified as follows:

$$\begin{aligned} Leverage_{it} = c &+ \alpha_1 BOD\ SAL_{it} + \alpha_2 BOD\ CB_{it} + \alpha_3 BOD\ EQTYBB_{it} \\ &+ \alpha_4 BOD\ SOWN_{it} + \alpha_5 BOD\ SOWN2_{it} \\ &+ \alpha_6 MGMT\ BSIZE_{it} + \alpha_7 MGMT\ BCOMPO_{it} \\ &+ \mathbf{X}_{it}\beta + \mathbf{Y}_{it}\beta + \mathbf{Z}_{it}\beta + \varepsilon_{it} \end{aligned} \tag{3.21}$$

$$\begin{aligned} Leverage_{it} = c &+ \gamma_1 CEO\ SAL_{it} + \gamma_2 CEO\ CB_{it} + \gamma_3 CEO\ EQTYBB_{it} \\ &+ \gamma_4 CEO\ tenure_{it} + \gamma_5 MGMT\ BSIZE_{it} + \gamma_6 MGMT\ BCOMPO_{it} \\ &+ \mathbf{X}_{it}\delta + \mathbf{Y}_{it}\delta + \mathbf{Z}_{it}\delta + \varepsilon_{it} \end{aligned} \tag{3.22}$$

where:

The index i denotes a firm, t denotes a year, c is a constant, $BODSAL$ is BOD's salaries, $BODCB$ is BOD's cash bonuses, $BODEQTYBB$ is BOD's equity-based bonuses, $BODSOWN$ is BOD's stock ownership, $MGMTBSIZE$ is management board size, $MGMTBCOMPO$ is management board composition;

X is a vector containing a group of variables controlling for asset specificity such as asset specificity consists of four variables: three variables to control for the uniqueness of assets (asset uniqueness 1 and asset uniqueness 2 and intangible) and asset collateral; **Y** is a vector containing a group of variables controlling for risk such as: firm size, earnings volatility and Z-score; **Z** is a vector containing a group of variables controlling for agency costs includes four main variables as growth, free cash flow, profitability, payout ratio, hidden agency cost 1 and hidden agency cost 2;

The OLS regression models for adjusted leverage are specified as follows:

$$\begin{aligned} Adjusted\ Leverage_{it} = c &+ \alpha_1 BOD\ SAL_{it} + \alpha_2 BOD\ CB_{it} + \alpha_3 BOD\ EQTYBB_{it} \\ &+ \alpha_4 BOD\ SOWN_{it} + \alpha_5 BOD\ SOWN2_{it} \\ &+ \alpha_6 MGMTB\ SIZE_{it} + \alpha_7 MGMT\ BCOMPO_{it} \\ &+ \mathbf{X}_{it}\beta + \mathbf{Y}_{it}\beta + \mathbf{Z}_{it}\beta + \varepsilon_{it} \end{aligned} \tag{3.23}$$

$$\begin{aligned} Adjusted\ Leverage_{it} = c + \gamma_1 CEO\ SAL_{it} + \gamma_2 CEO_C B_{it} + \gamma_3 CEO\ EQTYBB_{it} \\ + \gamma_4 CEO\ tenure_{it} \\ + \gamma_5 MGMT\ BSIZE_{it} + \gamma_6 MGMTB\ COMPOit \\ + \mathbf{X}_{it}\delta + \mathbf{Y}_{it}\delta + \mathbf{Z}_{it}\delta + \varepsilon_{it} \end{aligned} \tag{3.24}$$

where:

The index i denotes a firm, t denotes a year, c is a constant, $BODSAL$ is BOD's salaries, $BODCB$ is BOD's cash bonuses, $BODEQTYBB$ is BOD's equity-based bonuses, $BODSOWN$ is BOD's stock ownership, $MGMTBSIZE$ is management board size, $MGMTBCOMPO$ is management board composition;
X,**Y**,**Z** are defined similarly as of the OLS models for non-adjusted leverage (see 3.21, 3.22).

3.5 Empirical results

3.5.1 Descriptive findings

3.5.1.1 Descriptive statistics for the main variables

Table 3.7 reports the descriptive statistics of the main variables in this study. The mean book value and market value of leverage without the adjustment are both at 23%. These results are similar to those of Faulkender and Petersen (2006) who report average book and market leverage of 26.1% and 19.9%, respectively. However, these means change considerably after adjusting for the on and off-balance sheet financing items. Particularly, the average book value of adjusted leverage is now 46% (23% more than the book value of non-adjusted leverage). The average market value of leverage after the adjustment also changes to 47% (increases by 24%). The hidden agency cost 1, which is the MV of debt equivalents over total assets, accounts for 17% of the total assets on average. Meanwhile, the hidden agency cost 2, which is the BV of debt equivalents over total assets, on average accounts for 19% of total assets.

Top management compensation packages in Table 3.7 are not transformed to natural logarithm in these descriptive statistics. BOD's salaries range from $3 million to nearly

Table 3.7: Descriptive statistics for the main variables

Variables	Obs.	Mean	S.D	p25	p50	p75
BV of Leverage	715	0.23	0.14	0.12	0.22	0.30
MV of Leverage	750	0.23	0.19	0.09	0.17	0.35
BV of Adjusted Leverage	750	0.46	0.25	0.29	0.41	0.61
MV of Adjusted Leverage	750	0.47	0.37	0.18	0.36	0.69
BOD SAL	749	4.08	1.50	3.10	3.82	4.83
BOD CB	748	4.49	5.56	0.47	3.05	6.37
BOD EQTYBB	748	20.55	20.75	8.04	15.43	26.18
BOD SOWN	750	0.01	0.01	0.00	0.00	0.01
CEO SAL	750	1.29	0.56	0.96	1.20	1.50
CEO CB	749	1.81	2.35	0.00	1.10	2.68
CEO EQTYBB	748	8.41	9.66	2.49	6.09	11.12
CEO tenure	750	1.59	0.82	1.10	1.61	2.20
MGMT BSIZE	750	2.50	0.43	2.30	2.48	2.71
MGMT BCOMPO	750	46.07	10.91	39.13	45.83	52.94
Industry M&A volume	750	0.53	0.40	0.24	0.45	0.76

Note: Book value of leverage (BV of Leverage) = Total debt/BV of total assets. Market value of leverage (MV of Leverage) = Total debt/MV of total assets. MV of total assets = MV of equity + BV of debt. BV of Adjusted Leverage = (Total debt + DE)/BV of total assets. MV of Adjusted Leverage = (Total debt + DE)/MV of total assets. DE = Preferred Equity + Minority Interest + Pension Liability + Capitalised Operating Leases + Stock Options. BOD SAL = ln (BOD's salaries). BOD CB = ln (BOD's cash bonuses). BOD EQTYBB = ln (BOD's equity-based bonuses). BOD SOWN = No. of shares directly owned by the BOD/No. of shares outstanding. CEO SAL = CEO's salaries. CEO CB = ln (CEO's cash bonuses). CEO EQTYBB = ln (CEO's equity-based bonuses). CEO tenure = ln (No. of years the CEO holds the position). MGMT BSIZE = ln (No. of directors). MGMT BCOMPO = No. of outside (independent) directors/No. of directors. Industry M&A volume = total volume of M&A deals of each industry in each year.

$5 million. The average BOD's salary is $4.08 million with the standard deviation of $1.50 million. BOD's cash bonuses are higher than their salaries with the average value of $4.49 million and ranging among a high deviation of $5.56 million. BOD's equity-based compensation package outweighs other compensation packages, with the mean of $20.55 million and a large standard deviation of $20.75 million. However, BOD's average stock ownership only accounts for very small proportion of 1% over firms' shares outstanding.

CEO's average salary is approximately $1.29 million. About 25 percentile of the CEOs receives salaries under $0.96 million with an extreme case such as Steve Jobs - former CEO of Apple Inc. who received $1 per month for his salary. 75 percentiles of the CEOs receive $1.50 million for their salaries. CEO's average cash bonus is $1.81 million. However, the bottom 25 percentile of CEOs may not receive cash bonuses within the fiscal year. 75 percentiles of CEOs may receive up to $2.86 million as cash bonuses. CEO's equity-based bonuses account for outstanding proportion among other packages with the average value of $8.41 million and may receive up to $11.12 million.

The average log number of years a CEO holds his position is 1.59 (equivalent to 6.67 years). This mean log value of CEO's tenure is similar to what is reported by Berger et al.

(1997) which is 1.84. This result indicates one of the managerial features of which CEOs tend to stay in their positions for a long time. Management board composition has an average percentage of 46.07% of independent directors, which is lower in comparison with 56.80% and 53.99% reported in the studies by Mehran (1992) and Berger et al. (1997), respectively. The average log value of management board size of 2.50 (approximately 13.48 directors) is the same as 2.47 which is reported in the study by Berger et al. (1997). The result documents that the management board size of the sample is large. When the management board size is large, and the management board composition has a low percentage of independent directors, CEOs are likely to face not-so-strong monitoring.

3.5.1.2 Descriptive statistics for the control variables

Table 3.8: Descriptive statistics for the control variables

Variables	Obs.	Mean	S.D	p25	p50	p75
Group of control variables for assets specificity						
Asset collateral	750	0.50	0.26	0.28	0.46	0.73
Asset uniqueness 1	750	0.08	0.07	0.00	0.05	0.16
Asset uniqueness 2	700	0.27	0.18	0.11	0.27	0.38
Intangibles	750	0.22	0.20	0.05	0.16	0.36
Group of control variables for risk						
Firm size	678	10.93	1.07	10.14	10.95	11.76
Earnings volatility	750	0.15	0.07	0.10	0.13	0.18
Altman's Z-score	750	10.51	7.84	4.36	7.07	15.86
Group of control variables for agency cost						
Growth Opportunity	678	0.31	0.61	-0.10	0.24	0.68
Free cash flow	750	0.09	0.04	0.06	0.09	0.11
ROA	750	7.31	6.03	3.51	6.80	10.67
Payout ratio	750	0.53	0.40	0.24	0.45	0.76
Hidden agency cost 1	750	0.17	0.14	0.07	0.12	0.25
Hidden agency cost 2	750	0.19	0.13	0.09	0.16	0.31

Note: Asset collateral = (Net PP&E + inventory)/total assets. Asset uniqueness 1 = Total debt/MV of total assets. Asset uniqueness 2 = SGA expenses /sales. Intangibles = Intangible assets /total assets. Firm size = ln (total assets). Earnings volatility = Earnings volatility of the industry = Standard deviation of EBITDA of 10 firms with largest market capitalization in the industry using 5 years of consecutive observations/BV of total assets of same firms in the same industry over the same time horizon. Refer to Formula 3.14 for Altman's Z-score's calculation. Growth opportunity = ln (MV of total assets/BV of total assets). Free cash flow = (Operating income before income tax + depreciation + amortisation + total tax paid + dividend paid)/total assets. ROA = Net income/total assets. Payout ratio = Total distributions (dividends + repurchases)/EBIT. Hidden agency cost 1 = DE/MV of total assets. Hidden agency cost 2 = DE/BV of total assets. DE = Preferred Equity + Minority Interest + Pension Liability + Capitalised Operating Leases + Stock Options.

Table 3.8 reports the descriptive statistics for the three groups of the control variables for assets specificity, risk and agency cost. Asset collateral accounts for 50% of total assets on average. The bottom 25% of firms has asset collateral that accounts for 28% over total assets. Whilst, 75 percentiles of the firms have tangible assets and inventory that cover 73% of total assets. These numbers show that most of the large US firms are capable of paying their reported debt. Asset uniqueness 1 has the mean value of 8%, which is quite small in comparison with the mean of 27% for asset uniqueness 2. The mean of intangibles shows that intangible assets of large firms account for quite significant amount over total asset.

Altman's Z-score shows the mean of 10.51, which indicates that according to this credit risk measurement, most of the firms are financially safe. As we can see from the mean of growth opportunity of 31%, most of these large firms have quite a high growth. However, the bottom 25 percentile shows the negative 10%, which implies some of these firms might be in financial difficulty. Free cash flow accounts for 9% over total assets on average. The mean of ROA is 7.31, which is quite high. The payout ratio of these large firms is 53% on average, with quite large standard deviation of 40%.

3.5.2 Empirical results for non-adjusted leverage

Table 3.9 reports the results for BOD's compensation and MV and BV of non-adjusted leverage. My results show consistently negative links between BOD's compensation schemes (including salaries, cash and equity-based bonuses) and leverage (both MV and BV). However, among the compensation packages, only equity-based bonuses have explanatory power over both MV and BV of non-adjusted leverage at 5% level of significance. These results support that managers tend to be risk averse and that they want to reduce their non-diversifiable human capital risk. The more compensation incentives managers receive will make them opt for less debt in corporate capital structure because they want to ensure the continued viability of the firm. Put differently, managers do not want to put themselves up against the risk of financial distress when using excessive debt; since they probably face the risk of losing their jobs, a decrease in earnings capacity, the intensive cut in compensation incentives and the damage in their professional reputation. These findings are in line with my hypotheses and the studies by Eliot (1972), Fama (1980) and Friend and Lang (1988)).

BOD's stock ownership has significant negative non-linear relationships with both MV and BV of conventional leverage at 5% level of significance. Consistent with the study by Jensen and Meckling (1976), these results document the alignment of interest between managers and shareholders. Management board size is positively related with both MV and BV of leverage at 5% and 1% level of significance, respectively. These findings

Table 3.9: OLS regression with non-adjusted leverage – BOD's compensation

Variables	MV of Leverage	BV of Leverage
BOD SAL	-0.001 (0.023)	-0.004 (0.023)
BOD CB	-0.001 (0.004)	-0.001 (0.004)
BOD EQTYBB	-0.012** (0.006)	-0.014** (0.006)
BOD SOWN	-1.051** (0.433)	-1.742*** (0.363)
BOD SOWN2	8.056*** (1.459)	9.647*** (1.245)
MGMT BSIZE	0.056** (0.026)	0.129*** (0.026)
MGMT BCOMPO	0.001 (0.001)	0.003*** (0.001)
Asset collateral	0.006 (0.021)	0.032 (0.022)
Asset uniqueness 1	-0.003 (0.071)	-0.142* (0.073)
Asset uniqueness 2	0.068*** (0.026)	0.074*** (0.027)
Intangibles	-0.058* (0.029)	-0.019 (0.031)
Firm size	0.014* (0.008)	0.021*** (0.007)
Earnings volatility	-0.265*** (0.083)	-0.331*** (0.079)
Altman's Z-score	0.000 (0.000)	-0.001*** (0.000)
Growth Opportunity	-0.122*** (0.015)	0.022 (0.013)
Free cash flow	0.102 (0.221)	0.162 (0.226)
ROA	-0.011*** (0.002)	-0.011*** (0.002)
Payout ratio	-0.039*** (0.014)	-0.038*** (0.013)
Industry M&A volume	3.10e-08 (2.21e-08)	5.56e-10 (2.25e-08)
Hidden agency cost 1	-0.056 (0.043)	
Hidden agency cost 2		-0.146*** (0.037)
Observations	492	492
R-squared	0.62	0.48

Note: Robust standard errors in parentheses (using the Huber-White sandwich estimator), *** p<0.01, ** p<0.05 and * p<0.1 indicate statistical significance at the 1%, 5% and 10% test levels, respectively.
Book value of leverage (BV of Leverage) = Total debt/BV of total assets. Market value of leverage (MV of Leverage) = Total debt/MV of total assets. MV of total assets = MV of equity + BV of debt. BOD SAL = ln (BOD's salaries). BOD CB = ln (BOD's cash bonuses). BOD EQTYBB = ln (BOD's equity-based bonuses). BOD SOWN = No. of shares directly owned by the BOD/No. of shares outstanding. CEO SAL = CEO's salaries. CEO CB = ln (CEO's cash bonuses). CEO EQTYBB = ln (CEO's equity-based bonuses). CEO tenure = ln (No. of years the CEO holds the position). MGMT BSIZE = ln (No. of directors). MGMT BCOMPO = No. of outside (independent) directors/No. of directors. Industry M&A volume = total volume of M&A deals of each industry in each year.

indicate that the bigger board size leads to the higher level of leverage, which implies the presence of active monitoring. Moreover, management board composition is also documented to have significant positive impact on BV of leverage. Consistent with the studies by Morck et al. (1988) and Weisbach (1988), this result implies that leverage increases along with the increase of the monitoring by independent directors.

As for the first group of control variables for asset specificity, asset collateral does not have explanatory power over non-adjusted leverage. Nonetheless, asset uniqueness 1 has a significant negative impact on BV of leverage while asset uniqueness 2 has positive partial impact on both MV and BV of leverage. Intangibles are negatively related with BV of leverage. The second group of control variables for risk also report significant results. Firm size is positively related to both MV and BV of leverage at 10 and 1% level of significance, respectively. These results support the trade-off theory and are in line with the studies by Rajan and Zingales (1995), Wald (1999), Deesomsak and Pescetto (2004), Eriotis et al. (2007) and Serrasqueiro and Rogão (2009). Earnings volatility is negatively related to both MV and BV of leverage at 1% level of significance. These findings are supported by the pecking order and the trade-off theory and are consistent with my hypothesis the previous studies by Bradley et al. (1984), Booth et al. (2001), Fama and French (2002) and Jong et al. (2008). Altman's Z-score is found to be negatively associated with BV of leverage at 1% level of significance. This negative relationship, which is supported by the trade-off theory, indicates that firms with high credit ratings tend to use less debt.

Among the group of control variables for agency costs, growth opportunity has a negative relationship with MV of leverage at 1% level of significance. This result is in conformity with the agency theory, our hypothesis and other studies by Myers (1977), Titman and Wessels (1988), Chung (1993), Rajan and Zingales (1995), Barclay et al. (1995) and Chen et al. (1997). Free cash flow has positive relationships with MV and BV of leverage; however, these results do not have statistical power. Therefore, I cannot conclude whether or not firms with substantial free cash flows use debt to alleviate the agency costs of free cash flow (Jensen (1986)). Profitability (ROA) has significant negative relationships with both MV and BV of leverage at 1% level of significance. These negative relationships support the pecking order theory and are consistent with the majority of studies (for example Bennett and Donnelley (1993), Berger et al. (1997), Ozkan (2000) and Bevan and Danbolt (2001)). Payout ratio has negative relationships with both MV and BV of leverage, which is consistent with my hypothesis.

The positive links between industry M&A volume and both MV and BV of leverage imply the existence of managerial entrenchment. However, these results are not statistically significant. Hidden agency cost 1 and 2 are negatively related with both MV and BV of leverage although only the relationship between hidden agency cost 2 and BV of leverage is statistically significant at 1%. This result indicates that firms may have their techniques to hide debt off the balance sheet. As a result, plenty of debt equivalents can be hidden. If we ignore these hidden debt equivalents when evaluating firms' financial situation, firm's financial health can be misinterpreted easily, leading to information asymmetry and agency problems.

These OLS regression models with non-adjusted leverage for BOD's compensation have rather high goodness of fit for both MV and BV of leverage. All the explanatory variables can explain 62% of MV of leverage and 48% of BV of leverage. These models are robust to heteroskedasticity using the Huber-White sandwich estimator.

Table 3.10: OLS regression with non-adjusted leverage – CEO's compensation

Variables	MV of Leverage	BV of Leverage
CEO SAL	-0.004 (0.017)	-0.025 (0.019)
CEO CB	0.003 (0.006)	0.002 (0.006)
CEO EQTYBB	-0.014** (0.007)	-0.009 (0.006)
CEO tenure	-0.011* (0.006)	-0.007 (0.007)
MGMT BSIZE	0.086*** (0.024)	0.164*** (0.027)
MGMT BCOMPO	0.002** (0.001)	0.004*** (0.001)
Asset collateral	0.002 (0.025)	0.064** (0.027)
Asset uniqueness 1	0.041 (0.076)	-0.064 (0.086)
Asset uniqueness 2	0.049* (0.028)	0.069** (0.029)
Intangibles	-0.049 (0.030)	-0.021 (0.034)
Firm size	0.008 (0.009)	0.024** (0.009)
Earnings volatility	-0.159* (0.089)	-0.239*** (0.089)
Altman's Z-score	0.000 (0.000)	-0.002*** (0.001)
Growth Opportunity	-0.114*** (0.017)	0.021 (0.017)
Free cash flow	0.143 (0.236)	0.046 (0.266)
ROA	-0.010*** (0.002)	-0.011*** (0.002)
Payout ratio	-0.033** (0.015)	-0.034** (0.016)
Industry M&A volume	2.96e-08 (2.28e-08)	2.07e-08 (2.49e-08)
Hidden agency cost 1	-0.046 (0.059)	
Hidden agency cost 2		-0.114** (0.048
Observations	382	382
R-squared	0.61	0.45

Note: Robust standard errors in parentheses (using the Huber-White sandwich estimator), *** p<0.01, ** p<0.05 and * p<0.1 indicate statistical significance at the 1%, 5% and 10% test levels, respectively.
Book value of leverage (BV of Leverage) = Total debt/BV of total assets. Market value of leverage (MV of Leverage) = Total debt/MV of total assets. MV of total assets = MV of equity + BV of debt. BOD SAL = ln (BOD's salaries). BOD CB = ln (BOD's cash bonuses). BOD EQTYBB = ln (BOD's equity-based bonuses). BOD SOWN = No. of shares directly owned by the BOD/No. of shares outstanding. CEO SAL = CEO's salaries. CEO CB = ln (CEO's cash bonuses). CEO EQTYBB = ln (CEO's equity-based bonuses). CEO tenure = ln (No. of years the CEO holds the position). MGMT BSIZE = ln (No. of directors). MGMT BCOMPO = No. of outside (independent) directors/No. of directors. Industry M&A volume = total volume of M&A deals of each industry in each year.

Table 3.10 reports the OLS regression results for CEO's compensation and MV and BV of non-adjusted leverage. Among the compensation packages, CEO's equity-based bonuses have explanatory power over the MV of leverage at 5% level of significance. The negative partial impact of CEO's equity-based bonuses on MV of leverage supports that managers tend to use less leverage to protect themselves against non-diversifiable human capital risk. The negative relationship between CEO's tenure and MV of leverage indicates that the longer the CEO holds the position, the less leverage he/she uses. This result again documents one of the features of managerial entrenchment and is in line with the study by Berger et al. (1997). The results for management board size and management board composition in these models are the same as of BOD's compensation models.

Among the group of control variables for asset specificity, asset collateral shows significant positive impact on BV of leverage. Asset uniqueness 2 shows similar results as of the previous model for BOD's compensation. The group of control variables for risk show similar results to the previous models for BOD's compensation in terms of the relationships between firm size, earnings volatility, Altman's Z-score and non-adjusted leverage. In addition, I document the same results for the group control variables for agency costs in these models in comparison with those in BOD's compensation models. Once again, the hidden agency cost 2 has a negative relationship with BV of leverage, which suggests that conventional leverage may give the wrong signals about firms' financial health. Since firms can hide a certain amount of off-balance sheet debt, there exists information asymmetry between the agents and shareholders. It can be said that apart from other determinants of capital structure, the hidden agency cost 2 also contributes as an important determinant of non-adjusted leverage.

The OLS regression models with non-adjusted leverage for CEO's compensation have a similar goodness of fit for MV of leverage, which is 61%. In addition, all the explanatory variables explain 45% of the BV of leverage. The results of both models are robust to heteroskedasticity using the Huber-White sandwich estimator.

3.5.3 Empirical results for adjusted leverage

Table 3.11 reports OLS regression results for adjusted leverage in both market and book value for BOD's compensation. In general, the results show mixed results between BOD's compensation packages and adjusted leverage. However, none of these compensation packages has statistical explanatory power over adjusted leverage. Management board size is significantly and positively related with both BV of adjusted leverage at 10% level of significance. Nevertheless, BOD stock ownership and management board composition cannot statistically explain adjusted leverage. It can be said that when the on and off-balance sheet financing items are taken into account, the agency theory and its hypotheses fail to explain the managers' choice in adjusted leverage.

The first group of control variables for asset specificity reports fewer significant results with adjusted leverage in comparison to non-adjusted leverage. Asset uniqueness 1 is significantly and positively related to MV of adjusted leverage while asset uniqueness 2 has significant positive relationships with both MV and BV of adjusted leverage at 5% level of significance. These results contradict with the study by Berger et al. (1997)). As for the second group of control variables for risk, firm size has no explanatory power over adjusted leverage. Earnings volatility has significant inverse relationships with both MV and BV of adjusted leverage. These results are in line with those of non-adjusted leverage. Moreover, I document a significant positive relationship between Altman's Z-score and MV of adjusted leverage, which implies that firms might make use of ratings to raise more debt. This finding contradicts with the the trade-off theory and the results with non-adjusted leverage.

The third group of control variables for agency costs documents significant negative relationships between growth opportunity and both MV and BV of adjusted leverage at 1 and 10% level of significance, respectively. These relationships are consistent with the results for non-adjusted leverage. These results are supported by the agency theory which argues that firms with fewer investment opportunities and excessive cash flows employ debt to discipline managers' opportunistic behaviours. Free cash flow is positively related to BV of adjusted leverage at 5% level of significance. This finding supports the free cash flow hypothesis and indicates that adjusted leverage plays an important role in motivating managers to disgorge firms' free cash flow. Industry M&A volume, which signals the takeover threat is negatively related to BV of adjusted leverage at 5% level of significance. This finding implies that the managerial entrenchment for take-over effect is not applied in the case of adjusted leverage. The OLS regression models with adjusted leverage for BOD's compensation report the R-squared of 35% for MV of adjusted leverage and 16% for BV of adjusted leverage. As we can see, the goodness of fits of these models is lower than those of non-adjusted leverage models. This result shows that the traditional determinants may not explain adjusted leverage as much as they do for non-adjusted leverage. Both models' results are robust to heteroskedasticity using the Huber-White sandwich estimator.

Table 3.11: OLS regression with adjusted leverage – BOD's compensation

Variables	MV of Adjusted Leverage	BV of Adjusted Leverage
BOD SAL	0.042 (0.059)	0.017 (0.048)
BOD CB	-0.004 (0.011)	-0.002 (0.009)
BOD EQTYBB	-0.003 (0.018)	-0.005 (0.013)
BOD SOWN	-0.589 (1.162)	-0.788 (0.865)
BOD SOWN2	8.511* (4.680)	6.043* (3.396)
MGMT BSIZE	0.040 (0.072)	0.089* (0.050)
MGMT BCOMPO	-0.001 (0.003)	0.001 (0.002)
Asset collateral	0.128 (0.082)	0.093 (0.059)
Asset uniqueness 1	0.458** (0.219)	0.179 (0.163)
Asset uniqueness 2	0.171** (0.078)	0.129** (0.062)
Intangibles	-0.071 (0.078)	0.023 (0.065)
Firm size	-0.009 (0.024)	-0.003 (0.018)
Earnings volatility	-0.483** (0.197)	-0.585*** (0.146)
Altman's Z-score	0.002** (0.001)	-0.000 (0.001)
Growth Opportunity	-0.293*** (0.038)	-0.052* (0.027)
Free cash flow	0.880 (0.568)	1.122** (0.486)
ROA	-0.012*** (0.003)	-0.009*** (0.003)
Payout ratio	0.072* (0.042)	0.059 (0.039)
Industry M&A volume	-8.62e-08 (6.05e-08)	-1.07e-07** (4.75e-08)
Observations	492	492
R-squared	0.35	0.16

Note: Robust standard errors in parentheses (using the Huber-White sandwich estimator), *** p<0.01, ** p<0.05 and * p<0.1 indicate statistical significance at the 1%, 5% and 10% test levels, respectively.
BV of Adjusted Leverage = (Total debt + DE)/BV of total assets. MV of Adjusted Leverage = (Total debt + DE)/MV of total assets. DE = Preferred Equity + Minority Interest + Pension Liability + Capitalised Operating Leases + Stock Options. BOD SAL = ln (BOD's salaries). BOD CB = ln (BOD's cash bonuses). BOD EQTYBB = ln (BOD's equity-based bonuses). BOD SOWN = No. of shares directly owned by the BOD/No. of shares outstanding. CEO SAL = CEO's salaries. CEO CB = ln (CEO's cash bonuses). CEO EQTYBB = ln (CEO's equity-based bonuses). CEO tenure = ln (No. of years the CEO holds the position). MGMT BSIZE = ln (No. of directors). MGMT BCOMPO = No. of outside (independent) directors/No. of directors. Industry M&A volume = total volume of M&A deals of each industry in each year.

Table 3.12 reports the OLS regression results for adjusted leverage in both market and book value with CEO's compensation. Once again, it can be seen that CEO's compensation packages do have explanatory power over adjusted leverage. CEO's tenure and management board compensation show the same results in comparison with those of non-adjusted leverage. Nonetheless, these results are not statistically significant. Only management board size has significant positive relationships with both MV and BV of adjusted leverage. It can be said that the evidence about managerial entrenchment and non-diversifiable human capital hypotheses seems to be much weaker for adjusted leverage in comparison with non-adjusted leverage.

Table 3.12: OLS regression with adjusted leverage – CEO's compensation

Variables	MV of Adjusted Leverage	BV of Adjusted Leverage
CEO SAL	0.075	0.024
	(0.051)	(0.035)
CEO CB	0.003	0.002
	(0.014)	(0.012)
CEO EQTYBB	-0.012	-0.010
	(0.018)	(0.014)
CEO tenure	-0.009	-0.007
	(0.016)	(0.013)
MGMT BSIZE	0.123*	0.144***
	(0.063)	(0.047)
MGMT BCOMPO	0.001	0.003
	(0.003)	(0.002)
Asset collateral	0.163**	0.103*
	(0.082)	(0.060)
Asset uniqueness 1	0.558***	0.228
	(0.215)	(0.174)
Asset uniqueness 2	0.176*	0.111
	(0.095)	(0.075)
Intangibles	-0.057	0.020
	(0.073)	(0.063)
Firm size	-0.031	-0.014
	(0.020)	(0.016)
Earnings volatility	-0.366*	-0.494***
	(0.196)	(0.140)
Altman's Z-score	0.002**	0.000
	(0.001)	(0.001)
Growth Opportunity	-0.274***	-0.059*
	(0.043)	(0.034)
Free cash flow	0.807	1.103**
	(0.519)	(0.522)
ROA	-0.013***	-0.012***
	(0.004)	(0.004)
Payout ratio	0.080*	0.073
	(0.047)	(0.047)
Industry M&A volume	-4.40e-08	-7.98e-08
	(6.08e-08)	(5.22e-08)
Observations	382	382
R-squared	0.38	0.20

Note: Robust standard errors in parentheses (using the Huber-White sandwich estimator), *** p<0.01, ** p<0.05 and * p<0.1 indicate statistical significance at the 1%, 5% and 10% test levels, respectively.
BV of Adjusted Leverage = (Total debt + DE)/BV of total assets. MV of Adjusted Leverage = (Total debt + DE)/MV of total assets. DE = Preferred Equity + Minority Interest + Pension Liability + Capitalised Operating Leases + Stock Options. BOD SAL = ln (BOD's salaries). BOD CB = ln (BOD's cash bonuses). BOD EQTYBB = ln (BOD's equity-based bonuses). BOD SOWN = No. of shares directly owned by the BOD/No. of shares outstanding. CEO SAL = CEO's salaries. CEO CB = ln (CEO's cash bonuses). CEO EQTYBB = ln (CEO's equity-based bonuses). CEO tenure = ln (No. of years the CEO holds the position). MGMT BSIZE = ln (No. of directors). MGMT BCOMPO = No. of outside (independent) directors/No. of directors. Industry M&A volume = total volume of M&A deals of each industry in each year.

The group of control variables for asset specificity reports significant positive relationships between asset collateral and both MV and BV of adjusted leverage. These relationships are in line with the previous results for BOD's compensation, and affirm that firms with more tangible asset collateral have better access to finance. Assets uniqueness 1 and 2 have similar results to those in the BOD's compensation models for adjusted leverage. As for the group of control variables for risk, earnings volatility and Altman's Z-score provide the similar relationships with MV and BV of adjusted leverage, in comparison with the adjusted leverage models for BOD's compensation. The last group of control variables for agency costs also presents the same relationship signs and statistical significance as the adjusted leverage models for BOD's compensation.

Compared with the models using non-adjusted leverage, the goodness of fit decreases quite significantly with 38% with MV of adjusted leverage and 20% with BV of leverage. This result once again indicates that adjusted leverage cannot be thoroughly explained using traditional determinants. Finally, these results are robust to heteroskedasticity using the Huber-White sandwich estimator.

3.5.4 Robustness tests and results

This chapter employed the same robustness tests as in Chapter 2. Variables are normally distributed around the mean if and only if their skewness and kurtosis fall closely around 0 and 3, respectively. However, when these conditions are not satisfied, it is due to the existence of outliers. In order to mitigate these outliers, winsorization is applied at (i) 1% for MV and BV of adjusted leverage, intangibles, asset uniqueness 1 and 2; (ii) 5% for MV of leverage, asset collateral, profitability, FCF, CEO's salaries, Altman's Z-score, hidden agency cost 1 and 2.

To detect multicollinearity among explanatory variables, correlation matrices of all regressors are established. Empirical evidence shows that if the correlation between two independent variables is above 0.85, the problem of multicollinearity is present in the model. As we can see from Table B.1 and Table B.2 in Appendix B , the correlations of independent variables do not exceed 0.85. Therefore, multicollinearity is not present in this study. To confirm this result, the variance inflation factor (VIF) is also constructed basing on the following equation:

$$VIF_{Determinant} = \frac{1}{1 - R^2_{Determinant}} \tag{3.25}$$

where $R^2_{Determinant}$ is the coefficient of determination for the examined determinant. $R^2_{Determinant}$ is generated with an auxiliary regression of one of the determinants on the remaining determinants. Empirical evidence shows that when VIF is larger than 5, multicollinearity is detected which affects the reliability of estimators. Table B.3 in Appendix B reports the VIF results for multicollinearity problems and all VIFs are under 5. Thus, it can be confirmed that the independent variables in this studies are not correlated to one another and the models are robust to multicollinearity.

Breusch-Pagan/Cook-Weisberg test for heteroskedasticity is employed to test the null hypothesis that the error variances are all equal against the alternative hypothesis that the error variances fluctuate along with the predicted values of Y. A large chi-square would indicate that heteroskedasticity is present. The solution to this problem is to add the option "robust" to the end of the fixed effect regression commands. This helps control for heteroskedasticity by obtaining heteroskedasticity consistent errors using the Huber-White sandwich estimator.

In terms of omitted variables, Ramsey RESET tests are used to test the null hypotheses that the models have no omitted variables. The p values of Ramsey RESET tests are all significant; therefore, the study fails to reject the null hypotheses. However, by using fixed effects regression, the problem of omitted variables bias is controlled.

Wooldridge (2002)'s tests are employed to detect serial correlation (autocorrelation). Serial correlation exits in the idiosyncratic errors of a panel data model because the error in each time period contains a time-constant omitted factor. Wooldridge (2002)'s method uses the residuals from a regression in first-differences for $T > 2$ as follows:

$$\begin{aligned} y_{it} - y_{it-1} &= (X_{it} - X_{it-1})\beta + u_{it} - u_{it-1} \\ \Delta y_{it} &= \Delta X_{it}\beta + \Delta u_{it} \end{aligned} \tag{3.26}$$

where Δ is the first-difference operator.

Wooldridge (2002)'s procedure starts with the estimation of parameters β_1 by regressing Δy_{it} on ΔX_{it} to obtain the residuals $\Delta \hat{u}_{it}$. After that, Wooldridge suggests regressing the residuals $\Delta \hat{u}_{it}$ from the regression with first-differenced variables on their lagged residuals. He observes that if the coefficient on the lagged residuals is equal/close to -0.5, which means corr$(\Delta u_{it}, \Delta u_{it-1})$=-0.5, the u_{it} is not serially correlated. Therefore, the problem of autocorrelation is controlled. Moreover, the variance component estimator (VCE) is adjusted for clustering at the panel level so as to account for the within panel correlation in the regression of $\hat{u}_{it}$ on $\hat{u}_{it-1}$. This cluster implies robustness. Therefore, Wooldridge (2002)'s test for serial correlation is also robust to conditional heteroskedasticity. After running Wooldridge (2002)'s tests, the results show that there exists serial correlation in the models of this study.

To solve the problem of autocorrelation, there are two prominent methods: (1) difference generalised method of moments (difference GMM) by Arellano and Bond (1991) and (2) system generalised method of moments (system GMM) by Blundell and Bond (1998). Difference GMM differs from system GMM in the way that it removes the time-invariant fixed effects by taking the first difference of the panel data. Put differently, the difference GMM transforms the regressors by first differencing. Whilst, the system GMM combines in a system a regression in differences with a regression in levels.

When the lagged levels of the regressors are poor instruments for the first-differenced regressors, system GMM estimator is recommended. In this study, the lagged levels of the regressors in difference GMM were documented to be poor instruments. In addition, Baltagi (1995) argues that system GMM generally provides more efficient and precise estimates as well as reduces the finite sample bias. Moreover, Roodman (2006) suggests that for unbalanced data, it is better avoid difference GMM since it has the weakness of magnifying gaps. As a result, this chapter employs system GMM estimators to control for serial correlation. Besides, both system GMM–1 step (system GMM1) estimator and system GMM-2 steps (system GMM2) estimators are employed in this study to have an overall comparison of robustness among the results. The estimates of system GMM1 and GMM2 are robust to heteroskedasticity with Windmeijer's corrected standard errors (Windmeijer (2005)).

Apart from controlling for serial correlation, both difference GMM by Arellano and Bond (1991) and system GMM by Blundell and Bond (1998) can handle endogeous regressors, using the first differences or the lagged levels of those variables as instruments. The lagged levels of the endogenous regressors make endogenous variables predetermined and, thus, not correlated with the error term. As a result, these endogenous variables become exogenous. Furthermore, omitted variables bias is also taken into consideration when including the first differences or the lagged values of the dependent and independent variables as instrumental variables.

The STATA command - xtabond2 is exploited with the adjustments of sub-options to yield the needed results. By default, Stata's xtabond2 command reports four core tests' results: (i) the Arellano - Bond tests for autocorrelation (i.e. first order correlation - AR(1) and second order correlation - AR(2)) with the null hypotheses of no serial correlation and are applied to the differenced residuals; (ii) Sargan test and Hansen J statistic for overidentifying restrictions with the null hypotheses stating that the instruments as a group are exogenous.

Compared with AR(1), AR(2) is more important because it detects autocorrelation in levels. Also, according to Arellano and Bond (1991), the GMM estimator requires that there is first order autocorrelation but there should be no second order correlation. Therefore, AR(2) results will be used for the final conclusions. Roodman (2006) states that the Sargan statistic is the special case of the Hansen J statistic under the assumption of homoscedasticity. As a result, for robust system GMM estimates, the Sargan test statistic is inconsistent.

Moreover, in our sample, the number of instruments exceeds the number of firms, which causes the Sargan statistic to be weak. Therefore, the Hansen J statistic will be this research's final conclusion. The number of lags included for dependent variable is decided based on whether AR(2) and the Hansen J statistic results are satisfied. Once we fail to reject these two tests' hypotheses, autocorrelation and endogeneity are controlled.

Tables 3.13 and 3.14 report the robust estimates for non-adjusted leverage with BOD's compensation using different approaches as ordinary least squared regression (OLS), fixed effects regression (FE), system GMM1 and system GMM2. FE, OLS and system GMM1 provide robust results to heteroskedasticity with Huber-White standard errors. Whilst, system GMM2 estimator yields robust estimates that are Windmeijer corrected to both heteroskedasticiy and serial correlation asymptotically (Windmeijer (2005)).

Table 3.13: Robustness results for non-adjusted leverage - BOD's compensation

Variables	OLS		FE Regression		System GMM-1 step		System GMM-2 steps	
	MV of Leverage	BV of Leverage	MV of Leverage	BV of Leverage	MV of Leverage	BV of Leverage	MV of Leverage	BV of Leverage
L1					0.687***	0.774***	0.290**	0.761***
					(0.124)	(0.082)	(0.141)	(0.087)
L2					-0.159**		-0.267**	
					(0.078)		(0.108)	
BOD SAL	-0.001	-0.004	0.001	-0.029*	0.009	-0.009	0.012	-0.009
	(0.023)	(0.023)	(0.024)	(0.016)	(0.024)	(0.011)	(0.036)	(0.013)
BOD CB	-0.001	-0.001	-0.005	-0.007**	-0.007*	-0.003*	-0.003	-0.004
	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)	(0.002)	(0.005)	(0.002)
BOD EQTYBB	-0.012**	-0.014**	-0.006	-0.006	-0.007	-0.007**	-0.011*	-0.008**
	(0.006)	(0.006)	(0.004)	(0.004)	(0.004)	(0.003)	(0.006)	(0.003)
BOD SOWN	-1.051**	-1.742***	0.474	0.338	-0.997	-0.242	0.132	-0.456
	(0.433)	(0.363)	(0.628)	(0.561)	(1.499)	(0.996)	(2.282)	(0.703)
BOD SOWN2	8.056***	9.647***	-5.310	-4.445	7.921	1.244	-3.712	2.919
	(1.459)	(1.245)	(4.269)	(4.042)	(12.81)	(8.434)	(18.02)	(5.993)
MGMT BSIZE	0.056**	0.129***	-0.039	-0.024	0.0122	0.016	0.043*	0.011
	(0.026)	(0.026)	(0.026)	(0.019)	(0.019)	(0.012)	(0.026)	(0.012)
MGMT BCOMPO	0.001	0.003***	-0.001**	-0.000	0.000	-0.000	0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.000)
Industry M&A volume	3.10e-08	5.56e-10	-1.18e-08	1.19e-08	3.54e-08*	1.37e-08	3.59e-08	1.36e-08
	(2.21e-08)	(2.25e-08)	(3.85e-08)	(3.12e-08)	(1.99e-08)	(1.19e-08)	(2.80e-08)	(1.39e-08)
Observations	492	492	492	492	372	437	372	437
R-squared	0.62	0.48	0.52	0.27				
AR (1) – P value					0.008	0.000	0.023	0.000
AR (2) – P value					0.341	0.382	0.879	0.409
Sargan – P value					0.003	0.156	0.000	0.156
Hansen J – P value					0.736	0.638	0.753	0.638

Note: *** p<0.01, ** p<0.05 and * p<0.1 indicate statistical significance at the 1%, 5% and 10% test levels, respectively. Robust standard errors in parentheses for OLS anc are Huber-White standard errors. For system GMM – 1 step estimates, Huber-White standard errors are reported while for system GMM – 2 step estimates, Windm corrected standard errors are reported.

Table 3.14: Robustness results for non-adjusted leverage - BOD's compensation Groups of control variables

Variables	OLS		FE Regression		System GMM-1 step		System GMM-2 steps	
	MV of Leverage	BV of Leverage	MV of Leverage	BV of Leverage	MV of Leverage	BV of Leverage	MV of Leverage	BV of Leverage
Asset collateral	0.006	0.032	0.001	0.036	-0.001	0.009	0.004	0.005
	(0.021)	(0.022)	(0.041)	(0.031)	(0.019)	(0.011)	(0.031)	(0.013)
Asset uniqueness 1	-0.003	-0.142*	-0.011	-0.059	0.062	-0.019	0.003	-0.002
	(0.071)	(0.073)	(0.072)	(0.085)	(0.074)	(0.039)	(0.118)	(0.048)
Asset uniqueness 2	0.068***	0.074***	-0.011	-0.002	0.019	-0.002	0.059	0.004
	(0.026)	(0.027)	(0.019)	(0.018)	(0.023)	(0.012)	(0.043)	(0.016)
Intangible	-0.058*	-0.019	0.035*	0.065**	-0.029	0.013	-0.035	0.019
	(0.029)	(0.031)	(0.021)	(0.031)	(0.020)	(0.019)	(0.046)	(0.019)
Firm size	0.014*	0.021***	-0.029	-0.012	0.012*	0.009**	0.017	0.010**
	(0.008)	(0.007)	(0.026)	(0.021)	(0.007)	(0.004)	(0.011)	(0.004)
Earnings volatility	-0.265***	-0.331***	0.467**	0.419**	-0.140*	-0.081	-0.189	-0.055
	(0.083)	(0.079)	(0.210)	(0.208)	(0.076)	(0.065)	(0.195)	(0.070)
Altman's Z-score	0.000	-0.001***	0.001**	-0.000**	3.28e-06	-0.000**	0.000	-0.001**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Growth rate	-0.122***	0.022	-0.108***	0.011	-0.068***	0.018**	-0.109***	0.023**
	(0.015)	(0.013)	(0.022)	(0.012)	(0.019)	(0.007)	(0.019)	(0.007)
Free cash flow	0.102	0.162	-0.151	-0.095	0.212	0.098	0.129	0.115
	(0.221)	(0.226)	(0.156)	(0.125)	(0.193)	(0.134)	(0.272)	(0.134)
ROA	-0.011***	-0.011***	-0.004***	-0.003***	-0.005***	-0.005***	-0.008***	-0.005***
	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)
Payout ratio	-0.039***	-0.038***	0.000	0.005	-0.011	0.011	-0.027*	0.014
	(0.014)	(0.013)	(0.011)	(0.008)	(0.002)	(0.008)	(0.016)	(0.008)
Hidden AC 1	-0.056		-0.031		-0.001		-0.038	
	(0.043)		(0.075)		(0.045)		(0.074)	
Hidden AC 2		-0.146***		-0.046		-0.042*		-0.051**
		(0.037)		(0.055)		(0.023)		(0.025)
Observations	492	492	492	492	372	437	372	437
R-squared	0.62	0.48	0.52	0.27				
AR (1) – P value					0.008	0.000	0.023	0.000
AR (2) – P value					0.341	0.382	0.879	0.409
Sargan – P value					0.003	0.156	0.000	0.156
Hansen J – P value					0.736	0.638	0.753	0.638

Note: *** p<0.01, ** p<0.05 and * p<0.1 indicate statistical significance at the 1%, 5% and 10% test levels, respectively. Robust standard errors in parentheses for OLS and FE are Huber-White standard errors. For system GMM – 1 step estimates, Huber-White standard errors are reported while for system GMM – 2 step estimates, Windmeijer corrected standard errors are reported.

As we can see from Tables 3.13 and 3.14, the first lags are positively correlated with both current MV and BV of leverage, which implies that firms might have target leverage. As we can see from BOD's compensation packages, OLS regression results are similar to those of FE, system GMM1 and GMM2 in terms of relationship signs, coefficients and asymptotic errors for both MV and BV of leverage. The link between BOD's salaries and MV of non-adjusted leverage does not seem to be unanimous among different estimators while the association between BOD's salaries and BV of leverage remains consistent. In fact, FE estimator documents a significant negative link between BOD's salaries and BV of leverage.

As for BOD's cash bonuses and equity-based bonuses, all the three estimators share similar results regarding relationship signs, coefficients and asymptotic errors. After controlling for modelling problems such as omitted variable, endogeneity and serial correlation, FE and system GMM1 estimators even show statistical significance at 10% for the negative relationship between BOD's cash bonuses and non-adjusted leverage.

OLS and system GMM1 and GMM2 estimators share similar results for the associations between BOD's stock ownership and leverage while FE estimators yield different ones in terms of relationship signs. Regarding management board size, OLS estimates are identical to those of system GMM1 and GMM2 while FE estimates yield different results. The link between management board composition and BV of leverage seems to change to the opposite relationship sign after controlling for modelling biases. The positive association between industry M&A volume and non-adjusted leverage is consistent with those of system GMM1 and GMM2. Moreover, hidden agency cost 1 and 2 also show consistent negative partial impacts on both MV and BV of leverage using OLS, FE, system GMM1 and GMM2.

Overall, it can be said that after controlling for omitted variables, serial correlation and endogeneity, this research's main results are quite robust and they show strong evidence of managerial entrenchment and non-diversifiable human capital hypotheses with non-adjusted leverage. The coefficient parameters and standard errors of the estimators are very similar with very minor biases. The p values of AR (2) and Hansen J statistics of system GMM1 and system GMM2 for both MV of leverage and BV of leverage show that the study fails to reject the null hypothesis of no autocorrelation and that the instruments as a group are exogenous, respectively. Therefore, the problems of autocorrelation and endogeneity are solved.

Table 3.15: Robustness results for adjusted leverage - BOD's compensation

Variables	OLS		FE Regression		System GMM-1 step		System GMM-2 steps	
	MV of Adjusted Leverage	BV of Adjusted Leverage	MV of Adjusted Leverage	BV of Adjusted Leverage	MV of Adjusted Leverage	BV of Adjusted Leverage	MV of Adjusted Leverage	BV of Adjusted Leverage
L1					0.159	0.293**	0.141	0.289**
					(0.151)	(0.118)	(0.158)	(0.129)
L2						-0.237*		-0.276**
						(0.132)		(0.139)
BOD SAL	0.042	0.017	-0.032	-0.049	-0.002	-0.004	-0.006	-0.000
	(0.059)	(0.048)	(0.087)	(0.055)	(0.055)	(0.045)	(0.058)	(0.046)
BOD CB	-0.004	-0.002	-0.002	-0.011	-0.002	-0.007	-0.001	-0.008
	(0.011)	(0.009)	(0.010)	(0.008)	(0.009)	(0.009)	(0.011)	(0.009)
BOD EQTYBB	-0.003	-0.005	-3.45e-05	0.004	-0.017	-0.017*	-0.016	-0.021*
	(0.018)	(0.013)	(0.016)	(0.011)	(0.014)	(0.009)	(0.014)	(0.011)
BOD SOWN	-0.589	-0.788	3.561	3.745	-2.385	4.061	-2.178	3.167
	(1.162)	(0.865)	(4.360)	(3.571)	(3.652)	(4.686)	(3.878)	(4.541)
BOD SOWN2	8.511*	6.043*	-16.84	-20.39	17.88	-35.14	16.14	-29.68
	(4.680)	(3.396)	(30.99)	(22.98)	(19.93)	(41.06)	(21.92)	(39.65)
MGMT BSIZE	0.040	0.089*	-0.131*	-0.090*	0.097**	0.089	0. 092*	0.098*
	(0.072)	(0.050)	(0.070)	(0.054)	(0.047)	(0.051)	(0.049)	(0.050)
MGMT BCOMPO	-0.001	0.001	-0.005*	-0.003*	0.000	-0.000	0.000	-0.000
	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Industry M&A volume	-8.62e-08	-1.07e-07**	-1.75e-07	-1.45e-07	-5.50e-08	-1.05e-07*	-5.62e-08	-1.16e-07
	(6.05e-08)	(4.75e-08)	(1.31e-07)	(1.24e-07)	(6.60e-08)	(6.13e-08)	(7.31e-08)	(8.57e-08)
Observations	492	492	492	492	439	372	439	372
R-squared	0.35	0.16	0.24	0.23				
AR (1) – P value					0.010	0.098	0.071	0.110
AR (2) – P value					0.175	0.705	0.124	0.874
Sargan – P value					0.004	0.000	0.004	0.000
Hansen J – P value					0.292	0.775	0.292	0.775

Note: *** p<0.01, ** p<0.05 and * p<0.1 indicate statistical significance at the 1%, 5% and 10% test levels, respectively. Robust standard errors in parentheses for OLS and FE are Huber-White standard errors. For system GMM – 1 step estimates, Huber-White standard errors are reported while for system GMM – 2 step estimates, Windmeijer corrected standard errors are reported.

Table 3.16: Robustness results for adjusted leverage - BOD's compensation Groups of control variables

Variables	OLS		FE Regression		System GMM-1 step		System GMM-2 steps	
	MV of Adjusted Leverage	BV of Adjusted Leverage	MV of Adjusted Leverage	BV of Adjusted Leverage	MV of Adjusted Leverage	BV of Adjusted Leverage	MV of Adjusted Leverage	BV of Adjusted Leverage
Asset collateral	0.128	0.093	0.396	0.206*	0.205**	0.099	0.209**	0.116
	(0.082)	(0.059)	(0.245)	(0.121)	(0.096)	(0.068)	(0.107)	(0.086)
Asset uniqueness 1	0.458**	0.179	0.601*	0.236	0.249	0.181	0.181	0.249
	(0.219)	(0.163)	(0.318)	(0.305)	(0.238)	(0.175)	(0.244)	(0.171)
Asset uniqueness 2	0.171**	0.129**	0.027	0.045	0.118	0.127	0.116	0.097
	(0.078)	(0.062)	(0.108)	(0.077)	(0.121)	(0.097)	(0.113)	(0.075)
Intangible	-0.071	0.023	0.124	0.142*	-0.030	0.079	-0.031	0.099
	(0.078)	(0.065)	(0.086)	(0.076)	(0.078)	(0.076)	(0.082)	(0.095)
Firm size	-0.009	-0.003	-0.121**	-0.156***	0.009	0.021	0.013	0.020
	(0.024)	(0.018)	(0.059)	(0.043)	(0.021)	(0.018)	(0.024)	(0.018)
Earnings volatility	-0.483**	-0.585***	-0.429	0.129	-0.579**	-0.546**	-0.573*	-0.668***
	(0.197)	(0.146)	(0.879)	(0.800)	(0.294)	(0.229)	(0.361)	(0.245)
Altman's Z-score	0.002**	-0.000	0.001	0.000	0.002**	-0.001	0.002*	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Growth rate	-0.293***	-0.052*	-0.194***	-0.001	-0.246***	-0.057*	-0.253***	-0.048
	(0.038)	(0.027)	(0.064)	(0.043)	(0.074)	(0.030)	(0.083)	(0.039)
Free cash flow	0.880	1.122**	0.077	-0.114	1.043	0.605	1.031	0.802
	(0.568)	(0.486)	(0.584)	(0.452)	(0.624)	(0.499)	(0.646)	(0.391)
ROA	-0.012***	-0.009***	-0.005	-0.001	-0.013***	-0.004	-0.013***	-0.005
	(0.003)	(0.003)	(0.004)	(0.002)	(0.004)	(0.003)	(0.004)	(0.003)
Payout ratio	0.072*	0.059	0.104	0.083*	0.087*	0.011	0.081	0.014
	(0.042)	(0.039)	(0.063)	(0.045)	(0.051)	(0.048)	(0.051)	(0.041)
Observations	492	492	492	492	439	372	439	372
R-squared	0.35	0.16	0.24	0.23				
AR (1) – P value					0.010	0.098	0.071	0.110
AR (2) – P value					0.175	0.705	0.124	0.874
Sargan – P value					0.004	0.000	0.004	0.000
Hansen J – P value					0.292	0.775	0.292	0.775

Note: *** p<0.01, ** p<0.05 and * p<0.1 indicate statistical significance at the 1%, 5% and 10% test levels, respectively. Robust standard errors in parentheses for OLS and FE are Huber-White standard errors. For system GMM – 1 step estimates, Huber-White standard errors are reported while for system GMM – 2 step estimates, Windmeijer corrected standard errors are reported.

Tables 3.15 and 3.16 report robust results for adjusted leverage with BOD's compensation using three main models as: OLS, FE, system GMM1 and GMM2, respectively. As for BOD's compensation packages, overall, system GMM1 and GMM2 report consistent results compared with OLS estimator while FE reports slightly different findings for BOD's equity-based bonuses. The system GMM1 and GMM2 estimators even show statistical significant results for the negative association between BOD's equity-based bonuses and adjusted leverage, which document that non-diversifiable human capital hypothesis is also applied for adjusted leverage.

As for the associations between BOD's stock ownership, management board composition and adjusted leverage, there are mixed results among the three estimators. Nevertheless, there is a consistency in OLS, system GMM1 and GMM2's estimates regarding the relationship between management board size and adjusted leverage. The consistent negative impact of industry M&A volume on adjusted leverage is also documented throughout different estimators. These results indicate that managerial entrenchment is not obvious for adjusted leverage. The problems of autocorrelation and endogeneity are also solved using system GMM1 and GMM2 basing on AR(2) and Hansen J p values.

The estimates of FE, OLS and system GMM1 are robust to heteroskedasticity using Huber-White standard errors. In addition, system GMM2's estimates are robust to both heteroskedasticiy and serial correlation using Windmeijer corrected standard errors.

Table 3.17: Robustness results for non-adjusted leverage - CEO's compensation

Variables	OLS		FE Regression		System GMM-1 step		System GMM-2 steps	
	MV of Leverage	BV of Leverage	MV of Leverage	BV of Leverage	MV of Leverage	BV of Leverage	MV of Leverage	BV of Leverage
L1					0.625***	0.688***	0.756***	0.670***
					(0.088)	(0.110)	(0.141)	(0.096)
L2							-0.235**	
							(0.099)	
CEO SAL	-0.004	-0.025	0.015	-0.014	0.016*	-0.004	0.015	-0.008
	(0.017)	(0.019)	(0.009)	(0.011)	(0.009)	(0.008)	(0.011)	(0.008)
CEO CB	0.003	0.002	0.001	-0.009	-0.003	-0.001	-0.003	0.000
	(0.006)	(0.006)	(0.005)	(0.006)	(0.004)	(0.004)	(0.006)	(0.004)
CEO EQTYBB	-0.014**	-0.009	-0.003	-0.002	0.000	-0.002	-0.002	-0.001
	(0.007)	(0.006)	(0.005)	(0.004)	(0.003)	(0.003)	(0.005)	(0.004)
CEO tenure	-0.011*	-0.007	-0.012**	-0.005	-0.007	-0.004	-0.005	-0.004
	(0.006)	(0.007)	(0.005)	(0.005)	(0.005)	(0.004)	(0.005)	(0.004)
MGMT BSIZE	0.086***	0.164***	-0.021	-0.028	0.024*	0.014	0.025	0.012
	(0.024)	(0.027)	(0.019)	(0.020)	(0.005)	(0.016)	(0.018)	(0.015)
MGMT BCOMPO	0.002**	0.004***	-0.001	-0.000	0.000	-0.000	0.001	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Industry M&A volume	2.96e-08	2.07e-08	-7.85e-09	4.57e-08	1.28e-08	1.49e-08	2.19e-08	1.63e-08
	(2.28e-08)	(2.49e-08)	(3.96e-08)	(3.36e-08)	(1.78e-08)	(1.34e-08)	(2.06e-08)	(1.34e-08)
Observations	382	382	382	382	347	346	290	346
R-squared	0.61	0.45	0.53	0.29				
AR (1) – P value					0.004	0.007	0.006	0.004
AR (2) – P value					0.111	0.679	0.354	0.708
Sargan – P value					0.000	0.560	0.000	0.560
Hansen J – P value					0.357	0.740	0.802	0.740

Note: *** p<0.01, ** p<0.05 and * p<0.1 indicate statistical significance at the 1%, 5% and 10% test levels, respectively. Robust standard errors in parentheses for OLS and FE are Huber-White standard errors. For system GMM – 1 step estimates, Huber-White standard errors are reported while for system GMM – 2 step estimates, Windmeijer corrected standard errors are reported.

Table 3.18: Robustness results for Non-adjusted Leverage - CEO's compensation Groups of control variables

Variables	OLS		FE Regression		System GMM-1 step		System GMM-2 steps	
	MV of Leverage	BV of Leverage	MV of Leverage	BV of Leverage	MV of Leverage	BV of Leverage	MV of Leverage	BV of Leverage
Asset collateral	0.002 (0.025)	0.064** (0.027)	0.013 (0.043)	0.045 (0.034)	-0.031 (0.021)	0.019 (0.019)	-0.015 (0.027)	0.024 (0.016)
Asset uniqueness 1	0.041 (0.076)	-0.064 (0.086)	-0.073 (0.061)	-0.134 (0.087)	0.068 (0.065)	-0.034 (0.039)	0.062 (0.071)	-0.034 (0.048)
Asset uniqueness 2	0.049* (0.028)	0.069** (0.029)	-0.019 (0.016)	-0.019 (0.020)	0.004 (0.018)	0.006 (0.016)	0.008 (0.029)	0.015 (0.016)
Intangible	-0.049 (0.030)	-0.021 (0.034)	0.021 (0.024)	0.048 (0.032)	-0.042** (0.018)	0.001 (0.020)	-0.025 (0.022)	0.009 (0.020)
Firm size	0.008 (0.009)	0.024** (0.009)	-0.023 (0.026)	-9.72e-05 (0.027)	0.004 (0.005)	0.008 (0.006)	0.002 (0.009)	0.009 (0.006)
Earnings volatility	-0.159* (0.089)	-0.239*** (0.089)	0.647*** (0.223)	0.469** (0.219)	0.001 (0.062)	-0.071 (0.071)	-0.031 (0.094)	-0.019 (0.070)
Altman's Z-score	0.000 (0.000)	-0.002*** (0.001)	0.000 (0.000)	-0.001* (0.000)	9.37e-06 (0.000)	-0.000** (0.000)	-0.000 (0.000)	-0.001** (0.000)
Growth rate	-0.114*** (0.017)	0.021 (0.017)	-0.133*** (0.026)	0.019 (0.017)	-0.047*** (0.016)	0.013 (0.009)	-0.055** (0.023)	0.017 (0.011)
Free cash flow	0.143 (0.236)	0.046 (0.266)	-0.174 (0.196)	-0.115 (0.179)	0.184 (0.199)	0.119 (0.157)	0.299 (0.227)	0.108 (0.153)
ROA	-0.010*** (0.002)	-0.011*** (0.002)	-0.004** (0.001)	-0.002** (0.001)	-0.006*** (0.002)	-0.005*** (0.001)	-0.005*** (0.002)	-0.006*** (0.001)
Payout ratio	-0.033** (0.015)	-0.034** (0.016)	0.000 (0.012)	0.014 (0.009)	-0.016 (0.011)	0.011 (0.011)	-0.012 (0.012)	0.016 (0.011)
Hidden AC 1	-0.046 (0.059)		-0.046 (0.092)		0.006 (0.046)		0.018 (0.050)	
Hidden AC 2		-0.114** (0.048)		-0.064 (0.064)		-0.041 (0.032)		-0.057* (0.035)
Observations	382	382	382	382	347	346	290	346
R-squared	0.61	0.45	0.53	0.29				
AR (1) – P value					0.004	0.007	0.006	0.004
AR (2) – P value					0.111	0.679	0.354	0.708
Sargan – P value					0.000	0.560	0.000	0.560
Hansen J – P value					0.357	0.740	0.802	0.740

Note: *** $p<0.01$, ** $p<0.05$ and * $p<0.1$ indicate statistical significance at the 1%, 5% and 10% test levels, respectively. Robust standard errors in parentheses for OLS and FE are Huber-White standard errors. For system GMM – 1 step estimates, Huber-White standard errors are reported while for system GMM – 2 step estimates, Windmeijer corrected standard errors are reported.

Table 3.17 and Table 3.18 report the estimates of FE, OLS, system GMM1 and system GMM2 estimators for non-adjusted leverage with CEO's compensation. The significant positive relationships between the lagged values of both MV and BV of leverage and the current MV and BV of leverage imply that firms might use target leverage. In addition, among the CEO's compensation packages, CEO's salaries and cash bonuses seem to have mixed partial impacts on non-adjusted leverage when using different estimators.

Nonetheless, the relationships between CEO's equity-based bonuses and leverage are quite similar among the three estimators in relation to both coefficient parameters and asymptotic standard errors. In addition, there is a consistency in different estimates related to CEO tenure's and management board size's partial impacts on leverage. However, management board composition has mixed relationship with leverage when using FE, system GMM1 and GMM2 estimators.

As we can also see from Tables 3.17 and 3.18, OLS estimators provide quite similar estimates for the association between industry M&A volume and non-adjusted leverage. Additionally, the negative relationship between hidden agency cost 2 and non-adjusted leverage are documented in all estimators with minor biases among coefficient parameters and standard errors.

It can be concluded that the OLS's estimates, which are statistically significant, are robust in comparison with other methods' estimates. Moreover, these results show that the non-diversifiable human capital and managerial entrenchment hypotheses explain managers' decisions in capital structure. The estimates of system GMM1 and GMM2 are robust to autocorrelation and endogeneity (see AR (2) and Hansen J statistics).

Table 3.19: Robustness results for adjusted leverage - CEO's compensation

Variables	**OLS**		**FE Regression**		**System GMM-1 step**		**System GMM-2 steps**	
	MV of Adjusted Leverage	**BV of Adjusted Leverage**	**MV of Adjusted Leverage**	**BV of Adjusted Leverage**	**MV of Adjusted Leverage**	**BV of Adjusted Leverage**	**MV of Adjusted Leverage**	**BV of Adjusted Leverage**
L1					0.344***	0.631***	0.155	0. 391**
					(0.125)	(0.092)	(0.123)	(0.153)
L2						-0.218		-0.373**
						(0.158)		(0.173)
CEO SAL	0.075	0.024	0.070	0.033	0.050	0.016	0.048	0.013
	(0.051)	(0.035)	(0.049)	(0.044)	(0.050)	(0.031)	(0.054)	(0.032)
CEO CB	0.003	0.002	0.005	-0.010	0.001	-0.017**	-0.002	-0.015
	(0.014)	(0.012)	(0.013)	(0.014)	(0.011)	(0.008)	(0.012)	(0.022)
CEO EQTYBB	-0.012	-0.010	0.004	-0.009	-0.006	-0.002	-0.003	0.005
	(0.018)	(0.014)	(0.013)	(0.009)	(0.014)	(0.010)	(0.016)	(0.011)
CEO tenure	-0.009	-0.007	-0.039	-0.028	-0.008	-0.007	-0.016	-0.001
	(0.016)	(0.013)	(0.026)	(0.025)	(0.021)	(0.018)	(0.022)	(0.021)
MGMT BSIZE	0.123*	0.144***	-0.120	-0.114*	0.099**	0.038	0.106**	0.111
	(0.063)	(0.047)	(0.086)	(0.068)	(0.046)	(0.048)	(0.047)	(0.070)
MGMT BCOMPO	0.001	0.003	-0.003	-0.002	0.001	-0.001	0.001	0.001
	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)
Industry M&A volume	-4.40e-08	-7.98e-08	-1.73e-07	-1.22e-07	-2.87e-09	-3.76e-08	-5.00e-08	-1.14e-07
	(6.08e-08)	(5.22e-08)	(1.53e-07)	(1.64e-07)	(7.63e-08)	(5.80e-08)	(7.35e-08)	(7.44e-08)
Observations	382	382	382	382	347	269	347	290
R-squared	0.38	0.20	0.32	0.21				
AR (1) – P value					0.009	0.075	0.114	0.218
AR (2) – P value					0.236	0.139	0.136	0.266
Sargan – P value					0.000	0.000	0.000	0.001
Hansen J – P value					0.293	0.757	0.718	0.706

Note: *** p<0.01, ** p<0.05 and * p<0.1 indicate statistical significance at the 1%, 5% and 10% test levels, respectively. Robust standard errors in parentheses for OLS and FE are Huber-White standard errors. For system GMM – 1 step estimates, Huber-White standard errors are reported while for system GMM – 2 step estimates, Windmeijer corrected standard errors are reported.

Table 3.20: Robustness results for adjusted leverage - CEO's compensation Groups of control variables

Variables	OLS		FE Regression		System GMM-1 step		System GMM-2 steps	
	MV of Adjusted Leverage	BV of Adjusted Leverage	MV of Adjusted Leverage	BV of Adjusted Leverage	MV of Adjusted Leverage	BV of Adjusted Leverage	MV of Adjusted Leverage	BV of Adjusted Leverage
Asset collateral	0.163**	0.103*	0.661***	0.273**	0.199*	0.026	0.181	0.096*
	(0.082)	(0.060)	(0.181)	(0.108)	(0.114)	(0.062)	(0.13)	(0.109)
Asset uniqueness 1	0.558***	0.228	0.345	0.079	0.464**	0.098	0.391*	0.096
	(0.215)	(0.174)	(0.303)	(0.309)	(0.192)	(0.148)	(0.222)	(0.229)
Asset uniqueness 2	0.176*	0.111	0.075	0.074	0.103	0.072	0.136	0.130
	(0.095)	(0.075)	(0.157)	(0.119)	(0.117)	(0.099)	(0.147)	(0.122)
Intangible	-0.057	0.020	0.162	0.115	0.028	0.014	0.016	0.107
	(0.073)	(0.063)	(0.110)	(0.091)	(0.076)	(0.071)	(0.087)	(0.079)
Firm size	-0.031	-0.014	-0.105	-0.115**	-0.014	0.013	-0.009	0.005
	(0.020)	(0.016)	(0.079)	(0.055)	(0.019)	(0.013)	(0.019)	(0.025)
Earnings volatility	-0.366*	-0.494***	0.503	0.462	-0.208	-0.095	-0.167	-0.368
	(0.196)	(0.140)	(0.980)	(0.811)	(0.260)	(0.222)	(0.284)	(0.314)
Altman's Z-score	0.002**	0.000	0.000	0.001	0.001	-0.004	0.002*	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)
Growth rate	-0.274***	-0.059*	-0.274***	-0.016	-0.176**	-0.012	-0.220***	-0.071*
	(0.043)	(0.034)	(0.068)	(0.049)	(0.067)	(0.031)	(0.059)	(0.039)
Free cash flow	0.807	1.103**	0.350	0.343	0.518	0.769	0.751	0.669
	(0.519)	(0.522)	(0.710)	(0.530)	(0.645)	(0.500)	(0.630)	(0.716)
ROA	-0.013***	-0.012***	-0.004	-0.001	-0.010**	-0.001	-0.013***	-0.005
	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)	(0.005)	(0.004)	(0.004)
Payout ratio	0.080*	0.073	0.115*	0.096*	0.059	0.014	0.082	0.004
	(0.047)	(0.047)	(0.064)	(0.050)	(0.055)	(0.053)	(0.057)	(0.066)
Observations	382	382	382	382	347	269	347	290
R-squared	0.38	0.20	0.32	0.21				
AR (1) – P value					0.009	0.075	0.114	0.218
AR (2) – P value					0.236	0.139	0.136	0.266
Sargan – P value					0.000	0.000	0.000	0.001
Hansen J – P value					0.293	0.757	0.718	0.706

Note: *** p<0.01, ** p<0.05 and * p<0.1 indicate statistical significance at the 1%, 5% and 10% test levels, respectively. Robust standard errors in parentheses for OLS and FE are Huber-White standard errors. For system GMM – 1 step estimates, Huber-White standard errors are reported while for system GMM – 2 step estimates, Windmeijer corrected standard errors are reported.

Consistent with non-adjusted leverage robustness results, CEO's salaries are consistently positively associated with adjusted leverage although none of these relationships is statistically significant (see Table 3.19 and Table 3.20 for details). However, after controlling for post-estimation problems, CEO's cash bonuses show significant negative partial impacts on adjusted leverage through system GMM1 estimator. Besides, OLS's results show quite similar impacts of CEO's equity-based bonuses and CEO tenure on adjusted leverage in comparison with other methods.

OLS results for management board size are more in line with system GMM1 and GMM2 than FE results. Whilst, the estimates for the link between management board composition and adjusted leverage, seem to vary among different estimators. In addition, the negative link between industry M&A volume and adjusted leverage is consistent among the three estimators. All estimates of system GMM1 and system GMM2 are robust to serial correlation and endogeneity. Once again, it can be affirmed that the prominent agency hypotheses fail to explain managers' decision in adjusted capital structure thoroughly.

In conclusion, the results of FE, OLS and system GMM1 estimators are robust to heteroskedasticity with Huber-White standard errors. Furthermore, system GMM2 provides the estimates that are robust to both heteroskedasticiy and serial correlation using Windmeijer corrected standard errors.

3.6 Summary and conclusions

Jensen (1986) argues that debt plays an important part in reducing managers' discretion in deviating from firm value maximisation. However, without the pressure from a disciplining force, managers tend to avoid debt and do not issue debt to the optimal amount. Therefore, firms provide various compensation schemes to motivate managers to maintain their goals in maximizing firm value. This paper looks into three core compensation packages such as salaries, cash bonuses and equity-based bonuses of the board of directors (BOD) in general and of the CEOs in particular to investigate how these compensation packages (as a whole or individually) affect managers' decision on firms' financial gearing. Moreover, along with the conventional financial leverage that has long been studied, adjusted leverage for the on and off-balance sheet debt equivalents are examined to find out whether the adjusted capital structure can also be explained by the agency theory and its hypotheses.

As for non-adjusted leverage, my evidence shows that among compensation packages, cash bonuses and equity-based bonuses are important factors for the BOD in considering their non-adjusted leverage while, for CEO, equity-based bonuses have a stronger impact in their decision-making process. The consistent negative links between top-management compensation and non-adjusted leverage indicate that managers appear to entrench themselves against non-diversifiable human capital risk. These results are in line with the studies by Fama (1980) and Berger et al. (1997)). Moreover, I also document the alignment of interest between managers and shareholders, which is consistent with the study by Jensen and Meckling (1976). In addition, this study shows that active monitoring does help in preventing managers from deviating from value-maximizing financing decision. Last but not least, managers tend to increase conventional leverage when they face the threat of takeover. This result is in line with the study by Berger et al. (1997).

However, when adjusted leverage for the on and off-balance sheet debt equivalents is taken into consideration, these compensation packages fail to explain both the BOD's and CEO's choices in adjusted leverage. After controlling for serial correlation and endogeneity, BOD's equity-based bonuses and CEO's cash bonuses have explanatory power over adjusted leverage. These findings show that for adjusted leverage, managerial entrenchment and non-diversifiable human capital risk hypotheses are the only two hypotheses that explain the BOD and CEO's decisions in adjusted capital structure. The high-risk high-return, alignment of interest between managers and shareholders and active monitoring hypotheses, fail to explain managers' choices in adjusted leverage.

My study also developed the new agency cost proxies of which I take into account the ratios of off-balance sheet debt equivalents over total assets (in both MV and BV) under hidden agency cost 1 (for MV) and hidden agency cost 2 (for BV), respectively. I document a consistently negative relationship between hidden agency cost 1 and 2 with both MV and BV of conventional leverage although only the hidden agency cost 2 has statistical explanatory power over non-adjusted leverage. This finding indicates that apart from other prominent determinants of leverage, hidden agency cost is also a significant determinant of corporate capital structure. The negative link between off-balance sheet debt and firms' conventional debt implies that managers might have their ways of shifting debt around, making firms less levered. Obviously, if these debt equivalent items are ignored, firms' financial health can be misinterpreted, which ultimately results in the information asymmetry among managers and shareholders. I suggest that off-balance sheet debt should be taken into careful consideration to reflect the financial conditions of firms.

I also try to solve the post-estimation problems by using different estimators to compare and contrast the results with a view to improving the robustness of my empirical results. OLS estimator is mainly used in examining the link between the top-management compensation and capital structure. However, this estimator does not consider other post-estimation problems as omitted variables, serial correlation and endogeneity. As a result, OLS estimates might be biased. Therefore, this research also uses the FE, system GMM1 and system GMM2 estimators to compare and contrast the OLS estimator to achieve robust results. Overall, my main results are similar to those of system GMM1 and GMM2 in terms of relationship signs, coefficients and asymptotic standard errors while FE estimator yields quite different results. All in all, it can be said that the significant results in this study are robust to heteroskedasticity, multicollinearity, serial correlation and endogeneity.

This research can be extended by increasing the sample size and including firms of different sizes instead of only large firms in this sample. However, the data collection process for the off-balance sheet debt items and other compensation variables may take a great deal of time and effort. Furthermore, other compensation packages can be added to the research such as phantom stock plans and performance shares, dividend units and insurance, etc. to see which incentive plans motivate managers to align their interest with shareholders when making capital structure choice. These are two main suggestions for future research.

Chapter 4

Do credit risk measurements reflect the on and off-balance sheet financing items?

Abstract

Are investors and creditors fully aware that firms can take advantage of accounting rules to hide some of their debt off the balance sheets? Is the market fooled by firms' clever use of the existing accounting rules? What is the true corporate financial structure? Do all the credit risk measurements incorporate these on and off-balance sheet debt equivalents into their default risk assessment? This study contributes to the literature in a way that it reveals the hidden debt that is merely disclosed in the footnotes of the financial statements. In addition, my study presents evidence that these debt equivalents account for such significant amounts over total reported debt and that it might be very misleading if we ignore these items when we evaluate firms' financial health. Moreover, not all of these debt equivalents are incorporated in the credit risk measurements. Thus, I suggest that these default risk measurements should be adjusted so that corporate credit risk could be more accurately assessed.

4.1 Introduction

Despite the Financial Accounting Standard Board's attempts to improve accounting rules, there exists loopholes that allow managers to keep many assets and their correspond debt off the balance sheet. In other words, firms' true value of debt is kept hidden. Instead of recognizing these assets and their corresponding debts, firms may record just the rental and transaction fees in the statement of income and may only realize the values when transactions are exercised (Koller et al. (2010)). Indeed, the real nature of these transactions is merely disclosed in the financial reports' footnotes. Ketz (2003) highlights that hiding debt does matter because whenever investors and creditors realise that they are misled, they will immediately increase the financial reporting risk premium. The cost of capital goes up while the stock and bond prices go down, which eventually affects firm value.

The important question here is that whether and how much the public is aware of the impact of these hidden debt equivalents. Except for expert financial analysts, not everyone else bothers to recalculate all the accounting numbers to achieve the true value of debt even if some of them might be aware of the existence of these debt equivalents. Instead, most of the investors and creditors may either rely on the corporate credit risk assessment provided by the credit rating agencies or bond ratings or credit default swaps (CDS). Some of them may opt for the traditional way such as Merton distance to default risk or a user-friendly way such as Altman's Z-score to measure corporate default risk. However, regardless of their popularity, the market has become more sceptical about the validity of these credit risk measurements due to the existence of accounting scandals and especially the occurrence of the financial crisis in 2007. Companies such as Enron, WorldCom, Global Crossing, Adelphia were involved in the scandals related to the under-reporting of corporate liabilities. Obviously, if these credit risk measurements were trustworthy enough, these accounting scandals and the financial crisis would have been predicted and prevented.

Managers have certain incentives to hide firms' true debt value from the balance sheets that are publicly available. The reason is that they understand that investors and creditors investigate firms' debt when evaluating the capital structure on the balance sheets. Also, not everyone is fully aware of off-balance sheet financing. If investors and creditors perceive that firms' debt level is too high, firms might have difficulty in raising capital as the default risk is higher. Moreover, if they eventually choose to provide capital, they require the cost of capital that compensates for the risk that they are bearing. As a result, to obtain the needed capital at a lower cost, managers are tempted to distort the accounting numbers on their balance sheets. Securities and Exchange Commission - SEC (2005) estimates that the total undiscounted non-cancelable future cash flow obligations related to operating leases for US companies are roughly about \$1.25 trillion. Franzen et al. (2009) report the pronounced trend from 1980 to 2007 (over the last 27 years) that shows the mean value of off-balance sheet operating leases (as a percentage of total debt) increases by 775%. Apparently, off-balance sheet financing has been increasingly used over the last decades, and it can be ascertained that ignoring these debt equivalents can lead to the mis-perception of firms' financial conditions.

There are several ways to hide firms' liabilities. Ketz (2003) documents that corporate managers can hide debt using the equity method, lease accounting, pension accounting and special-purpose entities. Welch (2011) reports that the standard measures of leverage usually exclude non-debt liabilities from the numerator, therefore, ceteris pirabus, firms with more non-debt liabilities appear to be less levered. Rampini and Viswanathan (2010) and Rauh and Sufi (2010) all propose to include the capitalised value of operating leases in debt measurement. Cronaggia et al. (2012) show evidence that the role of leases has increased over time, and these increased operating leases appear to substitute for debt usage. Koller et al. (2010) analyse operating leases, pension liability and securitised receivables as off-balance sheet debt equivalents and suggest including them in firms' debt to avoid omission biases in calculating financial ratios. However, the choice of debt equivalents to add up to debt in order to truly measure the value of financial gearing remains quite controversial. This study investigates three main off-balance sheet financing items such as operating leases, stock options and pension plans. In addition, two on-balance sheet items such as preferred equity and minority interest are also taken into consideration. The off-balance sheet debt equivalents are manually collected from the footnotes of the financial statements. Thus, the quality of the data set is significantly improved since the problem of missing data is controlled.

With an attempt to unveil the true structure of corporate debt, my study aims at several goals. The first one is to examine some main on and off-balance sheet debt equivalents to see how much these items accounts for over total debt and how much they are used over time. The second objective of this study is to adjust these debt equivalents to two main credit risk measurements as the Merton distance to default risk and Altman's Z-score to see if these adjustments make any difference in credit risk measurements. The last but not least research objective is to investigate whether these on and off-balance sheet debt equivalents are reflected in CDS spreads and credit ratings. This target also helps to answer the question of whether the public and credit rating agencies are aware of these on and off-balance sheet financing items in corporate debt structure and whether they incorporate them into the credit risk measurements.

Focusing on large US firms from 1996 to 2010, this study excludes inactive companies, financial institutions and insurance companies. My results show that the off-balance sheet financing items account for significant amounts in corporate financial structure. In particular, among the debt equivalents, capitalised operating leases, stock options and pension liability account for large proportions over total reported debt (on average 64%, 43% and 27%, respectively) during preferred equity and minority interest account for small proportions over total reported debt (on average 3% and 6%, respectively). As for the most favourable default risk measurement as CDS, it incorporates minority interest, capitalised operating leases and stock options in its measurement. Nonetheless, preferred equity and pension liability are not reflected in CDS risk measurement. Additionally, credit ratings are proved to be slow at catching up these on and off-balance sheet financing items as only capitalised operating leases are reflected in credit ratings. This study also documents a small difference between conventional Merton distance to default risk and the adjusted one for the on and off-balance sheet items. Nonetheless, when

Altman's Z-score is adjusted for the these debt equivalents, there is a clearer gap between Altman's Z-score and the adjusted one.

The structure of this research is presented as follows. Section 4.2 summarises some credit risk measurements. Section 4.3 reports the on and off-balance sheet financing items and firm credit quality. Section 4.4 summarises the firm fundamental determinants of credit quality. Section 4.5 describes the data collection process. Section 4.6 explains the empirical model specification. Section 4.7 shows research analysis and results. The final Section 4.8 concludes the study.

4.2 Credit risk measurements

4.2.1 Merton distance to default model

The Merton distance to default model (M_DtD) estimates firms' probability of default at any given point in time. The model measures the market value of debt by applying the classic Merton (1974) bond pricing model with the two particularly important assumptions. The first assumption is that firm's total value must follow geometric Brownian motion with constant drift equal to the risk-free rate r and a constant diffusion rate equal to σ_A.

$$\frac{dA_t}{A_t} = r(A_t, t)dt + \sigma_A dW_{1t} \tag{4.1}$$

where A_t is the total assets of the firm, r is the risk free rate which is constant and identical for borrowing and lending and W_{1t} is the standard Brownian motion.

The second assumption requires firm to have issued one discount bond maturing in T periods. Under these assumptions, the equity of the firm is a call option on the underlying value of the firm with a strike price equal to the face value of the firm's debt and a time-to-maturity of T. By the put-call parity, the value of the firm's debt is equal to the value of a risk-free discount bond minus the value of a put option written on the firm, again with a strike price equal to the face value of debt and a time-to-maturity of T. Therefore, the current value of assets A can be achieved using Black-Scholes call option pricing formula as follows:

$$S_0 = A_0 N(d1) - D^T e^{-rT} N(d2) \tag{4.2}$$

where $d1 = \frac{ln(\frac{A_0}{DT})+(r+0.5\sigma_A^2)T}{\sigma_A\sqrt{T}}$ and $d2 = d1 - \sigma_A\sqrt{T}$. Formula 4.2 consists of two unobservable variables: the market value of assets A_0 and the asset volatility σ_A. Fortunately, the market value of equity S_0 is observable in the stock market and equity and asset volatility are related.

$$\sigma_S = \sigma_A \frac{A_0}{S_0}\frac{\delta S_0}{\delta A_0} \tag{4.3}$$

Formula 4.3 which provides the equity-implied asset volatility estimate can be solved using Ito's lemma. Formula 4.2 and 4.3 are two non-linear equations that are used to achieve the Merton distance to default. Under the above-mentioned assumptions, the Merton distance to default (M_DtD) is calculated as follows:

$$M\_DtD = N(\frac{ln(\frac{A_0}{DT}) + (r - \frac{1}{2}\sigma_A^2)T}{\sigma_A\sqrt{T}}) \tag{4.4}$$

where N is the normal distribution function. The Merton distance to default provides the estimated risk neutral distance to default metric and measures the number of standard deviations that the firm's asset value is away from the default. In other words, the higher the estimate, the further distance the firm is to its default. On the contrary, the closer the estimate is to zero, the closer distance the firm is to its default.

The Merton distance to default model is proved to be a powerful measure of predicting firm bankruptcy in some studies (Oderda et al. (2003), Kealhofer (2003) and Vassalou and Yuhang (2004)). These studies show that the M_DtD model has more predictive power over credit ratings. In fact, the M_DtD model can predict the rating changes long before the actual rating changes. Gropp et al. (2006) examine the predictive ability of the M_DtD model and bond spreads in signalling the fragility of European banks. They document that the M_DtD model can predict the probability of a rating downgrade of the bank from six to eight months before the real downgrade. However, Benos and Papanastasopoulos (2007) argue that the Merton approach does not reflect all available information related to credit quality of firms because financial ratios and accounting variables contain significant and incremental information as well.

4.2.2 Credit default swaps

The market for credit default swap (CDS) first came into existence in the late 1990s to reduce corporate exposure to credit risk. However, from 2002, CDS trading grew rapidly, and CDS has become the most commonly traded derivative in the market. CDS is an insurance contract against firms' default risk. In other words, CDS is a contingent claim with payoffs that compensate the credit risk of a certain entity (Das and Hanouna (2006)). In this contract, the buyer pays the seller the periodic premium which is known as CDS spread. CDS spread represents the percentage of the notional value of the CDS contract and is acknowledged as the firm's metric of the credit risk. In addition, CDS spread is also a forecast of the expected loss on firms' bonds. Differently put, it signals the probability of firms' default and the recovery rate that can be obtained in the event of firms' default. Therefore, the higher CDS spread implies, the higher probability of firm's default.

In a recent study by Hull et al. (2004), the theoretical relationship between CDS spreads and bond yield spreads is found to hold fairly well. This relationship can be used to estimate the benchmark 5-year risk-free rate used by participants in the credit default swap market (approximately 10 basis points less than the 5-year swap rate on average). In addition, Hull et al. (2004) further explores the relationship between the CDS market and rating announcements to find out whether high (low) CDS spreads indicate that a firm is more likely to be downgraded (upgraded). Their findings show that 42.6% of downgrades, 39.8% of all reviews for downgrade and 50.9% of negative outlooks come from the top quartile of CDS changes. Nonetheless, the results for positive rating events are not statistically significant.

Employing the event study methodology, Micu et al. (2006) also examine the impact of rating announcements on CDS prices. They present evidence that all types of rating announcements including outlooks, reviews and rating changes, despite positive or negative announcement, have significant impacts on CDS prices. These findings suggest that investors value both the timely signal of possible changes in the creditworthiness as well as the stable signal of underlying creditworthiness. The study also suggests that two ratings are more informative than one. In other words, a rating announcement preceded by a similar rating announcement (by another rating agency) contains pricing-relevant information. Last but not least, the negative rating announcements are found to have the greatest impact on the issuers who are at the risk of being downgraded to speculative grade while the positive rating announcements are found to have the greatest impact on the issuers who are just below the investment grade.

Peristiani and Savino (2011) report the bankruptcy rate for large CDS firms significantly increases in 2008 compared to non-CDS firms. In addition, they look into the relationship between credit derivatives and the measures of implied default using Merton contingent claims model. They apply both the Merton distance to default model and Moody's KVM expected default frequency model and report a significant positive relationship between CDS and implied default from 2004 to 2008. Moreover, after constructing a firm-specific CDS exposure index to control for reverse-causality problems, the results continue to show a strong positive relationship between the firm-specific index of CDS exposure and implied default.

4.2.3 Credit ratings

Credit ratings are mainly provided by the three most popular and largest agencies Standard & Poor's (aka S&P), Moody's and Fitch. Although these agencies create different rating scales in their credit ratings, these rating scales can be translated into equivalent information. For example, S&P credit ratings for firms that are not in default may range from AAA (highest grade) to C while, as for Moody's, these rating scales range from Aaa to Caa. S&P's ratings from AA to CCC are further divided into three subcategories with a '+' or a '–' added to the rating (A+, A, A-). Whilst, Moody's ratings are further divided into subgroups such as Aa1, Aa2, Aa3. Ratings below Baa3 for Moody's and BBB- for S&P are referred to as "below investment grade". For all agencies' rating scales, grade D represents companies that are in default. Higher grades indicate the lower probability of default.

In a recent study by Hilscher and Wilson (2013), they point out that ratings are not an optimal predictor of default failure because they are dominated by a simple default prediction model, which is based on the publicly available accounting and market-based measures. They also highlight that ratings can explain little of the variation in default probability across firms and that they fail to capture considerable variation in credit risk and empirical failure rate over the firm's business cycle. DeHaan (2013) reports a decline in the information content of corporate credit rating changes from mid-2007 onward, which is also accompanied by a decline in the relevance of credit ratings for debt price levels. Despite the criticism about their credibility, credit ratings remain as the most commonly and widely used as a default risk measurement.

Hull et al. (2004) look into the link between the CDS market and rating announcements by examining the CDS changes conditional on rating announcements. Their results show that reviews for downgrade contain significant information while downgrades and negative outlooks do not. Additionally, CDS market anticipates all three types of rating announcements. Jacobs et al. (2010) document that CDS price changes occur prior to rating announcements. Furthermore, the rating announcements are still an important source of information. They also suggest that credit ratings do not always correspond to the relative riskiness of a reference entity.

4.2.4 Altman's Z-score

The last but not least estimator of predicting corporate bankruptcy is the Altman's Z-score model (Altman (1968)). Due to its user-friendliness, the model is widely used and has become one of the influential tools in predicting firms' failure. Altman's Z-score model is based on the accounting information (extracted from company financial statements) to establish accounting ratios. Thus, the model provides accounting-based forecasts of firms' defaults. The model is calculated as follows:

$$ALTMANZ = 1.2X_1 + 1.4X_2 + 3.3X_3 + 0.66X_4 + 1.0X_5 \tag{4.5}$$

where:
X_1: working capital/total assets; X_2: retained earnings/total assets; X_3: earnings before interest and taxes/total assets; X_4: market value of equity/book value of total debt; X_5: sales/total assets.

If the Z-score is above 3, this means the company is safe based on the financial figure only. If the Z-score is between 2.9 & 2.99, this means the company is on financial alert. This is the zone where the company should exercise cautiously. If the Z-score is between 1.8 & 2.7, there is a high possibility that the company will go bankrupt within two years of operations from the date of financial figures given. Finally, if the Z-score falls below 1.8, the probability of corporate failure is very high.

4.3 The on and off-balance sheet financing items and firm credit quality

Lander and Auger (2008) point out that there are many ways for firms to accomplish off-balance sheet financing. Nonetheless, in this study, I included the main off-balance sheet items such as capitalised operating leases, stock options and pensions liability. In addition, I included two on-balance sheet financing items as preferred equity and minority interest and treated them as debt equivalents together with the off-balance sheet items. Recently, some off-balance sheet financing items have received more attention. However, only a few studies investigate whether some of these items are incorporated in the credit risk measurements (Ericsson et al. (2009) and Franzen et al. (2009)).

4.3.1 Preferred equity

Preferred equity is a share which is issued by a corporation to provide its holders with fixed dividend in perpetuity (Ross et al. (2003)). There are different arguments about whether to treat preferred equity as debt or equity of firms since preferred equity is hybrid financing that possesses the characteristics of both debt and equity. Since preferred shares pay a fixed, periodic preferred dividend to shareholders, they represents the similar characteristic of fixed income securities. Preferred shareholders receive a stated dividend only, and in case of corporate bankruptcy, preferred shareholders get a stated share value. However, preferred shares also represent the ownership investment, which is similar to equity. Ross et al. (2003) imply that preferred shares appear to be like debt; nevertheless, unlike debt, when determining taxable corporate income, preferred share dividends cannot be deducted as interest expense. Put differently, interest expense is tax deductible for debt while dividend expense is paid with after-tax profit. As a result, tax savings on interest expense makes debt financing less expensive than preferred equity financing. In addition, the interest of debt holders is paid first; then the preferred dividend holders are paid, followed by any profits for common equity holders. In terms of tax savings, preferred equity is more expensive than debt financing. Therefore, preferred equity is riskier than debt but less risky than equity.

In a recent study by Koller et al. (2010), they argue that although the name denotes equity, preferred equity in well-established companies resembles unsecured debt more closely. In fact, they categorise preferred equity as one of the non-equity claims. In addition, Ericsson et al. (2009) treat preferred equity as a debt equivalent. They adjust the leverage ratio (measured by book value of debt over market value of assets) by adding preferred equity to both the numerator and the denominator of the ratio. Their findings show that the adjusted leverage is both statistically and economically significant determinant of CDS spreads. In other words, it can be implied from the study by Ericsson et al. (2009) that preferred equity passively acts as an important component of debt that might affect firm credit quality. However, up to now, preferred equity has never been investigated as the independent determinant of CDS spreads or any other credit risk measurements.

4.3.2 Minority interest

Minority interest (aka a non-controlling interest) is the portion of equity ownership which belongs to non-controlling shareholders or subsidiaries and is not attributable directly or indirectly to the parent companies (Morgan et al. (2010)). These subsidiaries or shareholders own less than 50% of parents' outstanding shares and have the right to claim their profits in the firms. Under the US accounting rules, the parent company has to consolidate the minority interest in its consolidated balance sheet to reflect the claim on assets that belong to the non-controlling shareholders. In addition, minority interest must be reported on the consolidated income statement as a share of profit that belongs to the minority shareholders.

International Financial Reporting Standards (IFRS) require firms to report minority interest in the equity section of the consolidated balance sheet. Whilst, from 2007, the US Generally Accepted Accounting Principles (US GAAP) require companies to classify minority interest under shareholder equity and not liabilities, or mezzanine sections (FASB-N160 (2007) and FASB-N141R (2007)). Although minority interest is reported in the equity section, it is a debt equivalent that the parent company owes to the non-controlling shareholders. In the study by Koller et al. (2010), minority interest is categorised as one of non-equity claims. In this study, I also treat minority interest as one of the debt equivalent components. Also, to my knowledge, no research has examined whether minority interest is incorporated in credit risk measurements.

4.3.3 Capitalised operating leases

Among the off-balance sheet equivalents, operating leases act as the prevalent item and as one of the largest sources of corporate financing (Ge (2006)). Operating leases are not reported on the balance sheet. Only the periodic rental expenses are recorded on the income statement (Ketz (2003) and Ge (2006)); and the payments of operating leases are merely recorded as rental expenses and minimum rental expenses due within five years are disclosed in the footnotes of financial statements (Lim et al. (2003)). The Securities and Exchange Commission estimates that the total undiscounted non-cancellable future cash flow obligations due to operating leases for US companies are about $1.25 trillion (SEC (2005)). Franzen et al. (2009) show that the mean of off-balance sheet operating leases (as a percentage of total debt) over the last 27 years (from 1980 to 2007) increased significantly by 775%.

Graham et al. (1998) report that operating leases account for a much larger part of corporate capital structure in comparison to capital leases. They indicate that since the implementation of SFAS No. 13[1] on leases, firms structure the terms of most operating leases to avoid balance sheet recognition (Imhoff and Thomas (1988)). Franzen et al. (2009) highlight that if lease assets were brought onto the balance sheet, average debt-to-capital ratios would increase by 50-75% over their sample period of 27 years from 1980 to 2007. They imply that there seems to be a significant benefit for managers to keep these non-cancellable obligations off the balance sheet.

Hirshleifer and Teoh (2003) point out one of the reasons for operating leases to stay off the balance sheet is that limited attention is paid to operating leases as people are not fully aware of their importance. Ge (2006) shows that investors seem to underestimate the implications of off-balance sheet operating leases for firms' future earnings. As a consequence, a long-short investment strategy that exploits this mis-estimation of the investors generates significant future abnormal stock returns. Another reason for their staying off the balance sheet is that it is quite costly for firms to process the information, and there might be discrepancies in the reliability of the recognised (on the balance sheet) and disclosed information (in the footnotes) related to operating leases (Aboody (1996), Davis-Friday et al. (1999) and Barth et al. (2003)). Furthermore, firms also enjoy tax benefits from operating leases; as these tax shields are transferred from lessors to lessees (Graham et al. (1998)). As a matter of fact, Miller and Bahnson (2008) document that

[1]Statement of Financial Accounting Standards No. 13 (FASB-N13 (1976))

reputable accounting firms help their clients to structure lease arrangements specifically to remain off their balance sheets intentionally.

Recent studies have been looking at operating leases from different perspectives. Graham et al. (1998) examine the relationship between operating leases and costs of bankruptcy. They show that operating leases are positively associated with the costs of bankruptcy. They also document a negative relationship between operating leases and pre-financing marginal tax rates, which indicates that operating leases transfer tax shields. Put differently, firms with higher propensity to lease assets are likely to pay less tax. Lim et al. (2003) find that firms may be able to manage credit ratings by using off-balance sheet debt. In other words, moving debt off the balance sheet might be useful in maintaining higher debt ratings. However, they highlight that the market cannot be fooled by off-balance sheet debt, as it is reflected in bond yields despite its limited disclosure. In addition, their study suggests that operating leases obligations are of comparable magnitude to on-balance sheet debt.

Ge (2006) shows that after he controls for current earnings, greater off-balance sheet operating leases lead to lower future earnings. The study also documents a negative relationship between operating lease activities and stock returns. Franzen et al. (2009) find that the benefit of the accounting treatment for off-balance sheet operating leases is a significant determinant of corporate capital structure. They show that conventional debt ratios decrease with an increase of operating leases. Furthermore, the increase in off-balance sheet leases is largely in addition to, not necessarily in stead of, on-balance sheet debt. They highlight that due to the long-term and non-cancellable obligations of operating leases, risk metrics such as conventional debt and coverage ratios, conventional levered equity beta, Z-scores and adjusted Z-scores (which do not take into account the off-balance sheet obligations) can no longer capture financial risk fully.

4.3.4 Stock options

Ross et al. (2003) define a stock option as a contract that gives its owner the right to buy or sell an asset at a fixed price on or before a given date. Stock options give firms the obligations to sell stocks (put options) to option holders at an the agreed price within a certain period or on a specific date. In contrast, option owners have the right, not the obligation to buy firm's stocks (call options). Option holders exercise the options only if it is advantageous to do so; otherwise the options can be forgone. There are two scenarios. The first one is that if the exercise/strike price is lower than the market price, option holders will obviously exercise their call options. The second scenario is that if the exercise/strike price exceeds the market price, option holders have the right to forgo their call options. In either of these cases, firms have to fulfill their financial obligations with the option holders.

In fact, stock options have debt features. Most of the stock options have relatively long maturity. Moreover, they contain the time value; thus, the exercise prices remain lower than the market price at expiry date. As a result, option holders will opt for exercising their options. Robert (1980) argues that the presence of stock options outstanding affects the measurement of the denominator of the leverage ratio, regardless the form of the variables used. He also adds that stock options are potentially significant sources of leverage mis-measurement. Therefore, this study considers stock options as corporate debt equivalents. In addition, up to now, no research has investigated whether stock options are reflected in the credit risk measurements. Thus, this study aims at examining if the market is aware of the underlying risk of this debt equivalent item.

4.3.5 Pension liability

Pension plans are agreements between employers and employees in which the employers provide cash payments for the employees when they retire under pre-specified conditions (Ketz (2003)). Along with the pension plans, US firms also promise other postretirement benefits such as health plans to their employees. The employers provide two types of pension plans to their employees such as defined contribution plan and defined benefit plan. SEC (2005) reports that the accounting treatment for defined contribution plans is straightforward and does not have off-balance sheet implications. Once the employer contributes a predetermined amount to the pension plan, the employees will incur any future risk or reward generated by this plan. Contrarily, the accounting treatment for defined benefit plans is quite complicated and requires a considerable number of estimations and assumptions.

Employers have obligations to make sure that the employees receive their predetermined benefits after retirement. As a result, companies frequently set up separate legal entities, such as trusts, to manage and invest pension funds (e.g. in stocks, bonds and other investments). The ERISA requires these investments to be placed into low-risk assets so that the employee pension funds are protected (Ketz (2003)). The employers have control over these trusts but simultaneously have obligations to fund the pension benefits. In other words, the employer bears the risk when these trusts' assets under-perform but gains the profits when these assets outperform (SEC (2005)). To protect the workers' rights of receiving pensions, the Congress passed the Employee Retirement Income Security Act (ERISA) in 1974. The Pension Benefit Guaranty Corporation (PBGC) was then created by the ERISA to make sure that firms contribute at least certain minimum amounts (specified by both the PBGC and ERISA) to their different pension plans (Ketz (2003)).

Under FIN No. 46(R) (FASB (2003)), before 2006, companies are not required to consolidate employees' benefit plans. Instead, defined benefit pension plans and other post-retirement benefits plans are merely reported off the balance sheet. As a result, the company that has an overfunded plan in the past but is currently experiencing a shortfall may continue to show overfunded pension assets for many years, even though, in reality, a large liability may exist (Koller et al. (2010)). However, since the issuance of the new accounting standard - SFAS No. 158 (effective after 15 December 2006, FASB (2006)), companies are required to report either net recognized accumulated plan assets (if overfunded) or liability (if unfunded) on the balance sheet. This information can be found in the mezzanine section of the balance sheet. The remaining information of pension benefits plans is still disclosed in the financial statement footnotes. Koller et al. (2010) report that despite this change in the accounting standards, the idiosyncrasies of pension accounting still distort operating profitability and might be manipulated by managers to enhance margins artificially.

In the footnotes of the financial statements, pension obligation is presented in two types of measures (SFAS No. 87 – FASB (1985)): (1) Accumulated benefit obligation (ABO) which is the present value of the amounts expected to be paid to employees during retirement based on accumulated service and current salary and (2) Projected benefit obligation (PBO) which is the present value of the amounts expected to be paid to employees on retirement based on accumulated service to date, but using the level of salary expected to serve as a basis for computing pension benefits. In other words, ABO bases on the assumption that the salary stays constant over time while PBO assumes that salary increases along with the employee's years of service with the company.

The report of SEC (2005) highlights that the cost of funding future benefit payments is determined by employee's age, length of service, retirement date, expected mortality, the trends in medical costs, interest and inflation rate. Once assumptions are made about these determinants; the estimated cost of future payments is then discounted to the present value and used as a starting point. It can be acknowledged that these assumptions are not constant over time, and the actual employee's length of service in the company also changes over time. However, SFAS No. 87 does not require companies to recognise changes in pension obligation estimates on the balance sheet or the income statement until the obligation becomes due (FASB (1985)). As a result, companies may have "unrecognised" gains or losses from its pension obligations. Since companies can decide when to recognise their gains and losses at their discretion, they may smooth their earnings. SFAS No. 158 addresses the issues of changes in assumptions and requires companies to report periodic changes (gains and losses) in the value of their benefit obligations or plan assets in the "other comprehensive income" section of the financial statement (FASB (2006)).

Ketz (2003) argues that debt does matter, and that includes pension liabilities. Given the large amounts of money that are involved in pension plans, he suggests that the investment community should have the right understanding of what pension accounting is really about and how business enterprises hide these financial commitments off their balance sheets. Koller et al. (2010) demonstrate the ways to treat pensions and other postretirement benefits properly. They suggest that excess pension assets should be treated as non-operating assets and unfunded pension liabilities should be treated as a debt equivalent. SEC (2005) estimates that 16% of US companies sponsor defined benefit pension plans are having plan assets of approximately $1.12 trillion and plan obligations of $1.32 trillion, which suggests that the pension plans of these companies are unfunded by a net amount of approximate $201 billion. The PBGC reports that within only one year from 2000 to 2001, unfunded pension liabilities increased four times, from $26 billion to $111 billion (Chen (2002)). This considerable increase in pension obligations foreshadows some potential problems in US firms. Therefore, in this study, I look into whether the market can evaluate the underlying risk in the pension liability. Put differently, this chapter investigates if the credit risk measurements incorporate pension liability in their risk assessment.

Despite the increasing use of pension liability, there are quite a few studies that examine unfunded pension liabilities and their impacts on firm credit quality. Dhaliwal (1986) finds that unfunded vested pension obligations are viewed as a form of debt by the capital market participants when assessing firm risk. He adjusts leverage by adding pension liabilities to both the numerator and the denominator of the leverage ratio (measured by the ratio of total debt to total equity) and concludes that this adjustment improves the explanatory power of the model. Thomas and Niehaus (1998) examine the relationship between defined benefit pension plans and corporate debt ratings. They document that unfunded pension liabilities reduce debt ratings more than an equivalent amount of excess pension assets increase debt ratings. In addition, they suggest that unfunded pension liabilities are corporate liabilities that compete with debt claims.

4.4 Firm fundamental determinants of credit quality

Just until recently, have researchers been investigating whether firm's fundamental determinants of default risk are also reflected in credit ratings and CDS spreads (for instance Adams et al. (2003), Das et al. (2009), Ericsson et al. (2009) and Bai and Wu (2012)). Das et al. (2009) classify these determinants into accounting-based and market-based levels and examine the relationships between these determinants with CDS spreads. Whilst, Bai and Wu (2012) only focus on firm fundamentals and anchor credit default swap to these fundamentals.

In this study, I specifically look into some of the firm accounting-based determinants as controlled variables such as leverage, interest coverage, liquidity, profitability, investment, firm size and stock market volatility and examine the relationships between these firms' fundamental determinants with credit ratings and CDS spreads.

4.4.1 Leverage

Leverage is measured by total of total debt over total assets. Financial leverage reflects firms risk in their obligations fulfilment. Put differently, the higher level of leverage is associated with the higher level of firms' default risk which leads to lower credit rating grades. Adams et al. (2003) apply the rating likelihood and the ordered probit/logit model in their study and document a significant negative relationship between leverage and S&P ratings. This finding indicates that firms with lower level of financial leverage is more likely to be assigned with higher S&P ratings. However, the reverse causal relationship can also be true as capital structure decisions might be affected by the rating changes for both upgrade and downgrade (see Kisgen (2006) for more details). Ericsson et al. (2009) point out in their study that leverage has substantial explanatory power over CDS spreads in both univariate and multivariate regressions. They document a significant positive relationship between leverage and CDS spreads. This result shows the evidence that high financial leverage increases firms' default risk, as a result, CDS spreads also increase.

4.4.2 Interest coverage

Interest coverage is computed as the ratio of EBIT to interest expenses. Interest coverage measures firms' capability in covering their interest payments on their outstanding debt. The higher ratio of interest coverage indicates that firms are surely capable of paying the interest expense while the lower ratio signals the fact that firms might be burdened by their interest expenses. In the recent study by Bai and Wu (2012), they document a negative relationship between interest coverage and CDS spreads using linear regression on the pooled data over 351 weeks and 579 companies. This negative relationship is also documented by Das et al. (2009). It can be said that when the interest coverage ratio is high, firms' risk of default is reduced since the probability of their obligations fulfilment is high. Consequently, all other things being equal, CDS spreads should be lower as well. Contrarily, if the interest coverage ratio is high, credit ratings should be high as well since firms' default risk is low.

4.4.3 Liquidity

Liquidity is calculated by the fraction of working capital over total assets. Theoretically speaking, all other things being equal, firms with high liquidity carry the message of firms' good operation and performance to the market. In other words, these firms possess lower risk of default. Therefore, their CDS spreads should be low. Nevertheless, Das et al. (2009) show that there is no obvious relationship between liquidity and CDS spreads. As for credit ratings, on the one hand, liquidity may act as an important factor in obtaining good credit ratings for firms. The reason is that it is possible that managers of highly liquid firms may signal their performance and financial health through their credit ratings while at the same time increase their management reputation. However, on the other hand, managers can make use of firms' high liquidity as a means to pursue their self-interest, increase their salaries and bonuses and invest in projects with negative net present values; that eventually leads to a decrease in shareholders' value. In fact, the negative relationship between liquidity and credit ratings is found in the recent studies by Adams et al. (2003) and Bai and Wu (2012), implying the existence of agency problems among the firms.

4.4.4 Profitability

Profitability is measured by the ratio of EBITDA over total assets. The higher ratio of profitability indicates the more profit the firm is generating per dollar asset. Therefore, the default risk for firms with high profitability ratio is low. As a result, low default risk leads to low CDS spread and higher credit ratings. Adams et al. (2003) report a consistently and significantly positive link between profitability and S&P credit ratings in both the rating likelihood logit and probit models as well as the ordered probit model. On the contrary, a negative relationship between profitability and CDS spreads is also documented in the study by Bai and Wu (2012).

4.4.5 Investment

Investment is captured by the ratio of retained earnings to total assets. Retained earnings are the leftover earnings after dividends payout. They are the earnings that can be used for reinvestment in positive net present value projects or simply for debt repayment. It can be said the investment ratio reflects the availability or the readiness of firms for investing in potential projects. High investment ratio signals firms' potentials for development, thus, their credit ratings are also improved. Additionally, firms with high investment ratio have lower default risk. As a consequence, CDS spreads for these firms are low. Das et al. (2009) document a significant negative link between investment and CDS spreads in their accounting-based measure model as well as the model that includes both accounting and market-based measures. Bai and Wu (2012) also report a decline in the investment ratio along with the increase of CDS spreads.

4.4.6 Firm size

Firm size is calculated by the logarithm of market value of total assets. It is more likely to argue that firm size is positively related with credit ratings. This argument is based on the fact that large firms have certain advantages over small firms. For example, large firms have better access (with lower costs) to financing, certain economies of scale in their operations, resourceful know-how, more competent labour and lower insolvency risk in comparison with small firms. Moreover, since large firms are less likely to face the risk of default compared with small firms, hence, the relationship between firm size and CDS spread should be negative. However, Adams et al. (2003) report a consistent negative relationship between firm size and S&P credit ratings at 5% level of significance. Nevertheless, the negative link between firm size and CDS spreads is reported in both studies by Das et al. (2009) and Bai and Wu (2012).

4.4.7 Stock market volatility

Stock market volatility, which reflects the volatility of weekly stock returns within a fiscal year, is measured by the standard deviation of weekly stock returns. High stock market volatility implies the instability of firms' performance and the higher firms' default risk. Hence, based on this argument, high stock market volatility leads to firms' lower credit ratings and higher CDS spreads. In fact, Das et al. (2009) document a significant positive relationship between the volatility of equity return and CDS spreads at 1% level of significance. They use the market-based measure in their models and the model that includes both accounting and market-based measures. Their finding is consistent with the study by Ericsson et al. (2009). In addition, in the recent study by Bai and Wu (2012), their results show that companies with declining stock market performance during the previous year tend to have higher CDS spreads.

4.5 Data collection

The data used in this research are secondary data extracted from two main sources as Bloomberg and the annual financial reports of the selected companies (hand collected). The reason for using these two sources are to enhance the quality of data and to create a unique data set (which is not available elsewhere) because some key variables (e.g. some off-balance sheet financing items) extracted from Bloomberg either contained too many missing values or were not available in Bloomberg. The final dataset of this research is unbalanced panel data with gaps.

4.5.1 Manual data collection

The hand-collected variables in this research are the variables that cannot be achieved through other sources (i.e. Bloomberg or Datastream) because the information related to these variables is either unavailable or available for only a few years with a lot of missing data. In order to avoid the missing data bias, these variables were manually collected from companies' annual financial reports from 1996 to 2010. The process of manual data collection has been discussed in details in Section 2.3.1 of Chapter 2.

Due to the nature of manual data collection approach which is time-consuming, the top 50 large US listed companies with highest revenues within the fiscal year (according to the Fortune 500 ranking list) are included in the sample of this study. This sample excludes financial institution and insurance companies. A list of 50 top listed large firms is filtered and updated continuously over the research window of 15 years from 1996 to 2010. The reason is that during the research period, some of these firms in the ranking list had either M&A activities or went into liquidation. In addition, some firms' annual financial reports (for unknown reasons) are missing partly or as a whole and are nowhere to be found. Therefore, the list of firms is regularly updated along the data collection process and only finalised when all information needed is available. The survivorship bias is controlled in this study since the list of the firms is not narrowed down to the survivors in 2010 to collect the data backwards to 1996. Instead, this list was regularly updated from 1996 onwards, based on the top 50 highest revenue and the availability of data. The final number of firms adds up to 103 listed firms. Table A.3 in Appendix A reports the list of firms and years in this study.

The hand-collected variables in this research are the off-balance sheet financing items which come from the notes appended to the financial statements. Companies' annual reports (aka form 10-K in sec filings) are mainly collected from the U.S. Security and Exchange Commission website (www.sec.gov) for each company in every single year within 15 years. However, for unknown reasons, some of these reports do not fully provide all needed information; therefore, other sources are also deployed to achieve annual reports such as the firms' websites, Thomson Reuters to gather all the missing information. The number of processed annual reports totals up to 750 reports. As manual data collection process is very time-consuming, requires intensive work and carefulness, the total number of observations in this study remains at 750 firm-year observations of 103 US listed large firms. The data in this research are unbalanced panel data with gaps. The hand-collected variables in this study consist of the following variables: pension liability, operating leases and stock options. The process of collecting and formulating these variables is summarised in Table 4.1 and has been carefully discussed in Section 2.3.2 of Chapter 2.

Table 4.1: The off-balance sheet financing formulation

Off-balance sheet items	Formula components	Formula
Pension Liability (PL)		$PL = DBPP + PBPP$
Defined Benefit Pension Plans (DBPP)	PBO Fair value of assets (FVOA)	$DBPP = FVOA - PBO$
Postretirement Benefit Pension Plans (PBPP)	APBO Fair value of assets (FVOA)	$PBPP = FVOA - APBO$
Capitalised Operating Leases (COL)		$COL = MNYR/[APTI + (1/20)]$
	Minum next-year rental (MNYR)	
Average pre-tax interest rate (APTI)	Current interest expenses Current & previous year total debt	Current interest expenses/ Average total debt
Stock Options (SO)		$SO = SO\ outstanding \times FV$
	SO outstanding (Year-end) FV per option (Black-Scholes/ Pro forma weighted average price)	

Note: The process of how the data are manually collected and how the variables are constructed is carefully interpreted in section 4.5.1.

Pension liability, capitalised operating leases and stock options are collected manually from the footnotes of the companies' financial statements (form 10-K in sec filings). The process of manual data collection for these three off-balance sheet financing items are carefully described in the Section 2.3.2.1, 2.3.2.2 and 2.3.2.3 of the Chapter 2.

4.5.2 Bloomberg data collection

The data were collected from the same 50 listed large firms with highest revenues (according to Fortune 500 ranking list) each year from 1996 to 2010, which added up to 103 listed firms in 15 years. These firms were identified in Bloomberg using the Bloomberg's ticker symbols (see Table A.3 in the Appendix A). An Excel template was designed with identification of all the firms, years, sub-industries, countries to extract all the necessary variables. Each variable was searched using Mnemonics symbols. The variables, provided by Bloomberg, are well defined. Therefore, before picking the variables, information related to the way variables were calculated by Bloomberg was carefully looked into to make sure all collected variables were relevant. I used STATA in this research to process the data, run the models and the post-regression tests.

4.6 Empirical model specification

4.6.1 Conventional Merton distance to default versus adjusted Merton distance to default

In order to investigate the impact of the on and off-balance sheet financing items on some prominent credit measurements, this research examines the Merton distance to default in two different ways: (1) the Merton distance to default model that is normally used in many existing studies (non-adjusted model); (2) the adjusted Merton distance to default that is adjusted for debt equivalents (including some on and off-balance financing items).

The conventional Merton distance to default model is calculated based on the following formula.

$$M\_DtD = \frac{ln(\frac{A_t}{D_t}) + (r - \frac{1}{2}\sigma_A^2)T}{\sigma_A\sqrt{T}} \tag{4.6}$$

where:

A_t is the market value of total assets in year t; D_t is total debt at time t; r is risk-free rate which represents the 10-year US bond rate; σ_A is the standard deviation of weekly stock return during one fiscal year; t denotes a year; T denotes the total research period which is 15 years in this study.

The adjusted Merton distance to default model is measured as follows:

$$AM\_DtD = \frac{ln(\frac{(A_t+PE_t+MI_t)}{(D_t+DE_t)}) + (r - \frac{1}{2}\sigma_A^2)T}{\sigma_A\sqrt{T}} \tag{4.7}$$

where:

A_t is the market value of total assets in year t; PE_t stands for preferred equity in year t; MI_t stands for minority interest in year t; D_t is total debt in year t; r is risk-free rate which represents the 10-year US bond rate; σ_A is the standard deviation of weekly stock return during one fiscal year; t denotes a year; T denotes the total research period which is 15 years in this study. DE_t stands for debt equivalents in year t and is calculated as in the following Formula 4.8:

$$DE_t = PE_t + MI_t + COL_t + SO_t + PL_t \tag{4.8}$$

where:

PE_t stands for preferred equity in year t; MI_t stands for minority interest in year t; COL_t stands for capitalised operating leases in year t; SO_t stands for stock options in year t and PL_t stands for pension liability in year t.

4.6.2 Conventional Altman's Z-score versus adjusted Altman's Z-score

In addition to the Merton distance to default model, Altman's Z-score (Altman (1968)) is also taken into account to find out the difference that the on and off-balance sheet financing items would make if they are reflected in some prominent credit risk models. Therefore, Altman's Z-score is looked into from both the conventional and the adjusted ones as well.

The conventional Altman's Z-score is calculated as follows:

$$ALTMANZ = 1.2X_1 + 1.4X_2 + 3.3X_3 + 0.66X_4 + 1.0X_5 \tag{4.9}$$

where:

X_1: working capital/total assets; X_2: retained earnings/total assets; X_3: earnings before interest and taxes/total assets; X_4: market value of equity/book value of total debt; X_5: sales/total assets.

The adjusted Altman's Z-score (adjusted for the on and off-balance sheet financing items) is measured as follows:

$$A\_ALTMANZ = 1.2Y_1 + 1.4Y_2 + 3.3Y_3 + 0.66Y_4 + 1.0Y_5 \tag{4.10}$$

where:

Y_1: working capital/(total assets+preferred equity+minority interest);

Y_2: retained earnings/(total assets+preferred equity+minority interest);

Y_3: earnings before interest and taxes/(total assets+preferred equity+minority interest);

Y_4: market value of equity/(book value of total debt+DE), where DE is defined similarly to the Formula 4.8;

Y_5: sales/(total assets+preferred equity+minority interest).

4.6.3 Empirical models

Up to now, just few research has been done to examine whether some off-balance sheet financing items are reflected in the CDS spreads and credit ratings (Ericsson et al. (2009) and Franzen et al. (2009)). Besides, empirical work related to the determinants of CDS spreads and credit ratings is quite scarce. Most of the studies use the univariate and multivariate regression models to find the determinants of CDS spreads (Cossin and Hricko (2001), Ericsson et al. (2009), Das et al. (2009) and Jacobs et al. (2010)) while many other studies employ logit/probit models to investigate the determinants of credit ratings (Adams et al. (2003), Kisgen (2006) and Hilscher and Wilson (2013)). However, in some cases, the opposite relationships between CDS spreads and credit ratings and their determinants can also be true. For instance, Kisgen (2006) studies how credit ratings affect the choice of capital structure. Thus, reverse causality may exist in the model. Additionally, endogeneity may come in the form of omitted variable bias since we can not include all the possible determinants of CDS spreads/credit ratings in one model either due to multicollinearity problems or data unavailability. Last but not least, serial correlation may also exist in the model.

These estimation problems can be solved by (1) analysing the changes in the credit risk measurements over time (using first differences model) or (2) examining credit risk measurements deviations from average benchmark (using fixed effects model) or (3) including instrumental variables. The first approach using first differences (FD) takes the difference of variables between every two consecutive years in the regression. As a result, the observed and unobserved variables that are individual-specific and constant over time are all eliminated. The FD estimator is used to address the problem of omitted variables with panel data. However, FD is not ideal in this study since the FD approach causes the loss of observations, and since this research uses the hand-collected data, it already contains the relatively small sample size compared with other studies that extract data from other available sources. Also, it is possible that credit risk measurements estimators may have serial correlation of the regression errors. Therefore, the FD estimators are inefficient.

The second approach using fixed effects (FE) model assumes that unobservable factors that might simultaneously affect the left and the right-hand side of the regression are time-invariant. Besides, FE regression exploits within-group variation over time. By including fixed effects (firm dummy and time dummy), the average differences across the firms in any observable or unobservable predictors are controlled. The fixed effects coefficients reflect all the across-firm action with invariant time. Differently put, it captures the effects of all variables that are individual-specific and constant over time. It can be said that FE regression is a powerful tool for removing omitted variables bias, especially for panel data.

The third approach using instrumental variables (IV) to remove endogeneity is difficult to establish either due to the choice of IV at the authors' discretion or due to the availability of these variables. Also, the IV estimation does not necessarily lead to efficient estimates of the model parameters as it does not utilise all the available moment conditions, especially for credit risk measurements, of which the previous year impact might be reflected in the following year. Newey and West develop a methodology to compute heteroskedasticity and autocorrelation - consistent (HAC) standard errors (aka the Newey-West standard errors). These standard errors are calculated from a distributed lag of the OLS residuals. The longest lag at which autocovariances are computed must be specified. It can be said that the Newey-West standard errors in a time series context are robust to both arbitrary serial correlation as well as arbitrary heteroskedasticity.

Although traditional OLS regression model can not solve the above-mentioned existing post-estimation problems in modelling, it remains as a popular model in credit risk measurement studies. Therefore, OLS regression and logit models are still used as the main models in this study. In addition, FE regression and Newey-West estimator are also exploited in the robustness section to compare and contrast with the main model results so as to achieve the robust findings.

4.6.3.1 OLS regression model for CDS

The ordinary least square regression (OLS) model for CDS spreads is specified as follows:

$$\begin{aligned} CDS_{it} = c + \alpha_1 PE\_TA_{it} + \alpha_2 MI\_TA_{it} + \alpha_3 COL\_TA_{it} + \alpha_4 SO\_TA_{it} + \alpha_5 PL\_TA_{it} \\ + \alpha_6 RATING1 + \alpha_7 RATING2 + \alpha_8 M\_DtD_{it} + \mathbf{X}_{it}\beta + \varepsilon_{it} \end{aligned} \tag{4.11}$$

where:

CDS is the credit default swap spreads, measured by the logarithm of the average of monthly CDS spreads; The index i denotes a firm, t denotes a year, c is a constant;
PE_TA is preferred equity over total assets, MI_TA is minority interest over total assets, COL_TA is capitalised operating leases over total assets, SO_TA is stock options over total assets, PL_TA is pension liability over total assets;
$RATING1$ is S&P rating dummy variable that takes value 1 if upgrade and 0 otherwise, $RATING2$ is S&P rating dummy variable that takes value 1 if downgrade and 0 otherwise, M_DtD is Merton distance to default;
$\mathbf{X}$ is a vector containing a group of variables controlling for firm accounting-based determinants such as leverage (total debt/total assets, interest coverage (EBIT/interest expenses), liquidity (working capital/total assets), profitability (EBITDA/total assets), investment (retained earnings/total assets), firm size (ln(market value of total assets) and stock market volatility (sd(weekly stock returns)).

4.6.3.2 Ordered logit model for credit ratings

Credit ratings (CR) are defined as follows:

$$CR = \begin{cases} 1 & \text{if upgrade} \\ 0 & \text{if no change} \\ -1 & \text{if downgrade} \end{cases}$$

The ordered logit model for credit ratings is specified as follows:

$$\begin{aligned} Pr(CR_{it}) = \phi(c + \gamma_1 PE\_TA_{it} + \gamma_2 MI\_TA_{it} + \gamma_3 COL\_TA_{it} + \gamma_4 SO\_TA_{it} + \gamma_5 P\_TA_{it} \\ + \gamma_6 M\_DtD_{it} + \mathbf{Y}_{it}\delta) \end{aligned} \tag{4.12}$$

where:

The index i denotes a firm, t denotes a year, c is a constant;

PE_TA is preferred equity over total assets, MI_TA is minority interest over total assets, COL_TA is capitalised operating leases over total assets, SO_TA is stock options over total assets and PL_TA is pension liability over total assets;

M_DtD is Merton distance to default;

Vector **Y** is defined similarly to vector **X** in the OLS model for CDS (see Formula 4.11).

4.7 Analysis and results

4.7.1 Descriptive statistics

4.7.1.1 Merton distance to default vs. adjusted Merton distance to default

Figure 4.1 reports the median difference between the conventional versus the adjusted Merton distance to default for the on and off-balance sheet financing items (large US firms from 1996 to 2010). It can be seen from the figure that most of the firms are quite far distanced from the default line except for 2008 when the financial crisis occurred.

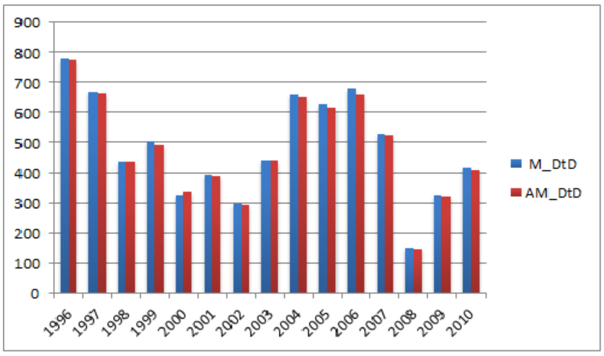


Figure 4.1: Merton distance to default and adjusted Merton distance to default

As we can see from Figure 4.1, the adjustment does not make much difference for this credit risk measurement. Over the period, the adjusted Merton distance to default estimates seem to be lower compared with the conventional ones. However, these gaps are not very noticeable. Especially, in some years (for instance 1998 and 2003) the estimates are almost equal. In 2000, the adjusted estimate is even higher than the non-adjusted one, which might be caused by outliers. However, the sample in this study consists only large firms in the US, therefore, due to the size effect, the adjustment does not reflect much of the story behind the on and off-balance sheet financing on this credit risk measurement. Probably, the adjustment will make more difference if we apply it with small firms.

4.7.1.2 Altman's Z-score vs. adjusted Altman's Z-score

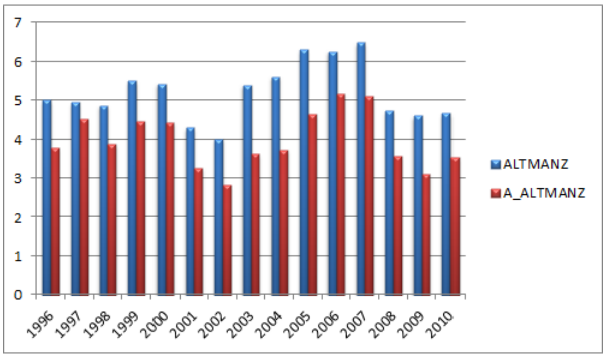


Figure 4.2: Altman's Z-score and adjusted Altman's Z-score

Figure 4.2 shows the median difference between Altman's Z-score and the adjusted Altman's Z-score for debt equivalents. As we can see from the figure that the adjustment does make a noticeable difference with this credit risk measurement. On average, the non-adjusted estimates are 1 to 2 scores higher than the adjusted ones. In general, although Altman's Z-scores fluctuate over 15 years, most of the scores reflect that large US firms are safe based on their financial figures. The adjustment does not put the firms in this study into financial difficulty alert, which might be due to the size effect. Nevertheless, it does show us the need of thorough consideration for these on and off-balance sheet financing items since credit risk might not be correctly measured if we ignore these items. Also, this suggests the calls for potential alternative credit risk measurement, perhaps more updated Altman's Z-score to reflect these debt equivalents.

4.7.1.3 Graph illustration for the on and off-balance sheet financing items

Figure 4.3 reports the means of each debt equivalent item over total assets (TA) for large US firms from 1996 to 2010. Pension liability/total assets (PL/TA) is illustrated in positive figures when pension plans are overfunded and in negative figures when these plans are unfunded. As we can see from Figure 4.3, minority interest (MI) and preferred

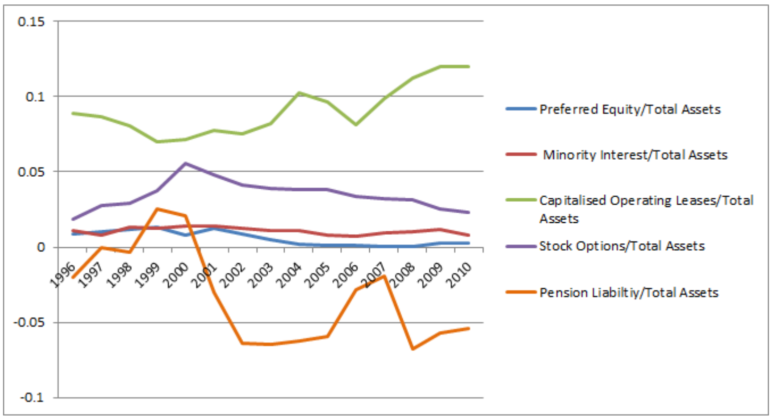


Figure 4.3: Debt equivalents over total assets

equity (PE) account for very small amounts over total assets. Also, their trends do not change much over 15 years. The means of MI/TA remain quite stable over time while the means of PE/TA show a slight decrease from 1996 to 2010.

Capitalised operating leases (COL) account for significant amounts over total assets and there is an increasing trend over time. From 1996 to 1999, there is a slight fall in COL/TA by about 2% (from 9% to 7%). From 2000 to 2004, COL/TA increases gradually to 10%, and then within two years from 2003 to 2005, it falls again to 8%. From 2005, COL/TA rises up considerably, reaching the peak of 12% in 2008 and continues to remain constant until 2010. In comparison with capitalised operating leases, stock options (SO) account for smaller amounts over total assets. Starting at 2% in 1996, SO/TA reaches the peak of 5.5% in 1999. From 1999, it decreases gradually over time to 2.5% until 2010. It can be said that the means of SO/TA do not show a lot of changes over 15 years from 1996 to 2010.

On the contrary, the means of pension liability over total assets (PL/TA) show significant changes over time. It can be seen from Figure 4.3 that from 1996 to 1997, pension liability accounts for a very small percentage over total assets (about 2% in 1996 and almost 0% in 1997). From 1998 to 2000, US firms' pension plans are even overfunded by roughly 2%. Nevertheless, from 2000 to 2004, these pension plans are unfunded by significant percentage of about 6% over total assets. From 2005 to 2006, PL/TA falls considerably by 4%. However, from 2007, it starts to increase again, reaching the peak of 6.5% in 2008 and then decreases slightly to 5% in 2010. This sudden increase might be caused by the financial crisis in 2007. Moreover, it can be acknowledged that pension liability is one of the off-balance sheet financing items that is used pronouncedly in addition to capitalised operating leases.

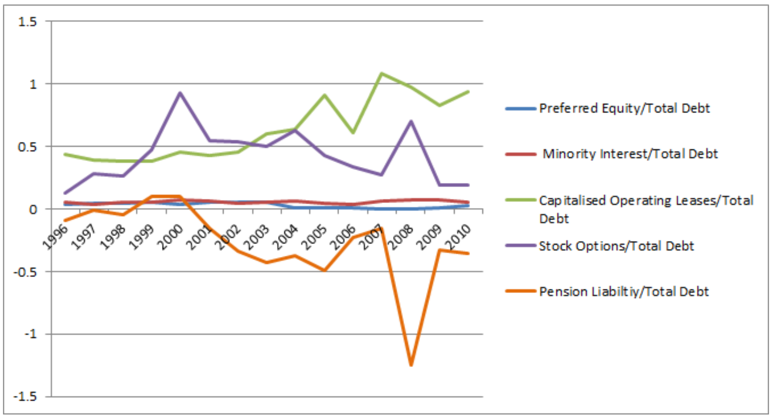


Figure 4.4: Debt equivalents over total reported debt

Figure 4.4 illustrates the means of each debt equivalent over total debt (TD) for large US firms from 1996 to 2010. Again, PL/TD is reported in positive figures when pension plans are overfunded and in negative figures when these plans are unfunded. Minority interest and preferred equity account for very small percentage over total debt (0% to 1%). In addition, the means of MI/TD and of PE/TD remain quite constant over time. Opposite to the on-balance sheet debt equivalents, the off-balance sheet financing items account for significant percentage over total reported debt. In particular, from 1996 to 2001, capitalised operating leases account for almost 50% over total debt on average. From 2003, COL/TD increases to 90% and then decreases to 60% in 2005. It starts to increase again from 2005, reaching the peak of 110% in 2006. From 2006, COL/TD falls slightly to 80% and increases again to 90% in 2010. It can be seen from Figure 4.4 that capitalised operating leases account for considerable amount over total reported debt and there is a significantly increasing trend over time from 1996 to 2010.

Stock options also account for pronounced percentage over total debt. From 1996 to 2000, the means of SO/TD increase significantly, reaching the peak of 90% in 2000. From 2000 to 2006, the ratio of SO/TD decreases gradually to 25% and rises up again to 70% in 2007. From 2007, it falls considerably to 20% and remains the same until 2010. PE/TD shows quite different trend over time in comparison with PE/TA. From 1996 to 1998, large US firms have very few pension liability. Corporate pension plans are even overfunded from 1998 to 2000 by roughly 10% over total reported debt. However, from 2001, large US firms begin to have more pension liability. From 2001 to 2004, the average percentage of pension liability over total debt is about 40%. This number decreases from 2004 to 2006 by 30%. Nevertheless, within one year, there is a considerable increase in pension liability, reaching the peak of 125% in 2007. This sudden increase in pension liability can be explained by the occurrence of the financial crisis in 2007. Large US firms might face difficulty in fulfilling their obligations of their pension plans. From 2007 to 2008, the pronounced gap in pension liability seems to be shortened quite quickly. As a result, PL/TD decreases to 40% by 2010.

4.7.1.4 Descriptive results for the on and off-balance sheet financing items

Table 4.2 summarises the descriptive statistics of debt equivalents. The fractions of both debt equivalents over total assets and debt equivalents over total debt are reported. Preferred equity accounts for only 6% over total assets on average. However, the bottom 25 percentile of the large US firms issue almost 0% preferred equity. Minority interest also accounts for an average of 1% over total assets with a standard deviation of 3%. The mean value of capitalised operating leases over total assets is 9% with a standard deviation of 12%. Both stock options and pension liability account for 3% over total assets on average. It can be acknowledged that debt equivalents do not seem to be a large amount in comparison with firms' total assets.

Table 4.2: Debt equivalents descriptive statistics

Variables	Obs.	Mean	S.D	p25	p50	p75
PE/TA	690	0.06	0.01	0.00	0.00	0.00
MI/TA	692	0.01	0.03	0.00	0.00	0.01
COL/TA	689	0.09	0.12	0.03	0.05	0.09
SO/TA	715	0.03	0.05	0.01	0.02	0.04
PL/TA	714	-0.03	0.07	-0.05	-0.02	0.00
PE/TD	676	0.03	0.10	0.00	0.00	0.01
MI/TD	678	0.06	0.14	0.00	0.00	0.04
COL/TD	684	0.64	1.64	0.16	0.33	0.61
SO/TD	701	0.43	1.55	0.04	0.08	0.24
PL/TD	701	-0.27	1.67	-0.29	-0.08	0.00

Note: PE/TA = preferred equity/total assets. MI/TA = minority interest/total assets. COL/TA = capitalised operating leases/total assets. SO/TA = stock options/total assets. PL/TA = pension liability/total assets. PE/TD = preferred equity/total debt. MI/TD = minority interest/total debt. COL/TD = capitalised operating leases/total debt. SO/TD = stock options/total debt. PL/TD = pension liability/total debt.
Since pension liability is recorded as a function of "pension assets - pension liability", therefore, the negative sign represents liability while the positive sign represents assets.

However, when we compare debt equivalents with total debt, we can see a considerable difference. Preferred equity and minority interest still accounts for a small percentage over total debt (3% and 6%, respectively) with larger standard deviation of 10% and 14%, respectively. On average, capitalised operating leases accounts for 64% over total debt. The bottom 50 percentile of firms have COL/TD of 33%, and the bottom 75 percentile of firms have COL/TD of 61%. Stock options also account for a significant percentage of 43% over total debt on average while the mean value of pension liability is 27%. Nevertheless, the standard deviation of these debt equivalents components is also significant with 1.64 for COL/TD, 1.55 for SO/TD and 1.67 for PL/TD. It can be concluded that the usage of stock options and pension liability among large US firms also varies considerably (as we can see from the percentile and standard deviation figures).

4.7.1.5 A summary of data statistics

Table 4.3: Data descriptive statistics

Variables	Obs.	Mean	S.D	p25	p50	p75
CDS	351	3.99	0.97	3.31	3.95	4.51
CR	616	-0.01	0.40	0.00	0.00	0.00
PE_TA	750	0.01	0.02	0.00	0.00	0.00
MI_TA	750	0.01	0.02	0.00	0.00	0.02
COL_TA	750	0.10	0.10	0.03	0.06	0.13
SO_TA	750	0.03	0.04	0.01	0.02	0.05
PL_TA	750	0.03	0.07	0.00	0.02	0.05
RATING1	615	0.07	0.26	0.00	0.00	0.00
RATING2	616	0.09	0.28	0.00	0.00	0.00
M_DtD	631	492.94	223.20	336.45	461.18	638.31
AM_DtD	602	492.04	223.74	336.12	460.72	639.04
ALTMANZ	664	10.28	17.33	3.44	5.20	9.68
A_ALTMANZ	631	5.15	4.88	2.68	3.92	6.58
LEVERAGE	715	0.23	0.14	0.12	0.22	0.30
INTEREST COVERAGE	686	2.26	1.17	1.51	2.16	2.88
LIQUIDITY	750	0.08	0.15	-0.01	0.05	0.15
PROFITABILITY	750	0.16	0.08	0.11	0.15	0.21
INVESTMENT	750	0.20	0.19	0.07	0.19	0.34
FIRM SIZE	678	11.40	0.99	10.70	11.39	12.18
STOCK MARKET VOLATILITY	750	4.48	3.30	2.17	3.51	5.72

Note: CDS = ln (the average of monthly CDS spreads). CR = S&P credit ratings which reflect the downgrade outweighs the upgrade. PE_TA = preferred equity/total assets. MI_TA = minority interest/total assets. COL_TA = capitalised operating leases/total assets. SO_TA = stock options/total assets. PL_TA = pension liability/total assets. RATING1 = S&P rating dummy variable that takes value 1 if upgrade and 0 otherwise. RATING2 = S&P rating dummy variable that takes value 1 if downgrade and 0 otherwise. M_DtD is Merton distance to default and is calculated in accordance with Formula 4.6. AM_DtD is adjusted Merton distance to default and is calculated in accordance with Formula 4.7. ALTMANZ is Altman's Z-score and is measured according to Formula 4.9. A_ALTMANZ is adjusted Altman's Z-score and is measured according to Formula 4.10. Leverage = total debt/total assets. Interest coverage = EBIT/interest expenses. Liquidity = working capital/total assets. Profitability = EBITDA/total assets. Investment = retained earnings/total assets. Firm size = ln (market value of total assets). Stock market volatility = sd (weekly stock returns).

Table 4.3 reports the descriptive statistics of all the variables in this study. CDS spreads are available in Bloomberg from 2002 to 2010 (9 years) with 351 observations. The mean spread is 3.99 basis points (bps) with the standard deviation of 0.97 bps among firms. S&P credit ratings (denoted as CR) show that the downgrade outweighs the upgrade. However, under 75 percentiles of the sample, CR remains unchanged. In fact, among 616 observations, 53 are downgrade while 45 are upgrade, and 518 remaining observations are unchanged. The on and off-balance sheet financing items are winsorised at 5% to mitigate outliers, and their descriptive statistics are similar to those of Section 4.2.

It can be seen from Table 4.3 that there is not much difference between M_DtD and AM_DtD while there is a noticeable gap between AltmanZ and A_AltmanZ. Particularly, the mean value of non-adjusted Altman's Z-score is double than the adjusted one. This major gap shows that the traditional Altman's Z-score might not be very reliable in reflecting firms' credit risk when these debt equivalent items are not taken into thorough consideration.

4.7.2 Empirical results

4.7.2.1 OLS regression results for CDS model

Table 4.4 reports the OLS regression results for CDS model. Among the debt equivalent items, only minority interest, capitalised operating leases and stock options are reflected in CDS spreads while preferred equity and pension liability seem to have no link with CDS spreads. Minority interest, capitalised operating leases and stock options are significantly positively related with CDS spreads at 1% and 5% level of significance. These findings show the fact that CDS spreads incorporate some of these debt equivalent items in their credit risk measurement. In other words, CDS spreads capture the credit risk inherent in minority interest, capitalised operating leases and stock options. Nevertheless, CDS spreads fail to reflect preferred equity although preferred equity merely accounts for 3% over total debt and 6% over total assets. These percentages are quite small in comparison with other debt equivalents. More importantly, CDS also fails to reflect pension liability that significantly accounts for 27% over total debt and 3% over total assets.

As we can see from Table 4.4, there is no link between the S&P credit rating upgrade (Rating 1) and CDS spreads while there is a significant positive link between downgrade

Table 4.4: Regression results for CDS model

Variables	Main variables	Control variables
PE_TA	-6.150 (4.068)	
MI_TA	7.809*** (2.520)	
COL_TA	0.766*** (0.294)	
SO_TA	3.990** (1.838)	
PL_TA	-0.437 (0.386)	
RATING1	0.016 (0.133)	
RATING2	0.154* (0.089)	
M_DtD	-0.002*** (0.000)	
LEVERAGE		0.455 (0.331)
INTEREST COVERAGE		-0.164*** (0.053)
LIQUIDITY		-1.295*** (0.376)
PROFITABILITY		-2.179*** (0.608)
INVESTMENT		0.210 (0.221)
FIRM SIZE		-0.040 (0.045)
STOCK MARKET VOLATILITY		-0.026** (0.012)
Observations	301	301
R-squared	0.65	0.65

Note: Robust standard errors in parentheses (using the Huber-White sandwich estimator), *** $p<0.01$, ** $p<0.05$ and * $p<0.1$ indicate statistical significance at the 1%, 5% and 10% test levels, respectively.
PE_TA = preferred equity/total assets. MI_TA = minority interest/total assets. COL_TA = capitalised operating leases/total assets. SO_TA = stock options/total assets. PL_TA = pension liability/total assets. RATING1 = S&P rating dummy variable that takes value 1 if upgrade and 0 otherwise. RATING2 = S&P rating dummy variable that takes value 1 if downgrade and 0 otherwise. M_DtD is Merton distance to default and is calculated in accordance with Formula 4.6. Leverage = total debt/total assets. Interest coverage = EBIT/interest expenses. Liquidity = working capital/total assets. Profitability = EBITDA/total assets. Investment = retained earnings/total assets. Firm size = ln (market value of total assets). Stock market volatility = sd (weekly stock returns).

and CDS spreads. This result documents that S&P credit rating downgrade (Rating 2) signals the firms' credit risk and as a consequence, CDS spreads increase. Merton distance to default has significant negative partial impact on CDS spreads at 1% level of significance. This finding implies that the further the firm's distance to default, which is equivalent to the less probability of default, the smaller the firm's CDS spreads are. This result is consistent with the finding in the study by Peristiani and Savino (2011).

As for other control variables, overall leverage, investment and firm size seem to have no partial impact on CDS spreads. Nevertheless, interest coverage, liquidity, profitability and stock market volatility act as powerful determinants of CDS spreads. Consistent with the studies by Das et al. (2009) and Bai and Wu (2012), interest coverage is negatively related with CDS spreads. This finding implies the fact that firms with high interest coverage have the capability of paying interest expenses, thus, have the lower risk of default while firms with low interest coverage might be burdened by interest expenses. Thus, their CDS spreads must be higher to reflect the credit risk.

In addition, this study document the negative relationships between liquidity and CDS spreads, and between profitability and CDS spreads. These results are in line with the study by Bai and Wu (2012). The explanation for these relationships is that liquid/ profitable firms have less risk of default; hence, their CDS spreads must be low. However, my findings document a significant negative link between stock market volatility and CDS spreads. This result contradicts with other findings of Ericsson et al. (2009), Das et al. (2009) and Bai and Wu (2012).

By and large, the model has goodness of fit of 65%, which means all the independent variables can explain 65% the dependent variable. Overall, this model has quite good explanatory power over CDS spreads. It is also robust to heteroskedasticity using the Huber-White sandwich estimator.

4.7.2.2 Ordered logit results for credit ratings model

Table 4.5 documents ordered logit results for credit ratings. It can be seen that only capitalised operating leases are reflected in credit rating measurement. Particularly, capitalised operating leases is reflected in rating downgrade at 5% level of significance. Other on and off-balance sheet debt equivalents have no statistical explanatory power over credit rating changes. This finding is not so surprising since it is a common knowledge that credit ratings are quite slow in catching up with the firms' credit risk. Put differently, rating agencies are not very active in estimating firms' default risk, and ratings have recently been proved to be a poor predictor of corporate failure (Hilscher and Wilson (2013)). Merton distance to default has a significant positive partial impact on rating upgrade. This result implies that Merton distance to default has a predictive power over rating upgrade. Although this relationship is statistically significant, it is not economically significant as the coefficient is quite small. Nevertheless, this result supplements the previous study by Gropp et al. (2006), in which they show that Merton distance to default has predictive power over rating downgrade.

Table 4.5: Ordered logit results for credit rating model

Variables	Main variables	Control variables
PE_TA	-6.410	
	(9.987)	
MI_TA	4.662	
	(7.022)	
COL_TA	-3.337**	
	(1.464)	
SO_TA	-4.635	
	(4.917)	
PL_TA	-1.574	
	(2.011)	
M_DtD	0.001*	
	(0.001)	
LEVERAGE		0.830
		(1.292)
INTEREST COVERAGE		0.675***
		(0.193)
LIQUIDITY		-2.578*
		(1.372)
PROFITABILITY		4.442*
		(2.451)
INVESTMENT		-1.415*
		(0.819)
FIRM SIZE		-0.680***
		(0.169)
STOCK MARKET VOLATILITY		0.034
		(0.051)
Observations	548	548

Note: *** p<0.01, ** p<0.05 and * p<0.1 indicate statistical significance at the 1%, 5% and 10% test levels, respectively.
PE_TA = preferred equity/total assets. MI_TA = minority interest/total assets. COL_TA = capitalised operating leases/total assets. SO_TA = stock options/total assets. PL_TA = pension liability/total assets. RATING1 = S&P rating dummy variable that takes value 1 if upgrade and 0 otherwise. RATING2 = S&P rating dummy variable that takes value 1 if downgrade and 0 otherwise. M_DtD is Merton distance to default and is calculated in accordance with Formula 4.6. Leverage = total debt/total assets. Interest coverage = EBIT/interest expenses. Liquidity = working capital/total assets. Profitability = EBITDA/total assets. Investment = retained earnings/total assets. Firm size = ln (market value of total assets). Stock market volatility = sd (weekly stock returns).

Regarding other control variables, most of them have statistical explanatory power over credit ratings except for leverage and stock market volatility. Interest coverage has a positive partial impact on rating upgrade at 1% level of significance. This finding is rational because if a firm's interest coverage is high, its default risk is low; thus, the rating should be an upgrade. Besides, liquidity has a negative partial impact on rating downgrade while profitability has a positive partial impact on rating upgrade. Moreover, this study also shows evidence that both investment and firm size have predictive power over large firms' downgrade.

4.7.3 Robustness tests and results

4.7.3.1 Robustness tests

This chapter applied the same post-estimation tests as in Chapter 2 and 3. To begin with, in order to satisfy the skewness and kurtosis criteria of normal distribution for CDS model and in order to mitigate some extreme outliers, I winsorised certain numbers of variables at 1% and 5%. Secondly, a correlation matrix of all regressors is established to detect multicollinearity among independent variables. Empirical evidence shows that if the correlation between two independent variables is above 0.85, the problem of multicollinearity is present in the model. Moreover, in case of doubts, the variance inflation factor (VIF) is also constructed based on the following equation:

$$VIF_{Determinant} = \frac{1}{1 - R^2_{Determinant}} \tag{4.13}$$

where $R^2_{Determinant}$ is the coefficient of determination for the examined determinant (explanatory variable). $R^2_{Determinant}$ is generated with an auxiliary regression of one of the determinants on the remaining determinants. Empirical evidence shows that when VIF is larger than 5, multicollinearity is detected which affects the reliability of estimators.

In terms of heteroskedasticity, Breusch-Pagan/Cook-Weisberg test is used with the null hypothesis that the error variances are all equal against the alternative hypothesis that the error variances fluctuate along with the predicted values of Y. A large chi-square would indicate that heteroskedasticity is present. In addition, with a view to detecting omitted variable problems, Ramsey RESET test is applied in this research.

To detect serial correlation (autocorrelation), I utilise the test discussed by Wooldridge (2002). It is acknowledged that serial correlation exits in the idiosyncratic errors of a panel data model because the error in each time period contains a time-constant omitted factor. The method of Wooldridge (2002) uses the residuals from a regression in first-differences for $T > 2$ as follows:

$$\begin{aligned} y_{it} - y_{it-1} &= (X_{it} - X_{it-1})\beta + u_{it} - u_{it-1} \\ \Delta y_{it} &= \Delta X_{it}\beta + \Delta u_{it} \end{aligned} \tag{4.14}$$

where Δ is the first-difference operator.

Wooldridge (2002)'s procedure starts with the estimation of parameters β_1 by regressing Δy_{it} on ΔX_{it} to obtain the residuals $\Delta \hat{u}_{it}$. After that, Wooldridge suggests regressing the residuals $\Delta \hat{u}_{it}$ from the regression with first-differenced variables on their lagged residuals. He observes that if the coefficient on the lagged residuals is equal/close to -0.5, which means corr($\Delta u_{it}, \Delta u_{it-1}$)=-0.5, the u_{it} is not serially correlated. As a result, the model is free from autocorrelation. Moreover, the variance component estimator (VCE) is adjusted for clustering at the panel level so as to account for the within panel correlation in the regression of $\hat{u}_{it}$ on $\hat{u}_{it-1}$. This cluster implies robustness. Therefore, Wooldridge (2002)'s test of serial correlation is also robust to conditional heteroskedasticity.

4.7.3.2 Robustness results

Table C.1 and Table C.2 in Appendix C shows the results of multicollinearity tests including correlation matrix and VIF tests. The results show that multicollinearity problems are not present in the models as correlations between independent variables are under 0.85, and VIFs are also under 5. This study uses Breusch-Pagan/Cook-Weisberg test of heteroskedasticity, and the result shows that heteroskedasticity does not exist in the CDS model.

The Ramsey RESET test result shows that omitted variables problem does not exist in the credit rating model while as for the CDS model, omitted variables does exist. In addition, Wooldridge (2002) shows that serial correlation also exists in CDS model. As fixed effects regression helps solve the problem of omitted variables bias, therefore, in this study, fixed effects regression is used to compare and contrast the main model to get the robust results. In addition, by using Newey-West methodology, omitted variables bias and endogeneity are also controlled by including the lagged values of independent variables as the instrumental variables. Moreover, Newey-West standard errors are also robust to autocorrelation and heteroskedasticity.

Table 4.6: Robustness results for CDS model

Variables	OLS	FE	NEWEY_WEST
PE_TA	-6.150	-2.415	-6.150
	(4.068)	(4.407)	(4.285)
MI_TA	7.809***	6.454**	7.809**
	(2.520)	(2.597)	(3.482)
COL_TA	0.766***	-0.802*	0.766**
	(0.294)	(0.469)	(0.365)
SO_TA	3.990**	1.131	3.990*
	(1.838)	(2.316)	(2.106)
PL_TA	-0.437	0.031	-0.437
	(0.386)	(0.270)	(0.438)
RATING1	0.016	-0.050	0.016
	(0.133)	(0.082)	(0.127)
RATING2	0.154*	0.124	0.154*
	(0.089)	(0.081)	(0.088)
M_DtD	-0.002***	-0.001***	-0.002***
	(0.000)	(0.000)	(0.000)
LEVERAGE	0.455	0.916	0.455
	(0.331)	(0.707)	(0.424)
INTEREST COVERAGE	-0.164***	-0.309***	-0.164**
	(0.053)	(0.082)	(0.066)
LIQUIDITY	-1.295***	-0.311	-1.295***
	(0.376)	(0.772)	(0.480)
PROFITABILITY	-2.179***	-2.324**	-2.179***
	(0.608)	(1.119)	(0.677)
INVESTMENT	0.210	0.866**	0.210
	(0.221)	(0.330)	(0.273)
FIRM SIZE	-0.040	0.064	-0.040
	(0.045)	(0.106)	(0.056)
STOCK MARKET VOLATILITY	-0.026**	0.022	-0.026**
	(0.012)	(0.015)	(0.013)
Observations	301	301	301
Number of firms		54	
R-squared	0.65	0.82	

Note: Robust standard errors in parentheses (using Huber-White sandwich estimator). *** p<0.01, ** p<0.05 and * p<0.1 indicate statistical significance at the 1%, 5% and 10% test levels, respectively. As for FE estimator, firm and year dummies are omitted in the table.
PE_TA = preferred equity/total assets. MI_TA = minority interest/total assets. COL_TA = capitalised operating leases/total assets. SO_TA = stock options/total assets. PL_TA = pension liability/total assets. RATING1 = S&P rating dummy variable that takes value 1 if upgrade and 0 otherwise. RATING2 = S&P rating dummy variable that takes value 1 if downgrade and 0 otherwise. M_DtD is Merton distance to default and is calculated in accordance with Formula 4.6. Leverage = total debt/total assets. Interest coverage = EBIT/interest expenses. Liquidity = working capital/total assets. Profitability = EBITDA/total assets. Investment = retained earnings/total assets. Firm size = ln (market value of total assets). Stock market volatility = sd (weekly stock returns).

Table 4.6 reports the robustness results for CDS model using two other models (fixed effects and Newey-West models) to compare and contrast. The OLS and Newey-West models show quite similar results in terms of relationship signs and coefficients. Although the Newey-West standard errors are a bit higher in comparison with OLS standard errors, these differences are not very noticeable. It can be said that after controlling for post-estimation biases (as mentioned in Section 4.7.3.1), the results of the main CDS model remain robust.

In contrast, FE regression results show some significant differences compared with other two models. Particularly, only minority interest and capitalised operating leases are reflected in CDS credit risk measurement, and there is a significant negative relationship between capitalised operating leases and CDS spreads. Nevertheless, this finding cannot be rationally explained since more capitalised operating leases may signal inherent default risk and, as a result, CDS spreads must be higher.

Credit ratings seem to be of no statistical significance in explaining CDS in FE model. Besides, liquidity and stock market volatility also lose their statistical explanatory powers in CDS. On the contrary, while investment has no significant relationship with CDS in OLS and Newey-West models, it does have a significant positive partial impact on CDS spreads. However, this result contradicts those in the studies by Das et al. (2009) and Bai and Wu (2012), which implies the fact that there might exist agency problems in the investment decision of large firms, and that the retained earnings might not be well-invested in the potential positive NPV projects.

4.8 Conclusions

Debt certainly matters, and that includes the on and off-balance sheet debt equivalents. Ketz (2003) implies that corporate managers have tools and techniques to hide their liabilities "under the carpets"; however, when these liabilities get too big, "the carpets split and the dirt go everywhere". Examples are companies that get involved in some big accounting scandals such as Eron, Global Crossing, Adelphia, WorldCom and many others. If the market were fully aware of the impact of these hidden liabilities, these accounting scandals would not have taken place. It can be said that these scandals point out the failure of corporate governance, regulation and accounting profession. Moreover, if the corporate credit risk measurements are concise enough, these hidden debt equivalents should have all been reflected in these measurements.

My study presents evidence that the on and off-balance sheet financing items account for such significant amounts in corporate financial structure and that ignoring these debt equivalents can be misleading. On average, from 1996 to 2010, the total reported debt of large US firms (the companies with highest revenues) accounts for 23% over total assets while the total debt equivalents account for 22% over total assets. In particular, compared with total reported debt, capitalised operating leases account for 64%, stock options account for 43%, pension liability account for 27%, preferred equity accounts for 3% and minority interest accounts for 6% on average. Moreover, there is a tendency that these debt equivalents are increasing over time. In other words, the gap between reported debt and adjusted debt has been extending considerable over the last 15 years. These findings reject the argument made by Bates et al. (2009) in which they report that US firms can pay back their debt.

In addition, I adjusted two credit risk measurements such as the Merton distance to default risk and Altman's Z-score for the on and off-balance sheet financing items. My evidence shows a minor difference between the conventional and the adjusted Merton distance to default, whilst, adjusted Altman's Z-score is significantly different from the conventional one. Another important finding of this research is that not all of these debt equivalents are reflected in the credit default swaps and credit ratings. In fact, CDS spreads incorporate minority interest, capitalised operating leases and stock options in its credit risk assessment but leave out preferred equity and more importantly pension liability. Credit ratings seem to be worse in reflecting these debt equivalents since only capitalised operating leases are incorporated in their credit risk assessment. Nonetheless, this is not a surprising result because credit ratings are documented to be quite a poor predictor of corporate failure (Hilscher and Wilson (2013)).

Last but not least, this study documents that accounting-based financial ratios are also significant determinants of the CDS spreads and the credit ratings. In particular, interest coverage, liquidity, profitability and stock market volatility have significant partial impacts on CDS spreads while interest coverage, liquidity, profitability, investment and firm size have explanatory power over credit ratings. Overall, the research results are robust to several post-estimation problems such as multicollinearity, heteroskedasticity and serial correlation.

All in all, my research contributes deeper understanding for some on and off-balance sheet debt equivalents and their relationships with corporate credit risk measurements.

It can be said that corporate managers might have smoothed the accounting numbers, manipulated the accounting practices for the sole purpose of hiding firms' true value of debt. The reason for their capability of doing this is due to the existing loopholes in the accounting rules. The accounting bodies and SEC have implicitly and explicitly endorsed certain methods, which allow these loopholes within the body of GAAP. My findings are of interest to investors, creditors, accounting regulators, information intermediaries, academics and practitioners who do not want to be mis-signalled about firms' financial risk. It is suggested that firms should bring the off-balance sheet debt equivalents onto the balance sheet to provide the transparent financial reports to the market and mitigate the information asymmetry among investors and creditors.

Chapter 5

Conclusions

5.1 Research results and contributions

Ketz (2003), when analysing the hidden financial risk in off-balance sheet accounting, states that debt does matter, and that includes the off-balance sheet debt equivalents. Lander and Auger (2008) point out that there are many ways for firms to accomplish off-balance sheet financing by taking advantage of the loopholes in the rules-based accounting. Examples are capitalised operating leases, pension liabilities and some others (Ketz (2003), Koller et al. (2010), Rampini and Viswanathan (2010) and Rauh and Sufi (2010)). Franzen et al. (2009) report that the mean value of off-balance sheet operating leases (as a percentage of total debt) increased profoundly by 775% from 1980 to 2007. Obviously, these off-balance sheet financing items have a tendency to increase significantly over time. Furthermore, keeping these debt equivalents off the balance sheet certainly makes firms less levered.

In addition, one of the noticeable shortcomings in the existing empirical research on capital structure is the mis-measurement of leverage (Graham and Leary (2011)). Welch (2011) argues that the standard measures of leverage usually exclude non-debt liabilities from the numerator; therefore, other things being equal, firms with more non-debt liabilities appear to be less levered. Rampini and Viswanathan (2010) and Rauh and Sufi (2010) suggest including the capitalised value of operating leases in debt measurement. To avoid omission biases in calculating financial ratios, Koller et al. (2010) propose that operating leases, pension liability and securitised receivables should be treated as off-balance sheet debt equivalents in firms' total debt.

Focusing on large US listed firms, my thesis has made some new contributions in the research area of corporate finance by analysing some important off-balance sheet financing items and bridging the mis-measurement gap of financial leverage. I included the on and off-balance sheet debt equivalents in the numerator of the leverage ratio (measured by total debt over total assets) to reflect the true value of debt. These on and off-balance sheet debt equivalents are preferred equity, minority interest, capitalised operating leases, stock options and pension liabilities. I hand-collected these off-balance sheet debt equivalents from the footnotes of the company financial statements because these variables were unavailable in Bloomberg or available for some years with many missing values. Thus, my thesis possesses a unique data set that is not available elsewhere. At the same time, the quality of the data set has been improved since the problem of missing data is controlled.

Furthermore, my thesis has also made new contributions to the capital structure research area by examining the impact of asset redeployability and top-management compensation on both non-adjusted and adjusted leverage. By comparing and contrast the results, this thesis shows that adjusted leverage is not always determined by the same factors or explained by the same theories as non-adjusted leverage. In addition, I investigated the reflection of the on and off-balance sheet financing items in the credit risk measurements. As far as I know, no similar research has been done on these financing items. Thus, this is also a new contribution to empirical corporate finance area. My findings are very useful for investors, creditors, accounting regulators, information intermediaries, academics and practitioners who do not want to be mis-signalled about firms' financial risk.

Although Bates et al. (2009) argue that US firms can pay back their debt, my findings show the evidence of the opposite result. I document that the off-balance sheet debt equivalents account for a substantial amount in comparison with reported debt. Among the debt equivalents, capitalised operating leases, stock options and pension liability account for 64%, 43% and 27% over total debt, respectively. After leverage is adjusted for the on and off-balance sheet debt equivalents are, my thesis reports a significant increase in adjusted leverage by 24% for market value and 23% for book value of adjusted leverage. Moreover, the gap between reported debt and adjusted debt has been extending significantly over the research period of 15 years, from 1996 to 2010. It can be acknowledged that firms' financial health can be misinterpreted if these off-balance sheet debt items are not carefully investigated.

In Chapter 2, the collateral role of asset redeployability in capital structure is examined for both conventional debt and adjusted debt for on and off-balance sheet financing. The findings show that the redeployability of overall tangible assets does not have statistic power in boosting conventional debt of large US firms. However, overall tangible asset redeployability is found to be the core determinant in facilitating firms' access to adjusted debt. Moreover, the decomposition of assets does not have explanatory power over non-adjusted leverage. Whilst, other tangibles (including net plant and equipment in progress and other miscellaneous tangible assets) are found to have negative partial impact on large firms' adjusted leverage. These findings contradict with the recent study by Campello and Giambona (2010), in which they document the collateral roles of overall as well as each decomposed tangible asset.

More importantly, Chapter 2 reports that intangible assets have a significant partial impact on firm leverage (both adjusted and non-adjusted leverage). Consistent with the arguments of Shleifer and Vishny (1991), these results indicate the fact that intangible assets can also be redeployed; thus, have the collateral role in getting firms' access to both adjusted and non-adjusted debt. In fact, I would argue that large firms may exploit intangible assets to increase their debt capacity. In other words, along the standard financial assessment procedures, which are based on the financial ratios and credit ratings, creditors may also rely on other factors such as long time relationship with firms, brand names and reputation to decide whether or not to finance them.

Chapter 3 examines three main compensation packages such as salaries, cash bonuses and equity-based bonuses of the board of directors (BOD) in general and of the CEOs in particular to investigate how these compensation packages affect managers' decisions in corporate capital structure. In addition to the conventional financial leverage, adjusted leverage for the on and off-balance sheet debt equivalents are considered to figure out if it can also be explained by the agency theory and its hypotheses.

As far as non-adjusted leverage is concerned, my findings show that cash bonuses and equity-based bonuses have important impacts on the BOD's choice in non-adjusted leverage while as for CEO, equity-based bonuses have a stronger impact in their decisions. The negative relationships between compensation packages and non-adjusted leverage indicate the fact that managers seem to entrench themselves against non-diversifiable human capital risk; as a result, they tend to avoid debt. Also, the results document the alignment of interest between managers (i.e. the BOD) and shareholders. Additionally, active monitoring is found to prevent managers from deviating from value-maximizing financing decision. My results also indicate that managers have a tendency to increase conventional leverage when they face the threat of takeover.

However, when adjusted leverage for the on and off-balance sheet debt equivalents are taken into consideration, these compensation packages fail to explain both the BOD's and CEO's choice of adjusted leverage. After controlling for serial correlation and endogeneity, BOD's equity-based bonuses and CEO's cash bonuses show more explanatory power over adjusted leverage. These findings show that the managerial entrenchment and non-diversifiable human capital risk hypotheses help explain the BOD and CEO's decisions in adjusted capital structure. Other hypotheses such as the high-risk high-return, the alignment of interest between managers and shareholders and the active monitoring fail to explain managers' choices in adjusted leverage.

Chapter 3 also developed the new agency cost proxies of which I took into account the ratios of off-balance sheet debt equivalents over total assets (in both MV and BV) under hidden agency cost 1 (for MV) and hidden agency cost 2 (for BV), respectively. The results show that apart from other prominent determinants of leverage, hidden agency cost also acts as a significant determinant of corporate capital structure. I document a significant negative relationships between hidden agency cost 2 with both MV and BV of non-adjusted leverage. In other words, the higher amount of off-balance sheet debt, the lower firms' conventional leverage; which implies the fact that managers might have their ways of shifting debt around, making firms less levered. Again, these results indicate that firms' financial health can be seriously misrepresented if these debt equivalent items are ignored.

Chapter 4 investigates whether the market is fully aware of the off-balance sheet debt equivalents by examining if the current credit risk measurements incorporate them in their risk assessments. In addition, I adjusted the two credit risk measurements such as Merton distance to default risk and Altman's Z-score to better reflect the on and off-balance sheet financing. My results present a minor difference between conventional and adjusted Merton distance to default, whilst, adjusted Altman's Z-score is significantly different from the non-adjusted one.

Furthermore, my findings indicate that not all of these debt equivalents are reflected in the credit default swaps and credit ratings. In fact, CDS spreads incorporate minority interest, capitalised operating leases and stock options in its credit risk assessment but leave out preferred equity and more importantly pension liability. Consistent with the study by Hilscher and Wilson (2013), credit ratings seem to be a poor predictor of corporate failure. I document that credit ratings only reflect capitalised operating leases in their credit risk assessment. It can be said that credit ratings underestimate firm financial risk as they forgo stock options, pension liabilities, preferred equity and minority interest in their credit risk evaluation.

Last but not least, Chapter 4 documents that accounting-based financial ratios also play as significant determinants of credit risk measurements as CDS spreads and credit ratings. In particular, interest coverage, liquidity, profitability and stock market volatility have partial impacts on CDS spreads while interest coverage, liquidity, profitability, investment and firm size have explanatory power over credit ratings.

5.2 Thesis limitations and directions for future research

Due to time-consuming manual data collection process, the sample size of this thesis is only limited to the top 50 large US listed firms with the highest revenues in the fiscal year (based on Fortune 500 ranking). Therefore, the research can be extended by increasing the sample size and including firms of different sizes in the sample.

In addition, although this thesis has examined the three important off-balance sheet debt equivalents, other forms of off-balance sheet financing such as special-purpose entities, securitised receivables and so on can also be taken into account (see Ketz (2003) and Koller et al. (2010)).

Furthermore, other compensation packages such as phantom stock plans and performance shares, dividend units and insurance can also be investigated to understand about firms' compensation incentive plans and policies, and to find out if these incentive plans act as a motivation for managers to align their interests with shareholders in their capital structure decisions (both non-adjusted and adjusted leverage).

The results of Chapter 4 suggest that it is necessary to develop a new credit risk measurement that incorporates these off-balance sheet debt equivalents to reflect firms' financial risk. Otherwise, the current credit risk measurements should be modified and updated accordingly with the increasing use of the off-balance sheet debt equivalents. Additionally, it is suggested that the regulatory bodies ensure more transparency in accounting standards, and perhaps work out an itinerary of bringing these off-balance sheet debt equivalents onto the balance sheet. However, the opinions on how and when these debt equivalents should be brought onto the balance sheet remain controversial. Therefore, this is a potential gap for future research.

Appendix A

Appendix for Chapter 2

Table A.1: Table of correlation matrix between independent variables (testing for multicollinearity)

	Tangibility	L&B	M&E	Other Tangibles	Intangibles	Firm size	Growth Opportunity	Earnings Volatility	Profitability	Payout ratio	Effective tax rate	NDTS
Tangibility	1.0000											
L&B	0.6617	1.0000										
M&E	0.5770	0.4582	1.0000									
Other Tangibles	0.0382	0.0924	0.1348	1.0000								
Intangibles	-0.2654	-0.2069	-0.1200	0.0381	1.0000							
Firm size	-0.0892	-0.1258	-0.0635	-0.2592	0.0567	1.0000						
Growth opportunity	0.1222	-0.0394	-0.0916	-0.0162	-0.0268	0.4406	1.0000					
Earnings volatility	0.2667	0.2845	0.4884	0.1008	-0.0777	0.0526	0.0495	1.0000				
Profitability	0.3428	0.1757	0.2683	0.0718	-0.0100	0.2702	0.6388	0.2729	1.0000			
Payout ratio	-0.1599	-0.1184	0.0071	-0.0126	0.0509	0.2058	0.1331	-0.0376	-0.0306	1.0000		
Effective tax rate	0.2237	0.2458	0.1513	0.1776	-0.0134	-0.2937	-0.2006	0.1044	-0.1593	-0.1407	1.0000	
NDTS	0.2237	0.2584	0.3849	0.1152	-0.0207	-0.0563	0.2141	0.3035	0.3596	-0.0294	0.1100	1.0000

Note: It is common in finance research that if the correlation between two independent variables is under 0.85, multicollinearity is not present.

Table A.2: Testing results for multicollinearity using VIF (Variance Inflation Factor)

Variable	VIF	1/VIF
M&E	1.75	0.570979
Other Tangibles	1.14	0.873398
Intangibles	1.04	0.957371
Firm size	1.51	0.661072
Growth opportunity	2.41	0.414657
Earnings volatility	1.37	0.727565
Profitability	2.28	0.437657
Payout ratio	1.10	0.910320
Effective tax rate	1.20	0.833373
NDTS	1.34	0.747522

Table A.3: 103 United States listed firms and firm-years in the research (1)

No.	Company Name	Ticker Symbol	Sub-industry	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10
1	3M	MMM US Equity	Diversified Manufact Op	X														
2	Albertson's	ABS US Equity	Food-Retail					X	X	X	X	X	X					
3	Altria Group	MO US Equity	Tobacco	X	X	X	X	X	X	X	X	X	X	X	X	X		
4	American Electric Power	AEP US Equity	Electric-Integrated							X								
5	American Stores	2691Q US Equity	Food-Retail	X	X	X												
6	AmerisourceBergen	ABC US Equity	Medical-Whsle Drug Dist								X	X	X	X	X	X	X	X
7	Amoco	0059069D US Equity	Chemicals-Other	X	X													
8	AMR	AMR US Equity	Airlines	X	X		X											
9	Apple	AAPL US Equity	Computers															X
10	Aquila	ILA US Equity	Electric-Distribution						X	X								
11	Archer Daniels Midland	ADM US Equity	Agricultural Operations									X	X	X	X	X	X	X
12	AT&T	T US Equity	Telephone-Integrated	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
13	Atlantic Richfield	300583Q US Equity	Oil Comp-Integrated	X	X	X												
14	AutoNation	AN US Equity	Retail-Automobile					X										
15	Bell Atlantic	VZ US Equity	Telephone-Integrated					X										
16	BellSouth	BLS US Equity	Telephone-Integrated	X	X	X	X	X	X									
17	Best Buy	BBY US Equity	Retail-Consumer Electron													X	X	X
18	Boeing	BA US Equity	Aerospace/Defense	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
19	Cardinal Health	CAH US Equity	Medical-Whsle Drug Dist					X	X	X	X	X	X	X	X	X	X	X
20	Caremark Rx (CMX)	CMX US Equity	Pharmacy Services											X				
21	Caterpillar	CAT US Equity	Machinery-Constr&Mining	X		X	X						X	X	X	X	X	
22	CenterPoint Energy	CNP US Equity	Gas-Distribution						X	X								
23	Chevron (CVX)	CVX US Equity	Oil Comp-Integrated	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
24	Chrysler	2251Q US Equity	Auto-Cars/Light Trucks	X	X													
25	Cigna	CI US Equity	Medical-HMO	X	X	X	X											
26	Cisco Systems	CSCO US Equity	Networking Products														X	X
27	Coca-Cola	KO US Equity	Beverages-Non-alcoholic	X	X	X	X											
28	Columbia/HCA Healthcare	7652927Z US Equity	Medical-Hospitals	X	X	X												
29	Comcast	CMCSA US Equity	Cable/Satellite TV															X
30	Compaq Computer	680884Q US Equity	Computers		X	X	X	X	X	X								
31	ConAgra Foods	CAG US Equity	Food-Misc/Diversified	X	X	X	X	X	X	X	X							
32	CONOCO/ ConocoPhillips	COP US Equity	Oil Comp-Integrated						X	X	X	X	X	X	X	X	X	X
33	Costco Wholesale	COST US Equity	Retail-Discount	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
34	CVS Caremark	CVS US Equity	Retail-Drug Store									X	X	X	X	X	X	X
35	Dell	DELL US Equity	Computers					X	X	X	X	X	X	X	X	X	X	X
36	Delphi	0532037D US Equity	Auto/Trk Prts&Equip-Orig						X	X	X	X	X					
37	Dow Chemical	DOW US Equity	Chemicals-Diversified	X	X	X	X		X	X	X	X	X	X	X	X	X	X
38	Duke Energy	DUK US Equity	Electric-Integrated					X	X	X								

Table A.3: 103 United States listed firms and firm-years in the research (2)

No.	Company Name	Ticker Symbol	Sub-industry	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10
39	DuPont	DD US Equity	Chemicals-Diversified	X	X	X	X	X	X		X	X						
40	Dynegy	DYN US Equity	Independ Power Producer						X	X								
41	El Paso	EP US Equity	Pipelines							X								
42	Enron	ENE US Equity	Pipelines			X	X	X										
43	Exxon Mobil	XOM US Equity	Oil Comp-Integrated	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
44	FedEx	FDX US Equity	Transport-Services												X		X	X
45	Fleming	FLMIQ US Equity	Food-Wholesale/Distrib	X	X													
46	Ford Motor	F US Equity	Auto-Cars/Light Trucks	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
47	General Electric	GE US Equity	Diversified Manufact Op	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
48	General Motors	GM US Equity	Auto-Cars/Light Trucks	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
49	GTE	4154Z US Equity	Telephone-Integrated	X	X	X												
50	Hess	HES US Equity	Oil Comp-Integrated														X	
51	Hewlett-Packard	HPQ US Equity	Computers	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
52	Home Depot	HD US Equity	Retail-Building Products	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
53	Honeywell Intl.	HON US Equity	Instruments-Controls					X										
54	Ingram Micro	IM US Equity	Distribution/Wholesale				X	X	X									
54	Intel	INTC US Equity	Electronic Compo-Semicon	X	X	X	X	X	X	X	X	X	X	X	X	X		X
56	International Paper	IP US Equity	Paper&Related Products	X	X	X	X	X	X	X	X							
57	Intl. Business Machines	IBM US Equity	Computer Services	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
58	J.C. Penney	JCP US Equity	Retail-Major Dept Store	X	X	X	X	X	X									
59	Johnson & Johnson	JNJ US Equity	Medical-Drugs	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
60	Johnson Controls	JCI US Equity	Auto/Trk Prts&Equip-Orig												X		X	
61	Kmart Holding	KM US Equity	Retail-Discount		X	X	X	X	X	X	X							
62	Kraft Foods	KFT US Equity	Food-Misc/Diversified													X	X	X
63	Kroger	KR US Equity	Food-Retail	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
64	Lockheed Martin	LMT US Equity	Aerospace/Defence	X	X	X	X	X	X		X	X	X	X	X	X	X	X
65	Lowe's (LOW)	LOW US Equity	Retail-Building Products					X			X	X	X	X	X	X	X	X
66	Lucent Technologies	LU US Equity	Telecommunication Equip			X	X	X	X									
67	Marathon Oil	MRO US Equity	Oil Comp-Integrated	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
68	MCI WorldCom	MCWEQ US Equity	Telephone-Integrated		X	X		X	X	X								
69	McKesson	MCK US Equity	Medical-Whsle Drug Dist				X	X	X	X	X	X	X	X	X	X	X	X
70	Medco Health Solutions	MHS US Equity	Pharmacy Services									X	X	X	X	X	X	X
71	Merck	SGP US Equity	Medical-Drugs	X	X	X	X	X	X	X	X							
72	Microsoft	MSFT US Equity	Applications Software								X	X	X	X	X	X	X	X
73	Mirant	MIRKQ US Equity	Independ Power Producer							X								
74	Mobil	XOM US Equity	Oil Comp-Integrated	X	X													
75	Motorola	MMI US Equity	Wireless Equipment	X		X						X	X	X	X	X		
76	Northrop Grumman	NOC US Equity	Aerospace/Defense									X	X	X				X

Table A.3: 103 United States listed firms and firm-years in the research (3)

No.	Company Name	Ticker Symbol	Sub-industry	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10
39	DuPont	DD US Equity	Chemicals-Diversified	X	X	X	X	X	X		X	X						
40	Dynegy	DYN US Equity	Independ Power Producer						X	X								
41	El Paso	EP US Equity	Pipelines							X								
42	Enron	ENE US Equity	Pipelines			X	X	X										
43	Exxon Mobil	XOM US Equity	Oil Comp-Integrated	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
44	FedEx	FDX US Equity	Transport-Services												X		X	X
45	Fleming	FLMIQ US Equity	Food-Wholesale/Distrib	X	X													
46	Ford Motor	F US Equity	Auto-Cars/Light Trucks	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
47	General Electric	GE US Equity	Diversified Manufact Op	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
48	General Motors	GM US Equity	Auto-Cars/Light Trucks	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
49	GTE	4154Z US Equity	Telephone-Integrated	X	X	X												
50	Hess	HES US Equity	Oil Comp-Integrated														X	
51	Hewlett-Packard	HPQ US Equity	Computers	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
52	Home Depot	HD US Equity	Retail-Building Products	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
53	Honeywell Intl.	HON US Equity	Instruments-Controls					X										
54	Ingram Micro	IM US Equity	Distribution/Wholesale				X	X	X									
54	Intel	INTC US Equity	Electronic Compo-Semicon	X	X	X	X	X	X	X	X	X	X	X	X	X		X
56	International Paper	IP US Equity	Paper&Related Products	X	X	X	X	X	X	X	X							
57	Intl. Business Machines	IBM US Equity	Computer Services	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
58	J.C. Penney	JCP US Equity	Retail-Major Dept Store	X	X	X	X	X	X									
59	Johnson & Johnson	JNJ US Equity	Medical-Drugs	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
60	Johnson Controls	JCI US Equity	Auto/Trk Prts&Equip-Orig												X		X	
61	Kmart Holding	KM US Equity	Retail-Discount		X	X	X	X	X	X	X							
62	Kraft Foods	KFT US Equity	Food-Misc/Diversified													X	X	X
63	Kroger	KR US Equity	Food-Retail	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
64	Lockheed Martin	LMT US Equity	Aerospace/Defence	X	X	X	X	X	X		X	X	X	X	X	X	X	X
65	Lowe's (LOW)	LOW US Equity	Retail-Building Products					X			X	X	X	X	X	X	X	X
66	Lucent Technologies	LU US Equity	Telecommunication Equip			X	X	X	X									
67	Marathon Oil	MRO US Equity	Oil Comp-Integrated	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
68	MCI WorldCom	MCWEQ US Equity	Telephone-Integrated		X	X		X	X	X								
69	McKesson	MCK US Equity	Medical-Whsle Drug Dist				X	X	X	X	X	X	X	X	X	X	X	X
70	Medco Health Solutions	MHS US Equity	Pharmacy Services									X	X	X	X	X	X	X
71	Merck	SGP US Equity	Medical-Drugs	X	X	X	X	X	X	X	X							
72	Microsoft	MSFT US Equity	Applications Software								X	X	X	X	X	X	X	X
73	Mirant	MIRKQ US Equity	Independ Power Producer							X								
74	Mobil	XOM US Equity	Oil Comp-Integrated	X	X													
75	Motorola	MMI US Equity	Wireless Equipment	X		X						X	X	X	X	X		
76	Northrop Grumman	NOC US Equity	Aerospace/Defense									X	X	X				X

Table A.3: 103 United States listed firms and firm-years in the research (4)

No.	Company Name	Ticker Symbol	Sub-industry	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10
77	PepsiCo	PEP US Equity	Beverages-Non-alcoholic	x	x	x	x			x	x	x	x	x	x	x	x	x
78	Pfizer	PFE US Equity	Medical-Drugs						x	x	x	x	x	x	x	x	x	x
79	PG&E Corp.	PCG US Equity	Electric-Integrated				x	x										
80	Plains All Amer. Pipeline (PAA)	PAA US Equity	Pipelines											x				
81	Procter & Gamble	PG US Equity	Cosmetics&Toiletries	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
82	Raytheon	RTN US Equity	Aerospace/Defense				x											
83	Safeway	SWY US Equity	Food-Retail	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
84	Sara Lee	SLE US Equity	Food-Meat Products	x	x	x	x											
85	SBC Communications	T US Equity	Telephone-Integrated			x	x	x	x	x	x	x	x					
86	Sears Roebuck/Sears Holdings	SHLD US Equity	Retail-Major Dept Store	x	x	x	x		x	x	x	x	x	x	x	x	x	x
87	Sprint/ Sprint Nextel (S)	S US Equity	Cellular Telecom							x	x			x	x	x		
88	Sunoco (SUN)	SUN US Equity	Oil Refining&Marketing											x	x	x	x	
89	Supervalu	SVU US Equity	Food-Retail	x												x	x	x
90	Sysco	SYY US Equity	Food-Wholesale/Distrib								x	x	x		x			x
91	Target	TGT US Equity	Retail-Discount	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
92	Texaco	677004Q US Equity	Oil Comp-Integrated	x	x	x	x	x										
93	Time Warner	TWX US Equity	Multimedia					x		x	x	x	x	x	x	x	x	
94	TXU	TXU US Equity	Electric-Integrated							x								
95	United Parcel Service	UPS US Equity	Transport-Services	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
96	United Technologies	UTX US Equity	Aerospace/Defense-Equip	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
97	UnitedHealth Group	UNH US Equity	Medical-HMO								x	x	x	x	x	x	x	x
98	Valero Energy	VLO US Equity	Oil Refining&Marketing								x	x	x	x	x	x	x	x
99	Verizon Communications	VZ US Equity	Telephone-Integrated			x	x	x	x	x	x	x	x	x	x	x	x	x
100	Wal-Mart Stores	WMT US Equity	Retail-Discount	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
101	Walgreen	WAG US Equity	Retail-Drug Store								x	x	x	x	x	x	x	x
102	Walt Disney	DIS US Equity	Multimedia		x	x	x	x	x		x	x	x	x	x	x	x	x
103	Xerox	XRX US Equity	Office Automation&Equip	x	x		x											

Note: Firms are included in the sample in the years that are marked "x".

Appendix B

Appendix for Chapter 3

Table B.1: Table of correlation matrix between independent variables (BOD's compensation)

	BOD SAL	BOD CB	BOD EBB	BOD SOWN	MB Size	MB Compo	Asset Collat	AU 1	AU 2	Intang	Firm size	Earn Vola	Z score	Growth	FCF
BOD SAL	1.000														
BOD CB	0.371	1.000													
BOD EBB	0.285	0.129	1.000												
BOD SOWN	-0.136	-0.024	0.113	1.000											
MB SIZE	0.210	0.043	0.084	-0.148	1.000										
MB COMPO	0.016	0.042	-0.064	0.003	-0.835	1.000									
Asset Collat	-0.259	-0.212	-0.248	-0.057	-0.143	0.114	1.000								
AU 1	-0.201	-0.084	-0.037	-0.004	-0.244	0.199	0.234	1.000							
AU 2	0.071	0.122	-0.059	0.025	-0.059	0.059	-0.087	0.071	1.000						
Intang	0.143	0.088	0.183	0.180	-0.074	0.056	-0.275	-0.122	0.061	1.000					
Firm size	0.729	0.404	0.301	-0.164	0.192	0.022	-0.356	-0.170	0.011	0.092	1.000				
Earn Vola	-0.120	0.137	-0.005	-0.058	-0.153	0.159	0.210	0.046	-0.123	-0.084	0.028	1.000			
Z score	-0.235	-0.013	0.140	0.142	0.011	-0.149	0.084	0.016	-0.012	0.170	-0.231	0.198	1.000		
Growth	-0.122	0.059	0.214	0.069	0.072	-0.123	0.026	0.088	0.146	-0.021	-0.113	0.066	0.506	1.000	
FCF	-0.214	0.024	0.127	0.082	0.006	-0.038	0.202	0.205	0.059	0.001	-0.143	0.264	0.369	0.666	1.000
ROA	-0.024	0.094	0.224	0.101	0.048	-0.071	0.054	0.053	0.037	0.013	-0.036	0.176	0.389	0.721	0.671
Payout ratio	0.087	-0.041	0.127	0.007	0.004	0.004	-0.171	-0.083	0.019	0.102	0.144	-0.020	0.089	0.136	-0.053
Industry MA	0.276	0.200	0.214	-0.011	0.100	-0.004	-0.413	-0.202	-0.109	0.087	0.377	0.121	0.013	-0.000	0.001
Hidden AC1	-0.048	-0.158	-0.127	0.025	-0.063	0.016	0.124	0.077	0.010	0.039	-0.128	-0.096	-0.133	-0.405	-0.116
Hidden AC2	-0.127	-0.122	-0.049	0.120	-0.029	-0.029	0.139	0.087	0.095	0.096	0.074	-0.183	-0.155	0.105	0.015

	ROA	Payout ratio	Industry MA	Hidden AC1	Hidden AC2
ROA	1.000				
Payout ratio	0.073	1.000			
Industry MA	0.113	0.187	1.000		
Hidden AC1	-0.242	-0.031	-0.197	1.000	--
Hidden AC2	0.167	0.061	-0.202	--	1.000

Note: It is common in finance research that if the correlation between two independent variables is under 0.85, multicollinearity is not present.

Table B.2: Table of correlation matrix between independent variables (CEO's compensation)

	CEO SAL	CEO CB	CEO EBB	CEO tenure	MB Size	MB Compo	Asset Collat	AU 1	AU 2	Intang	Firm size	Earn Vola	Z score	Growth	FCF
CEO SAL	1.000														
CEO CB	0.494	1.000													
CEO EBB	0.349	0.337	1.000												
CEO tenure	0.237	0.124	0.084	1.000											
MB SIZE	0.116	0.074	0.068	0.024	1.000										
MB COMPO	0.103	0.043	-0.007	0.025	-0.836	1.000									
Asset Collat	-0.082	-0.198	-0.182	0.134	-0.092	0.095	1.000								
AU 1	-0.155	-0.058	-0.023	-0.093	-0.201	0.173	0.229	1.000							
AU 2	0.064	0.064	-0.007	-0.041	-0.043	0.066	-0.120	0.077	1.000						
Intang	0.108	0.099	0.075	-0.029	-0.045	-0.001	-0.275	-0.179	0.039	1.000					
Firm size	0.625	0.489	0.243	0.018	0.157	0.055	-0.314	-0.194	-0.012	0.110	1.000				
Earn Vola	0.101	0.138	0.058	-0.001	-0.144	0.156	0.210	0.049	-0.124	-0.073	0.104	1.000			
Z score	-0.164	-0.099	0.075	-0.026	-0.002	-0.149	0.048	0.007	-0.004	0.213	-0.221	0.201	1.000		
Growth	-0.122	0.059	0.214	0.069	0.072	-0.123	0.026	0.088	0.146	-0.021	-0.113	0.066	0.506	1.000	
FCF	-0.083	0.017	0.107	0.049	-0.005	-0.022	0.195	0.236	0.076	-0.001	-0.135	0.276	0.374	0.678	1.000
ROA	0.061	0.115	0.223	0.042	0.033	-0.051	0.001	0.039	0.037	0.052	-0.006	0.173	0.391	0.724	0.655
Payout ratio	0.102	0.021	0.018	0.005	-0.018	0.031	-0.199	-0.075	0.047	0.135	0.165	-0.036	0.091	0.108	-0.045
Industry MA	0.218	0.241	0.171	-0.124	0.099	-0.018	-0.421	-0.209	-0.083	0.107	0.392	0.118	0.031	0.014	0.031
Hidden AC1	0.044	-0.069	-0.163	-0.009	0.127	-0.053	0.139	0.113	0.051	-0.067	-0.015	-0.131	-0.191	-0.476	-0.261
Hidden AC2	-0.134	-0.028	-0.145	0.007	0.215	-0.123	0.053	-0.054	0.088	-0.042	-0.007	-0.279	-0.228	-0.361	-0.212
	ROA	**Payout ratio**	**Industry MA**	**Hidden AC1**	**Hidden AC2**										
ROA	1.000														
Payout ratio	0.054	1.000													
Industry MA	0.117	0.187	1.000												
Hidden AC1	-0.433	-0.005	-0.134	1.000	--										
Hidden AC2	-0.327	-0.086	-0.147	--	1.000										

Note: It is common in finance research that if the correlation between two independent variables is under 0.85, multicollinearity is not present.

Table B.3: Results for multicollinearity test using VIF - Variance Inflation Factor

Variable	VIF	1/VIF
BOD CB	1.31	0.764830
BOD EBB	1.31	0.764451
BOD SOWN	1.17	0.856702
CEO CB	1.50	0.667788
CEO EBB	1.25	0.797948
CEO tenure	1.10	0.907193
MB SIZE	4.28	0.233566
MB COMPO	4.09	0.244349
Asset Collateral	1.52	0.657274
AU 1	1.22	0.818525
AU 2	1.14	0.880614
Intangible	1.26	0.790962
Firm size	1.87	0.533940
Earnings Volatility	1.33	0.751641
Z score	1.74	0.573895
Growth	3.69	0.270676
FCF	2.50	0.400722
ROA	2.60	0.384143
Payout ratio	1.16	0.864598
Industry MA	1.48	0.676500
Hidden AC1	1.42	0.702041
Hidden AC2	1.43	0.697036

Appendix C

Appendix for Chapter 4

Table C.1: Table of correlation matrix between independent variables

	PE_TA	MI_TA	COL_TA	SO_TA	PL_TA	RATING1	RATING2	M_DtD	LEVERAGE	INTEREST COVERAGE	LIQUIDITY	PROFITABILITY	INVESTMENT	FIRM SIZE	SM VOLA
PE_TA	1.000														
MI_TA	0.329	1.000													
COL_TA	-0.079	-0.117	1.000												
SO_TA	0.050	-0.157	-0.029	1.000											
PL_TA	0.029	0.006	0.003	0.019	1.000										
RATING1	0.005	-0.042	0.032	0.018	0.033	1.000									
RATING2	0.035	-0.002	0.092	-0.055	0.031	-0.033	1.000								
M_DtD	0.010	-0.034	-0.121	-0.069	-0.006	0.261	-0.109	1.000							
LEVERAGE	0.095	0.057	0.071	-0.373	-0.042	-0.027	0.024	-0.058	1.000						
INTEREST COVERAGE	-0.216	-0.266	-0.006	0.523	-0.007	0.007	-0.163	0.101	-0.563	1.000					
LIQUIDITY	0.009	-0.129	-0.001	0.326	-0.009	-0.069	-0.024	-0.097	-0.472	-0.324	1.000				
PROFITABILITY	-0.056	-0.121	0.024	0.375	-0.000	0.008	-0.158	0.135	-0.298	-0.568	-0.179	1.000			
INVESTMENT	-0.025	-0.095	0.032	0.104	0.040	-0.084	-0.051	0.155	-0.387	0.353	0.291	0.442	1.000		
FIRM SIZE	-0.193	0.042	-0.291	0.058	-0.134	-0.157	-0.085	0.143	-0.028	0.384	-0.207	0.193	0.084	1.000	
SM VOLA	-0.009	-0.016	0.081	0.187	0.077	-0.028	0.015	-0.402	-0.019	0.065	0.011	-0.036	-0.063	0.059	1.000

Note: SM VOLA stands for stock market volatility. It is common in finance research that if the correlation between two independent variables is under 0.85, multicollinearity is not present.

Table C.2: Results for multicollinearity test using VIF - Variance Inflation Factor

Variable	VIF	1/VIF
MI_TA	1.15	0.866411
COL_TA	1.21	0.826592
SO_TA	1.61	0.620993
PL_TA	1.06	0.947149
RATING1	1.07	0.933799
RATING2	1.07	0.936193
INTEREST COVERAGE	3.22	0.310446
LEVERAGE	1.96	0.511345
FIRMSIZE	1.82	0.511345
PROFITABILITY	1.76	0.567571
LIQUIDITY	1.59	0.630068
INVESTMENT	1.50	0.667129
M_DtD	1.31	0.765616
STOCK MARTKET VOLATILITY	1.28	0.779372

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