Summer 2013

Two essays on CEO inside debt compensation

Nilakshi Borah
Louisiana Tech University

TWO ESSAYS ON CEO INSIDE DEBT COMPENSATION

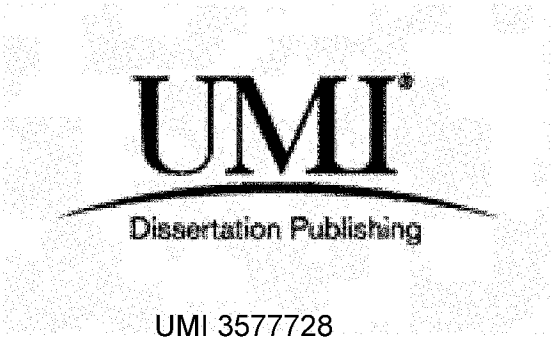
by

Nilakshi Borah, B.E., M.B.A.

A Dissertation Presented in Partial Fulfillment
of the Requirements for the Degree
Doctor of Business Administration

COLLEGE OF BUSINESS
LOUISIANA TECH UNIVERSITY

August 2013



ProQuest LLC
789 East Eisenhower Parkway
P.O. Box 1346
Ann Arbor, MI 48106-1346

LOUISIANA TECH UNIVERSITY

THE GRADUATE SCHOOL

May 13, 2013

Date

We hereby recommend that the dissertation prepared under our supervision by Nilakshi Borah

entitled

Two Essays on CEO Inside Debt Compensation

be accepted in partial fulfillment of the requirements for the Degree of Doctor of Business Administration

Supervisor of Dissertation Research

Head of Department

Department of Economics & Finance

Department

Recommendation concurred in:

Advisory Committee

Approved:

Director of Graduate Studies

Approved:

Dean of the Graduate School

Dean of the College

GS Form 13a
(6/07)

ABSTRACT

Jensen and Meckling (1976) argue that the separation of ownership and control in the modern corporation may lead to agency conflicts between principals (shareholders and debtholders) and agents (managers). That is, managers may not always allocate corporate resources in ways that maximize shareholder wealth. Managers may also engage in activities that reallocate wealth from debtholders to shareholders.

Recent literature in CEO compensation provide empirical evidence that CEO inside debt holdings may mitigate the agency conflicts between managers and debt holders by aligning the interests of mangers with those of debt holders. Two components of CEO inside debt compensation: pension and deferred compensation may mitigate agency conflicts between managers and debt holders (Sundaram and Yermack, 2007; Edmans and Liu, 2011; Wei and Yermack, 2011; Cassell, Huang, Sanchez, and Stuart, 2012). In the language of Jensen and Meckling (1976), "inside debt" represents a fixed obligation for the firm to make future payments to executives. Further, inside debt is typically an unsecured and unfunded liability for the firm. The unsecured and unfunded nature of inside debt exposes managers to the same default risks and insolvency treatment as outside debt holders. This aligns managers with debt holders and may cause managers to manage their firms conservatively (Jensen and Meckling, 1976; Edmans and Liu, 2011). Studies on CEO inside debt compensation are limited due to data availability.

CEO inside debt compensation is available only from 2006 fiscal year as effective for 2006 fiscal year-ends, the SEC issued a requirement that firms disclose their CEOs' inside debt positions. In this dissertation, I examine the effect of CEO inside debt compensation on two different corporate policies: corporate cash holdings and mergers and acquisitions (M&A).

In the first chapter, I examine the effect CEO inside debt holdings on firm cash holdings, as measured by the ratio of cash and marketable securities to net assets using a sample of EXECUCOMP firms over the period of 2006 to 2008. Following prior literature on CEO inside debt holdings (Cassell et al., 2012), I use the following two measures as proxies for CEO inside debt compensation: (1) the CEO to firm debt/equity ratio, which is calculated as the CEO's debt/equity ratio scaled by the firm's debt to equity ratio and 2) an indicator variable equal to one when the CEO to firm debt/ equity ratio is greater than one. Higher CEO inside debt compensation alleviates agency conflicts between managers and debt holders by aligning mangers with debt holders. CEOs with higher inside debt may prefer to invest in cash as cash holdings are less risky projects (Tong, 2010). Consequently, based on risk-aversion hypothesis, I posit a positive relation between CEO inside debt holdings and corporate cash holdings. I find a significant and positive relation between CEO inside debt holdings and firm cash holdings. I find that the positive relation between CEO inside debt compensation and firm cash holdings remain significant even after controlling for the effect of CEO equity-based incentives on firm cash holdings. I also find that the positive relation between CEO inside debt holdings and firm cash holdings is mitigated by the financial constraint status of the firm based on the notion that CEOs of a financially constrained firms may face

difficulty accumulating excess cash as their inside debt compensation goes up since capital is limited. I adopt instrumental variable approach to explicitly address the endogeneity problem as CEO compensation is endogenously determined by firm and CEO characteristics. My main findings still hold after endogeneity bias corrections and findings are robust to alternative specifications. Utilizing a modified version of the Fama and French (1998) valuation regression, I find that cash increases have a more positive valuation effect for firms with low levels of CEO inside debt relative to those with high levels of CEO inside debt.

In the second chapter I investigate the effect of CEO inside debt compensation on post-merger firm risk using acquiring firm risk changes over the period of 2007 to 2009. I utilize four alternative measures to proxy for post-merger firm risk: the change in pre and post-merger distance-to-default risk calculated by a naïve alternative of the Merton distance-to-default model developed by Bharath and Shumway, 2008; the change in pre and post-merger default risk as calculated by the Altman bankruptcy prediction model (Altman, 1968); change in total firm risk measured as post-merger minus pre-merger stock return standard deviation in percentage; and change in idiosyncratic risk measured as post-merger minus pre-merger standard deviation of return residuals in percentage estimated by the single factor market model. Following prior literature on CEO inside debt holdings (Cassell et al., 2012), I use the CEO to firm debt/equity ratio and CEO to firm debt/equity ratio>1, a dummy variable that equals to one when the CEO to firm debt/equity ratio is greater than one, to proxy for CEO inside debt compensation. Prior literature on CEO inside debt finds that CEO inside debt compensation motivates CEOs to engage in less risky investment and financial decisions. For example, Cassell, Huang,

Sanchez, and Stuart (2012) find that higher levels of CEO inside debt are associated with less risky investment and financial policies. Based on empirical findings of prior literature, I conjecture a negative relation between CEO inside debt holdings and post-merger firm risk. I find a significant negative relation between post-merger firm risk, as measured by change in total firm risk, measured as post-merger minus pre-merger stock return standard deviation in percentage, and change in idiosyncratic risk, measured as post-merger minus pre-merger standard deviation of return residuals in percentage estimated by the single factor market model and CEO inside debt holdings as measured by the CEO to firm debt/equity ratio. I adopt instrumental variable approach to address the endogeneity problem as CEO compensation is endogenously determined by firm and CEO characteristics. My main findings still hold after endogeneity bias corrections.

APPROVAL FOR SCHOLARLY DISSEMINATION

The author grants to the Prescott Memorial Library of Louisiana Tech University the right to reproduce, by appropriate methods, upon request, any or all portions of this Dissertation. It was understood that "proper request" consists of the agreement, on the part of the requesting party, that said reproduction was for his personal use and that subsequent reproduction will not occur without written approval of the author of this Dissertation. Further, any portions of the Dissertation used in books, papers, and other works must be appropriately referenced to this Dissertation.

Finally, the author of this Dissertation reserves the right to publish freely, in the literature, at any time, any or all portions of this Dissertation.

Author Nilakshi Borah
Date 05/13/2013

Author Nilakshi Borah

TABLE OF CONTENTS

ABSTRACT iii

LIST OF TABLES xi

ACKNOWLEDGMENTS xii

CHAPTER 1 CEO INSIDE DEBT CORPORATE CASH HOLDINGS 1

Introduction 1

Literature Review 8

Corporate Cash Holdings and Agency Costs 8

Inside Debt Compensation as a Means to Reduce Agency Costs of Debt 11

Hypothesis Development 13

Sample Selection and Data 14

Sample Selection 14

Variable Descriptions 16

Corporate Cash Holdings 16

CEO Inside Debt Compensation 16

Control Variables 17

CEO compensation incentives 17

Governance variables 18

Firm-specific control variables 18

Instruments 20

Descriptive Statistics 20

Methodology 23

Effect of CEO Inside Debt Holdings on Cash Holdings 23

Empirical Results 25

Effect of CEO Inside Debt Holdings on Firm Cash Holdings 25

Effect of Pension and Deferred Compensation on Firm Cash Holdings 31

Effect of CEO Inside Debt and Equity Compensation Incentives on Firm Cash Holdings 33

Effect of CEO Inside Debt Holdings on Firm Cash Holdings for Firms Facing Financial Constraints 37

Endogeneity Concern 41

Effect of Cash Increases (Decreases) on Valuation Effect for Firms with Lower CEO to Firm Debt/Equity Ratio 46

Conclusion 51

CHAPTER 2 CEO INSIDE DEBT: IS THERE A RELATION BETWEEN POST MERGER FIRM RISK AND CEO INSIDE DEBT? 57

Introduction 57

Literature Review 62

Mergers and Acquisitions (M&As) and Agency Costs 62

Inside Debt Compensation as a Means to Reduce Agency Costs of Debt 65

Hypothesis Development 67

Sample Selection and Data 68

Sample Selection 68

Variable Descriptions 70

Post-Merger Equity Risk 70

CEO Inside Debt Holdings 72

Control Variables 73

CEO compensation incentives 73

Firm-specific control variables 73

Methodology 74

Descriptive Statistics 75

Empirical Results 77

Effect of CEO Inside Debt Holdings on Post-Merger Firm Risk, Measured by Bharath and Shumway (2008) Distance-to-Default Model 77

Effect of CEO Inside Debt Holdings on Post-Merger Firm Risk, Measured by Altman (1968) Bankruptcy Prediction Model 79

Effect of CEO Inside Debt Holdings on Post-Merger Firm Risk, Measured by Total Firm-Risk 82

Effect of CEO Inside Debt Holdings on Post-Merger Firm Risk, Measured by Idiosyncratic Risk 85

Exploring Endogeneity 87

Instrumental Variable Approach 88

Conclusion 92

CHAPTER 3 CONCLUSION 95

REFERENCES 100

APPENDIX A DEFINITION OF VARIABLES FOR FIRST ESSAY 104

APPENDIX B DEFINITION OF VARIABLES FOR SECOND ESSAY 107

LIST OF TABLES

Table 1.1 *Descriptive Statistics and Correlations* 21

Table 1.2 *Contemporaneous Regressions of Cash Holdings on CEO Inside Debt Holdings* 25

Table 1.3 *Lagged Regressions of Cash Holdings on CEO Inside Debt Holdings* 28

Table 1.4 *The Effect of Pension and Deferred Compensation on Firm Cash Holdings* 31

Table 1.5 *The Effect of CEO Inside Debt VCompensation and Vega on Firm Cash Holdings* 35

Table 1.6 *Regressions of Cash Holdings on Inside Debt for Financially Constrained Firms* 39

Table 1.7 *2SLS Regressions of Cash Holdings on CEO Inside Debt Holdings* 44

Table 1.8 *CEO Inside Debt Compensation and Cash Valuations* 48

Table 2.1 *Summary Statistics* 75

Table 2.2 *The Effect of CEO Inside Debt Holdings on Post-Merger Firm Risk, Measured by Bharath and Shumway (2008) Distance-to-Default Model* 77

Table 2.3 *The Effect of CEO Inside Debt Holdings on Post-Merger Firm Risk, Measured by Altman (1968) Bankruptcy Prediction Model* 80

Table 2.4 *The Effect of CEO Inside Debt Holdings on Post-Merger Firm Risk, Measured Total Firm Risk* 83

Table 2.5 *The Effect of CEO Inside Debt Holdings on Post-Merger Firm Risk, Measured by Idiosyncratic Risk* 85

Table 2.6 *2SLS Regressions of Post-Merger Firm Risk on CEO Inside Debt Holdings* 90

ACKNOWLEDGMENTS

I am indebted to my dissertation committee members, Dr. Qin Lian and Dr. Qiming Wang, and especially to my chairman, Dr. Otis W. Gilley for their support and guidance throughout the entire dissertation process. I would also like to thank Dr. Bradley W. Benson for his insight and assistance during the proposal phase.

I am also thankful to all the professors and staff of the College of Business, Louisiana Tech University that have helped me to get to completion. I would like to thank all the professors and staff of the Herberger Business School, St. Cloud State University that have always encouraged me to finish this program. I appreciate my friendship with my fellow doctoral students and special thanks go to Hui Liang James, Rebecca Martin, Liu Pan, and Nan Shao for their support. I would also like to thank my roommates without whom graduate study would have been a lonely process.

Finally, I would like to thank my family and friends for their unconditional love and support throughout this journey. Thanks go to my family – my parents, my brother, my sister, and my mother-in-law for their constant support and encouragement throughout my doctoral program. Special thanks go to my husband for his faith in me and for his extraordinary patience and sacrifice throughout this process. I would have neither started nor finished this doctorate program without his love and encouragement.

And finally, though he cannot possibly know how much of a help he has been, I would like to thank our dog, Rody for being genuinely excited about this journey or for sleeping next to me as I work.

CHAPTER 1

CEO INSIDE DEBT CORPORATE CASH HOLDINGS

Introduction

Agency theory (Jensen and Meckling, 1976) posits that agency conflicts between principals (shareholders and debtholders) and agent (managers) exist in modern corporations as the goals and desires of agents may not be consistent with those of principals. Managers, as a result, may not always use the firm's capital in a manner that maximizes shareholder's wealth and mangers may engage in activities that reallocate wealth from debtholders to shareholders. Theoretically, managerial equity-based compensation aligns manager's interest with those of shareholders (Jensen and Meckling, 1976). Several studies examine the managerial incentive effects of equity-based compensation and provide empirical evidence on whether managerial stock and stock option ownership impact firm performance and particular corporate decisions and policies.[1] Nevertheless, excessive equity-based compensation may motivate managers to take more risk than debtholders prefer.

Pension and deferred compensation, inside debt, may mitigate agency conflicts between managers and debt holders (Sundaram and Yermack, 2007; Edmans and Liu, 2011; Wei and Yermack, 2011; Cassell, Huang, Sanchez, and Stuart, 2012).

[1] See for example, Core, Guay, and Larcker (2003) for a review of literature.

In the language of Jensen and Meckling (1976), "inside debt" represents a fixed obligation for the firm to make future payments to executives. Further, inside debt is typically an unsecured and unfunded liability for the firm. The unsecured and unfunded nature of inside debt exposes managers to the same default risks and insolvency treatment as outside creditors. This aligns managers with debt holders and may cause CEOs to manage their firms more conservatively (Jensen and Meckling, 1976; Edmans and Liu, 2011).

Corporate liquidity policy seems an ideal area to explore the link between CEO compensation incentives and shareholder-debtholder conflicts. Excessive equity-based compensation may motivate mangers to hold smaller cash balances than debtholders desire. Inside debt compensation may motivate managers to manage firms conservatively by holding higher cash balances. I examine the effect of CEO inside debt on corporate cash holdings in this paper.

Agency conflicts between managers and shareholders occur when managers do not allocate corporate resources in ways that maximize shareholder wealth. For example, a primary agency conflict between managers and shareholders involves the overinvestment of free cash flows – managers may choose to invest in negative net present value projects. Prior literature in executive compensation suggests that equity-based compensation acts as a vehicle to resolve the conflicts of interests between managers and shareholders. For example, prior studies suggest that stock and stock options encourage risk-averse CEOs to manage their firms in ways that benefit shareholders (Guay, 1999; Coles, Daniel, and Naveen, 2006; Low, 2009).

Agency conflicts between managers (or managers acting for shareholders) and debt holders occur when managers increase firm risk in ways that benefit shareholders at the expense of debt holders. Debt holders and shareholders have different payoff structures – debt holders are fixed claimants to firm assets while shareholders are residual claimants. Once debt is issued, shareholders may increase the value of their residual claims at the expense of debt holders. For instance, shareholders may increase the risk of the firm by changing investment or financial policies (asset substitution or risk shifting) in ways that reallocate wealth from debt holders, generally through some increase in the overall risk of the firm (Jensen and Meckling, 1976; Dewatripont and Tirole, 1994). Similarly, lower cash holdings may increase agency conflicts between managers and debtholders by increasing firm risk beyond what debtholders prefer.

While equity-based compensation mitigates agency conflicts between managers and shareholders, equity-based compensation may also exacerbate agency conflicts between managers and debt holders by motivating CEOs to increase risk beyond that which debtholders prefer. Higher managerial inside debt serves to alleviate agency conflicts between managers and debt holders by aligning mangers with debt holders. For example, Cassell, Huang, Sanchez, and Stuart (2012) find that higher levels of CEO inside debt are associated with less risky investment and financial policies. This suggests that CEO inside debt compensation may also be associated corporate liquidity policy.

I examine the effect of CEO inside debt compensation on corporate cash holdings, as measured by the ratio of cash and marketable securities to net assets using a sample of EXECUCOMP firms over the period of 2006 to 2008. Specifically, I test whether CEO inside debt is positively or negatively correlated with cash holdings. Higher CEO inside

debt compensation alleviates agency conflicts between managers and debt holders by aligning mangers with debt holders. For example, Cassell, Huang, Sanchez, and Stuart (2012) find that higher levels of CEO inside debt are associated with less risky investment and financial policies. CEOs with higher inside debt may prefer to invest in cash as cash holdings are less risky projects (Tong, 2010). Therefore, based on risk-aversion hypothesis, I posit a positive relation between CEO inside debt holdings and corporate cash holdings. Conversely, CEOs with debt-like compensation bear a lower cost of borrowing (Anantharaman, Fang, and Gong, 2010). This provides firms with easier access to external financing. Similarly, creditors anticipate that mangers with high inside debt compensation will pursue less risky policies and require fewer covenants limiting their investing, financing, and payout decisions after debt issuance (Anantharaman et al., 2010; Chen, Dou, and Wang, 2010). Thus, based on costly external finance hypothesis (Liu and Mauer, 2011), CEOs with higher inside debt may hold less cash as a hedge for future financing needs.

I begin by examining the effect of CEO inside debt holdings on firm cash holdings, measured as the ratio of cash plus marketable securities to net assets where net assets is equal to total assets minus cash plus marketable securities. The main explanatory variable of interest is CEO inside debt holdings. Following previous empirical studies on CEO inside debt holdings (Cassell et al., 2012), I use two measures as proxies for CEO inside debt holdings: 1) CEO to firm debt/equity ratio and 2) an indicator variable equal to one if the CEO to firm debt/equity ratio is greater than one. Utilizing a contemporaneous regression where cash and all independent variables including CEO inside debt holdings are measured at time *t*, I find a positive relation between CEO inside

debt holdings and firm cash holdings. I next examine the relation between firm cash holdings and lagged CEO inside debt holdings to mitigate the endogeneity problem and the positive relation between CEO inside debt holdings and firm cash holdings still hold. Further, I use a two-stage regression analysis to explicitly control for the endogeneity problem and I find that the main results of CEO inside debt holdings and firm cash holdings still hold. I next divide the CEO inside debt compensation into two main components: pension and deferred compensation and examine the effect of these two components on firm cash holdings to find out the main driving channel of the positive relation between CEO inside debt holdings and firm cash holdings. I find that the deferred compensation is the main driving channel behind the positive relation between CEO inside debt compensation and firm cash holdings.

Though CEO inside debt compensation induces CEOs to hold cash, CEOs may face constraints in their ability to hold excess cash. Financial constraint status of the firm is one of the constraining factor and the relation between CEO inside debt holdings and firm cash holdings could depend on whether a firm is financially constrained. CEOs of a financially constrained firms may face difficulty accumulating excess cash as their inside debt compensation goes up since capital is limited. This implies that the positive relation between firm cash holdings and CEO inside debt compensation may be mitigated by financial constraint status of the firm. To examine whether financial constraint status of a firm influences the relation between CEO inside debt compensation and firm cash holdings, I interact CEO inside debt compensation with several variables that proxy for the degree to which a firm is financially constrained. I find significant negative coefficients on the interaction terms which imply the mitigating role of financial

constraint status of the firm on the positive relation between firm cash holdings and CEO inside debt holdings.

Following Cassell et al. (2012), I construct the ratio of the vega (the sensitivity of the value of the CEO's accumulated equity-based compensation to a one percent change in the volatility of stock prices) to delta (the sensitivity of the value of the CEO's equity-based compensation to one percent change in the stock price) to control for the effects of equity-based incentives on CEO risk-taking preferences and corporate cash holdings. I include CEO vega/delta ratio in all regressions as a control variable and find a positive relation between CEO inside debt and firm cash holdings. My empirical finding that firm cash holdings are increasing in CEO inside debt compensation mimics the findings of Liu and Mauer (2011) who investigate the effect of CEO equity-based incentives on firm cash holdings. In their study, Liu and Mauer (2011) document a positive relation between equity-based incentives as measured by the sensitivity of equity compensation to volatility (vega) and firm cash holdings. I examine these separate effects by including both CEO inside debt compensation and vega in the cash regression and find that the positive effect of CEO inside debt holdings on firm cash holdings remains significant even after controlling for the effect of vega.

Finally, I examine whether cash increases (decreases) have a more positive (negative) valuation effect for firms with lower CEO inside debt. Following Pinkowitz, Stulz, and Williamson (2006), I use a modified version of the Fama and French (1998) valuation regression. I find that cash increases have a more positive valuation effect for firms with low levels of CEO inside debt relative to those with high levels of CEO inside debt.

This study makes several contributions to the literature. First, prior studies on executive compensation focus on equity-based (stocks and stock-options) and fixed (salary and bonus) compensation, while few studies examine debt-like compensation. This paper extends the literature which investigates the incentive effects of various components of CEO wealth, particularly CEO equity holdings (Guay, 1999; Rajgopal, and Shevlin, 2002; Coles, Daniel, and Naveen, 2006). Focusing on a different component of CEO compensation, inside debt, this study provides evidence of the effect CEO inside debt compensation on corporate cash holdings.

Second, this study contributes to a nascent literature on executive compensation which investigates the theoretical prediction that inside debt mitigates agency costs of debt by strengthening the alignment of CEO and debtholder incentives (Jensen and Meckling, 1976; Edmans and Liu, 2011). To date, extant research (Anantharaman, Fang, and Gong, 2010; Chen, Dou, and Wang, 2010; Wang, Xie, and Xin, 2011; Wei and Yermack, 2011; Francis and Yilmaz, 2012; He, 2011) has focused on market-based implications of CEO inside debt holdings (e.g. reduced cost of debt, fewer restrictive debt covenants, market reactions after initial disclosures of CEO inside debt compensation, financial reporting quality, etc.). In contrast, this study provides direct evidence of the effect of CEO inside debt on firm investment and financial policies by examining the relation between CEO inside debt compensation and corporate cash holdings. I extend Cassell et al., (2012), who look at the effect of CEO inside debt holdings on firm investment and financial policies, by investigating the effect of CEO inside debt on

corporate cash holdings.[2] Further, I extend Liu, Mauer, and Zhang (2012), who look at the effect of CEO inside debt on the marginal value of cash to shareholders, by utilizing a valuation regression, a total firm value approach which yields a net value of cash that combines the assessments of both shareholders and debtholders.

Finally, this study adds to the corporate cash holdings literature by documenting the effect of CEO inside debt compensation on corporate cash holdings. Prior literature documents several motives for firms to hold cash[3]: the transaction motive, the precautionary motive, the tax motive, and the agency motive. The literature on corporate cash holdings empirically examines agency theory by viewing cash holdings as a source of financing. My study contributes to the agency motive view of corporate cash holdings literature by focusing on the investment perspective of cash holdings and by exploring the link between CEO inside debt and corporate cash-holdings.

I organize the remainder of this paper as follows. I discuss my research, review the literature, and develop the hypotheses; then comes an overview of sample selection and variables used in this study, methodology, and a description of my sample. The empirical results and conclusion complete the first essay.

Literature Review

Corporate Cash Holdings and Agency Costs

Corporate liquidity policy is regarded as one of the firm's most important decisions. This is especially true as prior studies document that US firms hold a large

---

[2] Cassell et al. (2012) find a positive relation between CEO inside debt and asset liquidity, measured by working capital. In my sample for this study, the correlation between working capital and firm cash holdings is not significant.

[3] See Bates, Kahle, and Stulz, 2009 for details about why firms hold cash.

portion of their assets in the form of cash. For example, Bates, Kahle and Stulz (2009) find that the average cash-to-assets ratio more than doubles from 10.5% in 1980 to 23.2% in 2006. Based on Bates, Kahle, and Stulz (2009), there are four main motives for firms to hold cash: the *transaction* motive (Baumol, 1952; Miller and Orr, 1966; Mulligan, 1977)[4]; the *precautionary* motive (Opler, Pinkowitz, Stulz, and Williamson, 1999)[5]; the *tax* motive (Foley, Hartzell, Titman, and Twite, 2007)[6]; and the agency motive (Dittmar, Mahrt-Smith, and Servaes, 2003; Dittmar, and Mahrt-Smith, 2007; Pinkowitz, Stulz, and Williamson, 2006; Harford, Mansi, and Maxwell, 2008).

This study focuses primarily on the agency motive of cash holdings. Prior literature focuses on whether the agency theory explains the level of corporate cash holdings (Opler et al., 1999; Dittmar, Mahrt-Smith and Servaes, 2003; Dittmar, Mahrt-Smith, 2007; Pinkowitz, Stulz, and Williamson, 2006), and whether corporate cash holdings affect firm value through the agency problem (Harford, 1999). While Opler et al. (1999) do not find support for the agency motive using managerial ownership as the combined measure for the free cash flow hypothesis and risk-reduction hypothesis, other researchers find support. Dittmar et al. (2003) find that corporate cash holdings in different countries are affected by the degree of shareholder protection from law and firms hold more cash in countries with greater agency problems. Consistent with free cash flow hypothesis, Harford (1999) finds that cash-rich firms are more likely to make

[4] Transaction motive focuses on the need to conserve on the cost of converting non-financial assets into cash and posits that firms that are more likely to incur higher transaction costs are expected to maintain higher cash balances.

[5] The precautionary motive posits that firms hold cash to meet the needs of the firms when it faces unanticipated contingencies and when access to capital markets is costly.

[6] The tax motive predicts that US firms that would incur tax consequences related with repatriating foreign earnings hold higher cash balances.

value-decreasing acquisitions. Dittmar, Mahrt-Smith (2007) and Pinkowitz, Stulz, and Williamson (2006) find that cash is worth less when agency problems between insiders and outside shareholders are greater. Harford, Mansi, and Maxwell (2008) find that entrenched managers are more likely to build excess cash balances but spend excess cash quickly.

The agency theory explanation for cash holdings includes both the free-cash flow hypothesis and risk-reduction hypothesis. According to the free-cash flow hypothesis, cash is viewed as a source of financing available to the manager who serves his own interest at the cost of shareholders' wealth (Jensen, 1986; Harford, 1999). Risk-reduction is a typical agency problem originating from different risk preferences between managers and shareholders. The risk-reduction hypothesis posits that cash holdings are risk-free investments and so, a risk-averse and self-interested manager allocates higher corporate cash holdings to reduce firm risk. For instance, Amihud and Lev (1981) argue that a risk-averse manager may select lower NPV but less risky investment projects, which can reduce firm value.

As noted above, previous studies on corporate cash holdings primarily focus on the free-cash flow hypothesis. However, there are limited studies which explore the risk-reduction hypothesis in the context of corporate cash holdings. Consistent with risk-related agency theory, Tong (2010) finds that firms with higher CEO risk incentives have less cash holdings using a sample of 1,768 firms from 1993 to 2000. Conversely, Liu and Mauer (2011) find a positive relation between CEO risk-taking (vega) incentives and cash holdings utilizing a sample of EXECUCOMP firms from 1992 to 2006. Liu and Mauer (2011) measure the marginal value of cash to shareholders and find that high CEO

vega is associated with a lower value of cash. This empirical evidence is also consistent with the costly contracting hypothesis, which posits that debtholders expect greater risk-taking in high vega firms and so, require greater liquidity.

Inside Debt Compensation as a Means to Reduce Agency Costs of Debt

Many CEOs in the US hold significant amounts of pay in the form of defined benefit pension plans and deferred compensation (Sundaram and Yermack, 2007; Wei and Yermack, 2011). These forms of executive compensation are defined as inside debt (in the language of Jensen and Meckling (1976)) as this compensation represents fixed obligation for the firm to make future payments to corporate insiders. Inside debt compensation are unsecured and unfunded, exposing CEOs to the same default risks and insolvency treatment as outside creditors. Therefore, CEO inside debt compensation can be used as a vehicle to mitigate the agency costs of debt (Sundaram and Yermack, 2007; Edmans and Liu, 2011; Wei and Yermack, 2011; Lee and Tang, 2011; Cassell et al., 2012).

Agency costs of debt occur when managers vary the firm's investment policy, payout policy, or capital structure in ways that reallocate wealth from debtholders to stockholders, generally through some increase in the overall risk of the firm (Jensen and Meckling, 1976; Dewatripont and Tirole, 1994). To alleviate the agency costs of debt, Jensen and Meckling (1976) recommend implementing an optimal incentive structure under which the CEO's personal holdings of the firm's debt and equity ratio is similar to the firm's overall capital structure. Based on agency theory, studies on CEO inside debt compensation find that CEOs with higher inside debt holdings prefer less risky investment and financial policies (Cassell et al., 2012). Sundaram and Yermack (2007)

find that as the value of a CEO's pension increases relative to the value of her equity holdings, risk taking, as measured by distance-to-default declines. Wei and Yermack (2011) examine stockholder and bondholder reactions to firms' initial reports of their CEOs' inside debt positions in early 2007 when new SEC disclosure rules took effect. The authors find that bond prices rise, equity prices fall, and the volatility of both securities drops upon disclosures by firms where the CEO has a sizeable defined benefit pension or deferred compensation. This suggests that inside debt may reduce firm risk and transfer wealth from equity toward debt. This is also consistent with the idea that investors anticipate less risk taking by managers with higher levels of inside debt.

Several recent studies also find a negative relation between CEO inside debt holdings and the cost of debt (Anantharaman et al., 2010; Chen, Dou, and Wang, 2010; Wang, Xie, and Xin, 2011). When compensation packages of CEOs consist of both inside debt compensation and equity-based compensation, CEO incentives vary with the relative importance of debt versus equity based compensation in the pay structure (inside leverage of the CEO). The higher a CEO's inside leverage relative to firm leverage (the CEOs' relative leverage), the more closely the CEO's incentives are aligned with debtholders vis-à-vis shareholders and the lesser the degree to which CEO engages in risk-seeking behavior to damage debt holders wealth (Edmans and Liu, 2011). Anantharaman et al. (2010) argue that if debtholders realize the incentive effects of CEO inside debt holdings, firms providing CEOs with higher relative leverage should bear a lower borrowing cost and fewer covenants. Utilizing a sample of private loans originated during 2006-2008, they find that higher CEO relative leverage is associated with lower cost of debt financing and fewer restrictive covenants. Wang et al. (2011) posit that banks demand

lower yield spreads and less strict terms on loans to firms where CEOs have large inside debt holdings.

Using a sample of 1,280 loan facilities for 676 unique firms originated for the period of 2007 to 2010, they find that banks charge lower yield spreads on loans when CEOs of those firms hold larger inside debt holdings. Empirical evidence also shows that loans to firms providing CEOs with larger inside debt holdings are associated with fewer covenant restrictions. This is consistent with the view that debtholders anticipate lower expropriation risk by firms with larger CEO inside debt holdings. For instance, Chen, Dou, and Wang (2010) find that public debtholders charge lower interest rates to firms providing CEOs with more inside debt. In addition, they find that the level of CEO inside debt holdings exhibits a negative relation with restrictive debt covenants. In summary, these studies suggest that CEOs with higher inside debt compensation are associated with lower borrowing costs of debt financing and fewer restrictive covenants.

Hypothesis Development

CEO inside debt compensation mitigates agency costs of debt by aligning interests of CEOs with those of debtholders. Prior studies find that the firms whose CEOs are paid with inside debt holdings manage firms more conservatively as inside debt reduces CEOs' excessive risk-taking incentives. Since investment in cash lowers overall firm risk, an increase in CEO inside debt should increase cash holdings. This indicates a positive relation between CEO inside debt and the cash holdings of a firm.

H_1: Cash holdings increase in CEO inside debt holdings.

Conversely, firms that encourage less risk-taking with high inside debt compensation may find it easier to raise external capital. Debtholders recognize the

incentive effects of CEO inside debt holdings. Therefore, firms providing their CEOs with debt-like compensation bear a lower cost of borrowing. Hence, firms have better access to external financing market when CEO pay packages consist of a substantial amount of inside debt holdings. Debtholders also recognize the incentive effects of CEO inside debt holdings. Firms providing their CEOs with debt-like compensation bear fewer covenants limiting their investing, financing, and payout decisions after debt issuance. All these indicate a negative relation between CEO inside debt and cash holdings of a firm.

H_2: Cash holdings decrease in CEO inside debt holdings.

Sample Selection and Data

Sample Selection

Data for this study comes from the followings sources: CEO compensation data from EXECUCOMP; corporate cash holdings and other accounting data from COMPUSTAT; stock price data from Center for Research in Securities Prices (CRSP), governance variables from Investor Responsibility Research Center (IRRC).

The Securities and Exchange Commission (SEC) required all firms to expand executive compensation disclosure effective in 2006 fiscal year end. Therefore, 2006 marks the beginning of my sample period because this is the first year that EXECUCOMP reports CEO pension and deferred compensation information.

I use the Standard and Poor's EXECUCOMP database to create an initial sample of US firms from 2006 fiscal year to 2008 fiscal year. EXECUCOMP includes annual compensation data from proxy statements for the five highest paid executives for firms in the S&P 500, the S&P MidCap 400, and the S&P SmallCap 600. Following previous

literature, I exclude all financial firms (SIC codes 6000-6999) as liquidity is hard to access in these firms. I also exclude all utility firms (SIC codes 4900-4999) due to their unique regulatory environment. I then match this sample with COMPUSTAT, CRSP, and IRRC for accounting data, stock return data, and governance data respectively.

The initial sample of EXECUCOMP is matched with COMPUSTAT Annual Industrial file and Center for Research in Securities Prices (CRSP) databases from 2006 to 2008. I exclude all financial and utility firms (SIC code of 4900-4949 and 6000-6999), all leverage buyouts (LBO) firms (stock code four in CRSP), and all firms that incorporate abroad (incorporation code 99 in Compustat). I further limit my sample to ordinary common shares (share code 10 or 11 in CRSP). This excludes certificates, Americus trust components, closed-end funds, ADRs, shares of beneficial interest, units, and REITs from analysis. I delete any observations with missing values on CEO pension, deferred compensation, and CEO stock incentives. After deleting observations with missing values for these variables, I have a final matched sample of 1,859 firm-year observations from 2006 to 2008. My sample is comparable with recent studies on CEO inside debt holdings using the EXECUCOMP database over the period 2006 to 2008 (Cassell et al., 2012; Cen, 2011; Lee and Tang, 2011). I then match this final sample with Investor Responsibility Research Center (IRRC) for governance variables and sub-sample is smaller due to the data availability from IRRC.

My final sample does not include 453 firms which have zero debt or missing debt. This may raise a question if CEO inside debt compensation does not matter for all-equity firms. Sundaram and Yermack (2007) argue that the incentive impact of debt and equity holdings of CEOs depends on the capital structure of the firm. When a firm has debt and

equity in its capital structure, then the CEO tends to shift risk from shareholders to debtholders if the CEO has only equity holdings in the firm. Compensating CEOs with pension and deferred compensation aligns interests of CEOs with that of debtholders which in turn, reduces agency costs of debt. CEO inside debt compensation impacts on decision-making by CEOs only when firm has debt in the capital structure. Therefore, CEO inside debt compensation does not matter for all-equity firms as risk shifting from shareholders to debtholders by CEOs does not happen for these firms.

Variable Descriptions

The primary variable is corporate cash holdings. The primary independent variable is CEO inside debt compensation. I also include several additional control variables that are related to both corporate cash holdings and CEO inside debt compensation. Appendix A provides detailed definition of the dependent and independent variables utilized in my analysis.

Corporate Cash Holdings

The primary dependent variable for this study is corporate cash holdings of a firm. Following prior literature (for example, Opler et al., 1999), I measure corporate cash holdings as the ratio of cash and marketable securities to net assets, where net assets are total assets minus cash and marketable securities. I also measure corporate cash holdings as cash and marketable securities to total assets and my results are similar if I use this alternative measure of corporate cash holdings.

CEO Inside Debt Compensation

The primary explanatory variable is CEO inside debt holdings. Following prior literature on CEO inside debt holdings (for example, Cassell et al., 2012), I use two

measures for CEO inside debt holdings: 1) the CEO to firm debt/equity ratio and 2) an indicator variable equal to one when the CEO to firm debt/ equity ratio is greater than one. The first measure, the CEO to firm debt/equity ratio, is calculated as the CEO's debt/equity ratio scaled by the firm's debt to equity ratio. The CEO's debt/ equity ratio is calculated as CEO inside debt holdings scaled by CEO equity holdings. CEO inside debt holdings are calculated as the sum of the present value of accumulated pension benefits and deferred compensation. CEO equity holdings are calculated as the value of both stock and stock options held by the CEO, where the value of stock is calculated by multiplying the number of shares held by the stock price at the firm's fiscal year end and the value of option is calculated by multiplying the total option delta (using the Black-Scholes (1973)) by the stock price at the firm's fiscal year end. Firm debt is the sum of current and long-term debt. Firm equity is the product of shares outstanding and the stock price at the firm's fiscal year end. The second measure is an indicator variable equal to one when the CEO to firm debt/ equity ratio is greater than one (i.e. the CEO is more levered than the firm), and zero otherwise.

Control Variables

CEO compensation incentives. I include additional control variables to proxy for CEO compensation incentives that influence corporate cash holdings. Liu and Mauer (2011) find a positive relation between vega and cash holdings but no signification relation between delta and cash holdings. Following prior literature (for example, Guay, 1999; Core and Guay, 2002; Coles, Daniel, and Naveen, 2006), I measure CEO compensation incentives by the sensitivity of CEO wealth to stock return volatility (vega) and the sensitivity of CEO wealth to stock price (delta). Following Cassell et al. (2012), I

construct the ratio of the vega to delta (CEO vega/delta ratio) to control for the effects of equity-based incentives on CEO risk-taking preferences and corporate cash holdings. I adjust the CEO vega/delta ratio by multiplying it by the ratio of total CEO equity holdings to CEO inside debt to capture the relative importance of the CEO's accumulated equity holdings.[7]

Governance variables. Following prior literature (for example, Dittmar and Mahrt-Smith, 2007), I control for the impact of corporate governance on cash holdings. I measure the degree of managerial entrenchment due to takeover protection using the Gompers, Ishii, and Metrick (2003) (GIM INDEX) index. GIM INDEX is the number of antitakeover provisions in a firm's charter and the index varies from zero to 24. As the most recent data on antitakeover amendments is 2006, I use the G-Index of 2006 for my sample firms from 2006 to 2008.

Firm-specific control variables. Following prior literature on corporate cash holdings (Opler et al., 1999; Bates, Kahle, and Stulz, 2009), I also include several additional control variables to proxy for firm specific factors that may motivate and influence corporate cash holdings. These control variables are motivated by the transaction and precautionary explanations for corporate cash holdings. Firm size is related with the transaction cost motive for cash holdings (Opler et al, 1999). Firm size is calculated as the logarithm of total assets. The precautionary motives suggest that firms with better investment opportunities hold more cash because adverse shocks and financial distress are more costly for them (Opler et al, 1999). I use market-to-book asset ratio, computed as the book value of net assets minus the book value of equity plus the market

[7] If CEO equity holdings are large (small), the effect of the CEO vega/delta ratio is likely to be large (small).

value of equity, all divided by the book value of net assets, to indicate investment opportunities. Firms with higher cash flow accumulate more cash, all else equal (Bates et al., 2009). I use Cash flow/net assets which is computed as the ratio of earnings after interest, dividends and taxes but before depreciation divided by the book value of net assets. I include NWC/net assets, computed as the net working capital-to-net assets ratio, as net working capital consists of assets that substitute for cash. Capital expenditures can affect corporate cash holdings either from the tradeoff theory or from the financing hierarchy theory (Opler et al., 1999). I measure capital expenditures as Capex/net assets which are computed as the ratio of capital expenditures to the book value of net assets. I include leverage as firms will use cash to reduce leverage if debt is sufficiently constraining. Leverage is measured as sum of long-term debt and debt in current liabilities divided by the book value of net assets. Bates et al (2009) argue that firms that pay dividends are likely to be less risky and have greater access to capital markets and so, they tend to hold less cash. I include a dividend dummy which is a dummy variable equal to one in years in which a firm pays a common dividend and is zero otherwise to proxy for dividends. I employ R&D/sales, the ratio of research and development expense to sales, to measure growth opportunities. I use acquisition activity, the ratio of expenditures on acquisitions to the book value of net assets, as Bates et al. (2009) argue that acquisitions and capital expenditures would seem to be substitutes.

Instruments. Following prior literature on CEO inside debt compensation (Sundaram and Yermack, 2007, Anantharaman et al., 2011 and Cassell et al., 2012), I include the following variables as instruments for CEO inside debt holdings: CEO age[8]; Firm age; a dummy variable (Liquidity Constraint) that equals to one if the firm is facing liquidity constraint indicated by negative operating cash flow, and zero otherwise; a dummy variable (Tax Status) that equals to one if the firm has favorable tax status identified by if the firm has a loss carry-forward, and zero otherwise; maximum state tax rate on individual income.[9]

Descriptive Statistics

Table 1.1 presents summary statistics for the full sample. All continuous variables are winsorized at upper and lower 1% of the sample distribution to address potential problems associated with extreme observations. Panel A of Table 1.1 reports descriptive statistics. The mean (median) cash is 0.1467 (0.0699). I find that the mean (median) CEO debt/equity ratio is 0.280 (0.078). This suggests that CEO equity holdings are larger than CEO inside debt holdings for the majority of my sample firms. However, the average CEO holds more than $5 million in inside debt, suggesting that inside debt holdings are nontrivial to my sample CEOs. The CEO to firm debt/equity ratio shows a similar distribution with mean (median) values of 0.684 (0.296).

[8] Following Cassell et al., 2012, I do not include CEO tenure as another instrument since CEO age and CEO tenure tend to be highly correlated.

[9] I collect the information for the state tax rates from http://www.nber.org/~taxsim/state-rates/. These tax rates are calculated using TAXSIM model (Feenberg and Coutts, 1993).

Table 1.1

Descriptive Statistics and Correlations

Panel A: Summary Statistics

	N	Mean	Std.Dev	P25	Median	P75
Cash holdings	1859	0.1467	0.2318	0.0253	0.0699	0.1751
CEO inside debt holdings ($ Millions)	1859	5.8810	11.9230	0.0350	1.4830	6.7330
CEO debt/equity ratio ($ Millions)	1859	0.2800	0.5520	0.0010	0.0780	0.3158
CEO to firm debt/equity ratio	1859	0.6840	1.0710	0.0050	0.2960	0.9560
CEO to firm debt/equity ratio >1	1859	0.2399	0.4271	0.0000	0.0000	0.0000
CEO age	1848	56.088	6.9370	52.0000	56.0000	60.0000
CEO tenure	1859	8.2120	6.7170	3.0000	6.0000	11.0000
Firm size	1859	7.6860	1.4520	6.6490	7.5820	8.6510
Dividend dummy	1859	0.5760	0.4940	0.0000	1.0000	1.0000
Market-to-book ratio	1859	2.1970	2.1310	1.1870	1.5930	2.2190
Cash flow/Net assets	1859	0.0920	0.1470	0.0570	0.0960	0.1430
NWC/Net assets	1859	0.0780	0.1980	-0.0190	0.0880	0.1890
Capex/Net assets	1859	0.0636	0.0652	0.0246	0.0431	0.0771
Leverage	1859	0.2099	0.1446	0.1022	0.1978	0.2989
R&D/Sales	1859	0.0510	0.1030	0.0000	0.0020	0.0490
Acquisition Activity	1859	0.0340	0.0770	0.0000	0.0010	0.3020
GIM Index	1144	9.1200	2.6510	7.0000	9.0000	11.0000
CEO Vega/Delta ratio	1859	0.3135	0.3659	0.0714	0.2098	0.4763

Panel B: Sample distribution by industry

Two-digit SIC		Frequency	Percent
20	Food and Kindred Products	74	3.98
26	Paper and Allied Products	49	2.64
27	Printing and Publishing	38	2.04
28	Chemicals & Allied Products	177	9.52
33	Primary Metal Industries	42	2.26
35	Industrial & Commercial Machinery& Computer Equip.	147	7.91
36	Electronic & Other Electrical Equip. & Components Except Computer Equip.	137	7.37
37	Transportation Equip.	62	3.34
38	Measuring Analyzing Controlling Inst.; Photographic Medical & Optical Goods	136	7.32
48	Communications	39	2.10
50	Wholesale Trade- Durable Goods	58	3.12
58	Eating and Drinking Places	43	2.31
59	Miscellaneous Retail	45	2.42
73	Business Services	143	7.69
Industries with less than 2% of sample representation		669	35.99
Total		1,859	100.00

Table 1.1 presents descriptive statistics and correlations. Variables include the ratio of cash plus marketable securities to net assets, where net assets are total assets minus cash and marketable securities (Cash), the sum of the present value of accumulated pension benefits and deferred compensation (CEO inside debt holdings), the natural log of one plus the ratio of CEO's debt-to-equity ratio (CEO to firm debt/equity ratio), a dummy variable that equals one if CEO to firm debt/equity ratio is larger than one and zero otherwise (CEO to firm debt/equity ratio>1), the ratio of CEO vega to the delta (CEO Vega/Delta Ratio), the natural logarithm of net assets (Firm Size), the ratio of the book value of net assets minus the book value of equity plus the market value of equity to the book value of net assets (Market-to-book), the ratio of earnings after interest, dividends and taxes but before depreciation divided by the book value of net assets (Cash flow/assets), the ratio of net working capital to net assets (NWC/assets), the ratio of capital expenditures to the book value of net assets (Capex/assets), the sum of long-term debt and debt in current liabilities divided by the book value of net assets (Leverage), a dummy variable that equals one if regular cash dividends on common stock is positive in a given fiscal year (Dividend payout dummy), the ratio of research and development expense to sales (R&D/sales), the ratio of expenditures on acquisitions to the book value of net assets (Acquisition activity), the number of years since the first year that the firm is reported in Compustat (Firm age), the number of years the executive has served as CEO (CEO tenure), a dummy variable that equals to one if CEO is also the chairman of the board (Duality), the number of antitakeover provisions in the firm's charter as reported by the Investor Responsibility Research Center (IRRC) in 2006 and varies from zero to 24 (GIM Index). Detailed definitions of all variables are reported in Appendix A. Data

are obtained from COMPUSTAT, CRSP, EXECUCOMP, and IRRC and consist of 1,859 firm-year observations from 2006 to 2008. Panel A reports descriptive statistics. Panel B reports the sample distribution by industry. Panel C reports pairwise correlation of primary variables. Correlations significant at 5% or better are marked with stars.

The mean (median) CEO to firm debt/equity ratio>1 is 0.2399 (0.0000) indicating that CEO's debt-to-equity ratio is less than firm's debt-to-equity ratio for the majority of my sample firms.

Panel B of Table 1.1 reports the industry classification (by two-digit SIC codes) across my sample. My sample firms are from a broad spectrum of industries.

Panel C of Table 1.1 reports Pearson correlations for my variables of interest and our primary dependent variables. Interestingly, I find a negative and significant relation between firm cash holdings and CEO inside debt holdings. I find a positive but insignificant relation between CEO to firm debt/equity ratio and firm cash holdings while I find a negative but insignificant relation between CEO to firm debt/equity ratio>1 and firm cash holdings.

Methodology

I examine the effect of CEO inside debt compensation on corporate cash holdings in this section. I begin by employing multivariate regressions of cash holdings on CEO inside debt compensation.

Effect of CEO Inside Debt Holdings on Cash Holdings

To examine the effect of CEO inside debt compensation on corporate cash holdings, I regress cash holdings on CEO inside debt compensation and controls with controls for industry (2-digit SIC code dummies) and year (year dummies) fixed effect.

Following Liu and Mauer (2011), first examine the contemporaneous relation between cash holdings and CEO compensation incentives. The Model One test is as shown below:

$$CASH_{it} = \alpha + \beta_1 (CEO\ inside\ debt\ compensation)_{it} + \beta_k (controls)_{it} + \beta_i \sum(2 - digit\ SIC\ dummy\ variables)_i + \beta_y \sum(year\ dummy\ variables)_t + \varepsilon_{it}$$

Next, following prior studies on corporate cash holdings (Harford, Mansi, and Maxwell, 2008 and Liu and Mauer, 2011), I examine the relation between cash holdings and lagged CEO compensation incentives to control for potential endogeneity of compensation incentives. The Model One test is as shown below:

$$CASH_{it} = \alpha + \beta_1 * (CEO\ inside\ debt\ compensation)_{i,\ t-1} + \beta_k (controls)_{i,t-1} + \beta_i \sum(2 - digit\ SIC\ dummy\ variables)_i + \beta_y \sum(year\ dummy\ variables)_t + \varepsilon_{it}$$

I use two-stage least squares estimation (2SLS) to control for the endogeneity of compensation incentives. In the first-stage, I separately regress CEO compensation incentives on all of the variables along with the instruments. In the second-stage, CEO compensation incentives are replaced by their predicted values from their respective first-stage regressions.

After examining the effect of CEO inside debt holdings on firm cash holdings, I next examine whether cash increases (decreases) have a more positive valuation effect for firms with lower CEO inside debt. Following Pinkowitz, Stulz, and Williamson (2006), I use a modified version of the Fama and French (1998) valuation regression. Prior studies in corporate cash holdings use this valuation regression and it is a total firm value approach which yields a net value of cash that combines the assessments of both shareholders and debtholders.

Empirical Results

I examine the effect of CEO inside debt compensation on firm cash holdings in this section. I begin by employing multivariate regressions of firm cash holdings on CEO inside debt compensation. I then report results of a Fama and French (1998) valuation regression to examine whether cash increases (decreases) have a more positive (negative) valuation effect for firms with higher CEO to firm debt/equity ratio.

Effect of CEO Inside Debt Holdings on Firm Cash Holdings

I begin by examining the effect of CEO inside debt compensation on firm cash holdings. Following Liu and Mauer (2011), I first examine the contemporaneous relation between cash holdings and CEO compensation incentives, where firm cash holdings and all independent variables are measured at time t. Table 1.2 reports the results of multivariate regressions with controls for industry and year fixed effect. Models One and Two report results for the full sample where the main explanatory variable is the first measure of CEO inside debt holdings, CEO to firm debt/equity ratio. Models Three and Four include the alternative measure of CEO inside debt holdings, CEO to firm debt/equity ratio>1.

Table 1.2

Contemporaneous Regressions of Cash Holdings on CEO Inside Debt Holdings

	(1)	(2)	(3)	(4)
CEO to firm debt/equity ratio	0.0057 ***	0.0035 ***		
	(3.8800)	(3.43)		
CEO to firm debt/equity ratio>1			0.037 ***	0.029 ***
			(4.80)	(4.97)
Firm Size		-0.071 ***		-0.073 ***
		(-13.11)		(-8.45)
Market-to-book ratio		0.073 ***		0.075 ***
		(13.44)		(15.31)

Table 1.2 (Continued)

Cash flow/Net Assets	-0.027		-0.023	
	(-0.37)		(-0.45)	
NWC/Net Assets	-0.334	***	-0.325	***
	(-6.18)		(-5.79)	
Capex/Net Assets	-0.103		-0.115	
	(-0.87)		(-0.75)	
Leverage	-0.017		-0.023	
	(-0.48)		(-0.57)	
R&D/Sales	1.357	***	1.413	***
	(11.67)		(10.54)	
Dividend Dummy	-0.014		-0.017	
	(-1.38)		(-1.61)	
Acquisition Activity	-0.319	***	-0.327	***
	(-6.67)		(-6.98)	
GIM Index	-0.004	*	-0.005	*
	(-1.77)		(-1.83)	
CEO Vega/Delta Ratio	0.0013	**	0.0015	**
	(2.40)		(2.27)	
Industry and year fixed effect	YES	YES	YES	YES
N	1859	1144	1859	1144
Adj. R^2	0.49	0.51	0.50	0.52

Table 1.2 reports results of the effect of CEO inside debt holdings on cash holdings in contemporaneous specification where cash and all independent variables are measured at time *t*. All models control for industry and year fixed effect, where industry is defined based on Fama and French 49 industry classification. The dependent variable is the ratio of cash plus marketable securities to net assets, where net assets are total assets minus cash and marketable securities (Cash). The two main independent variables are two measures to proxy CEO inside debt holdings: CEO to firm debt/equity ratio, and a dummy variable with a value of one if CEO to firm debt/equity ratio is larger than one and zero otherwise (CEO to firm debt/equity ratio>1). Control variables are the ratio of CEO vega to the delta (CEO Vega/Delta Ratio), the natural logarithm of net assets (Firm

Size), the ratio of the book value of net assets minus the book value of equity plus the market value of equity to the book value of net assets (Market-to-book), the ratio of earnings after interest, dividends and taxes but before depreciation divided by the book value of net assets (Cash flow/assets), the ratio of net working capital to net assets (NWC/assets), the ratio of capital expenditures to the book value of net assets (Capex/assets), the sum of long-term debt and debt in current liabilities divided by the book value of net assets (Leverage), a dummy variable that equals one if regular cash dividends on common stock is positive in a given fiscal year (Dividend payout dummy), the ratio of research and development expense to sales (R&D/sales), the ratio of expenditures on acquisitions to the book value of net assets (Acquisition activity), GIM Index, the number of antitakeover provisions in the firm's charter as reported by the Investor Responsibility Research Center (IRRC) in 2006 and the index varies from zero to 24, and CEO vega/delta ratio. Detailed definitions of all variables are reported in Appendix A. Sample period is 2006 - 2008. Models One and Two report results where the main explanatory variable is the first measure of CEO inside debt holdings (CEO to firm debt/equity ratio) while Models Three and Four report results where the main explanatory variable is the second measure of CEO inside debt holdings (CEO to firm debt/equity ratio>1). The *t*-statistics are reported in parentheses. Superscripts *, ** and *** indicate levels of significance of 10%, 5%, and 1%, respectively.

The estimated coefficients on CEO to firm debt/equity ratio are positive and significant in Models One and Two. This supports H_1, which predicts that cash holdings are increasing in CEO inside debt holdings. My conclusions are unchanged using an alternative proxy for inside debt in Models Three and Four. The estimated coefficients on

CEO to firm debt/equity >1 are positive and significant. I continue to find support for H_1. The firm cash holdings are increasing in CEO inside debt holdings.

While studying the effect of corporate governance on firm cash holdings, Harford, Mansi, and Maxwell (2008) lag their governance variables and argue that lagging helps control for potential endogeneity of governance. Liu and Mauer (2011) report the results of the relation between cash holdings and lagged CEO compensation incentives. To control for potential endogeneity of compensation incentives, I next examine the effect of lagged CEO inside debt compensation on firm cash holdings. Table 1.3 reports the results of multivariate regressions with controls for industry and year fixed effect. Models One and Two report results for the full sample where the main explanatory variable is the first measure of CEO inside debt holdings, CEO to firm debt/equity ratio. Models Three and Four include the alternative measure of CEO inside debt holdings, CEO to firm debt/equity ratio>1.

Table 1.3

Lagged Regressions of Cash Holdings on CEO Inside Debt Holdings

	(1)		(2)		(3)		(4)	
CEO to firm debt/equity ratio	0.0062	***	0.0049	***				
	(3.39)		(2.84)					
CEO to firm debt/equity ratio>1						***		***
					0.047		0.027	
					(4.79)		(3.47)	
Firm Size			-0.073	***			-0.076	***
			(-12.58)				(-10.66)	
Market-to-book ratio			0.078	***			0.081	***
			(9.63)				(11.78)	
Cash flow/Net Assets			-0.057				-0.075	
			(-1.05)				(-1.59)	
NWC/Net Assets			-0.461	***			-0.491	***
			(-8.57)				(-7.42)	

Table 1.3 (Continued)

Capex/Net Assets		-0.138		-0.157
		(-0.92)		(-1.56)
Leverage		-0.105		-0.113
		(-0.98)		(-0.81)
R&D/Sales		1.973 ***		1.995 ***
		(7.67)		(8.13)
Dividend Dummy		-0.023		-0.027
		(-1.45)		(-1.26)
GIM Index		-0.001*		-0.003 *
		(-1.71)		(-1.87)
CEO Vega/Delta Ratio		0.0009 **		0.0013 **
		(1.99)		(2.32)
Industry and year fixed effect	YES	YES	YES	YES
N	1832	1110	1832	1110
Adj. R^2	0.34	0.37	0.39	0.42

Table 1.3 reports results of the effect of CEO inside debt holdings on cash holdings in lagged specification where cash is measured at time $t+1$ and all independent variables are measured at time t. All models control for industry and year fixed effect, where industry is defined based on Fama and French 49 industry classification. The dependent variable is the ratio of cash plus marketable securities to net assets, where net assets are total assets minus cash and marketable securities (Cash). The two main independent variables are two measures to proxy CEO inside debt holdings: CEO to firm debt/equity ratio, and a dummy variable with a value of one if CEO to firm debt/equity ratio is larger than one and zero otherwise (CEO to firm debt/equity ratio>1). Control variables are the ratio of CEO vega to the delta (CEO Vega/Delta Ratio), the natural logarithm of net assets (Firm Size), the ratio of the book value of net assets minus the book value of equity plus the market value of equity to the book value of net assets (Market-to-book), the ratio of earnings after interest, dividends and taxes but before

depreciation divided by the book value of net assets (Cash flow/assets), the ratio of net working capital to net assets (NWC/assets), the ratio of capital expenditures to the book value of net assets (Capex/assets), the sum of long-term debt and debt in current liabilities divided by the book value of net assets (Leverage), a dummy variable that equals one if regular cash dividends on common stock is positive in a given fiscal year (Dividend payout dummy), the ratio of research and development expense to sales (R&D/sales), the ratio of expenditures on acquisitions to the book value of net assets (Acquisition activity), GIM Index, the number of antitakeover provisions in the firm's charter as reported by the Investor Responsibility Research Center (IRRC) in 2006 and the index varies from zero to 24, and CEO vega/delta ratio. Detailed definitions of all variables are reported in Appendix A. Sample period is 2006 - 2008. Models One and Two report results where the main explanatory variable is the first measure of CEO inside debt holdings (CEO to firm debt/equity ratio) while Models Three and Four report results where the main explanatory variable is the second measure of CEO inside debt holdings (CEO to firm debt/equity ratio>1). The *t*-statistics are reported in parentheses. Superscripts *, ** and *** indicate levels of significance of 10%, 5%, and 1%, respectively.

The estimated coefficients on CEO to firm debt/equity ratio are positive and significant in Models One and Two. This supports H_1, which predicts that cash holdings are increasing in CEO inside debt holdings. My conclusions are unchanged using an alternative proxy for inside debt in Models Three and Four. The estimated coefficients on CEO to firm debt/equity >1 are positive and significant. I continue to find support for H_1. The firm cash holdings are increasing in CEO inside debt holdings.

Effect of Pension and Deferred Compensation on Firm Cash Holdings

Next, I examine which component of CEO inside debt compensation primarily drives the positive relation between CEO inside debt compensation and firm cash holdings. I partition the CEO inside debt compensation into pension and deferred compensation to examine the effect of these components of CEO inside debt compensation on firm cash holdings. Table 1.4 reports the results of multivariate regressions with controls for industry and year fixed effect. Models One and Two report results for the full sample where the main explanatory variable is the pension scaled by total compensation, measured as the sum of CEO inside debt holdings and equity holdings. Models Three and Four include the other component of CEO inside debt holdings: deferred compensation scaled by total compensation and total compensation is the sum of CEO inside debt holdings and equity holdings.

Table 1.4

The Effect of Pension and Deferred Compensation on Firm Cash Holdings

	(1)	(2)	(3)	(4)
CEO Pension	0.029	0.022		
	(1.17)	(1.43)		
CEO Deferred Compensation			0.068 *	0.061 *
			(1.83)	(1.77)
Firm Size		-0.073 ***		-0.075 ***
		(-15.27)		(-15.85)
Market-to-book ratio		0.077 ***		0.079 ***
		(12.34)		(12.58)
Cash flow/Net Assets		-0.032		-0.033
		(-0.37)		(-0.41)
NWC/Net Assets		-0.311 ***		-0.314 ***
		(-5.51)		(-5.87)
Capex/Net Assets		-0.085		-0.087
		(-0.71)		(-0.79)

Table 1.4 (Continued)

Leverage		-0.019		-0.021
		(-0.53)		(-0.65)
R&D/Sales		1.427 ***		1.435 ***
		(9.23)		(9.57)
Dividend Dummy		-0.005		-0.008
		(-1.07)		(-1.19)
GIM Index		-0.003 *		-0.004*
		(-1.74)		(-1.87)
CEO Vega/Delta Ratio		0.0019 ***		0.0023 ***
		(3.43)		(3.76)
Industry and year fixed effect	YES	YES	YES	YES
N	2312	1590	2312	1590
Adj. R^2	0.54	0.56	0.55	0.58

Table 1.4 reports results of the effect of two components of CEO inside debt holdings: pension and deferred compensation on cash holdings. All models control for industry and year fixed effect, where industry is defined based on Fama and French 49 industry classification. The dependent variable is the ratio of cash plus marketable securities to net assets, where net assets are total assets minus cash and marketable securities (Cash). The two main independent variables are: Pension and Deferred compensation and they are scaled by the sum of CEO inside debt and equity holdings. Control variables are the ratio of CEO vega to the delta (CEO Vega/Delta Ratio), the natural logarithm of net assets (Firm Size), the ratio of the book value of net assets minus the book value of equity plus the market value of equity to the book value of net assets (Market-to-book), the ratio of earnings after interest, dividends and taxes but before depreciation divided by the book value of net assets (Cash flow/assets), the ratio of net working capital to net assets (NWC/assets), the ratio of capital expenditures to the book value of net assets (Capex/assets), the sum of long-term debt and debt in current

liabilities divided by the book value of net assets (Leverage), a dummy variable that equals one if regular cash dividends on common stock is positive in a given fiscal year (Dividend payout dummy), the ratio of research and development expense to sales (R&D/sales), the ratio of expenditures on acquisitions to the book value of net assets (Acquisition activity), GIM Index, the number of antitakeover provisions in the firm's charter as reported by the Investor Responsibility Research Center (IRRC) in 2006 and the index varies from zero to 24. Detailed definitions of all variables are reported in Appendix A. Sample period is 2006 - 2008. Models One and Two report results where the main explanatory variable is pension while Models Three and Four report results where the main explanatory variable is deferred compensation. The t-statistics are reported in parentheses. Superscripts *, ** and *** indicate levels of significance of 10%, 5%, and 1%, respectively.

The estimated coefficients on both pension and deferred compensation are positive. However, the estimated coefficients on deferred compensation are significant. In summary, results from Table 1.4 suggest that deferred compensation is the driving channel behind the positive relation between firm cash holdings and CEO inside debt holdings.

Effect of CEO Inside Debt and Equity Compensation Incentives on Firm Cash Holdings

My finding that a positive relation exists between CEO inside debt holdings and firm cash holdings mimics the findings in Liu and Mauer (2011), who find a positive relation between firm cash holdings and the vega of a CEO's equity compensation. Therefore, one can interpret that a positive relation exits between CEO debt and equity compensation and firm cash holdings. In their paper, Liu and Mauer (2011) argue that

debtholders anticipate the risk-shifting incentives associated with vega and therefore require high vega firms to hold greater cash holdings to protect their interests. CEO inside debt compensation reduces agency cost of debt by aligning the interests of CEO with those of debtholders. I find a positive relation between CEO inside debt holdings and cash holdings and this may be due to the fact that inside debt reduces the CEOs risk-taking incentives. In this section, I examine whether the significant positive relation CEO inside debt compensation and firm cash holdings still remain after including vega of a CEO's equity compensation as a control variable.

Table 1.5 investigates these separate effects by including inside debt and vega in the cash regression. Positive coefficients on inside debt and vega suggest that both channels have a direct effect on cash balances. Model One includes the first measure of inside debt holdings and vega while Model Two includes the second measure of CEO inside debt holdings and vega, respectively. As seen in Model One, the first measure of CEO inside debt holdings: CEO to firm debt/equity ratio and vega are significantly positively related to cash. Again in Model Two, both the second measure of CEO inside debt holdings, CEO to firm debt/equity ratio>1 and vega are significantly positively related to firm cash holdings. Overall, results in Table 1.5 confirm my main findings that the positive effect of inside debt on cash holdings is distinct from the effect of vega of a CEO's equity compensation on firm cash holdings.

Table 1.5

The Effect of CEO Inside Debt Compensation and Vega on Firm Cash Holdings

	(1)	(2)
CEO to firm debt/equity ratio	0.0023 ***	
	(2.97)	
CEO to firm debt/equity ratio>1		0.014 ***
		(3.44)
CEO Vega	0.213 **	0.234 **
	(2.49)	(2.31)
Firm Size	-0.072 ***	-0.074 ***
	(-12.17)	(-10.11)
Market-to-book ratio	0.067 ***	0.071 ***
	(13.63)	(14.92)
Cash flow/Net Assets	-0.055	-0.078
	(-1.23)	(-1.58)
NWC/Net Assets	-0.389 ***	-0.412 ***
	(-7.22)	(-6.66)
Capex/Net Assets	-0.111	-0.121
	(-1.37)	(-0.98)
Leverage	-0.011	-0.019
	(-0.67)	(-0.78)
R&D/Sales	1.062 ***	1.091 ***
	(10.98)	(11.34)
Dividend Dummy	-0.009	-0.012
	(-0.93)	(-1.51)
Acquisition Activity	-0.281 ***	-0.297 ***
	(-6.45)	(-6.76)
GIM Index	-0.002 *	-0.003 *
	(-1.86)	(-1.79)
Industry and year fixed effect	YES	YES
N	1144	1144
Adj. R^2	0.54	0.53

Table 1.5 reports results of the effect of CEO inside debt holdings and vega on cash holdings. All models control for industry and year fixed effect, where industry is defined based on Fama and French 49 industry classification. The dependent variable is the ratio of cash plus marketable securities to net assets, where net assets are total assets

minus cash and marketable securities (Cash). The three main independent variables are two measures to proxy CEO inside debt holdings: CEO to firm debt/equity ratio, and a dummy variable with a value of one if CEO to firm debt/equity ratio is larger than one and zero otherwise (CEO to firm debt/equity ratio>1), the sensitivity of the value of the CEO's accumulated equity-based compensation to a one percent change in the volatility of stock prices (Vega). Control variables are the natural logarithm of net assets (Firm Size), the ratio of the book value of net assets minus the book value of equity plus the market value of equity to the book value of net assets (Market-to-book), the ratio of earnings after interest, dividends and taxes but before depreciation divided by the book value of net assets (Cash flow/assets), the ratio of net working capital to net assets (NWC/assets), the ratio of capital expenditures to the book value of net assets (Capex/assets), the sum of long-term debt and debt in current liabilities divided by the book value of net assets (Leverage), a dummy variable that equals one if regular cash dividends on common stock is positive in a given fiscal year (Dividend payout dummy), the ratio of research and development expense to sales (R&D/sales), the ratio of expenditures on acquisitions to the book value of net assets (Acquisition activity), GIM Index, the number of antitakeover provisions in the firm's charter as reported by the Investor Responsibility Research Center (IRRC) in 2006 and the index varies from zero to 24. Detailed definitions of all variables are reported in Appendix A. Sample period is 2006 - 2008. Models One and Two report results where the main explanatory variables are the first measure of CEO inside debt holdings (CEO to firm debt/equity ratio) and Vega while Models Three and Four report results where the main explanatory variables are the second measure of CEO inside debt holdings (CEO to firm debt/equity ratio>1)

and Vega. The *t*-statistics are reported in parentheses. Superscripts *, ** and *** indicate levels of significance of 10%, 5%, and 1%, respectively.

Effect of CEO Inside Debt Holdings on Firm Cash Holdings
for Firms Facing Financial Constraints

CEOs may face constraints in their ability to hold excess cash. Financial constraint status of the firm is one of the constraining factor and the relation between CEO inside debt holdings and firm cash holdings could depend on whether a firm is financially constrained. CEOs of a financially constrained firms may face difficulty accumulating excess cash as their inside debt compensation goes up as capital is limited. This implies that the positive relation between firm cash holdings and CEO inside debt compensation may be mitigated by financial constraint status of the firm.

To examine whether financial constraints influence the relation between CEO inside debt compensation and firm cash holdings, I interact CEO inside debt compensation with variables that proxy for the degree to which a firm is financially constrained. Negative coefficients on these interaction terms indicate that the positive relation between CEO inside debt compensation and firm cash holdings is smaller for financially constrained firms than for financially unconstrained firms.

Following prior literature, I construct a number of financial constraint proxies. Small firms are less likely than large firms to have access to external funds and based on this argument Gertler and Gilchrist (1994) utilize firm size as a proxy for financial constraint status of the firm. Lamont, Polk, and Saa-Requejo (2001) argue that firms with large amounts of growth options and few assets in place generate less internal funds and they face difficulty funding their growth options with external funds. Based on this argument Lamont, Polk, and Saa-Requejo (2001) utilize the market-to-book ratio as a

proxy for financial constraint. Fazzari, Hubbard, and Peterson (1988) use dividend payout to proxy for financial constraint status of the firm as it suggests that low dividend payout firms have insufficient internal cash flow to fund investments and so, these firms have to rely on external funds.

Following Liu and Mauer (2011), I use two different dummy variables for small firm size (SMALLSALES and SMALLNA). SMALLSALES is a dummy variable equal to one if a firm's sales in below the sample median and zero otherwise whereas SMALLNA is a dummy variable equal to one if a firm's net assets (total assets minus cash plus marketable securities) is below the sample median and zero otherwise. I use a dummy variable HIGHMB for high market-to-book ratio and HIGHMB is a dummy variable equal to one if the firm's market to book ratio is above the sample median and zero otherwise. Finally, I use a dummy variable LOWPAYOUT to proxy for whether a firm has low dividend payout. LOWPAYOUT is a dummy variable equal to one if the firm's payout ratio is below the sample median and zero otherwise. Payout ratio of a firm is measured as the ratio of common dividends plus share repurchases to earnings.

Table 1.6 reports regression results in which I interact the measure of CEO inside debt: CEO to firm debt/equity ratio with two different dummy variables for small firm size (SMALLSALES and SMALLNA) in Models One and Two, a dummy variable for high market-to-book (HIGHMB) in Model Three, and a dummy variable for whether the firm has low payouts (LOWPAYOUT) in Model Four. I exclude the continuous variable firm size as a control in Models One and Two as I use two proxies for size to measure financial constraints while in Model Three, I exclude the continuous variable market-to-book as a control because I use market-to-book to proxy for financial constraint.

Table 1.6

Regressions of Cash Holdings on Inside Debt for Financially Constrained Firms

	(1)		(2)		(3)		(4)	
CEO to firm debt/equity ratio	0.0041	***	0.0052	***	0.0068	***	0.0077	***
	(2.97)		(3.41)		(3.29)		(3.07)	
CEO to firm debt/equity ratio x SMALLSALES	-0.085	***						
	(-3.11)							
CEO to firm debt/equity ratio x SMALLNA			-0.091	***				
			(-2.68)					
CEO to firm debt/equity ratio x HIGHMB					-0.107	***		
					(-3.47)			
CEO to firm debt/equity ratio x LOWPAYOUT							-0.063	*
							(-1.69)	
Firm Size					-0.069	***	-0.070	***
					(-10.73)		(-9.67)	
Market-to-book ratio	0.067	***	0.065	***			0.063	***
	(12.77)		(15.37)				(13.46)	
Cash flow/Net Assets	-0.013		-0.019				-0.021	
	(-1.35)		(-1.09)				(-1.61)	
NWC/Net Assets	-0.403	***	-0.391	***			-0.363	***
	(-7.56)		(-6.29)				(-6.87)	
Capex/Net Assets	-0.089		-0.117				-0.109	
	(-1.57)		(-1.31)				(-1.49)	
Leverage	-0.009		-0.011				-0.007	
	(-0.78)		(-0.29)				(-0.62)	
R&D/Sales	1.079	***	1.098	***			1.103	***
	(10.50)		(12.56)				(9.84)	
Dividend Dummy	-0.008		-0.010				-0.009	
	(-0.97)		(-1.04)				(-1.32)	
Acquisition Activity	-0.298	***	-0.301	***			-0.312	***
	(-5.78)		(-6.79)				(-6.54)	
GIM Index	-0.003	*	-0.003	*			-0.004	*
	(-1.67)		(-1.93)				(-1.89)	
Industry and year fixed effect	YES		YES		YES		YES	
N	1144		1144		1144		1144	
Adj. R^2	0.50		0.51		0.48		0.53	

Table 1.6 reports results of the effect of CEO inside debt holdings on cash holdings for financially constrained firms. All models control for industry and year fixed effect, where industry is defined based on Fama and French 49 industry classification. The dependent variable is the ratio of cash plus marketable securities to net assets, where net assets are total assets minus cash and marketable securities (Cash). The main independent variable is the measures to proxy CEO inside debt holdings: CEO to firm debt/equity ratio. In Models (1) and (2) I exclude the continuous variable firm size as a control as I use two proxies for size to measure financial constraints and in Model Three. I exclude the continuous variable market-to-book as a control because I use market-to-book to proxy for financial constraint. SMALLSALES is a dummy variable equal to one if a firm's sales is below the sample median, and zero otherwise. SMALLNA is a dummy variable equal to one if a firm's net assets (total assets minus cash plus marketable securities) is below the sample median, and zero otherwise. HIGHMB is a dummy variable equal to one if the firm's market-to-book ratio is above the sample median, and zero otherwise. LOWPAYOUT is a dummy variable equal to one if the firm's payout ratio is below the sample median, and zero otherwise. The payout ratio in a given year is calculated as the ratio of common dividends plus share repurchases to earnings before extraordinary items plus interest, deferred tax credits, and investment tax credits. Control variables are the ratio of CEO vega to the delta (CEO Vega/Delta Ratio), the natural logarithm of net assets (Firm Size), the ratio of the book value of net assets minus the book value of equity plus the market value of equity to the book value of net assets (Market-to-book), the ratio of earnings after interest, dividends and taxes but before depreciation divided by the book value of net assets (Cash flow/assets), the ratio of net

working capital to net assets (NWC/assets), the ratio of capital expenditures to the book value of net assets (Capex/assets), the sum of long-term debt and debt in current liabilities divided by the book value of net assets (Leverage), a dummy variable that equals one if regular cash dividends on common stock is positive in a given fiscal year (Dividend payout dummy), the ratio of research and development expense to sales (R&D/sales), the ratio of expenditures on acquisitions to the book value of net assets (Acquisition activity), GIM Index, the number of antitakeover provisions in the firm's charter as reported by the Investor Responsibility Research Center (IRRC) in 2006 and the index varies from zero to 24. Detailed definitions of all variables are reported in Appendix A. Sample period is 2006 - 2008. The *t*-statistics are reported in parentheses. Superscripts *, ** and *** indicate levels of significance of 10%, 5%, and 1%, respectively.

Results in the Table 1.6 indicate that the coefficients on inside debt interacted with the financial constraint proxies are all negative and significant consistent with the predicted effect of financial constraints. However, the coefficient on the interaction with LOWPAYOUT is negative but not statistically significant. Interestingly, the magnitudes of the coefficients on the interaction terms are large enough so that they are able to offset the positive effect of CEO inside debt compensation on cash. In summary, findings in the Table 1.6 indicate that financial constraint status of a firm can entirely offset the incentive of CEOs with inside debt compensation to build excess cash reserves in a firm.

Endogeneity Concern

My multivariate analysis is based on OLS regression. My analysis assumes that CEO inside debt compensation is exogenous whereas CEO inside debt compensation

could be determined endogenously with firm cash holding policy. The possibility that CEO inside debt compensation is endogenous gives rise to two related concerns. First, the model specification suffers an omitted variable bias and consequently, the model does not capture all determinants of firm cash holding policy and there are unobserved firm-specific and CEO-specific characteristics that influence both firm cash policy and CEO inside debt compensation. Second, the direction of causality between CEO inside debt compensation and firm cash policy is hard to conclude. It is possible that changes in cash holding policy change firm value which requires the adjustment in CEO inside debt compensation. This imply that the contemporaneous relation between CEO inside debt compensation and firm cash holdings is subject to the concern that changes in firm cash policy lead to changes in CEO inside debt compensation. By estimating the impact of CEO inside debt holdings on future firm cash holdings, I attempt to control for the potential endogeneity that exists between CEO compensation structure and firm cash policy.

As further sensitivity tests, I estimate my models using a two-stage least-squares framework to explicitly account for endogeneity issue. In the first stage, I separately regress CEO inside debt holdings on all of the independent variables along with the instruments. The second stage then utilizes the predicted value of CEO inside debt holdings from the first stage. Following prior literature on CEO inside debt compensation (Sundaram and Yermack, 2007, Anantharaman et al., 2011 and Cassell et al., 2012), I include the following variables as instruments for CEO inside debt holdings: CEO age[10]; Firm age; a dummy variable (Liquidity Constraint) that equals to one if the firm is facing

[10] Following Cassell et al., 2012, I do not include CEO tenure as another instrument since CEO age and CEO tenure tend to be highly correlated.

liquidity constraint indicated by negative operating cash flow, and zero otherwise; a dummy variable (Tax Status) that equals to one if the firm has favorable tax status identified by if the firm has a loss carry-forward, and zero otherwise; maximum state tax rate on individual income. These rates are calculated using the TAXSIM model (Feenberg and Coutts, 1993), and were obtained from http://www.nber.org/~taxsim/state-rates/.

Table 1.7 reports the second-stage regression in which CEO inside debt holding is replaced by its predicted value from its respective first-stage regression. Models One and Two report results for the full sample where the main explanatory variable is the predicted values of first measure of CEO inside debt holdings, CEO to firm debt/equity ratio. Models Three and Four include the predicted values of alternative measure of CEO inside debt holdings, CEO to firm debt/equity ratio>1. The estimated coefficients on CEO to firm debt/equity ratio are positive and significant in Models One and Two. This supports H_1, which predicts that firm cash holdings are increasing in CEO inside debt holdings. My conclusions remain unchanged using the predicted values of the alternative proxy for CEO inside debt in Models Three and Four. The estimated coefficients on CEO to firm debt/equity >1 are positive and significant. Overall, results from two-stage least-squares framework suggest that the firm cash holdings are increasing in CEO inside debt holdings.

Table 1.7

2SLS Regressions of Cash Holdings on CEO Inside Debt Holdings

	(1)		(2)		(3)		(4)	
CEO to firm debt/equity ratio	0.067	***	0.043	***				
	(5.54)		(4.88)					
CEO to firm debt/equity ratio>1					0.177	***	0.139	***
					(6.39)		(4.57)	
Firm Size			-0.075	***			-0.077	***
			(-13.89)				(-11.37)	
Market-to-book ratio			0.087	***			0.089	***
			(11.23)				(12.96)	
Cash flow/Net Assets			-0.017				-0.019	
			(-0.59)				(-0.86)	
NWC/Net Assets			-0.351	***			-0.373	***
			(-5.71)				(-6.34)	
Capex/Net Assets			-0.083				-0.087	
			(-0.74)				(-1.03)	
Leverage			-0.029				-0.031	
			(-0.93)				(-0.86)	
R&D/Sales			1.295	***			1.324	***
			(9.13)				(9.35)	
Dividend Dummy			-0.017				-0.024	
			(-1.44)				(-1.35)	
GIM Index			-0.0007	*			-0.0009	*
			(-1.78)				(-1.82)	
CEO Vega/Delta Ratio			0.057	**			0.063	**
			(2.17)				(2.35)	
Industry and year fixed effect	YES		YES		YES		YES	
N	1716		1006		1716		1006	
Adj. R^2	0.53		0.56		0.54		0.55	

Table 1.7 reports results of the effect of CEO inside debt holdings on cash holdings in two stage least square where in the first stage CEO inside debt holdings are regressed on all independent variables plus instruments and in the second stage cash is regressed on the predicted values of CEO inside debt compensation. All models control for industry and year fixed effect, where industry is defined based on Fama and French

49 industry classification. The dependent variable is the ratio of cash plus marketable securities to net assets, where net assets are total assets minus cash and marketable securities (Cash). The two main independent variables are two measures to proxy CEO inside debt holdings: CEO to firm debt/equity ratio, and a dummy variable with a value of one if CEO to firm debt/equity ratio is larger than one and zero otherwise (CEO to firm debt/equity ratio>1). Control variables are the ratio of CEO vega to the delta (CEO Vega/Delta Ratio), the natural logarithm of net assets (Firm Size), the ratio of the book value of net assets minus the book value of equity plus the market value of equity to the book value of net assets (Market-to-book), the ratio of earnings after interest, dividends and taxes but before depreciation divided by the book value of net assets (Cash flow/assets), the ratio of net working capital to net assets (NWC/assets), the ratio of capital expenditures to the book value of net assets (Capex/assets), the sum of long-term debt and debt in current liabilities divided by the book value of net assets (Leverage), a dummy variable that equals one if regular cash dividends on common stock is positive in a given fiscal year (Dividend payout dummy), the ratio of research and development expense to sales (R&D/sales), the ratio of expenditures on acquisitions to the book value of net assets (Acquisition activity). Detailed definitions of all variables are reported in Appendix A. Sample period is 2006 - 2008. Models One and Two report results where the main explanatory variable is the predicted value of the first measure of CEO inside debt holdings (CEO to firm debt/equity ratio) while Models Three and Four report results where the main explanatory variable is the predicted value of the second measure of CEO inside debt holdings (CEO to firm debt/equity ratio>1). The *t*-statistics are reported in

parentheses. Superscripts *, ** and *** indicate levels of significance of 10%, 5%, and 1%, respectively.

Effect of Cash Increases (Decreases) on Valuation Effect
for Firms with Lower CEO to Firm
Debt/Equity Ratio

I now examine whether cash increases (decreases) have a more positive (negative) valuation effect for firms with lower CEO to firm debt/equity ratio. I employ the Fama and French (1998) valuation regression. This regression has been used in many studies examining valuation effects and is well suited for my purpose as it accounts for cross-section variations in firm value. This total firm value regression approach has been used in many studies examining valuation effect. Pinkowitz and Williamson (2005) use this model to analyze the determinants of the value of cash for domestic firms. Pinkowitz, Stulz, and Williamson (2003) use this model to investigate the valuation effect of cash and dividends for firms in countries with different level of investor protection. Dittmar and Mahrt-Smith (2007) use this model to show that cash is worth less when agency problems between insiders and outsiders are greater. Brockman and Unlu (2009) use this model to test whether dividend reductions (increases) are value increasing (decreasing) for firms in countries with poor creditor rights. Following Pinkowitz, Stulz, and Williamson (2006), I use the modified version of the Fama and French (1998) valuation regression by replacing the two year change in value of variables by one year change in value of variables. The basic regression specification is as follows:

$$\begin{aligned} V_{i,t} = {} & \beta_0 + \beta_1 E_{i,t} + \beta_2 dE_{i,t} + \beta_3 dE_{i,t+1} + \beta_4 dA_{i,t} + \beta_5 dA_{i,t+1} + \beta_6 RD_{i,t} + \beta_7 dRD_{i,t} \\ & + \beta_8 dRD_{i,t+1} + \beta_9 I_{i,t} + \beta_{10} dI_{i,t} + \beta_{11} dI_{i,t+1} + \beta_{12} D_{i,t} + \beta_{13} dD_{i,t} \\ & + \beta_{14} dD_{i,t+1} + \beta_{15} C_{i,t} + \beta_{16} dC_{i,t} + \beta_{17} dC_{i,t+1} + \beta_{18} dV_{i,t+1} + \varepsilon_{i,t} \end{aligned} \quad (1.1)$$

In the above equation (1.1), all variables are scaled by total assets to control for heteroskedasticity (see Pinkowitz, Stulz, and Williamson, 2003; and Brockman and Unlu, 2009). X_t is the level of variable X in fiscal year t scaled by total assets in year t. dX_t is the change in variable X from year t-1 to year t scaled by total assets in year t $((X_t - X_{t-1})/A_t)$. dX_{t+1} is the change in variable X from year t to year t+1 scaled by total assets in year t $((X_{t+1} - X_t)/A_t)$. Firm value is measured by the market value of the firm, which is calculated as the sum of market value of equity and total liabilities at fiscal year end. The independent variables include earnings (E), total assets (A), research and development expenditures (RD), interest expense (I), common dividends (D), cash plus marketable securities (C), and total value of the firm value for year t+1 (V_{t+1}). Earnings are calculated as earnings before extraordinary items, plus interest expense, plus income statement deferred taxes and investment tax credit (if available). A is the book value of total assets. RD is R&D expenditures and is set to zero when missing. I is the interest expense. D is the cash dividends paid to common stock. V is firm's common stock price multiply shares outstanding at the end of fiscal year, plus preferred stock, plus total book liabilities, minus balance sheet deferred taxes and investment tax credit (if available), where preferred stock is taken to be, in order and as available, redemption value, liquidating value, or par value. Notice that this model includes next-period variables to absorb changes in expectations. The primary variable of interest in my study is the contemporaneous relation between firm value and cash plus marketable securities ($C_{i,t}$). This directly measures the valuation effect of current cash plus marketable securities on firm.

Table 1.8 reports the results using a modified version of the Fama and French (1998) valuation regression model. I allow the coefficient estimates and intercept to vary with inside debt in order to estimate how cash plus marketable securities have a different valuation effect for firms with different levels of inside debt. More specifically, in each fiscal year, I create a dummy variable with a value of one for firms with a CEO to firm debt/equity ratio above median and zero otherwise. This dummy variable is further interacted with all the independent variables as well as the constant. Therefore, the coefficient estimates on the interaction term are the additional valuation effect of cash for firms with relative inside debt ratio above median. Cash increases should generate more value for firms with lower relative inside debt ratio. Following Fama and French (1998), I estimate the equation using the Fama-MacBeth (1973) methodology. Models One and Two do not include induce industry effects, while Model Three and Four include industry effects.

Table 1.8

CEO Inside Debt Compensation and Cash Valuations

	(1)			(2)		
	Low inside debt	High inside debt	T-statistics of difference	Low inside debt	High inside debt	T-statistics of difference
E_t	4.39 ***	5.96 ***	3.14 *	4.89 ***	6.31 ***	2.04
	(5.85)	(7.77)		(7.45)	(7.79)	
dE_t	-0.69 ***	-1.23 ***	-0.59	-0.89 ***	-0.49 ***	-0.39
	(-8.11)	(-8.41)		(-12.67)	(-12.48)	
dE_{t+1}	2.63 ***	2.71 ***	0.14	2.56 ***	2.79 ***	0.65
	(6.19)	(6.73)		(7.57)	(7.76)	
dA_t	-0.13	-0.17	-0.24	-0.14	-0.10	0.03
	(-1.15)	(-1.39)		(-0.81)	(-1.09)	
dA_{t+1}	0.55	0.34	-0.51	0.46	0.35	-0.33
	(1.13)	(1.51)		(1.45)	(1.27)	
RD_t	2.23	1.13	-1.10	2.67	2.09	-1.10

Table 1.8 (Continued)

	(1.17)		(1.58)				(1.17)		(1.55)			
dRD_t	-1.45		0.59	*	3.25	*	-1.87		-0.65		0.43	
	(-0.99)		(1.91)				(-1.43)		(-1.58)			
dRD_{t+1}	3.21	**	4.57	**	4.35	*	3.47	**	4.11	**	3.63	*
	(2.39)		(2.45)				(2.17)		(2.46)			
I_t	-11.88	**	-10.83	**	1.47		-12.11	**	-9.09	**	3.31	*
	(-2.20)		(-2.31)				(-2.41)		(-2.28)			
dI_t	5.65		2.79		-0.34		7.16*		3.39	*	-0.39	
	(1.57)		(1.45)				(1.86)		(1.92)			
dI_{t+1}	1.87		5.03*		3.99	*	3.17		3.76		0.13	
	(1.05)		(1.75)				(1.46)		(1.49)			
D_t	3.57*		10.11	***	6.57	**	3.67	**	7.47	***	3.49	*
	(1.73)		(11.35)				(2.37)		(9.56)			
dD_t	-2.49		-3.17		-0.17		-2.52		-2.67		-0.06	
	(-1.57)		(-1.09)				(-1.59)		(-1.22)			
dD_{t+1}	-1.47		1.67	*	4.01	*	-1.78		-3.67		0.45	
	(-1.03)		(1.87)				(-1.35)		(-1.46)			
Ct	9.58	***	4.56	***	-5.18	**	9.78	***	5.52	***	-3.78	*
	(11.19)		(3.68)				(9.77)		(8.32)			
dC_t	3.25		1.77		-2.17		3.13		1.98		-2.06	
	(1.25)		(1.11)				(1.60)		(1.12)			
dC_{t+1}	1.94*		1.36		4.01	*	1.99		1.78		-0.67	
	(1.78)		(1.16)				(1.22)		(1.29)			
dV_{t+1}	-0.36		-0.55		-2.46		-0.24		-0.49		-2.38	
	(-1.24)		(-1.49)				(-1.07)		(-1.47)			
Constant	1.55	***	1.33	***	-13.50	***	1.67	***	1.23	***	-3.79	*
	(18.79)		(14.73)				(10.57)		(9.77)			
Industry fixed effect	No						YES					
N	1756						1756					
r2	0.51						0.6011					

Table 1.8 presents the regression results of cash valuation effect for firms with different level of CEO to firm debt/equity ratio using Fama and MacBeth (1973) methodology. Sample period is 2006-2008. Due to data limitation on Compustat, sample size is reduced to 1,756 firm-year observations. Model One does not include industry fixed effect. Model Two includes industry fixed effect. Industry is defined based on Fama

and French 49 industry classification. X_t is the level of variable X in fiscal year t scaled by total assets in year t. dX_t is the change in variable X from year t-1 to year t scaled by total assets in year t ($(X_t - X_{t-1})/A_t$). dX_{t+1} is the change in variable X from year t to year t+1 scaled by total assets in year t ($(X_{t+1} - X_t)/A_t$). The independent variables include earnings (E), total assets (A), research and development expenditures (RD), interest expense (I), common dividends (D), cash plus marketable securities (C), and total value of the firm value for year t+1 (V_{t+1}). Earnings is calculated as earnings before extraordinary items, plus interest expense, plus income statement deferred taxes and investment tax credit (if available). A is the book value of total assets. RD is $R\&D$ expenditures and is set to zero when missing. I is the interest expense. D is the cash dividends paid to common stock. V is the market value of the firm calculated by multiplying firm's common stock price by shares outstanding at the end of fiscal year, plus preferred stock, plus total book liabilities, minus balance sheet deferred taxes and investment tax credit (if available), where preferred stock is taken to be, in order and as available, redemption value, liquidating value, or par value. The t-statistics are reported in parentheses. Superscripts *, ** and *** indicate levels of significance of 10%, 5%, and 1%, respectively.

The estimated coefficient for low inside debt firms in Model One is positive and significant (9.58). While the estimated coefficient for high inside debt firms is also positive and significant (4.56) in Model One, the positive valuation effect is significantly greater for low inside debt firms relative to high inside debt firms. My results are similar in Model Two which includes firm fixed effects. Overall, my results suggest that cash

changes have a more positive valuation effect for firms with lower level of inside debt than firms with a higher level of inside debt.

Conclusion

In this essay, I examine the effect of CEO inside debt compensation on firms' cash holdings. CEO inside debt compensation mitigates the agency conflicts between debtholders and shareholders by aligning the interests of CEOs with those of debtholders. Two components of CEO inside debt compensation: pension and deferred compensation may mitigate agency conflicts between managers and debt holders (Sundaram and Yermack, 2007; Edmans and Liu, 2011; Wei and Yermack, 2011; Cassell, Huang, Sanchez, and Stuart, 2012). In the language of Jensen and Meckling (1976), "inside debt" represents a fixed obligation for the firm to make future payments to executives. Further, inside debt is typically an unsecured and unfunded liability for the firm. The unsecured and unfunded nature of inside debt exposes managers to the same default risks and insolvency treatment as outside debt holders. This aligns managers with debt holders and may cause managers to manage their firms conservatively (Jensen and Meckling, 1976; Edmans and Liu, 2011).

Cassell, Huang, Sanchez, and Stuart (2012) find that higher levels of CEO inside debt are associated with less risky investment and financial policies. CEOs with higher inside debt may prefer to invest in cash as cash holdings are less risky projects (Tong, 2010). Therefore, based on risk-aversion hypothesis, I posit a positive relation between CEO inside debt holdings and corporate cash holdings. Conversely, CEOs with debt-like compensation bear a lower cost of borrowing (Anantharaman, Fang, and Gong, 2010). This provides firms with easier access to external financing. Similarly, creditors

anticipate that mangers with high inside debt compensation will pursue less risky policies and require fewer covenants limiting their investing, financing, and payout decisions after debt issuance (Anantharaman et al., 2010; Chen, Dou, and Wang, 2010). Thus, based on costly external finance hypothesis (Liu and Mauer, 2011), CEOs with higher inside debt may hold less cash as a hedge for future financing needs.

I examine the effect of CEO inside debt compensation on corporate cash holdings, as measured by the ratio of cash and marketable securities to net assets where net assets is equal to total assets minus cash plus marketable securities, using a sample of EXECUCOMP firms over the period of 2006 to 2008. Specifically, I test whether CEO inside debt is positively or negatively correlated with cash holdings. The main explanatory variable of interest is CEO inside debt holdings. Following previous empirical studies on CEO inside debt holdings (Cassell et al., 2012), I use two measures as proxies for CEO inside debt holdings: 1) CEO to firm debt/equity ratio and 2) an indicator variable equal to one if the CEO to firm debt/equity ratio is greater than one. Utilizing a contemporaneous regression where cash and all independent variables including CEO inside debt holdings are measured at time *t*, I find a positive relation between CEO inside debt holdings and firm cash holdings. I next examine the relation between firm cash holdings and lagged CEO inside debt holdings to mitigate the endogeneity problem and the positive relation between CEO inside debt holdings and firm cash holdings still hold. Further, I use a two-stage regression analysis to explicitly control for the endogeneity problem and I find that the main results of CEO inside debt holdings and firm cash holdings still hold. I next divide the CEO inside debt compensation into two main components: pension and deferred compensation and

examine the effect of these two components on firm cash holdings to find out the main driving channel of the positive relation between CEO inside debt holdings and firm cash holdings. I find that the deferred compensation is the main driving channel behind the positive relation between CEO inside debt compensation and firm cash holdings.

Though CEO inside debt compensation induces CEOs to hold cash, CEOs may face constraints in their ability to hold excess cash. Financial constraint status of the firm is one of the constraining factor and the relation between CEO inside debt holdings and firm cash holdings could depend on whether a firm is financially constrained. CEOs of a financially constrained firms may face difficulty accumulating excess cash as their inside debt compensation goes up since capital is limited. This implies that the positive relation between firm cash holdings and CEO inside debt compensation may be mitigated by financial constraint status of the firm. To examine whether financial constraint status of a firm influences the relation between CEO inside debt compensation and firm cash holdings, I interact CEO inside debt compensation with several variables that proxy for the degree to which a firm is financially constrained. I find significant negative coefficients on the interaction terms which imply the mitigating role of financial constraint status of the firm on the positive relation between firm cash holdings and CEO inside debt holdings.

Following Cassell et al. (2012), I construct the ratio of the vega (the sensitivity of the value of the CEO's accumulated equity-based compensation to a one percent change in the volatility of stock prices) to delta (the sensitivity of the value of the CEO's equity-based compensation to one percent change in the stock price) to control for the effects of equity-based incentives on CEO risk-taking preferences and corporate cash holdings. I

include CEO vega/delta ratio in all regressions as a control variable and find a positive relation between CEO inside debt and firm cash holdings. My empirical finding that firm cash holdings are increasing in CEO inside debt compensation mimics the findings of Liu and Mauer (2011) who investigate the effect of CEO equity-based incentives on firm cash holdings. In their study, Liu and Mauer (2011) document a positive relation between equity-based incentives as measured by the sensitivity of equity compensation to volatility (vega) and firm cash holdings. I examine these separate effects by including both CEO inside debt compensation and vega in the cash regression and find that the positive effect of CEO inside debt holdings on firm cash holdings remains significant even after controlling for the effect of vega.

Finally, I examine whether cash increases (decreases) have a more positive (negative) valuation effect for firms with lower CEO inside debt. Following Pinkowitz, Stulz, and Williamson (2006), I use a modified version of the Fama and French (1998) valuation regression. I find that cash increases have a more positive valuation effect for firms with low levels of CEO inside debt relative to those with high levels of CEO inside debt.

This study makes several contributions to the literature. First, prior studies on executive compensation focus on equity-based (stocks and stock-options) and fixed (salary and bonus) compensation, while few studies examine debt-like compensation. This paper extends the literature which investigates the incentive effects of various components of CEO wealth, particularly CEO equity holdings (Guay, 1999; Rajgopal, and Shevlin, 2002; Coles, Daniel, and Naveen, 2006). Focusing on a different component

of CEO compensation, inside debt, this study provides evidence of the effect CEO inside debt compensation on corporate cash holdings.

Second, this study contributes to a nascent literature on executive compensation which investigates the theoretical prediction that inside debt mitigates agency costs of debt by strengthening the alignment of CEO and debtholder incentives (Jensen and Meckling, 1976; Edmans and Liu, 2011). To date, extant research (Anantharaman, Fang, and Gong, 2010; Chen, Dou, and Wang, 2010; Wang, Xie, and Xin, 2011; Wei and Yermack, 2011; Francis and Yilmaz, 2012; He, 2011) has focused on market-based implications of CEO inside debt holdings (e.g. reduced cost of debt, fewer restrictive debt covenants, market reactions after initial disclosures of CEO inside debt compensation, financial reporting quality, etc.). In contrast, this study provides direct evidence of the effect of CEO inside debt on firm investment and financial policies by examining the relation between CEO inside debt compensation and corporate cash holdings. Further, I extend Cassell et al., (2012), who look at the effect of CEO inside debt holdings on firm investment and financial policies, by investigating the effect of CEO inside debt on corporate cash holdings.[11]

Finally, this study adds to the corporate cash holdings literature by documenting the effect of CEO inside debt compensation on corporate cash holdings. Prior literature documents several motives for firms to hold cash[12]: the transaction motive, the precautionary motive, the tax motive, and the agency motive. The literature on corporate

[11] Cassell et al. (2012) find a positive relation between CEO inside debt and asset liquidity, measured by working capital. In my sample for this study, the correlation between working capital and firm cash holdings is not significant.

[12] See Bates, Kahle, and Stulz, 2009 for details about why firms hold cash.

cash holdings empirically examines agency theory by viewing cash holdings as a source of financing. My study contributes to the agency motive view of corporate cash holdings literature by focusing on the investment perspective of cash holdings and by exploring the link between CEO inside debt and corporate cash-holdings.

CHAPTER 2

CEO INSIDE DEBT: IS THERE A RELATION BETWEEN POST MERGER FIRM RISK AND CEO INSIDE DEBT?

Introduction

The separation of ownership and control in the modern corporation may lead to agency conflicts between principals (shareholders and debtholders) and agents (managers) (Jensen and Meckling, 1976). That is, managers may not always allocate corporate resources in ways that maximize shareholder wealth. Managers may also engage in activities that reallocate wealth from debtholders to shareholders.

Pension and deferred compensation, inside debt, may mitigate agency conflicts between managers and debt holders (Sundaram and Yermack, 2007; Edmans and Liu, 2011; Wei and Yermack, 2011; Cassell, Huang, Sanchez, and Stuart, 2012). In the language of Jensen and Meckling (1976), "inside debt" represents a fixed obligation for the firm to make future payments to executives. Further, inside debt is typically an unsecured and unfunded liability for the firm. The unsecured and unfunded nature of inside debt exposes managers to the same default risks and insolvency treatment as outside creditors. This aligns managers with debt holders and may cause CEOs to manage their firms conservatively (Jensen and Meckling, 1976; Edmans and Liu, 2011).

Inside debt may also influence managerial incentives to pursue diversifying mergers (Sundaram and Yermack, 2007). This paper attempts to answer whether higher CEO inside debt causes CEO to diversify firm operations and reduce firm risk by examining the effect of CEO inside debt compensation of post-merger firm risk.

Agency conflicts between managers and shareholders occur when managers do not allocate corporate resources in ways that maximize shareholder wealth. For example, a primary agency conflict between managers and shareholders involves the overinvestment of free cash flows – managers may choose to invest in negative net present value projects. Prior literature in executive compensation suggests that equity-based compensation act as a vehicle to resolve the conflicts of interests between managers and shareholders. For example, prior studies suggest that stock and stock options of CEO compensation encourage risk-averse CEOs to manage their firms in ways that benefit shareholders (Guay, 1999; Coles, Daniel, and Naveen, 2006; Low, 2009).

Agency conflicts between managers (or managers acting for shareholders) and debt holders occur when managers increase firm risk in ways that benefit shareholders at the expense of debt holders. Debt holders and shareholders have different payoff structures – debt holders are fixed claimants to firm assets while shareholders are residual claimants. Once debt is issued, shareholders may increase the value of their residual claims at the expense of debt holders. For instance, shareholders may increase the risk of the firm by changing investment or financial policies (asset substitution or risk shifting) in ways that reallocate wealth from debt holders, generally through some increase in the overall risk of the firm (Jensen and Meckling, 1976; Dewatripont and Tirole, 1994). Similarly, excessive risk-taking by CEOs through M&As may transfer wealth from debt

holders to shareholders by decreasing assets available for meeting fixed claims which increases default risk. Equity-based compensation may motivate managers to increase overall firm risk through M&As. For instance, Datta, Datta, and Raman (2001) find a positive relation between equity-based compensation and the change in stock return volatility of the acquirers.

Thus, while equity-based compensation mitigates agency conflicts between managers and shareholders, equity-based compensation may exacerbate agency conflicts between managers and debt holders by motivating CEOs to take excessive risk at the expense of debtholders. Higher managerial inside debt serves to alleviate agency conflicts between managers and debt holders by aligning mangers with debt holders. For example, Cassell, Huang, Sanchez, and Stuart (2012) find that higher levels of CEO inside debt are associated with less risky investment and financial policies. With respect to M&As, this suggests that CEO inside debt compensation may mitigate excess risk taking by CEOs.

To examine the effect of CEO inside debt on alleviating agency costs to debtholders, I use a sample of mergers and acquisitions (M&As). M&As are regarded as one of the firm's major, externally observable investing decisions and this is especially true given large capital commitments. In 2007, the aggregate deal value for acquisitions of US targets was $1.37 trillion, while aggregate capital expenditure activity was $1.85 trillion. This suggests that acquisition activity represents a large proportion of corporate investment (Garfinkel and Hankins, 2011).

There are at least two strong reasons why M&As offer a useful opportunity to test the effect of CEO inside debt on managerial risk-taking behavior. First, M&As represent discretionary risk-taking by CEOs and so, M&A activity can dramatically alter the risk

profile of the firm by altering the asset structure. Second, M&As may be a possible source of agency conflicts between managers and principals (shareholders and debtholders) even though M&As create value through the acquisition of undervalued assets or synergy. For example, agency costs occurring as a result of overinvestment by acquiring firms are often explained by the free cash hypothesis (Jensen, 1986; Lang, Stulz, and Walking, 1991) and the hubris hypothesis (Roll, 1986). Further, due to their complexity, M&As are often sources of information asymmetry problems, a necessary condition for agency problems.

I examine the effect of CEO inside debt compensation on post-merger firm risk, as measured by the change in pre and post-merger distance-to-default risk, using acquiring firm risk changes over the period of 2007 to 2009. Following prior literature on CEO inside debt holdings (Cassell et al., 2012), I use the following two measures as proxies for CEO inside debt compensation: (1) the CEO to firm debt/equity ratio, which is calculated as the CEO's debt/equity ratio scaled by the firm's debt to equity ratio and 2) an indicator variable equal to one when the CEO to firm debt/ equity ratio is greater than one. I utilize four alternative measures to proxy for post-merger firm risk: the change in pre and post-merger distance-to-default risk calculated by a naïve alternative of the Merton distance-to-default model developed by Bharath and Shumway, 2008; the change in pre and post-merger default risk as calculated by the Altman bankruptcy prediction model (Altman, 1968); change in total firm risk measured as post-merger minus pre-merger stock return standard deviation in percentage; and change in idiosyncratic risk measured as post-merger minus pre-merger standard deviation of return residuals in percentage estimated by the single factor market model.

I find a significant negative relation between post-merger firm risk, as measured by change in total firm risk, measured as post-merger minus pre-merger stock return standard deviation in percentage, and change in idiosyncratic risk, measured as post-merger minus pre-merger standard deviation of return residuals in percentage estimated by the single factor market model and CEO inside debt holdings as measured by the CEO to firm debt/equity ratio. CEO compensation is not exogenously given but determined by the contracting environment and so, concern for endogeneity comes into the picture which may make my findings spurious. I adopt the instrumental variable approach to address the endogeneity problem. My main findings still hold after endogeneity bias corrections. I find insignificant negative relations between CEO inside debt holdings other two measures of post-merger firm risk: the change in pre and post-merger distance-to-default risk calculated by a naïve alternative of the Merton distance-to-default model developed by Bharath and Shumway, 2008, and the change in pre and post-merger default risk as calculated by the Altman bankruptcy prediction model (Altman, 1968).

I make several contributions to the literature. First, prior studies on executive compensation focus primarily on equity-based (stocks and stock-options) and fixed (salary and bonus) compensation, while studies on debt-like compensation are limited due to data availability.[13] This paper extends the literature by focusing on a different component of CEO compensation, inside debt. Second, this study provides a contribution to a nascent literature on executive compensation which investigates the theoretical prediction that inside debt mitigate agency costs of debt by strengthening the alignment

[13] CEO inside debt compensation is available only from 2006 fiscal year as effective for 2006 fiscal year-ends, the SEC issued a requirement that firms disclose their CEOs' inside debt positions.

of CEO and debtholder incentives (Jensen and Meckling, 1976; Edmans and Liu, 2011). Further, I extend Phan (2013), who looks at the relation between CEO inside debt and M&As, by investigating the relation between post-merger risk and CEO inside debt holdings. I also extend Liu, Mauer, and Zhang (2012), who look at the effect of CEO inside debt on firms' incentives to pursue diversifying acquisitions, by examining whether CEO inside debt reduces firm risk after M&As. Finally, this study adds to the M&A literature by documenting the effect of CEO inside debt compensation on post-merger firm risk. This is important because prior literature only examines the relation between CEO equity-based compensation and M&A (e.g., Datta, Datta, and Raman, 2001; Benson, Park and Davidson, 2011).

The remainder of this essay is organized as follows. I motivate my research, review the literature, and develop my hypotheses, provide an overview of sample selection and variables used in this study, methodology, and a description of my sample, discusses empirical results and finish with a conclusion to the second essay.

Literature Review

Mergers and Acquisitions (M&As) and Agency Costs

Merger and acquisition decisions create opportunities that can intensify the inherent conflicts of interests between managers and shareholders (Jensen and Meckling, 1976). Numerous studies find that corporate merger and acquisition decisions are often related to agency conflicts. These studies recognize possible links between mergers and managerial self-interest. It is well recognized that managers do not always make shareholder value-maximizing acquisitions.

Jensen (1986) suggests that the free cash flow hypothesis can be used to understand overinvestment by acquiring firms. Jensen (1986) document that conflicts of interest between agents and owners are especially severe when the firm generates substantial free cash flow, the cash flow in excess of that required to fund all projects that have positive net present values when discounted at the relevant cost of capital. The free cash flow hypothesis argues that managers realize large personal gains from empire building. Firms with abundant free cash flows but few profitable investment opportunities are more likely to make value-destroying acquisitions than to return the excess cash flows to shareholders. Lang, Stulz, and Walkling (1991) provide empirical evidence supporting the free cash flow hypothesis using a sample of firms that decide to acquire control of other firms through tender offers. Roll (1986) presents a hubris hypothesis to explain overinvestment by acquiring firms. According to the hubris hypothesis, managers overestimate the value of what they buy and so, most of the times, they simply overpay. Morck, Shleifer, and Vishny (1990) document that several corporate acquisitions seem to be governed by the desire of managers to switch into businesses with long term growth potential even when the managers have no special expertise in running such businesses when the value maximizing strategy should be to distribute free cash flows to shareholders. Morck et al. (1990) recognize several types of acquisitions including diversifying acquisitions and acquisitions of high growth targets that can yield substantial benefits to managers, while at the same time hurting shareholders. Recently, Masulis, Wang and Xie (2007) focus on corporate acquisition decisions and find that bidders with more antitakeover provisions experience significantly lower abnormal returns around acquisition announcements. The empirical results support the hypothesis that managers

protected by more antitakeover provisions face weaker discipline from the market for corporate control and so, tend to indulge in empire building acquisitions that destroy shareholder returns.

Conversely, studies suggest that M&As may increase bondholder wealth through the co-insurance effect as the probability of default decreases when the assets and liabilities of two firms are combined through M&As as compared to the likelihood of default in individual firms (Levy and Sarnat, 1970; Lewellen, 1971; Higgins and Schall, 1975). The co-insurance effect suggests that diversifying M&As are beneficial to bondholders because existing risky debt is spread across the new firm's operations which have imperfectly correlated cash flows. Billet, King, and Mauer (2004) investigate the wealth effects of M&As on target and acquirer bondholders during 1980s and 1990s and find that below investment grade bonds of target firms earn significantly positive announcement period returns in support of co-insurance effect. On the other hand, Shastri (1990) note that merged firm bondholders may either gain from co-insurance effect or lose from expropriation effect when merging firms may have different leverage ratios, risk levels, and debt maturities. Datta, Datta, and Raman (2001) note that if CEO compensation is biased toward equity, acquirers tend to select riskier targets with higher growth opportunities and acquirers become riskier following the M&A deals. This suggests that during M&As CEO may engage in activities to increase firm risk beyond that which debtholders prefer and this, in turn, leads to agency conflicts between debtholders and managers or managers acting for shareholders.

Inside Debt Compensation as a Means to Reduce Agency Costs of Debt

Many CEOs in the US hold significant amounts of pay in the form of defined benefit pension plans and deferred compensation (Sundaram and Yermack, 2007; Wei and Yermack, 2011). These forms of executive compensation are defined as inside debt (in the language of Jensen and Meckling (1976)) as this compensation represents a fixed obligation for the firm to make future payments to corporate insiders. Inside debt compensation are unsecured and unfunded, exposing CEOs to the same default risks and insolvency treatment as outside creditors. Therefore, CEO inside debt compensation can be used as a vehicle to mitigate the agency costs of debt (Sundaram and Yermack, 2007; Edmans and Liu, 2011; Wei and Yermack, 2011; Lee and Tang, 2011; Cassell et al., 2012).

Agency costs of debt occur when managers vary the firm's investment policy, payout policy, or capital structure in ways that reallocate wealth from debtholders to stockholders, generally through some increase in the overall risk of the firm (Jensen and Meckling, 1976; Dewatripont and Tirole, 1994). To alleviate the agency costs of debt, Jensen and Meckling (1976) recommend implementing an optimal incentive structure under which the CEO's personal holdings of the firm's debt and equity ratio is similar to the firm's overall capital structure. Based on agency theory, studies on CEO inside debt compensation find that CEOs with higher inside debt holdings prefer less risky investment and financial policies (Cassell et al., 2012). Sundaram and Yermack (2007) find that as the value of a CEO's pension increases relative to the value of her equity holdings, risk taking, as measured by distance-to-default declines. Wei and Yermack

(2011) examine stockholder and bondholder reactions to firms' initial reports of their CEOs' inside debt positions in early 2007 when new SEC disclosure rules took effect. The authors find that bond prices rise, equity prices fall, and the volatility of both securities drops upon disclosures by firms where the CEO has a sizeable defined benefit pension or deferred compensation. This suggests that inside debt may reduce firm risk and transfer wealth from equity toward debt. This is also consistent with the idea that investors anticipate less risk taking by managers with higher levels of inside debt.

Several recent studies also find a negative relation between CEO inside debt holdings and the cost of debt (Anantharaman et al., 2010; Chen, Dou, and Wang, 2010; Wang, Xie, and Xin, 2011). When compensation packages of CEOs consist of both inside debt compensation and equity-based compensation, CEO incentives vary with the relative importance of debt versus equity based compensation in the pay structure (inside leverage of the CEO). The higher a CEO's inside leverage relative to firm leverage (the CEOs' relative leverage), the more closely the CEO's incentives are aligned with debtholders vis-à-vis shareholders and the lesser the degree to which CEO engages in risk-seeking behavior to damage debt holders wealth (Edmans and Liu, 2011). Anantharaman et al., 2010 argues that if debtholders realize the incentive effects of CEO inside debt holdings, firms providing CEOs with higher relative leverage should bear a lower borrowing cost and fewer covenants. Utilizing a sample of private loans originated during 2006-2008, they find that higher CEO relative leverage is associated with lower cost of debt financing and fewer restrictive covenants. Wang et al., 2011 posit that banks demand lower yield spreads and less strict terms on loans to firms where CEOs have large inside debt holdings. Using a sample of 1,280 loan facilities for 676 unique firms originated for

the period of 2007 to 2010, they find that banks charge lower yield spreads on loans when CEOs of those firms hold larger inside debt holdings. Empirical evidence also shows that loans to firms providing CEOs with larger inside debt holdings are associated with fewer covenant restrictions. This is consistent with the view that debtholders anticipate lower expropriation risk by firms with larger CEO inside debt holdings. For instance, Chen, Dou, and Wang (2010) find that public debtholders charge lower interest rates to the firms providing CEOs with more inside debt. In addition, they find that the level of CEO inside debt holdings exhibits a negative relation with restrictive debt covenants.

Hypothesis Development

As such, CEO inside debt compensation may perform an essential alignment role between CEOs and debtholders by reducing CEOs' excessive risk-taking incentives. Higher managerial inside debt serves to alleviate agency conflicts between managers and debt holders by aligning mangers with debt holders. For example, Cassell, Huang, Sanchez, and Stuart (2012) find that higher levels of CEO inside debt are associated with less risky investment and financial policies. CEOs can also reduce the riskiness of their firms' operations by diversifying firms' operations among different industry segments (Amihud and Lev, 1981; Coles, Daniel, and Naveen, 2006). Further, Cassell et al. (2012) expect that CEO with large inside debt holdings diversify firm operations since diversified firm faces a reduced exposure to bankruptcy. Based on prior literature, I conjecture that, all else being equal, CEO inside debt is associated with a risk management strategy in M&As. Large CEO inside debt holdings may motivate CEOs to engage in diversifying M&A in order to reduce firm risk. Consistent with the evidence

that CEO inside debt compensation motivates CEOs to engage in less risky investment and financial decisions, I expect that there exists a negative relation between post-merger firm risk and CEO inside debt compensation.

H_1: The post-merger risk is decreasing in CEO inside debt holdings.

The implies that CEOs with higher inside debt compensation are more aligned with debtholders and so, they are more likely to conduct less risky M&As that are more likely to benefit debtholders.

Sample Selection and Data

Sample Selection

I obtain the initial sample of corporate acquisitions from Securities Data Corporation (SDC). I focus only on acquisitions of United States (U.S.) targets to reduce the potential effect of risks of targets' domicile countries on my empirical tests. My initial sample includes M&As announced between 2007 and 2009. 2007 marks the beginning of the sample period because 2006 is the first year that EXECUCOMP reports CEO pension and deferred compensation information. The Securities and Exchange Commission (SEC) required all firms to expand executive compensation disclosure effective in 2006 fiscal year end. Following conventions in the M&A literature, I require that the sample satisfy the following criteria: (1) the deal should be completed, (2) the transaction value needs to be at least one million dollars, (3) The acquirer controls less than 50% of the shares of the target at the time of the announcement and obtains 100% of the target shares, and (4) necessary information on each transaction should be available. Necessary information includes transaction date, types (merger vs. tender offer). I match this initial data with COMPUSTAT for accounting data and Center for Research in

Securities Prices (CRSP) for stock price data. I then merge the sample with compensation information from Standard and Poor's EXECUCOMP database. EXECUCOMP includes annual compensation data from proxy statements for the five highest paid executives for firms in the S&P 500, the S&P MidCap 400, and the S&P SmallCap 600.

Following prior literature, I exclude all financial firms (SIC codes 6000-6999) as liquidity is hard to access in these firms. I also exclude all utility firms (SIC codes 4900-4999) due to their unique regulatory environment. My final sample does not include all-equity acquirers (zero debt) or acquires having missing debt as CEO to firm debt/equity ratio cannot be computed for these firms. This may raise a question if CEO inside debt compensation does not matter for all-equity firms. Sundaram and Yermack (2007) argue that the incentive impact of debt and equity holdings of CEOs depends on the capital structure of the firm. When a firm has debt and equity in its capital structure, then the CEO tends to shift risk from shareholders to debtholders if the CEO has only equity holdings in the firm. Compensating CEOs with pension and deferred compensation aligns interests of CEOs with that of debtholders which in turn, reduces agency costs of debt. CEO inside debt compensation impacts on decision-making by CEOs only when firm has debt in the capital structure. Therefore, CEO inside debt compensation does not matter for all-equity firms as risk shifting from shareholders to debtholders by CEOs does not happen for these firms.

Some acquirers in my sample made more than one M&A announcement in a year. To rule out the possibility that empirical results can be driven by serial M&As pursed by these acquirers, I keep only the earliest merger pursued by each acquirer in a given year.

After deleting firms with missing values for explanatory variables, I have a final matched sample of 330 deals from 2007 to 2009.

Variable Descriptions

The primary dependent variable is post-merger equity risk. The primary independent variable is CEO inside debt holdings. I also include several additional control variables that are related to both M&A and CEO inside debt holdings. Appendix B provides a precise description of all the variables utilized in my analysis.

Post-Merger Equity Risk

I am planning to use the difference in distance-to default before and after the merger as the main dependent variable. The change in the distance-to-default of a firm is utilized as an indicator to show if the M&A increase the value of the firm and as a consequence the distance-to-default became larger. The distance-to-default will be calculated before and after the merger year where the merger year is the year when the merger became effective. The difference between the resulting numbers will be the dependent variable. I will utilize a naïve alternative of the Merton distance-to-default model (developed by Bharath and Shumway, 2008) to calculate the distance-to-default before and after the merger. The method is as described below:

First, the market value of equity, the face value of debt, the volatility of stock returns and the risk-free rate are obtained. The market value of a firm's equity is measured as the product of the acquirer's share price and the number of shares. The face value of debt is calculated as the sum of current liabilities and one half of the company's long-term debt, following Bharath & Shumway (2008) and Vassalou & Xing (2004). The volatility of stock returns is estimated by calculating the annualized percent standard

deviation of returns using prior monthly stock return data from the CRSP database. Last, the acquirer's stock return over the year previous to the M&A is generated. The derived inputs are then used to calculate the missing variables which are the volatility of the firm's debt, the total firm volatility and finally the naïve distance-to-default. The following formulas based on Bharath and Shumway (2008) are used to calculate the distance-to-default:

Volatility of each firm's debt

Naïve $\sigma D = 0.05 + 0.25*\sigma E$

Total volatility of the firm

Naïve $\sigma V = (E / E + \text{naïve } D)*\sigma E + (\text{naïve } D / E + \text{naïve } D)*\text{naïve } \sigma D$

$= (E / E + F)*\sigma E + (F / E + F)*(0.05 + 0.25*\sigma E)$

Naïve distance-to-default

Naïve DD $= [ln((E + F)/F) + (r_{it-1} - 0.5 \text{ naïve } \sigma_v^2)T] / \text{naïve } \sigma_v\sqrt{T}$ *(Equation 12 of* Bharath and Shumway (2008) paper)

Altman Bankruptcy Prediction Model (Altman, 1968) is used as an alternative model to measure a firm's default risk. Altman bankruptcy prediction model classifies a firm as bankrupt if it yields a z-score below 1.8 (Altman, 1968) and a firm is likely to be financially sound if the Z-score of the firm is greater than 2.99. Following prior M&A study, the Altman Z-Score is calculated using the equation given below:

$$Z = 1.2X1 + 1.4X2 + 3.3X3 + 0.6X4 + 0.999X5$$

where X1 = working capital / total assets

X2 = retained earnings / total assets

X3 = earnings before interest and tax / total assets

X4 = market value of equity / book value of total debt

X5 = sales / total assets

Further following prior literature on CEO compensation and M&A, my study will utilize another two measures to proxy for post-merger firm risk: change in total firm risk measured as post-merger minus pre-merger stock return standard deviation in percentage and change in idiosyncratic risk measured as post-merger minus pre-merger standard deviation of return residuals in percentage estimated by the single factor market model. I use daily stock returns for the standard deviation calculation but non-tabulated results using monthly return volatilities are similar to my main findings.

CEO Inside Debt Holdings

The primary explanatory variable is CEO inside debt holdings measured at the end of the fiscal year (t-1) relative to the M&A announcement. Following prior literature on CEO inside debt holdings (e.g., Cassell et al., 2012), I use two measures for CEO inside debt holdings: 1) the CEO to firm debt/equity ratio and 2) an indicator variable equal to one when the CEO to firm debt/ equity ratio is greater than one. The first measure, the CEO to firm debt/equity ratio, is calculated as the CEO's debt/equity ratio scaled by the firm's debt to equity ratio. The CEO's debt/ equity ratio is calculated as CEO inside debt holdings scaled by CEO equity holdings. CEO inside debt holdings are calculated as the sum of the present value of accumulated pension benefits and deferred compensation. CEO equity holdings are calculated as the value of both stock and stock options held by the CEO, where the value of stock is calculated by multiplying the number of shares held by the stock price at the firm's fiscal year end and the value of option is calculated by multiplying the total option delta (using the Black-Scholes (1973))

by the stock price at the firm's fiscal year end. Firm debt is the sum of current and long-term debt. Firm equity is the product of shares outstanding and the stock price at the firm's fiscal year end. My second measure is an indicator variable equal to one when the CEO to firm debt/ equity ratio is greater than one (i.e. the CEO is more levered than the firm), and zero otherwise.

Control Variables

CEO compensation incentives. I include additional control variables to proxy for CEO compensation incentives that influence post-merger firm risk. Following prior literature (for example, Guay, 1999; Core and Guay, 2002; Coles, Daniel, and Naveen, 2006), I measure CEO compensation incentives by the sensitivity of CEO wealth to stock return volatility (vega) and the sensitivity of CEO wealth to stock price (delta). Following prior literature on CEO inside debt (for example, Cassell et al., 2012), I construct the ratio of the vega to delta (CEO vega/delta ratio) to control for the effects of equity-based incentives on CEO risk-taking preferences. I adjust the CEO vega/delta ratio by multiplying it by the ratio of total CEO equity holdings to CEO inside debt to capture the relative importance of the CEO's accumulated equity holdings.[14]

Firm-specific control variables. I include several control variables based on the previous M&A literature and CEO inside debt literature. Following Sundaram and Yermack (2007), I control for firm size (the log of total assets) and leverage (long-term debt/total assets) because default risk is generally large for small firms and highly leveraged firms. Jensen (1993) argues that monitoring of high-growth firms is costly while Fama and Jensen (1983) propose that firms with higher stock return volatility have

[14] If CEO equity holdings are large (small), the effect of the CEO vega/delta ratio is likely to be large (small).

higher levels of information asymmetry. Following prior literature (Berger and Ofek, 1995; Denis, Denis, and Yost, 2002), I include Tobin's Q, the level of R&D expenditures (R&D/total assets), the level of advertising expenditures (adverting expense/ total assets), capital expenditures (capital expenditures/sales), and prior total firm risk to proxy for growth opportunities and information asymmetry. The relation between CEO inside debt compensation and post-merger firm risk may also depend on the characteristics of the merger transaction. Following Benson, Park and Davidson (2011), I include a dummy variable equal to one if the acquisition is financed entirely with stock (Stock Dummy) and the ratio of transaction value to acquirer's market value of equity (Deal Ratio).

Methodology

I examine the effect of CEO inside debt compensation on post-merger firm risk in this section. I begin by employing multivariate regressions of post-merger firm risk on CEO inside debt compensation. To examine the effect of CEO inside debt holdings on post-merger firm risk I employ the following model:

$$DID_{i,t+1} = \alpha + \beta_1 (CEO\ inside\ debt\ compensation)_{i,t-1} + \beta_k (controls)_{i,t-1} + \beta_i \sum(2\text{-}digit\ SIC\ dummy\ variables)_i + \beta_y \sum(year\ dummy\ variables)_t + \varepsilon_{it}$$

As CEO compensation is not exogenously given but determined by the contracting environment, there is a concern for endogeneity. The estimated coefficients in my regressions may be biased as CEO compensation is endogenously formed. The main problem of my analysis is that there can be omitted firm characteristics and CEO characteristics that affect both CEO compensation and the firm's M&A decisions. Therefore, after presenting multivariate regressions of post-merger firm risk on CEO

inside debt compensation, I adopt an instrument variable (IV) approach to address the endogeneity problem.

Descriptive Statistics

Table 2.1 presents summary statistics for the full sample. All continuous variables are winsorized at upper and lower 1% of the sample distribution to address potential problems associated with extreme observations. Panel A of Table 2.1 provides the distribution of the sample firms across years. The number of M&A deals decreases from 135 in 2007 to 85 in 2009, which coincides with the recent financial crisis in US.

Panel B of Table 2.1 reports descriptive statistics of acquirer firm. I find that the mean (median) acquirer CEO to firm debt/equity ratio is 2.034 (0.273). The mean (median) CEO to firm debt/equity ratio>1 is 0.353 (0.000) indicating that CEO's debt-to-equity ratio is less than firm's debt-to-equity ratio for the majority of my sample firms.

Table 2.1

Summary Statistics

Panel A: Sample Distribution by Year

year	Frequency	Percent
2007	135	40.91
2008	110	33.33
2009	85	25.76
Total	330	100

Table 2.1 (Continued)

Panel B: Summary Statistics

	N	Mean	Std.Dev	P25	Median	P75
CEO to firm debt/equity ratio	330	2.034	5.891	0.000	0.273	1.459
CEO to firm debt/equity ratio >1	330	0.353	0.417	0.000	0.000	1.000
Firm Size	330	8.131	1.685	7.092	8.269	9.594
Leverage	330	0.231	0.147	0.178	0.203	0.305
Tobin's Q	330	2.379	3.896	0.893	1.397	2.584
R&D/Total Assets	330	0.042	0.063	0.000	0.016	0.069
Adv./Total Assets	330	0.011	0.034	0.000	0.000	0.005
CAPEX/Sales	330	0.079	0.141	0.024	0.046	0.076
Deal Ratio	330	0.143	0.162	0.019	0.081	0.184
CEO Vega/Delta Ratio	330	0.294	0.317	0.072	0.196	0.461

Table 2.1 presents descriptive statistics of my sample. Variables include the natural log of one plus the ratio of CEO's debt-to-equity ratio (CEO to firm debt/equity ratio), a dummy variable that equals one if CEO to firm debt/equity ratio is larger than one and zero otherwise (CEO to firm debt/equity ratio>1), the ratio of CEO vega to the delta (CEO Vega/Delta Ratio), the natural logarithm of net assets (Firm Size), the sum of long-term debt and debt in current liabilities divided by the total assets (Leverage), the ratio of capital expenditures to sales (CAPEX/Sales), the ratio of research and development expense to total assets (R&D/sales), the ratio of advertising expense to total assets (Adv./Total Assets), the ratio of market value of the equity plus the book value of debt to the total assets (Tobin's Q) and the ratio of transaction value to acquirer's market value of equity (Deal Ratio). Detailed definitions of all variables are reported in Appendix B. Data are obtained from SDC, COMPUSTAT, CRSP and EXECUCOMP and consist of 330 deals from 2007 to 2009. Panel A reports sample distribution by year. Panel B reports descriptive statistics of independent variables utilized in this study.

Empirical Results

I examine the effect of CEO inside debt compensation on post-merger firm risk in this section. I begin by employing multivariate regressions of post-merger firm risk on CEO inside debt compensation.

Effect of CEO Inside Debt Holdings on Post-Merger Firm Risk, Measured by Bharath and Shumway (2008) Distance-to-Default Model

I begin by examining the effect of CEO inside debt compensation on post-merger firm risk. It is noteworthy to mention that distant-to-default increases for 99 firms out of 330 firms while distance-to-default deceases for other 231 firms after the M&A. Following prior studies on M&A and CEO compensation, I examine the effect of lagged CEO inside debt compensation of post-merger firm risk to control for potential endogeneity of compensation incentives. Table 2.2 reports the results of multivariate regressions with controls for industry and year fixed effect. Models One and Two report results for the full sample where the main explanatory variable is the first measure of CEO inside debt holdings, CEO to firm debt/equity ratio. Models Three and Four include the alternative measure of CEO inside debt holdings, CEO to firm debt/equity ratio>1.

Table 2.2

The Effect of CEO Inside Debt Holdings on Post-Merger Firm Risk, Measured by Bharath and Shumway (2008) Distance-to-Default Model

	(1)	(2)		(3)	(4)	
CEO to firm debt/equity ratio	-0.0193	-0.0074				
	(-0.22)	(-0.61)				
CEO to firm debt/equity ratio>1				-0.0102	-0.0045	
				(-0.80)	(-0.97)	
Firm Size		-0.461			-0.445	
		(-0.59)			(-0.52)	
Leverage		15.37	***		15.59	***

Table 2.2 (Continued)

	(2.93)		(2.78)	
Tobin's Q	27.13	***	27.37	***
	(14.21)		(13.44)	
R&D/Total Assets	0.0451	***	0.0476	***
	(3.62)		(3.85)	
Adv./Total Assets	-0.0001		-0.0002	
	(-0.27)		(-0.19)	
CAPEX/Sales	0.013	***	0.015	***
	(2.71)		(2.95)	
Stock Dummy	-0.769	**	-0.834	**
	(-2.08)		(-2.19)	
Deal Ratio	0.007		0.006	
	(0.33)		(0.47)	
CEO Vega/Delta Ratio	0.0004		0.0002	
	(0.63)		(0.51)	
Industry and year fixed effect	YES	YES	YES	YES
N	330	330	330	330
Adj. R^2	0.27	0.34	0.24	0.31

Table 2.2 reports results of the effect of CEO inside debt holdings on post-merger firm risk, measured as the difference in distance-to default before and after the merger utilizing a naïve alternative of the Merton distance-to-default model (developed by Bharath and Shumway, 2008). All models control for industry and year fixed effect, where industry is defined based on Fama and French 49 industry classification. The dependent variable is the change in distance-to-default before and after the merger. The two main independent variables are two measures to proxy CEO inside debt holdings: CEO to firm debt/equity ratio, and a dummy variable with a value of one if CEO to firm debt/equity ratio is larger than one and zero otherwise (CEO to firm debt/equity ratio>1). Control variables are the ratio of CEO vega to the delta (CEO Vega/Delta Ratio), the natural logarithm of net assets (Firm Size), the sum of long-term debt and debt in current liabilities divided by the total assets (Leverage), the ratio of capital expenditures to sales

(CAPEX/Sales), the ratio of research and development expense to total assets (R&D/sales), the ratio of advertising expense to total assets (Adv./Total Assets), the ratio of market value of the equity plus the book value of debt to the total assets (Tobin's Q), a dummy variable that equal to one if the acquisition is financed entirely with stock (Stock Dummy) and the ratio of transaction value to acquirer's market value of equity (Deal Ratio). Detailed definitions of all variables are reported in Appendix B. Sample period is 2006 - 2010. Models One and Two report results where the main explanatory variable is the first measure of CEO inside debt holdings (CEO to firm debt/equity ratio) while Models Three and Four report results where the main explanatory variable is the second measure of CEO inside debt holdings (CEO to firm debt/equity ratio>1). The *t*-statistics are reported in parentheses. Superscripts *, ** and *** indicate levels of significance of 10%, 5%, and 1%, respectively.

The estimated coefficients on CEO to firm debt/equity ratio are negative but interestingly they are not significant in Models One and Two. The results do not support H_1, which predicts that post-merger firm risk, measured as distance-to-default, is decreasing in CEO inside debt holdings. My conclusions are unchanged using an alternative proxy for inside debt in Models Three and Four. The estimated coefficients on CEO to firm debt/equity >1 are negative but not significant. Overall, no significant relation is detected between CEO inside debt holdings and the firm's engagement in M&A to decrease firm risk.

Effect of CEO Inside Debt Holdings on Post-Merger Firm Risk,
Measured by Altman (1968) Bankruptcy Prediction Model

Next, I examine the effect of CEO inside debt compensation on post-merger firm risk, measured by using the Altman bankruptcy prediction model (Altman, 1968). Table

2.3 reports the results of multivariate regressions with controls for industry and year fixed effect. Models One and Two report results for the full sample where the main explanatory variable is the first measure of CEO inside debt holdings, CEO to firm debt/equity ratio. Models Three and Four include the alternative measure of CEO inside debt holdings, CEO to firm debt/equity ratio>1.

Table 2.3

The Effect of CEO Inside Debt Holdings on Post-Merger Firm Risk, Measured by Altman (1968) Bankruptcy Prediction Model

	(1)	(2)	(3)	(4)
CEO to firm debt/equity ratio	-0.4043	-0.3791		
	(-0.78)	(-0.37)		
CEO to firm debt/equity ratio>1			-0.4703	-0.4437
			(-0.63)	(-0.42)
Firm Size		-12.35		-12.51
		(-0.23)		(-0.47)
Leverage		715.74		721.85
		(0.65)		(0.97)
Tobin's Q		523.24		533.13
		(1.41)		(1.35)
R&D/Total Assets		0.007 *		0.009 *
		(2.19)		(1.98)
Adv./Total Assets		-0.0003		-0.0003
		(-1.09)		(-1.23)
CAPEX/Sales		0.009 **		0.008 **
		(2.24)		(2.37)
Stock Dummy		-0.713 *		-0.739 *
		(-1.73)		(-1.87)
Deal Ratio		0.0005		0.0006
		(0.28)		(0.53)
CEO Vega/Delta Ratio		0.0001		0.0002
		(0.84)		(0.72)
Industry and year fixed effect	YES	YES	YES	YES
N	330	330	330	330
Adj. R^2	0.19	0.22	0.20	0.23

Table 2.3 reports results of the effect of CEO inside debt holdings on post-merger firm risk, measured as the difference default risk before and after the merger utilizing Altman (1968) Bankruptcy Prediction Model. All models control for industry and year fixed effect, where industry is defined based on Fama and French 49 industry classification. The dependent variable is the change in Altman Z-score before and after the merger. The two main independent variables are two measures to proxy CEO inside debt holdings: CEO to firm debt/equity ratio, and a dummy variable with a value of one if CEO to firm debt/equity ratio is larger than one and zero otherwise (CEO to firm debt/equity ratio>1). Control variables are the ratio of CEO vega to the delta (CEO Vega/Delta Ratio), the natural logarithm of net assets (Firm Size), the sum of long-term debt and debt in current liabilities divided by the total assets (Leverage), the ratio of capital expenditures to sales (CAPEX/Sales), the ratio of research and development expense to total assets (R&D/sales), the ratio of advertising expense to total assets (Adv./Total Assets), the ratio of market value of the equity plus the book value of debt to the total assets (Tobin's Q), a dummy variable that equal to one if the acquisition is financed entirely with stock (Stock Dummy) and the ratio of transaction value to acquirer's market value of equity (Deal Ratio). Detailed definitions of all variables are reported in Appendix B. Sample period is 2006 - 2010. Models One and Two report results where the main explanatory variable is the first measure of CEO inside debt holdings (CEO to firm debt/equity ratio) while Models Three and Four report results where the main explanatory variable is the second measure of CEO inside debt holdings (CEO to firm debt/equity ratio>1). The *t*-statistics are reported in parentheses.

Superscripts *, ** and *** indicate levels of significance of 10%, 5%, and 1%, respectively.

The estimated coefficients on CEO to firm debt/equity ratio are negative but interestingly they are not significant in Models One and Two. The results do not support H_1, which predicts that post-merger firm risk is decreasing in CEO inside debt holdings. My conclusions are unchanged using an alternative proxy for inside debt in Models Three and Four. The estimated coefficients on CEO to firm debt/equity >1 are negative but not significant. Overall, no significant relation is detected between CEO inside debt holdings and post-merger firm risk. My results do not support the argument that CEOs with higher inside debt holdings are more aligned with debtholders by conducting less risky M&As that are more likely to benefit debtholders.

Effect of CEO Inside Debt Holdings on Post-Merger Firm Risk, Measured by Total Firm-Risk

Next, I examine the effect of CEO inside debt compensation on post-merger firm risk, measured by change in total firm risk. A change in total risk is measured as post-merger minus pre-merger stock return standard deviation in percentage and I use daily stock returns for the standard deviation calculation.[15] Table 2.4 reports the results of multivariate regressions with controls for industry and year fixed effect. Models One and Two report results for the full sample where the main explanatory variable is the first measure of CEO inside debt holdings, CEO to firm debt/equity ratio. Models Three and Four include the alternative measure of CEO inside debt holdings, CEO to firm debt/equity ratio>1.

[15] Non-tabulated results using monthly return volatilities are similar to my main findings.

Table 2.4

The Effect of CEO Inside Debt Holdings on Post-Merger Firm Risk, Measured by Total Firm Risk

	(1)		(2)		(3)		(4)	
CEO to firm debt/equity ratio	-0.0063	*	-0.0057	*				
	(-1.85)		(-1.76)					
CEO to firm debt/equity ratio>1					-0.009		-0.0084	
					(-1.17)		(-1.03)	
Firm Size			-0.093				-0.024	
			(-0.63)				(-0.37)	
Leverage			0.773				0.835	
			(0.93)				(0.64)	
Tobin's Q			0.131				0.157	
			(1.56)				(1.33)	
R&D/Total Assets			0.0078	**			0.0083	**
			(2.32)				(2.27)	
Adv./Total Assets			-0.0071				-0.0083	
			(-0.87)				(-1.06)	
CAPEX/Sales			0.0084	**			0.0092	**
			(2.38)				(2.17)	
Stock Dummy			-0.835	**			-0.863	**
			(-2.43)				(-2.24)	
Deal Ratio			0.113				0.121	
			(0.19)				(0.20)	
CEO Vega/Delta Ratio			0.00008				0.00009	
			(1.03)				(1.07)	
Industry and year fixed effect	YES		YES		YES		YES	
N	330		330		330		330	
Adj. R^2	0.21		0.23		0.22		0.24	

Table 2.4 reports results of the effect of CEO inside debt holdings on post-merger firm risk, measured as the change in total firm risk. All models control for industry and year fixed effect, where industry is defined based on Fama and French 49 industry classification. The dependent variable is the change in total risk measured as post-merger minus pre-merger stock return standard deviation in percentage and I use daily stock returns for the standard deviation calculation. The two main independent variables are

two measures to proxy CEO inside debt holdings: CEO to firm debt/equity ratio, and a dummy variable with a value of one if CEO to firm debt/equity ratio is larger than one and zero otherwise (CEO to firm debt/equity ratio>1). Control variables are the ratio of CEO vega to the delta (CEO Vega/Delta Ratio), the natural logarithm of net assets (Firm Size), the sum of long-term debt and debt in current liabilities divided by the total assets (Leverage), the ratio of capital expenditures to sales (CAPEX/Sales), the ratio of research and development expense to total assets (R&D/sales), the ratio of advertising expense to total assets (Adv./Total Assets), the ratio of market value of the equity plus the book value of debt to the total assets (Tobin's Q), a dummy variable that equal to one if the acquisition is financed entirely with stock (Stock Dummy) and the ratio of transaction value to acquirer's market value of equity (Deal Ratio). Detailed definitions of all variables are reported in Appendix B. Sample period is 2006 - 2010. Models One and Two report results where the main explanatory variable is the first measure of CEO inside debt holdings (CEO to firm debt/equity ratio) while Models Three and Four report results where the main explanatory variable is the second measure of CEO inside debt holdings (CEO to firm debt/equity ratio>1). The *t*-statistics are reported in parentheses. Superscripts *, ** and *** indicate levels of significance of 10%, 5%, and 1%, respectively.

The estimated coefficients on CEO to firm debt/equity ratio are negative and significant in Models One and Two. The results support H_1, which predicts that post-merger firm risk is decreasing in CEO inside debt holdings. In Models Three and Four, the estimated coefficients on CEO to firm debt/equity >1 are negative but not significant.

Overall, multivariate results indicate some evidence that CEO inside debt holdings have a negative impact on the change in acquirer firm risk.

Effect of CEO Inside Debt Holdings on Post-Merger Firm Risk, Measured by Idiosyncratic Risk

Next, I examine the effect of CEO inside debt compensation on post-merger firm risk, measured by change in idiosyncratic risk. A change in idiosyncratic risk is measured as post-merger minus pre-merger standard deviation of return residuals in percentage estimated by the single factor market model. Table 2.5 reports the results of multivariate regressions with controls for industry and year fixed effect. Models One and Two report results for the full sample where the main explanatory variable is the first measure of CEO inside debt holdings, CEO to firm debt/equity ratio. Models Three and Four include the alternative measure of CEO inside debt holdings, CEO to firm debt/equity ratio>1.

Table 2.5

The Effect of CEO Inside Debt Holdings on Post-Merger Firm Risk, Measured by Idiosyncratic Risk

	(1)		(2)		(3)	(4)	
CEO to firm debt/equity ratio	-0.007	*	-0.006	*			
	(-1.81)		(-1.89)				
CEO to firm debt/equity ratio>1					-0.078	-0.081	
					(-0.11)	(-0.35)	
Firm Size			-0.023			-0.029	
			(-0.45)			(-0.53)	
Leverage			-0.347			-0.307	
			(0.87)			(0.73)	
Tobin's Q			-0.037			-0.034	
			(-1.41)			(-1.29)	
R&D/Total Assets			-0.187	*		-0.158	*
			(-1.74)			(-1.83)	
Adv./Total Assets			0.474	*		0.459	*
			(1.69)			(1.78)	
CAPEX/Sales			-0.068			-0.074	

Table 2.5 (Continued)

		(-0.76)		(-0.71)
Stock Dummy		-0.517 *		-0.501 *
		(-1.74)		(-1.86)
Deal Ratio		0.061		0.064

Table 2.5 (Continued)

		(0.16)		(0.13)
CEO Vega/Delta Ratio		-0.0002		-0.0003
		(-1.17)		(-1.32)
Industry and year fixed effect	YES	YES	YES	YES
N	330	330	330	330
Adj. R^2	0.14	0.17	0.16	0.17

Table 2.5 reports results of the effect of CEO inside debt holdings on post-merger firm risk, measured by the change in idiosyncratic risk. All models control for industry and year fixed effect, where industry is defined based on Fama and French 49 industry classification. The dependent variable is the change in idiosyncratic risk measured as post-merger minus pre-merger standard deviation of return residuals in percentage estimated by the single factor market model. The two main independent variables are two measures to proxy CEO inside debt holdings: CEO to firm debt/equity ratio, and a dummy variable with a value of one if CEO to firm debt/equity ratio is larger than one and zero otherwise (CEO to firm debt/equity ratio>1). Control variables are the ratio of CEO vega to the delta (CEO Vega/Delta Ratio), the natural logarithm of net assets (Firm Size), the sum of long-term debt and debt in current liabilities divided by the total assets (Leverage), the ratio of capital expenditures to sales (CAPEX/Sales), the ratio of research and development expense to total assets (R&D/sales), the ratio of advertising expense to total assets (Adv./Total Assets), the ratio of market value of the equity plus the book value of debt to the total assets (Tobin's Q), a dummy variable that equal to one if the

acquisition is financed entirely with stock (Stock Dummy) and the ratio of transaction value to acquirer's market value of equity (Deal Ratio). Detailed definitions of all variables are reported in Appendix B. Sample period is 2006 - 2010. Models One and Two report results where the main explanatory variable is the first measure of CEO inside debt holdings (CEO to firm debt/equity ratio) while Models Three and Four report results where the main explanatory variable is the second measure of CEO inside debt holdings (CEO to firm debt/equity ratio>1). The *t*-statistics are reported in parentheses. Superscripts *, ** and *** indicate levels of significance of 10%, 5%, and 1%, respectively.

The estimated coefficients on CEO to firm debt/equity ratio are negative and significant in Models One and Two. The results support H_1, which predicts that post-merger firm risk is decreasing in CEO inside debt holdings. In Models Three and Four, the estimated coefficients on CEO to firm debt/equity>1 are negative but not significant. Overall, multivariate results indicate some weak evidence that CEO inside debt holdings have a negative impact on the change in acquirer firm risk, measured by the change in idiosyncratic risk.

Exploring Endogeneity

My multivariate analysis is based on OLS regression. My analysis assumes that CEO inside debt compensation is exogenous whereas CEO inside debt compensation could be determined endogenously with the M&A decision. The possibility that CEO inside debt compensation is endogenous gives rise to two related concerns. First, the direction of causality between CEO inside debt compensation and firm's M&A decision is hard to conclude. It is possible that M&A decision change firm value which requires

the adjustment in CEO inside debt compensation. This imply that the contemporaneous relation between CEO inside debt compensation and firm's M&A decision is subject to the concern that M&A decisions lead to changes in CEO inside debt compensation. By estimating the impact of CEO inside debt holdings on future firm's M&A decision, I attempt to control for the potential endogeneity that exists between CEO compensation structure and firm cash policy.

Second, the model specification suffers an omitted variable bias and consequently, the model does not capture all determinants of firm's M&A decision and there are unobserved firm-specific and CEO-specific characteristics that influence both firm's M&A decision and CEO inside debt compensation. I adopt an instrument variable approach to explicitly account for endogeneity issue. I discuss this approach and empirical results in the following section.

Instrumental Variable Approach

Prior literature on CEO compensation employs an instrumental variable approach (IV) is to address endogeneity problem. Following prior literature on CEO inside debt compensation (Sundaram and Yermack, 2007, Anantharaman et al., 2011 and Cassell et al., 2012), I include the following variables as instruments for CEO inside debt holdings: CEO age[16]; Firm age; a dummy variable (Liquidity Constraint) that equals to one if the firm is facing liquidity constraint indicated by negative operating cash flow, and zero otherwise; a dummy variable (Tax Status) that equals to one if the firm has favorable tax status identified by if the firm has a loss carry-forward, and zero otherwise; maximum

[16] Following Cassell et al., 2012, I do not include CEO tenure as another instrument since CEO age and CEO tenure tend to be highly correlated.

state tax rate on individual income. The tax rates are obtained from http://www.nber.org/~taxsim/state-rates/ and these rates are calculated using the TAXSIM model (Feenberg and Coutts, 1993). I estimate my models using a two-stage least-squares framework to explicitly account for endogeneity issue. In the first stage, I separately regress CEO inside debt holdings on all of the independent variables along with the instruments. The second stage then utilizes the predicted value of CEO inside debt holdings from the first stage.

Table 2.6 reports the second-stage regression in which CEO inside debt holding is replaced by its predicted value from its respective first-stage regression. The dependent variable is change in total firm risk. A change in total risk is measured as post-merger minus pre-merger stock return standard deviation in percentage and I use daily stock returns for the standard deviation calculation. Models One and Two report results for the full sample where the main explanatory variable is the predicted values of first measure of CEO inside debt holdings, CEO to firm debt/equity ratio. Models Three and Four include the predicted values of alternative measure of CEO inside debt holdings, CEO to firm debt/equity ratio>1. The estimated coefficients on CEO to firm debt/equity ratio are negative and significant in Models One and Two. This supports H_1, which predicts that post-merger risk is decreasing in CEO inside debt holdings. The estimated coefficient of the alternative proxy for CEO inside debt in Models Three and Four is negative but not significant. The estimated coefficients on CEO to firm debt/equity>1 are positive and significant. Overall, results from two-stage least-squares framework provide some evidence that the firm post-merger risk, measured by the change in total firm risk, is decreasing in CEO inside debt holdings.

Table 2.6

2SLS Regressions of Post-Merger Firm Risk on CEO Inside Debt Holdings

	(1)		(2)		(3)	(4)	
CEO to firm debt/equity ratio	-0.0074	*	-0.0069	*			
	(-1.67)		(-1.73)				
CEO to firm debt/equity ratio>1					-0.0095	-0.0089	
					(-0.49)	(-0.31)	
Firm Size			-0.076			-0.068	
			(-0.73)			(-0.46)	
Leverage			0.645			0.664	
			(0.87)			(0.94)	
Tobin's Q			0.234			0.229	
			(1.55)			(1.48)	
R&D/Total Assets			0.0089	**		0.0096	**
			(2.49)			(2.33)	
Adv./Total Assets			-0.0063			-0.0069	
			(-0.58)			(-0.72)	
CAPEX/Sales			0.0093	*		0.0095	*
			(1.81)			(1.93)	
Stock Dummy			-1.015	**		-1.003	**
			(-2.19)			(-2.08)	
Deal Ratio			0.091			0.097	
			(0.38)			(0.23)	
CEO Vega/Delta Ratio			0.0002			0.0001	
			(0.71)			(0.79)	
Industry and year fixed effect	YES		YES		YES	YES	
N	297		297		297	297	
Adj. R^2	0.24		0.25		0.25	0.26	

Table 2.6 reports results of the effect of CEO inside debt holdings on post-merger firm risk, measured as the change in total firm risk, in two stage least square where in the first stage CEO inside debt holdings are regressed on all independent variables plus instruments and in the second stage post-merger firm risk is regressed on the predicted values of CEO inside debt compensation. All models control for industry and year fixed effect, where industry is defined based on Fama and French 49 industry classification.

The dependent variable is the change in total risk measured as post-merger minus pre-merger stock return standard deviation in percentage and I use daily stock returns for the standard deviation calculation. The two main independent variables are two measures to proxy CEO inside debt holdings: CEO to firm debt/equity ratio, and a dummy variable with a value of one if CEO to firm debt/equity ratio is larger than one and zero otherwise (CEO to firm debt/equity ratio>1). Control variables are the ratio of CEO vega to the delta (CEO Vega/Delta Ratio), the natural logarithm of net assets (Firm Size), the sum of long-term debt and debt in current liabilities divided by the total assets (Leverage), the ratio of capital expenditures to sales (CAPEX/Sales), the ratio of research and development expense to total assets (R&D/sales), the ratio of advertising expense to total assets (Adv./Total Assets), the ratio of market value of the equity plus the book value of debt to the total assets (Tobin's Q), a dummy variable that equal to one if the acquisition is financed entirely with stock (Stock Dummy) and the ratio of transaction value to acquirer's market value of equity (Deal Ratio). Detailed definitions of all variables are reported in Appendix B. Sample period is 2006 - 2010. Models One and Two report results where the main explanatory variable is the first measure of CEO inside debt holdings (CEO to firm debt/equity ratio) while Models Three and Four report results where the main explanatory variable is the second measure of CEO inside debt holdings (CEO to firm debt/equity ratio>1). The *t*-statistics are reported in parentheses. Superscripts *, ** and *** indicate levels of significance of 10%, 5%, and 1%, respectively.

Conclusion

Pension and deferred compensation, inside debt, may mitigate agency conflicts between managers and debt holders (Sundaram and Yermack, 2007; Edmans and Liu, 2011; Wei and Yermack, 2011; Cassell, Huang, Sanchez, and Stuart, 2012). In the language of Jensen and Meckling (1976), "inside debt" represents a fixed obligation for the firm to make future payments to executives. Further, inside debt is typically an unsecured and unfunded liability for the firm. The unsecured and unfunded nature of inside debt exposes managers to the same default risks and insolvency treatment as outside creditors. This aligns managers with debt holders and may cause CEOs to manage their firms conservatively (Jensen and Meckling, 1976; Edmans and Liu, 2011). Inside debt may also influence managerial incentives to pursue diversifying mergers (Sundaram and Yermack, 2007). This paper attempts to answer whether higher CEO inside debt causes CEO to diversify firm operations and reduce firm risk by examining the effect of CEO inside debt holdings on post-merger firm risk.

I examine the effect of CEO inside debt compensation on post-merger firm risk, as measured by the change in pre and post-merger distance-to-default risk, using acquiring firm risk changes over the period of 2007 to 2009. Following prior literature on CEO inside debt holdings (Cassell et al., 2012), I use the following two measures as proxies for CEO inside debt compensation: (1) the CEO to firm debt/equity ratio, which is calculated as the CEO's debt/equity ratio scaled by the firm's debt to equity ratio and 2) an indicator variable equal to one when the CEO to firm debt/ equity ratio is greater than one. I utilize four alternative measures to proxy for post-merger firm risk: the change in pre and post-merger distance-to-default risk calculated by a naïve alternative of

the Merton distance-to-default model developed by Bharath and Shumway, 2008; the change in pre and post-merger default risk as calculated by the Altman bankruptcy prediction model (Altman, 1968); change in total firm risk measured as post-merger minus pre-merger stock return standard deviation in percentage; and change in idiosyncratic risk measured as post-merger minus pre-merger standard deviation of return residuals in percentage estimated by the single factor market model.

I find a significant negative relation between post-merger firm risk, as measured by change in total firm risk, measured as post-merger minus pre-merger stock return standard deviation in percentage, and change in idiosyncratic risk, measured as post-merger minus pre-merger standard deviation of return residuals in percentage estimated by the single factor market model and CEO inside debt holdings as measured by the CEO to firm debt/equity ratio. CEO compensation is not exogenously given but determined by the contracting environment and so, concern for endogeneity comes into the picture which may make my findings spurious. I adopt an instrumental variable approach to address the endogeneity problem. My main findings still hold after endogeneity bias corrections. I find insignificant negative relations between CEO inside debt holdings other two measures of post-merger firm risk: the change in pre and post-merger distance-to-default risk calculated by a naïve alternative of the Merton distance-to-default model developed by Bharath and Shumway, 2008, and the change in pre and post-merger default risk as calculated by the Altman bankruptcy prediction model (Altman, 1968).

As documented in Sundaram and Yermack (2007), by affecting both the overall level of CEO compensation and its composition, CEO inside debt holdings may influence managerial incentives to pursue diversifying mergers. Thus my research question of

whether and how CEO inside debt is related to post merger firm risk remains an important question. I make several contributions to the literature. First, prior studies on executive compensation focus primarily on equity-based (stocks and stock-options) and fixed (salary and bonus) compensation, while studies on debt-like compensation are limited due to data availability. CEO inside debt compensation is available only from 2006 fiscal year as effective 2006 fiscal year-ends, the SEC issued a requirement that firms disclose their CEOs' inside debt positions. This paper extends the literature by focusing on a different component of CEO compensation, inside debt. Second, this study provides a contribution to a nascent literature on executive compensation which investigates the theoretical prediction that inside debt mitigate agency costs of debt by strengthening the alignment of CEO and debtholder incentives (Jensen and Meckling, 1976; Edmans and Liu, 2011). Finally, this study adds to the M&A literature by documenting the effect of CEO inside debt compensation on post-merger firm risk. This is important because prior literature only examines the relation between CEO equity-based compensation and M&A (e.g., Datta, Datta, and Raman, 2001; Benson, Park and Davidson, 2011).

CHAPTER 3

CONCLUSION

CEO inside debt compensation, mainly comprised of pension and deferred compensation, may mitigate the agency conflicts between managers and debt holders by aligning the interests of mangers with those of debt holders ((Sundaram and Yermack, 2007; Edmans and Liu, 2011; Wei and Yermack, 2011; Cassell, Huang, Sanchez, and Stuart, 2012). In the language of Jensen and Meckling (1976), "inside debt" represents a fixed obligation for the firm to make future payments to executives. Further, inside debt is typically an unsecured and unfunded liability for the firm. The unsecured and unfunded nature of inside debt exposes managers to the same default risks and insolvency treatment as outside debt holders. This aligns managers with debt holders and may cause managers to manage their firms conservatively (Jensen and Meckling, 1976; Edmans and Liu, 2011). Studies on CEO inside debt compensation are limited due to data availability. CEO inside debt compensation is available only from 2006 fiscal year as effective for 2006 fiscal year-ends, the SEC issued a requirement that firms disclose their CEOs' inside debt positions. This dissertation comprises of two essays that look at the relation between CEO inside debt holdings and two different corporate policies: corporate cash holdings and mergers and acquisitions (M&A).

Following prior literature on CEO inside debt holdings (Cassell et al., 2012), I use the following two measures as proxies for CEO inside debt compensation: (1) the CEO to firm debt/equity ratio, which is calculated as the CEO's debt/equity ratio scaled by the firm's debt to equity ratio and 2) an indicator variable equal to one when the CEO to firm debt/ equity ratio is greater than one.

In the first essay, I examine the effect CEO inside debt holdings on firm cash holdings, as measured by the ratio of cash and marketable securities to net assets using a sample of EXECUCOMP firms over the period of 2006 to 2008. Higher CEO inside debt compensation alleviates agency conflicts between managers and debt holders by aligning mangers with debt holders. CEOs with higher inside debt may prefer to invest in cash as cash holdings are less risky projects (Tong, 2010). Consequently, based on risk-aversion hypothesis, I posit a positive relation between CEO inside debt holdings and corporate cash holdings. I find a significant and positive relation between CEO inside debt holdings and firm cash holdings. I find that the positive relation between CEO inside debt compensation and firm cash holdings remain significant even after controlling for the effect of CEO equity-based incentives on firm cash holdings. I also find that the positive relation between CEO inside debt holdings and firm cash holdings is mitigated by the financial constraint status of the firm based on the notion that CEOs of a financially constrained firms may face difficulty accumulating excess cash as their inside debt compensation goes up since capital is limited. I adopt instrumental variable approach to explicitly address the endogeneity problem as CEO compensation is endogenously determined by firm and CEO characteristics. My main findings still hold after endogeneity bias corrections and findings are robust to alternative specifications.

Utilizing a modified version of the Fama and French (1998) valuation regression, I find that cash increases have a more positive valuation effect for firms with low levels of CEO inside debt relative to those with high levels of CEO inside debt.

In the second essay, I examine the effect of CEO inside debt compensation on post-merger firm risk using acquiring firm risk changes over the period of 2007 to 2009. I utilize four alternative measures to proxy for post-merger firm risk: the change in pre and post-merger distance-to-default risk calculated by a naïve alternative of the Merton distance-to-default model developed by Bharath and Shumway, 2008; the change in pre and post-merger default risk as calculated by the Altman bankruptcy prediction model (Altman, 1968); change in total firm risk measured as post-acquisition minus pre-acquisition stock return standard deviation in percentage; and change in idiosyncratic risk measured as post-acquisition minus pre-acquisition standard deviation of return residuals in percentage estimated by the single factor market model. Prior literature on CEO inside debt finds that CEO inside debt compensation motivates CEOs to engage in less risky investment and financial decisions. For example, Cassell, Huang, Sanchez, and Stuart (2012) find that higher levels of CEO inside debt are associated with less risky investment and financial policies. Based on empirical findings of prior literature, I conjecture a negative relation between CEO inside debt holdings and post-merger firm risk. I find a significant negative relation between post-merger firm risk, as measured by change in total firm risk, measured as post-acquisition minus pre-acquisition stock return standard deviation in percentage, and change in idiosyncratic risk, measured as post-acquisition minus pre-acquisition standard deviation of return residuals in percentage estimated by the single factor market model and CEO inside debt holdings as measured

by the CEO to firm debt/equity ratio. I adopt the instrumental variable approach to address the endogeneity problem as CEO compensation is endogenously determined by firm and CEO characteristics. My main findings still hold after endogeneity bias corrections.

As documented in Sundaram and Yermack (2007), by affecting both the overall level of CEO compensation and its composition, CEO inside debt may influence managerial incentives to pursue diversifying mergers. Thus my research question of whether and how CEO inside debt is related to post merger firm risk remains an important question. Similarly, CEO inside debt may affect corporate cash holdings of a firm by influencing managerial incentives and so, my research question of whether and how CEO inside debt is related to corporate cash holdings remains a key question.

Both essays make several contributions to the literature. First, prior studies on executive compensation focus primarily on equity-based (stocks and stock-options) and fixed (salary and bonus) compensation, while studies on debt-like compensation are limited due to data availability. CEO inside debt compensation is available only from 2006 fiscal year as effective for 2006 fiscal year-ends, the SEC issued a requirement that firms disclose their CEOs' inside debt positions. Both essays extend the literature by focusing on a different component of CEO compensation, inside debt. Second, both essays provide a contribution to a nascent literature on executive compensation which investigates the theoretical prediction that inside debt mitigate agency costs of debt by strengthening the alignment of CEO and debtholder incentives (Jensen and Meckling, 1976; Edmans and Liu, 2011). To date, extant research (Anantharaman, Fang, and Gong, 2010; Chen, Dou, and Wang, 2010; Wang, Xie, and Xin, 2011; Wei and Yermack, 2011;

Francis and Yilmaz, 2012; He, 2011) has focused on market-based implications of CEO inside debt holdings (e.g. reduced cost of debt, fewer restrictive debt covenants, market reactions after initial disclosures of CEO inside debt compensation, financial reporting quality, etc.).

Finally, the first essay adds to the corporate cash holdings literature by documenting the effect of CEO inside debt compensation on corporate cash holdings. Prior literature documents several motives for firms to hold cash (Bates, Kahle, and Stulz, 2009): the transaction motive, the precautionary motive, the tax motive, and the agency motive. The literature on corporate cash holdings empirically examines agency theory by viewing cash holdings as a source of financing. My study contributes to the agency motive view of corporate cash holdings literature by focusing on the investment perspective of cash holdings and by exploring the link between CEO inside debt and corporate cash-holdings. The second essay adds to the M&A literature by documenting the effect of CEO inside debt compensation on post-merger firm risk. This is important because prior literature only examines the relation between CEO equity-based compensation and M&A (e.g., Datta, Datta, and Raman, 2001; Benson, Park and Davidson, 2011).

REFERENCES

Amihud, Y. and B. Lev, 1981. Risk reduction as a managerial motive for conglomerate mergers. *The Bell Journal of Economics* 12, 605-617.

Anantharaman, D., V.W. Fang, and G. Gong, 2010. Inside debt and the design of corporate debt contracts. Unpublished working paper, Rutgers University and Pennsylvania State University.

Bates, T.W., K.M. Kahle, and R. Stulz, 2009. Why do US firms hold so much more cash than they used to? *Journal of Finance* 64, 1985–2021.

Baumol, W.J., 1952. The transactions demand for cash: An inventory theoretic approach. *Quarterly Journal of Economics* 66, 545–556.

Bebchuk, L., A. Cohen, and A. Ferrell, 2009. What matters in corporate governance. *Review of Financial Studies* 22, 783–827.

Benson, B.W., J.C. Park, and W.N. Davidson, 2011. Equity-based incentives, risk aversion, and merger-related risk taking behavior. Working paper, Louisiana Tech University, Auburn University, and Southern Illinois University.

Berger, P., E. Ofek, and D. Yermack, 1997. Managerial entrenchment and capital structure decisions. *Journal of Finance* 52, 1411–1438.

Billett, M. T., T.H.D. King, and D.C. Mauer, 2004. Bondholder wealth effects in mergers and acquisitions: new Evidence from the 1980s and 1990s. *Journal of Finance* 59, 107-135.

Cassell, C.A., S.X. Huang, J.M. Sanchez, and M.D. Stuart, 2012. Seeking safety: the relation between CEO inside debt holdings and the riskiness of firm investment and financial policies. *Journal of Financial Economics* 103, 588-610.

Cen, W., 2011. The determinants of CEO inside debt and its components. Working Paper, Cornell University.

Chen, F., Y. Dou, and X. Wang, 2010. Executive inside debt holdings and creditors' demand for pricing and non-pricing protections. Unpublished Working Paper, University of Toronto and the Chinese University of Hong Kong.

Coles, J., N. Daniel, and L. Naveen, 2006. Managerial incentives and risk-taking. *Journal of Financial Economics* 79, 431- 468.

Core, J. and W. Guay, 2002. Estimating the value of employee stock option portfolios and their sensitivities to price and volatility. *Journal of Accounting Research* 40, 613-630.

Datta, S., M.I. Datta, and K. Raman, 2001. Executive compensation and corporate diversification decisions. *Journal of Finance* 56, 2299-2336.

Denis, D.J., D.K. Denis, K. Yost, 2002. Global diversification, industrial diversification, and firm value. *Journal of Finance* 57, 1951-1979.

Dewatripont, M. and J. Tirole, 1994. A theory of debt and equity: diversity of securities and manager-shareholder congruence. *Quarterly Journal of Economics* 109, 1027-1054.

Dittmar, A., J. Mahrt-Smith, and H. Servaes, 2003. International corporate governance and corporate cash holdings. *Journal of Financial and Quantitative Analysis* 38, 111-133.

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

Edmans, A. and Q. Liu, 2011. Inside debt. *Review of Finance* 15, 75-102.

Foley, C.F., J. Hartzell, S. Titman, and G.J. Twite, 2007. Why do firms hold so much cash? A tax-based explanation. *Journal of Financial Economics* 86, 579–607.

Francis, B.B. and G. Yilmaz, 2012. Inside debt and stock price performance. Working Paper, Rensselaer Polytechnic Institute.

Garfinkel, J.A. and K.W. Hankins, 2011. The role of risk management in mergers and merger waves. *Journal of Financial Economics* 101, 515–532.

Gerakos, J., 2010. CEO pensions: disclosure, managerial power, and optimal contracting. Working Paper, University of Chicago Booth School of Business.

Gompers, P., J. Ishii, and A. Metrick, 2003. Corporate governance and equity prices. *Quarterly Journal of Economics* 118, 107–155.

Guay, W., 1999. The sensitivity of CEO wealth to equity risk: An analysis of the magnitude and determinants. *Journal of Financial Economics* 53, 43-71.

Harford, J., 1999. Corporate cash reserves and acquisitions. *Journal of Finance* 54, 1969–1997.

Harford, J., S.A. Mansi, and W.F. Maxwell, 2008. Corporate governance and firm cash holdings in the US. *Journal of Financial Economics* 87, 535–555.

He, G., 2011. Effect of managerial ownership of debt on financial reporting quality and stock price crash risk. Working paper, Nanyang Technological University, Singapore.

Higgins, R.C. and L.D. Schall, 1975. Corporate bankruptcy and conglomerate merger. *Journal of Finance* 30, 93-111.

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

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

Lang, L.H.P., R.M. Stulz, and R.A. Walkling, 1991. A test of the free cash flow hypothesis: the case of bidder returns. *Journal of Financial Economics* 29, 315–336.

Lee, G. and H. Tang, 2011. CEO pensions and deferred compensation. Working Paper, Seton Hall University.

Levy, H. and M. Sarnat, 1970. Diversification, portfolio analysis, and the uneasy case for conglomerate mergers. *Journal of Finance* 25, 795-802.

Lewellen, W.G., 1971. A pure financial rationale for the conglomerate merger. *Journal of Finance* 26, 521-537.

Liu, Y. and D.C. Mauer, 2011. Corporate cash holdings and CEO compensation incentives. *Journal of Financial Economics* 102, 183–198.

Liu, Y., D.C. Mauer, and Y. Zhang, 2012. Firm cash Holdings and CEO inside Debt. Working paper, available at SSRN 2152372.

Liu, Y., D.C. Mauer, and Y. Zhang, 2012. Mergers decisions and inside debt. Working paper, available at SSRN 2170895.

Low, A., 2009. Managerial risk-taking behavior and equity-based compensation. *Journal of Financial Economics*, 92(3), 470-490.

Masulis, R.W., C. Wang, and F. Xie, 2007. Corporate governance and acquirer returns. *Journal of Finance* 62, 1851-1889.

Miller, M.H. and D. Orr, 1966. A model of the demand for money by firms. *Quarterly Journal of Economics* 80, 413–435.

Morck, R., A. Shleifer, and R.W. Vishny, 1990. Do managerial incentives drive bad acquisitions? *Journal of Finance* 45, 31-48.

Mulligan, C.B., 1997. Scale economies, the value of time, and the demand for money: Longitudinal evidence from firms. *Journal of Political Economy* 105, 1061–1079.

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

Pastor, L. and P. Veronesi, 2003. Stock valuation and learning about profitability. *Journal of Finance* 58, 1749–1789.

Phan, H.V., 2013. Inside debt and mergers and acquisitions. *Journal of Financial and Quantitative Analysis*, forthcoming. Available at SSRN 2233943.

Pinkowitz, L., R. Stulz, and R. Williamson, 2006. Does the contribution of corporate cash holdings and dividends to firm value depend on governance? A cross-country analysis. *Journal of Finance* 61, 2725–2751.

Rajgopal, S. and T. Shevlin, 2002. Empirical evidence on the relation between stock option compensation and risk taking. *Journal of Accounting and Economics*, 33(2), 145-171.

Roll, R., 1986. The hubris hypothesis of corporate takeovers. *Journal of Business* 59, 197-216.

Shastri, K., 1990. The differential effects of mergers on corporate security values. *Research in Finance* 8, 179-201.

Sundaram, R. and D. Yermack, 2007. Pay me later: inside debt and its role in managerial compensation. *Journal of Finance* 62, 1551-1588.

Tong, Z., 2010. CEO risk incentives and corporate cash holdings. *Journal of Business Finance & Accounting* 37, 1248 –1280.

Wang, C., F. Xie, and X. Xin, 2011. Managerial ownership of debt and bank loan contracting. Working Paper, Chinese University of Hong Kong.

Wei, C. and D. Yermack, 2011. Investor reactions to CEOs' inside debt incentives. *Review of Financial Studies* 24 (11), 3813-3840.

APPENDIX A

DEFINITION OF VARIABLES FOR FIRST ESSAY

Definition of Variables for First Essay

Dependent Variable	**Definition and Data Source**
Cash holdings	The ratio of cash and marketable securities to net assets (A1/A6 -A1) Data source: Compustat
Independent Variable	**Definition and Data Source**
CEO to firm debt/equity ratio	The natural log of one plus the ratio of the CEO's debt-to-equity ratio to the firm's debt-to-equity ratio. CEO's inside is calculated as sum of the present value of accumulated pension benefits and deferred compensation; CEO equity is calculated as the value of both stock and option held by the CEO, where the value of stock is calculated as the number of shares multiply by the stock price at the end of firm's fiscal year, and the value of option is calculated as the total option delta (calculated based on Black-Scholes (1973) option formula) multiply by the stock price at the end of firm's fiscal year; firm's debt is the sum of current and long-term debt; firm's equity is the product of shares outstanding and the stock price at the end of firm's fiscal year. Data source: Execucomp, CRSP, Compustat
CEO to firm debt/equity ratio>1	A dummy variable with a value of one if CEO to firm debt/equity ratio is larger than none and zero otherwise
CEO inside debt holdings	The sum of the present value of accumulated pension benefits and deferred compensation Data source: Execucomp
Firm size	The logarithm of total assets Data source: Compustat
Dividend payout dummy	A dummy variable that equals one if the regular cash dividends on common stock is positive in a given fiscal year, and zero otherwise. Data source: Compustat
R&D/Sales	The ratio of research and development expense to sales Data source: Compustat
GIM Index	The number of antitakeover provisions in the firm's charter as reported by the Investor Responsibility Research Center (IRRC) in 2006 and it varies from 0 to 24. Data source: Risk Metrics (IRRC)
NWC/Net Assets	The ratio of net working capital to net assets Data source: Compustat
Cash flow/Net Assets	The ratio of earnings after interest, dividends and taxes but before depreciation divided by the book value of net assets

	Data source: Compustat
CAPEX/Net Assets	The ratio of capital expenditures to net assets Data source: Compustat
Market-to-book ratio	The book value of net assets minus the book value of equity plus the market value of equity, all divided by the book value of net assets Data source: Compustat
Leverage	The ratio of sum of long-term debt and debt in current liabilities to net assets Data source: Compustat
CEO vega/delta ratio	The ratio of the vega (the sensitivity of the value of CEO's accumulated equity-based compensation to a one percent change in the volatility of stock prices) to the delta (the sensitivity of the value of the CEO's accumulated equity-based compensation to a one percent change in the stock price). I adjust this CEO vega/delta ration by multiplying it by the ratio of CEO equity-holdings to CEO inside debt holdings so that this measure captures the relative importance of the CEO's equity holdings. Data source: Execucomp, CRSP, Compustat
Acquisition activity	The ratio of expenditures on acquisitions to net assets Data source: Compustat

Instruments	**Definition and Data Source**
CEO age	The age of the CEO as reported in the Execucomp database
Firm age	The number of years since the first year that the firm is reported in Compustat
Maximum state tax rate	The maximum state tax rate on individual income Data source: The tax rates are obtained from http://www.nber.org/~taxsim/state-rates/.
Tax Status	A dummy variable that equals to one if the firm has a loss carry-forward and zero otherwise. Data source: Compustat
Liquidity Constraint	A dummy variable that equals to one if the firm generates negative operating cash flow, and zero otherwise. Data source: Compustat

APPENDIX B

DEFINITION OF VARIABLES FOR SECOND ESSAY

Definition of Variables for Second Essay

Independent Variable	Definition and Data Source
CEO to firm debt/equity ratio	The natural log of one plus the ratio of the CEO's debt-to-equity ratio to the firm's debt-to-equity ratio. CEO's inside is calculated as sum of the present value of accumulated pension benefits and deferred compensation; CEO equity is calculated as the value of both stock and option held by the CEO, where the value of stock is calculated as the number of shares multiply by the stock price at the end of firm's fiscal year, and the value of option is calculated as the total option delta (calculated based on Black-Scholes (1973) option formula) multiply by the stock price at the end of firm's fiscal year; firm's debt is the sum of current and long-term debt; firm's equity is the product of shares outstanding and the stock price at the end of firm's fiscal year. Data source: Execucomp, CRSP, Compustat
CEO to firm debt/equity ratio>1	A dummy variable with a value of one if CEO to firm debt/equity ratio is larger than none and zero otherwise
CEO inside debt holdings	The sum of the present value of accumulated pension benefits and deferred compensation Data source: Execucomp
Firm size	The logarithm of total assets Data source: Compustat
Leverage	The ratio of sum of long-term debt and debt in current liabilities to book value of total assets Data source: Compustat
Tobin's Q	The ratio of market value of the equity plus the book value of debt to the total assets Data source: Compustat
R&D/Total Assets	The ratio of research and development expense to total assets Data source: Compustat
Adv./Total Assets	The ratio of advertising expense to total assets Data source: Compustat
CAPEX/Sales	The ratio of capital expenditures to sales Data source: Compustat
Stock Dummy	An indicator variable with a value of one if the acquisition is financed entirely with stock Data source: SDC
CEO vega/delta ratio	The ratio of the vega (the sensitivity of the value of CEO's accumulated equity-based compensation to a one percent change in the volatility of stock prices) to the delta (the sensitivity of the value of the CEO's accumulated equity-based compensation to a one percent change in the

	stock price). I adjust this CEO vega/delta ration by multiplying it by the ratio of CEO equity-holdings to CEO inside debt holdings so that this measure captures the relative importance of the CEO's equity holdings Data source: Execucomp, CRSP, Compustat
Instruments	**Definition and Data Source**
CEO age	The age of the CEO as reported in the Execucomp database
Firm age	The number of years since the first year that the firm is reported in Compustat
Maximum state tax rate	The maximum state tax rate on individual income Data source: The tax rates are obtained from http://www.nber.org/~taxsim/state-rates/.
Tax Status	A dummy variable that equals to one if the firm has a loss carry-forward and zero otherwise. Data source: Compustat
Liquidity Constraint	A dummy variable that equals to one if the firm generates negative operating cash flow, and zero otherwise. Data source: Compustat