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Corporate Cash Holdings and the Refinancing Risk of Bank Debt and Non-Bank Debt

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Abstract

We empirically examine the relationship between a firm's debt composition and refinancing risk. In particular, we analyze the effects of non-bank debt on refinancing risk as the existing literature shows that both the ex-ante and ex-post costs of refinancing problems are higher for non-bank debt than for bank debt. We therefore propose that non-bank debt is associated with higher refinancing risk than bank debt. Following recent research findings we employ firms' cash holdings as a proxy measure of refinancing risk for a sample of U.S. incorporated firms over the ten year period from 2003 to 2013. We find that firms seem to accumulate cash in order to offset the refinancing risk associated with non-bank debt. Further analysis indicates that the effect is most accentuated for firms with relatively high leverage and for firms with relatively high non-bank debt proportions. We also find indications that the observed hedging behavior could be either of negative value to shareholders or mispriced by equity markets.

Keywords: Debt financing; Cash holdings; Capital structure; Bank lending; Refinancing risk

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1 Introduction

Over the last years U.S. companies have accumulated record cash holdings while at the same time issuing record amounts of debt both in the form of loans and bonds. According to Butters (2015) the cash and short-term investment holdings of S&P 500 firms (excluding financial firms) amounted to a record $1.43 trillion at the end of January 2015. The same firms issued $89.4 billion in financial debt obligations during the last quarter of 2014 marking it the third highest total for a quarter over the past ten years.

Both cash holdings and debt financing have long been subjects to various theories in corporate finance. Financial economists have analyzed corporate cash holdings as firms' primary liquidity pool and researched their determinants from various perspectives, foremost in the context of financing frictions, capital structure theories and agency conflicts. Key findings and empirical evidence of this research indicate that firms build up cash reserves for precautionary reasons (e.g. Kaynes (1936), Bates et al. (2009)) and to offset direct transaction costs and indirect costs due to information asymmetries (Opler et al. (1999)) as observed in some corporate governance measures (e.g. Ditttmar and Mahrt-Smith (2007)). Other recent approaches to cash holdings focus, for example, on the organizational structure of firms (e.g. Duchin (2010)) and the effect of tax structures (e.g. Foley et al. (2007)). Harford et al. (2014) analyze cash holdings in the context of firms' debt refinancing risk and propose that firms accumulate cash holdings in order to mitigate the adverse effects of refinancing risk. Debt refinancing risk is defined as firms' inability to roll over debt upon maturity inducing financial distress leading to losses in firm value from both an ex-ante perspective by facing higher risk of financial distress (e.g. Almeida and Philippon (1997)) and an ex-post perspective in the actual materialization of distress (e.g. Andrade and Kaplan (1998)).

It follows from the significant costs of financial distress[1] that debt refinancing risk should be an important factor in firms' financing decisions. One such decision is the choice between public and private debt. Historically, the public and private debt decision has been studied foremost in the context of flotation costs (e.g. Bhagat and Frost (1986), Smith (1986), Blackwell and Kidwell (1988), Carey et al. (1993)), adverse selection (e.g. Brealey et al. (1977), Diamond (1984), Fama (1985), Boyd and Prescott (1986)), moral hazard (e.g. Krishnaswami et al. (1999), Denis and Mihov (2003)), and firm credit characteristics such as ratings (e.g. Denis and Mihov (2003)). We believe that refinancing risk should be included as another key variable

[1] For example, Andrade and Kaplan (1998) estimate these costs at 10% to 20% of firm value.

in the debt placement and composition structure. Based on previous research findings on financial distress we propose that refinancing risk is higher in public debt than in private debt: private lenders such as banks are more likely to monitor firms more efficiently thereby reducing ex-ante costs of financial distress (e.g. Hoshi et al. (1990), Andrade and Kaplan (1998)) and are also likely to work out distressed situations more efficiently compared to public debt holders, thus decreasing potential losses in firm value (e.g. Gilson (1990)). In particular, we derive our research question from Harford et al. (2014) stating that cash holdings are built up by firms in order to mitigate refinancing risk and can therefore be used as a proxy measure of this risk. We expand this idea by analyzing the relationship between a firm's cash holdings as proxy for refinancing risk and its debt composition.

Our data is a sample of 16,352 firm-years over the period from 2003 to 2013 of 3,081 Compustat U.S. incorporated firms combined with firm-specific debt composition data from S&P Capital IQ. Using primarily a two-stage least squares (2SLS) methodology we find that refinancing risk measured by cash holdings is significantly higher in non-bank debt than in bank debt. Furthermore, we find that firms with relatively high leverage and non-bank debt proportions seem to be the most active hedgers of non-bank debt. However, we also find indications that the hedging behavior observed could be of negative value to shareholders or mispriced by equity markets.

By analyzing cash holdings, refinancing risk and a firm's debt composition of bank and non-bank debt, we are contributing empirical results that are interesting both from an academic and practical perspective. We add new insights to the ongoing academic research of optimal capital structure theories and evaluate a new quantifiable nuance of firms' choice of debt composition and changes in their financing structure. From a practical point of view, we believe that our analysis is interesting regarding the potential impact of regulatory issues, for example how decreased bank lending activity caused by tighter regulation after the financial crisis affects refinancing risk and firms' choice of public and private debt.

The remainder of the paper is organized as follows. In Section 2, we summarize the findings and theories of previous research on cash holdings and the choices in debt financing and develop our hypothesis in the context of refinancing risk. Section 3 describes the methodology and data. In Section 4, we present and analyze our empirical results. In Section 5, we conclude our analysis, and point out some limitations in our approach and discuss opportunities for further research.

2 Literature Review and Hypothesis Development

In this section, we first briefly summarize the findings of previous research on corporate cash holdings and on the financing choice between bank debt and non-bank debt. In a second step, we explain the motivation for using cash holdings as proxy for refinancing risk as presented in the paper by Harford et al. (2014). In the final step, we formulate our hypothesis by putting both cash holdings and the choice between bank and non-bank debt in the context of refinancing risk.

2.1 Cash Holdings

Explanations of corporate cash holdings have previously focused primarily on financing frictions, capital structure theory and agency conflicts. However, recent studies also offer new explanations, for example based on taxes and the spread between the cost and return of cash holdings.

Due to financing frictions firms build up cash holdings for precautionary reasons (e.g. Keynes (1936), Bates et al. (2009)). In particular, the effect of financial frictions due to information asymmetry about firm specific investment opportunities, driving a wedge between the internal and external cost of capital on corporate cash holdings, has been found to be significant in several previous studies (e.g. Harford (1999), Opler et al. (1999)). In more detail, Opler et al. (1999) in their paper on the determinants and implications of corporate cash holdings base their research on two broad capital structure theories: the tradeoff theory hypothesizing that firms trade off costs and benefits in their decision on debt financing and cash holdings and the financing hierarchy theory stating that cash balances are the pure outcome of firms' profitability and financing needs. They find substantial support for the tradeoff theory, indicating that both transaction costs and costs due to information asymmetry are important drivers either increasing the cost of cash shortfalls or increasing the cost of raising funds.

Another explanation of cash holdings can be derived from agency theory based conflicts. Since Jensen (1986) stated that internal funds are at the center of potential conflicts between managers and shareholders several empirical studies have analyzed the effect of agency conflicts on corporate cash holdings indicating mixed conclusions. For example, Opler et al. (1999), Mikkelson and Partch (2003) and Bates et al. (2009) find no effect of governance on cash holdings. However, Harford (1999) and Harford et al. (2008) find that firms with weaker corporate governance measures hold less cash and are more likely to engage in value-destroying takeover activities. Furthermore, Dittmar and Mahrt-Smith (2007) document that strong governance indicators have a substantial impact on firm value through their impact on cash holdings and the associated negative impact of large cash holdings (i.e. reducing operating performance and increasing value-destroying actions) on future operating performance. On a cross country level, Dittmar et al. (2003) show that firms in countries with low shareholder protection hold more cash in comparison to firms in shareholder friendly countries allowing investors to force managers to disgorge excessive cash balances.

Other recent approaches that explain corporate cash holdings focus on the organizational structure of firms (e.g. Duchin (2010) and Subramaniam (2011) stating that diversified firms hold less cash due to complementary growth opportunities across the different segments within these firms and the use of internal capital markets), on taxes (e.g. Foley et al. (2007) documenting that U.S. multinational firms hold cash in foreign subsidiaries because of the tax costs associated from repatriating foreign income) and on the spread between the cost and return of cash holdings (e.g. Azar et al. (2015)).

2.2 The Choice between Private and Public Debt

In this paper, we differentiate between bank debt and non-bank debt which we refer to as "public debt". While this might be an overall simplified classification as there are also other forms of private debt besides bank debt (e.g. debt issued privately under SEC Rule 144A to qualified institutional buyers) we believe that this distinction allows us to capture the unique characteristics of bank debt as main source of debt financing in contrast to other forms of debt. Given the rather large size of firms in the context of our study as further outlined in Section 3, the main alternative in debt financing for these firms are public debt markets. Hence, we are able to analyze the differences in the characteristics that influence the decision and capital structure mix between private and public debt found in previous research (e.g. Denis and Mihov (2003)).

Brealey et al. (1977), Diamond (1984), Fama (1985) and Boyd and Prescott (1986) argue that firms with high information asymmetry will borrow privately as banks are more efficient and effective at monitoring compared to public bond investors. This is also backed by Myers (1984) arguing that firms facing high costs due to asymmetric information will prefer the more information insensitive external financing, i.e. debt over equity. In their decision between private and public debt, these firms will ultimately prefer private debt since private debt holders are more informed through monitoring and screening and also private debt is typically safer due to being senior and collateralized (Welch (1997), Rajan and Winton (1995)).

Based on Krishnaswami et al. (1999), two moral hazard problems affect a firm's debt placement structure: agency costs of underinvestment and asset substitution. Myers (1977) points out that based on agency costs of underinvestment firms maintaining a close relationship with the lender can mitigate underinvestment problems that can result from risky debt financing and lead firms to forego valuable projects. Thus, especially firms with higher future growth opportunities are more likely to have these closer relations with concentrated private debt holders such as banks. This kind of relationship will also help overcome problems associated with asset substitution. Due to the concept of limited liability and its implied incentives, shareholders have an incentive to substitute less risky assets with riskier ones, thereby increasing the volatility of assets and in turn the value of equity (Jensen and Meckling (1976)). Thus, debt financing from better informed lenders, i.e. private debt holders, will decrease the yield on debt as compensation for this risk.

According to Denis and Mihov (2003) the primary determinant of the choice of debt source is the credit history and quality of the issuing firm. Firms with the highest credit quality prefer public debt whereas firms with mediocre credit characteristics are more likely to choose bank debt. The lowest quality issuers prefer private debt from non-bank sources. From a managerial discretion perspective, higher equity ownership by managers will result in a preference for private debt (Denis and Mihov (2003)). Managers will choose the external financing that maximizes value and the higher ownership/control stake insulates them from external pressures of debt holders. As public debt issuance requires certain direct flotation costs which to some extent are fixed (Bhagat and Frost (1986), Smith (1986), and Blackwell and Kidwell (1988)), there are greater economies of scale in public issues than in private issues (e.g. Carey et al. (1993)). Hence, as argued by Krishnaswami et al. (1999), smaller firms and firms with smaller average debt issues are expected to have higher proportions of private debt.

2.3 Refinancing Risk of Private and Public Debt

We define refinancing risk as the risk that a firm cannot roll over or repay debt upon maturity or only at significantly worse conditions (e.g. Froot et al. (1993)) leading to inefficient liquidation (Diamond (1991, 1993) and Sharpe (1991)), fire sale of important firm assets (Brunnermeier and Yogo (2009), Choi, Hackbarth, and Zechner (2013)) and an increase in the potential for underinvestment problems (Almeida et al. (2012)). Therefore, we analyze refinancing risk as part of a firm's wider financial distress risk and focus in this section on creditor characteristics affecting distress. Based on previous research in the area analyzing the effect of firm debt structures on financial distress, we hypothesize that refinancing risk is higher for non-bank, public debt than for bank debt.

For an elaborate description of the legal framework for restructuring in the U.S. we reference Chatterjee et al. (1996) and give a short summary here. Excluding a situation requiring liquidation through Chapter 7 of the U.S. bankruptcy code, firms can either restructure their debt in-court or out-of-court via an informal workout. In-court formal restructuring can take place following a regular Chapter 11 filing and procedure or in form of a prepackaged bankruptcy. Prepackaged bankruptcy is a hybrid method that includes a Chapter 11 filing but includes a restructuring plan that is already negotiated before the filing, thereby combining benefits of both formal and informal restructuring. For an in-depth analysis of the benefits and decision drivers of the different methods, we reference Gilson (1991), Chatterjee et al. (1996) and Chen, Weston, and Altman (1995). The main relevant finding important for our purpose is that formal in-court restructuring processes are more costly to firms than informal workouts (e.g. Franks and Torus (1994)).

Because the close relationship between a bank and a debtor firm increases monitoring efficiency banks are able to identify refinancing problems early (e.g. Hoshi et al. (1990)), potentially avoiding a costly restructuring process after a breach of credit contract covenants. Gopalakrishnan and Parkash (1995) identify six responses to credit covenant violations: termination of the agreement, demand for immediate repayment, increased collateral, increased interest rate, additional covenants and simply waiving the breach. Responses such as waiving covenant breaches and increasing interest rates allow creditors to keep firms out of distress but Garleanu and Zwiebel (2009) note that almost all covenant renegotiations occur with private debt. Because of the information advantage of a single bank or a lending consortium of several banks and the superior toolset of banks relative to public creditors, we believe that firms with a higher proportion of bank debt given the same underlying fundamentals will be less likely to require restructuring at all. That hypothesis is also supported empirically by Andrade and Kaplan (1998) who examine a sample of financially distressed LBOs from the 1980s. They find that an increasing proportion of bank debt decreases costs of financial distress. Furthermore, Brunner and Krahnen (2008) show that bargaining costs in distressed situations increase with a firm's lender pool size and Gertner and Scharfstein (1991) find that restructuring of private debt is more efficient than restructuring of public debt. Also, Hoshi et al. (1990) find in the Japanese setting that firms with tight bonds to a bank or an industrial group will exit financial distress in a better state than those without. Specifically, they find that firms with solid bank relationships are able to sell and invest more post-distress than those without. Also, the fact that banks are more likely to restructure debt out of Chapter 11 is pointed out by Gilson et al. (1990) as a reason why banks are more efficient than non-bank lenders at working out distressed debt. Gilson et al. (1990) in the analysis of 169 financially distressed firms also find that costs of financial distress generally increase in the number of debt holders. An explanation for these findings is proposed by Chemmanur and Fulghieri (1994). They show that banks are theoretically likely to allocate more resources to working out distressed situations than the public alternative. They do so with a model that incorporates each individual bank's reputation and also find that firms with solid financials will prefer the public credit market over bank debt.

2.4 Cash Holdings and Refinancing Risk

The size of cash holdings relative to a firm's total assets is used in this paper as a proxy for refinancing risk. The methodology is previously employed by Harford et al. (2014) and the rationale is that a firm can hedge the risk that it will not be able to refinance its debt upon maturity by holding cash. Cash holdings should work as a hedge of refinancing risk because a firm can use cash upon the maturity of debt to either retire the issue or signal financial strength. A difficulty in using cash holdings as a proxy for refinancing risk is that cash can be said to correlate with most metrics in a firm's balance sheet, income statement and cash flow statement. Opler et al. (1999) study determinants of cash holdings and find significant positive correlations with the market-to-book ratio, cash flow, capital expenditures, research and development expenditure and an industry risk statistic. They also find significant negative relationships with firm size, net working capital, total leverage, payment of dividends and operations in regulated industries[2].

2.5 Hypothesis

Our hypothesis is based on two previous research findings: first, banks are more likely to solve refinancing problems and subsequent restructuring more efficiently and are therefore more likely to keep debtors out of financial distress than non-bank lenders, i.e. primarily public debt holders. Second, firms seem to hold cash to offset refinancing risk as shown by Harford et al. (2014). Hence, we propose the following as the main hypothesis of our study:

H: Refinancing risk measured by cash holdings is higher in non-bank than in bank debt.

[2] Due to the correlation of cash holdings with many financial statements items we refrain from using instrumental variables based on financial statement data in the model of a firm's non-bank debt proportion as proposed in the methodology section.

3 Methodology and Sample Data

3.1 General Methodology

Firms' cash holdings and debt composition are likely endogenous by joint determination. Endogeneity in this case means that a firm's non-bank debt proportion affects its cash holdings as our proxy for refinancing risk and its cash holdings in turn affect its non-bank debt proportion. We have already elaborated on why non-bank debt affects cash holdings and we believe that cash is also likely to determine a firm's non-bank debt because of creditor rationing. As pointed out in Hardford et al. (2014) firms are rationed by their lenders in terms of how much they can borrow (e.g. Faulkender and Petersen (2006)) and Roberts and Sufi (2009) find that lenders generally can set terms of lending. If our hypothesis stated above holds this means that public and private creditors are likely to give different options to firms based on their current cash position. Hence, our model is based on a structural equations framework similar to the one used by Harford et al. (2014). However, instead of studying the relationship between debt maturity structures and refinancing risk approximated by cash holdings we analyze the use of non-bank debt and refinancing risk approximated by cash holdings. We employ a simultaneous equations framework treating cash holdings and the use of non-bank debt as endogenous to account for their joint determination. In our two-stage least squares (2SLS) model, we first estimate an OLS regression for non-bank debt and then estimate cash holdings by including the predicted values from the first-stage regression as explanatory variable in the second stage regression.

3.2 Estimating the Effect of Non-Bank Debt on Cash Holdings

In our first stage regression we estimate the proportion of non-bank debt to account for any endogeneity in the hypothesized joint decision of cash holdings and non-bank debt. To do so, we propose the following model of non-bank debt proportion ("NBDP") for firm i in year t:

$$\begin{aligned} NBDP_{it} = \alpha \, + \, & \beta_1 AvgIssueSize_i + \beta_2 VIX_t + \beta_3 BondYield_t + \beta_4 DD3_{it} + \beta_5 Size_{it} \\ & + \beta_6 MtB_{it} + \beta_7 R\&D_{it} + \beta_8 CapEx_{it} + \beta_9 AcqEx_{it} + \beta_{10} Div_{it} + \beta_{11} OpProf_{it} \\ & + \beta_{12} Leverage_{it} + \beta_{13} Issue_{it} + \beta_{14} CFRisk_i + \beta_{15} NWC_{it} + \beta_{16} IPO_{it} \\ & + IndustryEffects + \varepsilon_{it} \end{aligned}$$

Based on the beta estimates of the first stage regression we predict a non-bank debt proportion ("PNBDP") for firm i in year t ($PNBDP_{it}$). In order to estimate the effect of non-bank debt on cash holdings in the second stage we propose the following model by including the predicted values from the first stage regression for firm i in year t:

$$
\begin{aligned}
Cash_{it} = {} & \alpha + \beta_1 PNBDP_{it} + \beta_2 DD3_{it} + \beta_3 Size_{it} + \beta_4 MtB_{it} + \beta_5 R\&D_{it} + \beta_6 CapEx_{it} \\
& + \beta_7 AcqEx_{it} + \beta_8 Div_{it} + \beta_9 OpProf_{it} + \beta_{10} Leverage_{it} + \beta_{11} Issue_{it} \\
& + \beta_{12} CFRisk_i + \beta_{13} NWC_{it} + \beta_{14} IPO_{it} + IndustryEffects + \varepsilon_{it}
\end{aligned}
$$

In the following, we first motivate our selection of the instrumental variables in the first stage regression and then discuss the control variables used in both regressions to account for correlation between cash holdings and the proportion of non-bank debt attributable to non-related factors. Most of these control variables have been used in the existing relevant literature, foremost Opler et al. (1999) and Harford et al. (2014).

We include instrumental variables[3] in the first stage model proxying for flotation costs, liquidity and interest costs. As shown by Krishnaswami et al. (1999) larger debt issues are associated with decreasing marginal costs of issuance. We account for the scale effect in floating costs of debt issuance affecting the choice between bank debt and non-bank debt by including a firm's average bond issue size ("AvgIssueSize"). Furthermore, we use the Chicago Board Options Exchange Volatility Index ("VIX") as proxy for bond market liquidity. While the VIX index measures market expectations of near-term volatility conveyed by S&P 500 stock index options prices it has been shown by Bao et al. (2011) that the index is strongly related to changes in aggregate illiquidity and hence can proxy for liquidity in the corporate bond market. Harrison (2002) shows that liquidity impacts both the composition of firms entering the market and the issue size. As a measure of the cost of non-bank debt financing we use the Bank of America Merrill Lynch US Corporate & High Yield Index ("BondYield").

The predicted non-bank debt proportions ("PNBDP") defined as total debt excluding bank debt divided by total debt from this stage regression are then used as explanatory variable in the second stage regression estimating cash holdings ("Cash") defined as the sum of cash and short-term investments divided by total assets. We include 13 control variables in both regression stages to account for correlation between cash holdings and the proportion of non-bank debt affecting the joint determination of both variables of interest.

[3] We test for weakness in the instruments by using a F-test. The obtained statistic of 56.13 indicates that there is no weakness problem when comparing with relevant tabulated F-test statistic requirements in Stock and Yogo (2005).

As first control variable we include the ratio of long-term debt due within the next years (including the current portion) over total long-term debt ("DD3"). We include this ratio due to its significant effect on cash holdings studied by Harford et al. (2014): all else equal, an increasing proportion of this long-term debt due in the very near future increases the cash holdings of a firm. As shown in their paper, there is a decrease in the average maturity of firms' long-term debt over the study's 1980 to 2008 sample period which the authors trace back to the growth in the syndicated bank loan market originating typically shorter maturity debt, a finding in line with Sufi (2007). Hence, the debt maturity variable is included in order to isolate the effect that the longer maturity of non-bank debt is predicted to have on cash holdings. We include the natural logarithm of book assets ("Size") as measure of firm size approximating information asymmetry as show by Vermaelen (1981), Fama (1985) and Diamond and Verrecchia (1991) and as proxy for economies of scale in cash holdings as argued by Opler et al. (1999). Furthermore, as shown by Johnson (1997) firm size also correlates with the choice of debt financing regarding monitoring costs. Problems related to information asymmetry with external investors are less pronounced in larger firms these firms are less likely to rely on bank debt (James (1987)), Lummer and McConnell (1989), and Faulkender and Petersen (2006)).

To account for firm specific future growth options, we employ four control variables: market-to-book equity ("MtB"), research and development expenses scaled by sales ("R&D"), capital expenditures scaled by book assets ("CapEx") and acquisition expense scaled book assets ("AcqEx"). All four variables (or alternate forms of them) have been used either by Opler et al. (1999) or Harford et al. (2014) in their respective cash holdings models. Besides approximating growth and valuable investment opportunities (Smith and Watts (1992), Jung et al. (1996)), especially market-to-book equity and research and development expenses proxy for information asymmetry between firms and investors about a firm's prospects. Hence, to avoid underinvestment problems caused by being unable to raise outside funds or by raising them only at high costs these firms are assumed to hold more cash and to rely more on shorter maturity debt, e.g. in the form of bank debt (Myers (1977)). Furthermore, firms with higher research and development expenses can be assumed to have higher costs of financial distress according to Bates et al. (2009) giving these firms an incentive to accumulate cash and to borrow more from banks. As capital expenditures proxy for a firm's investment level firms that invest more in form of capital expenditures are predicted to have smaller cash reserves. The same logic applies to acquisition expenses (Bates et al. (2009)). Controlling for acquisition expenses also helps control for agency costs as shown by Jensen (1986) and Harford et al.

(1999). One more reason why controlling for acquisition expense is important is that acquisitions for one or another reason may be financed with more or less non-bank debt than other corporate activities.

To distinguish whether a firm pays dividends, we define a dummy control variable ("Div") set equal to one in years when a firm pays dividends and otherwise to zero. Doing so allows us to capture the effect of dividend payments on cash holdings. According to Opler et al. (1999) and Harford et al. (2014) dividend payments are expected to have a negative impact on cash holdings as firms paying dividends have presumably better access to external funding and therefore need smaller cash holding. This assumption is in line with firms having more external funding in the form of non-bank debt.

Operating profitability ("OpProf") calculated as earnings before interest and tax divided by sales controls for the idea that more profitable firms are less financially constrained and hence need less cash for precautionary reasons (Harford et al. (2014)). Operating profitability is also important from an agency cost perspective as the cash generation that follows operating profitability increases such costs (e.g. Jensen (1986)). Assuming better monitoring capabilities of banks decreasing agency cost issues, it is therefore likely that these firms have more external financing in the form of bank debt. The control variable leverage ("Leverage") as measured by total debt divided by book assets accounts for the expectation that higher levels of leverage cause higher interest payments that limit firms' ability to accumulate (excess) cash holdings (Jensen (1986)). Considering this incentive mechanism, more levered firms are presumably also in less need of additional bank monitoring resulting in a lower share of bank debt relative to total debt. We also include net debt issuance scaled by book assets ("Issue") as control variable following Harford et al. (2014) where net debt issuance is defined as annual long-term debt issuance minus long-term debt amortization. This allows us to control both for any increase in cash holdings caused by larger issuance than retirement of long-term debt and changes in the total debt composition. In order to control for the cash flow uncertainty within an industry we calculate industry specific cash flow risk ("CFRisk") as control variable following Harford et al. (2014) by first computing the standard deviation of cash flow to assets for the previous ten years. Second, we compute the average of the firm's cash flow standard deviations each year across each industry defined by a two-digit SIC code. Doing so allows us to capture the effect of cash flow risk within an industry which is presumably positively correlated with cash holdings as firms build up cash buffers to avoid any underinvestment problems. In addition, firms operating in industries with higher cash flow risk could face higher information asymmetries resulting in a preference for bank debt which would also correspond to lenders' preference as loans with shorter maturity are less sensitive to changes in firm risk.

Controlling for net working capital scaled by book assets ("NWC") accounts for the substitute effect net working capital may have on cash holdings (Opler et al. (1999), Harford et al. (2014)). In practical terms, this means that non-cash components of working capital can be converted into cash relatively quickly. As the last control variable we consider the initial public offering data of a firm by including a dummy variable ("IPO") equal to one if a firm had an IPO during the previous five years and otherwise equal to zero. This allows us to control for several effects: first, changes in the population of the sample, second, the potential of larger information asymmetry for recent IPO firms (Bates et al. (2009)), third, the cash received from the IPO (Bates et al. (2009)) and fourth, the limited access to capital markets for young firms resulting in a preference for bank debt. On a final note we also account for industry fixed effects based on Fama-French (1997) 48 industry groups to capture unobserved industry factors influencing debt composition and cash balances.

3.3 Summary Statistics

Our initial sample consists of panel data covering 16,543 firm-years of 3,138 U.S. incorporated firms (utilities and financial firms are excluded based on reported SIC codes) with non-zero sales, total assets and non-bank debt during the ten year period from 2003 to 2013[4]. All firm specific data is obtained from Compustat and S&P Capital IQ. Market data has been accessed via Bloomberg. We measure the proportion of non-bank debt ("NBDP") as total debt excluding bank debt divided by total debt. Issue size ("AvgIssueSize") is given as the natural logarithm of a firm specific average. The VIX index ("VIX") is the actual index value. The Bank of America Merrill Lynch US Corporate & High Yield Index ("BondYield") is measured in percentage points and all data except for the average issue size is as per the end of the respective year. Cash is defined as sum of cash and short-term investments scaled by book assets ("Cash"). The non-bank debt proportion is the ratio of non-bank debt ("NBDP") to total debt. "DD3" is the long-term debt due within the next three years, including its current portion, divided by total debt. "Size" is measured as the natural logarithm of book assets. The market-to-book equity ratio ("MtB") is computed as the firm's market capitalization divided by the book value of equity. The capital expenditure variable ("CapEx") is the cash flow statement figure of capital

[4] We access S&P Capital IQ through Wharton Research Data Services (WRDS) with earliest reported data dating back to 2003, hence the limited sample period of ten years.

expenditure divided by book assets and the acquisition expense ("AcqEx") variable is defined as acquisition expense scaled by book assets. The dividend variable ("Div") is a dummy variable signifying whether a firm pays dividend in the given year. Operating profitability ("OpProf") is the firm's earnings before interest and tax divided by sales. Leverage ("Leverage") is the firm's total debt divided by the book value of assets. The net debt issuance variable ("Issue") is the firm's annual gross issue of debt less gross amortization relative to assets. The cash flow risk variable ("CFRisk") is the average standard deviation in operating cash flow for each individual firm's industry as defined by a 2-digit SIC code. The working capital variable ("NWC") is net working capital divided by total assets. The IPO variable ("IPO") is a dummy signifying whether the firm had an IPO in the previous five years.

Table 1 – Summary Statistics Initial Sample

This table reports summary statistics for the initial sample of 16,543 firm-years of 3,138 Compustat U.S. incorporated firms with non-zero sales, total assets and non-bank debt over the period 2003 to 2013. All firm specific data is obtained from Compustat and S&P Capital IQ. All market data is obtained from Bloomberg.

					Distribution	
Variable	**Obs.**	**Mean**	**Median**	**Std. Dev.**	**5%**	**95%**
NBDP	16543	0.646	0.788	0.373	0.009	1.000
ln(AvgIssueSize)	16543	3.118	3.958	2.570	-1.359	6.257
VIX	16543	20.492	18.365	6.733	12.833	33.697
BondYield	16543	5.732	5.258	1.592	3.494	9.780
Cash	16543	0.162	0.088	0.192	0.003	0.606
DD3	16543	0.430	0.307	0.415	0.000	1.000
Size	16543	6.065	6.344	2.311	2.036	9.488
MtB	16543	2.762	1.872	52.937	-2.394	10.277
R&D	16543	4.555	0.000	229.091	0.000	0.748
CapEx	16543	0.056	0.033	0.078	0.003	0.196
AcqEx	16543	0.027	0.000	0.075	0.000	0.167
Div	16543	0.361	0.000	0.480	0.000	1.000
OpProf	16543	-0.148	0.060	2.147	-0.637	0.206
Leverage	16543	0.558	0.269	6.591	0.005	0.954
Issue	16543	0.043	-0.001	0.584	-0.124	0.271
CFRisk	16543	0.273	0.284	0.188	0.059	0.729
NWC	16543	-0.313	0.152	25.865	-0.214	0.599
IPO	16543	0.181	0.000	0.385	0.000	1.000

The computation of financial ratios as control variables based on the reported data on Compustat yields extreme values. These observations cannot necessarily be classified as outliers from an economic perspective but require mitigation regarding the statistical methodology to derive meaningful results. The high variance of these control variables both affects the mean and standard error of the variables in a significant way. We propose two alternative methods for mitigating the influence of extreme values in our financial ratios: the first method excludes the smallest firms by assets from our sample as the low asset base of these firms inflates the value of scaled variables artificially. Since Compustat exclusively reports data of publicly listed firms that we match with capital structure data from S&P Capital IQ it is likely that the firms with a very small asset base exhibit further unique characteristics For example, they can be publicly listed research firms without actual revenue and with negligible reportable assets. Furthermore, since our aim is to examine the choice in debt composition it is important to limit the sample to firms that are likely to have access to both private and public debt markets. To avoid any bias induced by very small firms, we exclude all observations with a negative natural logarithm of book assets, i.e. firms with less than one $ million in assets. This results in a final sample of 16,352 firm-years of 3,081 U.S. incorporated firms.

Table 2 – Summary Statistics Final Sample

This table reports summary statistics for the final sample of 16,352 firm-years of 3,081 Compustat U.S. incorporated firms with non-zero sales and non-bank debt and total assets of more than one $ million over the period 2003 to 2013. All firm specific data is obtained from Compustat and S&P Capital IQ. All market data is obtained from Bloomberg.

					Distribution	
Variable	**Obs.**	**Mean**	**Median**	**Std. Dev.**	**5%**	**95%**
NBDP	16352	0.644	0.784	0.374	0.008	1.000
ln(AvgIssueSize)	16352	3.170	3.999	2.536	-1.263	6.264
VIX	16352	20.451	18.365	6.727	12.833	33.697
BondYield	16352	5.731	5.258	1.585	3.494	9.780
Cash	16352	0.161	0.088	0.191	0.003	0.603
DD3	16352	0.427	0.303	0.414	0.000	1.000
Size	16352	6.149	6.377	2.187	2.333	9.503
MtB	16352	2.761	1.893	52.386	-1.962	10.226
R&D	16352	4.339	0.000	229.969	0.000	0.638
CapEx	16352	0.056	0.033	0.077	0.004	0.195
AcqEx	16352	0.027	0.000	0.075	0.000	0.169
Div	16352	0.364	0.000	0.481	0.000	1.000
OpProf	16352	-0.031	0.062	0.478	-0.536	0.207
Leverage	16352	0.356	0.267	0.727	0.005	0.887
Issue	16352	0.024	-0.001	0.186	-0.123	0.259
CFRisk	16352	0.272	0.284	0.187	0.059	0.729
NWC	16352	0.104	0.155	2.477	-0.161	0.600
IPO	16352	0.182	0.000	0.386	0.000	1.000

The alternative method we propose is based on a winsorisation approach as reported in Appendix 1. Both methods give similar results.

4 Multivariate Results and Analysis

In this section, we first summarize the results of the first stage regression predicting the proportion of non-bank debt. Second, we estimate the effect of the non-bank debt on corporate cash holdings and compare our results with previous research findings. Finally, we analyze the effect of non-bank debt on cash holdings and its implications in more detail.

4.1 Multivariate Results – First Stage Regression

Table 3 – First Stage Regression of Non-Bank Debt

This table reports the coefficient estimates of the first stage regression estimating non-bank debt proportions based on the final sample of 16,352 firm-years of 3,081 Compustat U.S. incorporated firms. Definitions of the variables are provided in Section 3.3.

Variable	Coefficient	Std. Err.	T-Score	Significance
Intercept	0.802	0.087	9.260	<1%
ln(AvgIssueSize)	0.059	0.005	12.940	<1%
VIX	-0.002	<0,001	-5.130	<1%
BondYield	-0.002	0.002	-0.900	37%
DD3	-0.026	0.011	-2.420	2%
Size	-0.026	0.005	-5.020	<1%
MtB	<0,001	<0,001	-0.090	93%
R&D	<0,001	<0,001	0.790	43%
CapEx	-0.163	0.057	-2.880	<1%
AcqEx	-0.513	0.043	-11.820	<1%
Div	0.034	0.011	3.260	<1%
OpProf	-0.086	0.015	-5.920	<1%
Leverage	-0.044	0.014	-3.130	<1%
Issue	0.036	0.025	1.450	15%
CFRisk	0.088	0.049	1.770	8%
NWC	<0,001	0.001	0.470	64%
IPO	-0.033	0.013	-2.640	1%
Industry fixed effects	Yes			
Observations	16352			
R^2-adjusted	14%			

In line with our expectations we find that the proportion of non-bank debt is increasing in the average issue size and decreasing in the level of bond market liquidity and interest costs. The average issue size has a positive impact on non-bank debt proportions with a coefficient of

0.059. Liquidity approximated by VIX assumes a coefficient of -0.002. Interest cost measured by BondYield is estimated with a coefficient of -0.002, but is not statistically significant. The proportion of long-term debt due within the next three years has a negative impact on non-bank debt with an estimated coefficient of -0.026. This indicates that firms with larger proportions of shorter maturity debt of their total long-term debt rely more on bank lending, in line with the findings of Harford et al. (2014). Contrary to our expectation, firm size is estimated to be negatively correlated with the use of non-bank debt, indicating that larger firms in our sample are more likely to rely on bank financing.

The coefficients of the control variables regarding firm growth are in line with our expectations. Capital expenditure and acquisition expenditure, both statistically significant, are estimated to have strong negative impacts on non-bank debt proportions with coefficients of -0.163 and -0.513. Whether a firm pays dividends or not is estimated to increase the proportion of non-bank debt, a finding in line with our expectation. However, operating profitability and leverage seem to decrease the fraction of non-bank debt in the total debt structure against our expectation. Net debt issuance, industry cash flow risk and net working capital have statistically non-significant coefficients. Firms that had an IPO within the last five years are estimated to rely more on bank debt, also in line with our expectation.

Appendix 2 illustrates the actual and predicted non-bank debt proportions over the sample period. As a robustness test the first stage regression results for both the initial sample and winsorised sample are reported in Appendix 3 and 4.

Using the predicted non-bank debt proportions from the first stage regression we estimate the effect of non-bank debt proportions on cash holdings in the second stage of our model.

4.2 Multivariate Results – Second Stage Regression

Having estimated the non-bank debt proportions in the first stage regression we include the predicted values as the explanatory variable in the second stage regression. Table 4 reports the results. A summary of our discussion regarding the impact of each variable is included in Appendix 5.

Table 4 – Second Stage Regression of Cash Holdings

This table reports the coefficient estimates of the second stage regression estimating cash scaled by book assets based on the final sample of 16,352 firm-years of 3,081 Compustat U.S. incorporated firms. The standard errors of the coefficients are adjusted for clustering of observations at the firm level. Definitions of the variables are provided in Section 3.3.

Variable	Coefficient	Std. Err.	T-Score	Significance
Intercept	0.020	0.039	0.520	60%
PNBDP	0.109	0.034	3.160	<1%
DD3	0.027	0.005	5.000	<1%
Size	-0.010	0.002	-5.690	<1%
MtB	<0,001	<0,001	2.350	2%
R&D	<0,001	<0,001	0.610	54%
CapEx	-0.083	0.026	-3.140	<1%
AcqEx	-0.207	0.024	-8.610	<1%
Div	-0.020	0.004	-4.560	<1%
OpProf	-0.035	0.009	-3.960	<1%
Leverage	-0.032	0.010	-3.170	<1%
Issue	0.075	0.015	4.860	<1%
CFRisk	0.104	0.019	5.560	<1%
NWC	0.002	0.002	1.250	21%
IPO	0.055	0.006	9.610	<1%
Industry fixed effects	Yes			
Observations	16352			
R^2-adjusted	36%			

We find both a statistically and economically significant effect of the non-bank debt proportion on cash holdings with an estimated coefficient of 0.109. A one standard deviation increase of 12.20 percentage points in the non-bank proportion translates into an estimated increase of 1.26 percentage points in the fraction of cash to total assets In Section 4.4, we illustrate the estimated effect in more detail.

The proportion of long-term debt due within the next three years assumes a positive coefficient of 0.027. The positive relationship is in line with the findings of Harford et al. (2014)

even though our estimated coefficient is lower. We estimate that for a one standard deviation increase (41.38 percentage points) in the proportion of long-term debt due within the next three years cash holdings scaled by book assets increase by approximately 1.12 percentage points. Corresponding to our expectation, firm size is negatively correlated with cash holdings and the effect is statistically significant with a coefficient of -0.010. The estimated effect for a one standard deviation increase (218.67 percentage points) in size on scaled cash holdings is a decrease by 2.19 percentage points. This is in line with our underlying assumption that larger firms suffer less from information asymmetry induced problems and have certain economies of scale in cash handlings. We confirm thereby the positive effect estimated by Opler et al. (1999). However, this finding is in contrast to Harford et al. (2014) who find a positive effect.

The positive sign of the estimated effect of the market-to-book equity ratio on cash balances corresponds to our expectation and the findings of previous research. Even though the estimated coefficient itself is relatively small, the estimated effect of a one standard deviation increase (5238.61 percentage points[5]) in the market-to-book variable is an increase in scaled cash of 0.34 percentage points. Our other variable proxying for growth options, the research and development expenses to sales ratio, also assumes the expected positive direction but is statistically not significant. However, if winsorised, this ratio is significant on the 1% level with a positive coefficient, in line with the previous findings of Harford et al. (2014). Accounting for the investment level of a firm, we include both firms' capital expenditure and acquisition expenditure, respectively scaled by book assets. The negative signs of both coefficients confirm our expectations and are in line with the findings in Harford et al. (2014). A one standard deviation increase (7.67 percentage points) in the capital expenditure to book assets ratio of a firm decreases its cash holdings as a fraction of assets by 0.634 percentage points. In line with Harford et al. (2014) and Opler et al. (1999), it seems reasonable to us that a firm with ample prospects for growth indeed would use more cash for capital expenditures in a given year than it would save for future years. The same logic applies to the acquisition expense to book assets ratio. A one standard deviation increase of 7.54 percentage points in this ratio decreases scaled cash balances by 1.56 percentage points. Whether a firm is paying dividends in a given year also affects its cash holdings. Statistically significant at the 1% level, the estimated coefficient of dividend payments is -0.020. This is in line with our expectation that is based on the

[5] Note that the standard deviations of the market-to-book equity ratio and research and development expenses to sales ratio are abnormally high. We provide the winsorised summary statistics in Appendix 1 and second stage regression output in Appendix 7 that shows the effects of a lower standard deviation in the variables.

assumption that dividend paying firms have better access to capital markets, hence accumulate less (excess) cash.

We find that a firm's increasing operating profitability seems to decrease its cash holdings: the estimated coefficient of -0.035 corresponds to a decrease in scaled cash holdings of 1.69 percentage points for a one standard deviation increase (47.79 percentage points) in operating profitability. The negative impact is in line with our underlying assumption that more profitable firms are more likely to have better access to capital markets and hence are less financially constrained and therefore do not accumulate (excess) cash holdings. Conversely, firms that have lower operating profitability might have to hoard cash due to worse access conditions to external financing. We find a negative relationship (estimated coefficient of -0.032) between leverage measured as total debt divided by assets and scaled corporate cash balances, in line with our expectation and the findings of previous research. We estimate that a one standard deviation increase (72.68 percentage points) in leverage decreases the fraction of total assets held in cash by 2.30 percentage points which is in line with our expectation that interest payments reduce the accumulation of cash holdings. Controlling for new debt financing by including the net debt issuance scaled by book assets we estimate a positive coefficient of 0.075. This translates into an increase of 1.39 percentage points in cash held as a fraction of assets for a one standard deviation increase (18.56 percentage points) in net debt issuance. The effect indicates that firms issue debt not only for immediate investment needs or retiring maturing debt but also for future cash needs. This is in line with our expectation and findings in Harford et al. (2014). An industry's cash flow risk also seems to have a positive impact on firms' cash accumulation behavior, a finding in line with Opler et al. (1999). A one standard deviation increase (18.71 percentage points) in this risk measure induces firms to hold 1.95 percentage points more of their assets in cash. The intended hedging effect seems to confirm our assumption that firms build up cash buffers to avoid potential underinvestment problems related to volatile cash flows. We control in our cash model for the potential substitute effect of net working capital on cash. We estimate only a statistically non-significant coefficient. This result does not align with the previous work of Opler et al. (1999) and Harford et al. (2014).

Last, we find that an IPO within the previous five years increases cash held as a fraction of a firm's assets by 5.46 percentage points. A positive effect, while not statistically significant, was also observed in Harford et al (2014). Hence, we find it reasonable to assume that either one or both of the following mechanisms are at work. First, due to the increased information asymmetry of these recently listed firms, it is likely that they hold on to more cash after the offering. Second, it is also likely that firms do not use cash from IPOs immediately and hold on to it for some time.

Table 5 – Coefficient Summary Second Stage Regression

This table gives an overview of our cash determinant regression coefficients estimated relative to our expectations and relative to findings in previous research. "n/a" means not available and "n/s" means not statically significant on the 5% level.

Variable	**Expectation**	**Coefficient**	**Harford et al. (2014)**	**Opler et al. (1999)*** **
Intercept	(n/a)	+	-	-
PNBDP	+	+	(n/a)	(n/a)
DD3	+	+	+	(n/a)
Size	-	-	+	-
MtB	+	+	+*	+
R&D	+	+ (n/s)	+	- (n/s)
CapEx	-	-	-	-
AcqEx	-	-	-	(n/a)
Div	-	-	- (n/s)	-
OpProf	-	-	+	(n/a)
Leverage	-	-	-	-
Issue	+	+	+	(n/a)
CFRisk	+	+	+ (n/s)	+
NWC	-	+ (n/s)	-	-
IPO	+	+	+ (n/s)	(n/a)
Interest rate**	(n/a)	(n/a)	+ (n/s)	(n/a)
Regulated industry	(n/a)****	(n/a)****	(n/a)****	-

* Harford et al. (2014) compare the market value to the book value of assets whereas we compare it to the book value of equity.
** Harford et al. (2014) include the commercial and industrial loan spread as published by the FED as a control variable. The variable is not predicted to have a significant effect on cash holdings.
*** Opler et al. (1999) results are based on the cross-sectional regression in table 4.
**** Papers exclude firms in regulated industries.

As a robustness test the second stage regression results for both the initial sample and winsorised sample are reported in Appendix 6 and 7.

4.3 Potential for Bias

In this section, we like to point out some limitations in our model that could potentially bias our estimated results. We also present an alternative panel data method using Fixed-Effects and Random-Effect models as robustness check.

In our first stage regression estimating non-bank debt proportions, we employ three instrumental variables. We use the firm-specific average issue size as proxy for flotation costs, the VIX index as measure of liquidity and the BondYield index as approximating measure of interest cost for non-bank debt. In addition, we control for correlation between the proportion of non-bank debt and cash holdings attributable to non-related factors. It is our view that the quality of the first stage regression estimates are the most threatened by omitted variable bias. Our adjusted R-squared as measure of explanatory power is relatively low at 14% for our first stage regression (Harford et al. (2014) report an adjusted R-squared of 19%). Hence, there could be plenty of room for omitted variable bias (unobservable heterogeneity) meaning that a variable, or rather an effect, that we have not included in our model correlates both with the dependent and one or more of the independent variables. One such omitted effect could be, for example, the regulatory changes in the banking environment over the sample period. To the best of our knowledge, there is no practical method for us to capture that effect in a proxy variable but we can say with a high probability that regulation has affected the willingness of banks to lend over the sample period. If the willingness to lend has changed over time and also correlates with one of our independent variables we would have an omitted variable bias in our estimates that we cannot quantify. What could be the effect in practical terms is, for example, that both willingness to lend and interest rates have decreased since the years of the financial crisis. That would amplify the effect of our non-bank, public market interest rate proxy on the proportion of non-bank debt a firm is holding as both effects would have a positive coefficient if captured separately in the regression. In addition, the unobserved effect of tighter regulation affecting bank lending itself could induce firms to hold more non-bank debt and consequently more cash according to our hypothesis. In that sense, the regressors would not fulfil the implicit assumption of strict exogeneity, i.e. they would be correlated with the error term in our regression model, which may lead to biased estimators.

Furthermore, there might be concerns about the quality of our control variables in terms of whether they capture the effects we are trying to control for. In particular, this is especially relevant for variables used to proxy for rather abstract concepts such as moral hazard and adverse selection. For example, the market-to-book ratio is used as a proxy for future growth options giving rise to problems related to moral hazard as hypothesized by Krishnaswami et al. (1999). However, there is a chance that this variable does not capture the real effect and is not a satisfactory estimator of moral hazard.

Biases related to the combination of the two regressions are in our view most likely to be related to some form of co-determination of one or more of our first stage instrumental variables and the second stage dependent variable which is cash holdings as a percentage of total assets. We are using the 2SLS methodology to avoid codetermination in the proportion of non-bank debt and cash holdings but if one of our non-bank debt proportion instruments are codetermined with cash holdings we are not solving the problem. In practice, such a problem could emanate for example from our interest rate variable also describing some effect that changes a firm’s choice to hold more or less cash. Another point on the instrumental variable estimator is that validity of the instrumental variables cannot be easily statistically tested. Therefore, the conclusions drawn from instrumental variable estimation mainly rest on the non-testable assumption that the instrumental variables are uncorrelated with the error term (Bruederl (2010)).

As we analyze an (unbalanced) sample of panel data we also present results obtained by using panel data methods. Since we follow Harford et al. (2014) in their methodology focusing on the 2SLS approach, we provide panel data results mainly as a robustness check. Panel data estimators might be more efficient than those obtained by cross sectional analysis and offer the advantage of reducing the problem of individual unobserved heterogeneity, i.e. omitted variable bias (Bruederl (2010), Cameron and Trivedi (2009)), as they allow us to control for potential influence factors on cash holdings we can`t measure or observe. They also control for variables that change over time but not across entities. We consider two panel data models: a Random-Effects (RE) Model as well as a Fixed-Effects (FE) Model. While the RE model assumes exogenous regressors, the FE approach allows independent variables to be correlated with a part of the error term, thereby eliminating the problem of time-constant unobservable heterogeneity. However, we note that FE cannot estimate the effect of time invariant variables. Therefore, performing FE drops any time invariant variables. We perform a Hausman-Test to check whether a RE or a FE model is more appropriate. The Hausman-Test tests the null hypothesis that the (efficient) RE estimator is not different from the (consistent) FE estimator. The Hausman-Test shows a significant p-value, indicating that RE estimators are not consistent. This points out that the assumption of the RE model that all regressors are exogenous may not be valid. Therefore we conclude that the FE model is more appropriate. The proportion of non-bank debt as our main variable of interest remains significantly positive and the results of our control variables are predominantly robust. The RE and FE models are reported in Appendix 8.

4.4 The Effect of Non-Bank Debt on Cash Holdings

As reported in Table 4 the coefficient of non-bank debt in the second stage regression is estimated to be 0.109. To give a practical illustration of the estimation we measure the effect for a one standard deviation change in a firm's predicted non-bank debt proportion. The standard deviation in the predicted non-bank debt proportion variable is 12.20 percentage points around a mean of 60%. Therefore the resulting increase in cash as a proportion of assets for a one standard deviation increase in the non-bank debt proportion is as much as 1.26 percentage points. Furthermore, to give an indication of the potential range of the effects, we calculate the effect range for the 95% confidence interval as presented in Table 6.

Table 6 – The Effect of Non-Bank Debt on Cash Holdings

This table presents the estimated increase in cash scaled by book assets for a one standard deviation increase in our predicted non-bank debt proportion with an average of 60%. The low and high columns represent the minimum and maximum of the estimated 95% confidence interval of the effect of non-bank debt on cash holdings.

	Low	**Mid**	**High**
Coefficient	0.041	0.109	0.176
Standard deviation of PNBDP	0.122	0.122	0.122
Effect on cash scaled by book assets	0.005	0.013	0.021

In order to provide a further practical illustration of the estimated effects, we suggest that the magnitude of the effect of non-bank debt proportions on cash be set in comparison to the changes in the debt structure. Given a sample average leverage of 35.6% measured as total debt divided by total assets the effect on debt resulting from a one standard deviation increase (12.20 percentage points) in the non-bank debt proportion is 4.30 percentage points. Hence, the ratio of the effect on cash (1.30 percentage points) to the effect on debt (4.30 percentage points) is 30.5%. This ratio can be interpreted in the following way: if $100 of debt are refinanced from bank to non-bank debt the firms will offset the refinancing risk of that debt with $30.5 in cash. Our 95% confidence interval around the estimated effect gives us a ratio range of 11.6% to 49.4%.

Table 7 – The Cash Effect to Debt Effect of Non-Bank Debt

This table presents how much cash a firm has to hold against a one standard deviation increase in its predicted non-bank debt proportion. The low and high columns represent the minimum and maximum of the estimated 95% confidence interval of the effect of non-bank debt on cash holdings.

	Low	**Mid**	**High**
Effect on cash scaled by book assets	0.005	0.013	0.021
Average leverage	0.356	0.356	0.356
Standard deviation of PNBDP	0.122	0.122	0.122
Effect on debt	0.043	0.043	0.043
Effect on cash/effect on debt	0.116	0.305	0.494

We like to point out that the ratio of the cash effect to debt effect is sensitive to different levels of leverage and in all likelihood not valid for debt ratios other than the average in the sample. Ratio estimates in the 10th and 90th percentile of leverage ratios in our sample give a cash/debt effect ranging from 16.5% to 543.0% at the regression point estimate of the cash impact. Given the ratio's high sensitivity to leverage, we see a potential next step in the research area to be an estimate of how refinancing risk affects cash holdings scaled by debt instead of assets.

Table 8 – The Cash Effect to Debt Effect of Non-Bank Debt at Different Leverage Levels

This table presents how a cash effect to debt effect ratio is sensitive to leverage assumptions. The leverage examples given are the 90th, 50th and 10th percentile observations of leverage in the final sample data of 16,352 firm-years of 3,081 Compustat U.S. incorporated firms.

Leverage Level	**Low**	**Mid**	**High**
90th percentile (2%)	2.064	5.430	8.797
Median (26%)	11.227	0.418	0.677
10th percentile (66%)	1.515	0.165	0.267

4.5 Subsample Analysis

Subsample analysis indicates that the estimated effect of non-bank debt on cash holdings is most prevalent for firms with above median predicted non-bank debt proportions and for firms with above median leverage.

We find that the effect of non-bank debt on cash holdings is the most accentuated in the subsample of observations with above median predicted non-bank debt proportions. In contrast, in the subsample of observations with below median predicted non-bank debt proportions we find no statistically significant effect. However, in the above median subsample the effect is considerably larger than in the model using the full final sample of 16,352 firm-years of 3,081 Compustat U.S. incorporated firms as reported in Table 4.

Table 9 – Second Stage Regressions for Subsamples of Non-Bank Debt Proportions

This table reports the coefficient estimates of the second stage regression estimating cash scaled by book assets for subsamples of below and above median predicted non-bank debt proportions based on the final sample of 16,352 firm-years of 3,081 Compustat U.S. incorporated firms. The median is calculated on a yearly basis. The values and method are otherwise identical to that of the second stage main regression. The standard errors of the coefficients are adjusted for clustering of observations at the firm level. Definitions of the variables are provided in Section 3.3.

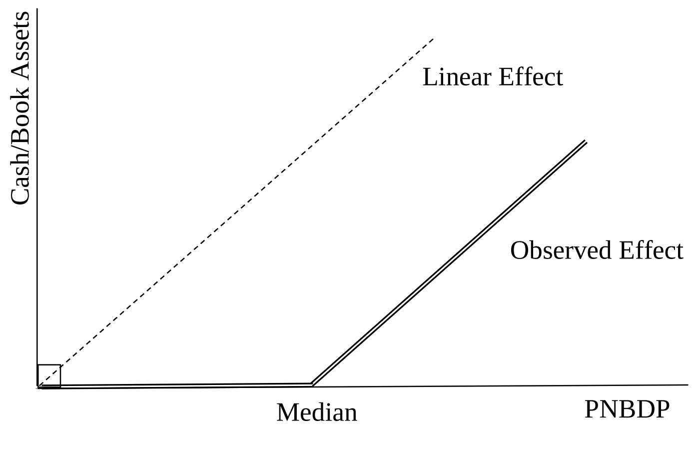
	PNBDP < Median			**PNBDP > Median**		
	Coefficient	**Std. Err.**	**Significance**	**Coefficient**	**Std. Err.**	**Significance**
Intercept	0.134	0.061	3%	-0.197	0.095	4%
PNBDP	-0.062	0.040	12%	0.511	0.110	<1%
DD3	0.028	0.008	<1%	0.061	0.013	<1%
Size	-0.004	0.002	7%	-0.032	0.003	<1%
MtB	<0,001	<0,001	0%	<0,001	<0,001	10%
R&D	<0,001	<0,001	18%	<0,001	<0,001	95%
CapEx	-0.071	0.037	5%	-0.069	0.052	19%
AcqEx	-0.216	0.026	<1%	-0.108	0.079	17%
Div	-0.008	0.007	23%	-0.029	0.007	<1%
OpProf	-0.134	0.022	<1%	0.018	0.011	9%
Leverage	-0.041	0.008	<1%	-0.036	0.013	1%
Issue	0.050	0.024	4%	0.072	0.020	<1%
CFRisk	0.114	0.042	1%	0.107	0.035	<1%
NWC	0.012	0.006	3%	0.001	0.001	60%
IPO	0.072	0.008	<1%	0.047	0.011	<1%
Industry f.e.	Yes			Yes		
Observations	8179			8173		
R^2-adjusted	10%			9%		

In our opinion, there are two reasonable explanations why the effect is distinguishable only in the above median group of observations. First, refinancing risk may not increase linearly in the proportion of non-bank debt. The indication in the data would be that refinancing risk is immaterial at lower proportions of non-bank debt and significant at higher proportions of non-bank debt. As we assume that non-bank debt is mainly held publicly and hence presumably by a large number of different investors, the increasing potential restructuring inefficiencies associated with a larger lender pool might induce firms with high non-bank debt proportions to hedge refinancing risk more aggressively.

Second, refinancing risk may be increasing linearly or at least somewhat linearly in the proportion of non-bank debt, while firms choose not to hedge refinancing risk at lower levels of on-bank debt. For example, firms could choose not to hedge refinancing risk at lower levels of non-bank debt proportions because the perceived risk is low enough to bear unhedged. Another possibility is that when a large fraction of a firm's debt is held by a bank the firm may rely on the bank to be sufficiently incentivized to refinance the firm's entire debt position in the event of distress. The bank could be incentivized to do so if it holds a large share of a firm's debt and could keep the firm out of a costly restructuring process by refinancing the firm's relatively small proportion of non-bank debt.

Figure 1 – Observed Effects for Firms with Low and High Non-Bank Debt Proportions

This figure illustrates the observed effects of PNBDP on cash scaled by book assets and its deviation from a linear relationship.



Analyzing the effect of non-bank debt on cash for below and above median leverage levels we observe that the effect is more pronounced in the subsample of observations with above median leverage levels (however, both coefficients are larger than the coefficient of the full sample analysis). This indicates that firms with a relatively high leverage will hold a larger cash proportion against any non-bank debt on their balance sheets. In our view this could be further evidence of firms offsetting refinancing risk of non-bank debt with cash. Firms with higher leverage have financed a larger portion of their assets with debt. If that debt is issued by creditors that are relatively inefficient at sorting our financial distress it would make sense that the firms with relatively high leverage also hold relatively high amounts of cash against their debt. As an example, we consider two firms that are identical in every aspect except for their leverage ratio. Both firms have the same non-bank debt proportion and total debt. The firm with the higher leverage will in this case hold a higher absolute amount of non-bank debt in terms of assets and will need to offset that risk with more cash.

Table 10 – Second Stage Regression for Subsamples of Leverage

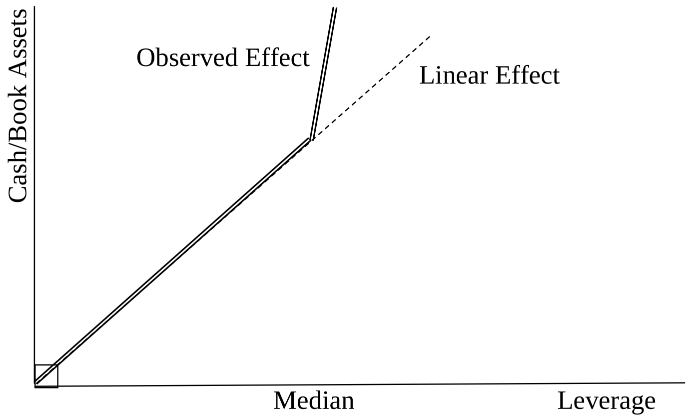
This table reports the coefficient estimates of the second stage regression estimating cash scaled by book assets for subsamples of below and above leverage based on the final sample of 16,352 firm-years of 3,081 Compustat U.S. incorporated firms. The median is calculated on a yearly basis. The values and method are otherwise identical to that of the second stage main regression. The standard errors of the coefficients are adjusted for clustering of observations at the firm level. Definitions of the variables are provided in Section 3.3.

	Leverage < Median			**Leverage > Median**		
	Coefficient	**Std. Err.**	**Significance**	**Coefficient**	**Std. Err.**	**Significance**
Intercept	0.066	0.050	19%	-0.130	0.034	<1%
PNBDP	0.169	0.036	<1%	0.246	0.025	<1%
DD3	0.011	0.006	7%	0.016	0.008	5%
Size	-0.011	0.002	<1%	-0.010	0.002	<1%
MtB	<0,001	<0,001	53%	<0,001	<0,001	6%
R&D	<0,001	<0,001	1%	<0,001	<0,001	<1%
CapEx	-0.058	0.050	25%	-0.045	0.028	11%
AcqEx	-0.243	0.032	<1%	-0.086	0.023	<1%
Div	-0.018	0.006	<1%	-0.020	0.005	<1%
OpProf	-0.085	0.015	<1%	-0.003	0.008	72%
Leverage	-0.396	0.056	<1%	-0.012	0.004	1%
Issue	0.067	0.024	1%	0.080	0.016	<1%
CFRisk	0.083	0.030	1%	0.092	0.024	<1%
NWC	0.035	0.015	2%	0.001	0.001	57%
IPO	0.082	0.008	<1%	0.030	0.006	<1%
Industry f.e.	Yes			Yes		
Observations	8175			8177		
R^2-adjusted	33%			42%		

Another possible explanation for the effect is that the refinancing risk actually has a more linear relationship than we have observed but the firms with high leverage ratios for some reason are “overhedging”. For example, this could be explained by the managers of a firm being overly precautious because they would personally be adversely affected by financial distress.

Figure 2 – Observed Effects for Firms with Low and High Leverage

This figure illustrates the observed effect of PNBDP on cash scaled by book assets regarding leverage and its deviation from a linear relationship.



4.6 The Use of Cash Accounts and Short-Term Investments

To isolate whether firms are using deposited cash or short-term-investments to offset refinancing risk we run the second stage regression two times: once with cash accounts excluding short-term investments and once with short-term investments as the dependent variable. We find strong significance only in the model based on short-term investments. Both variables however take the expected positive coefficient. We see our results as an indications that these two forms of liquidity may be used for different purposes.

Table 11 – The Use of Cash and Short-Term Investments

This table presents the results of separate second stage regressions with cash accounts and short-term investments as dependent variables. The values given are the coefficients, standard deviations, T-scores and p-values of the predicted non-bank debt variable in the respective regressions. The full regressions are presented in Appendix 9.

Dependent Variable	Coefficient	Std. Err.	T-Score	Significance
Cash accounts	0.043	0.027	1.610	11%
Short- term investments	0.065	0.018	3.550	<1%

We believe that the indicated preference of firms to use short-term investments over readily available cash to offset refinancing risk is logical because potential refinancing issues will often be known ex ante. As a practical example, we consider a firm in a severe financial situation with a bond as a form of non-bank debt expiring in six months. The managers of this firm will know that they need all the cash they can get in six month and will be incentivized to make a fixed term investment of current cash to maximize the value of cash at the time of refinancing.

4.7 Non-Bank Debt and the Contribution of Cash Holdings to Market Value

We find that refinancing risk seems to be increasing in non-bank debt and see indications that firms are offsetting this risk by holding cash. In examining the value of this type of hedging we follow the research design adopted by Harford et al. (2014) drawn from Faulkender and Wang (2006). An OLS regression of yearly excess returns regressed on yearly changes in cash and several control and interaction variables make up the core of the model. Because the model uses variables based on lagged values firm-year observations without a corresponding prior year entry are excluded, reducing the sample of 16,352 observations to 9,874 observations.

The dependent variable is excess returns given as yearly returns less the return of the corresponding Fama-French 25 (5x5) portfolio[6]. The Fama-French 25 portfolio returns are used here to proxy for expected returns. The independent variables are all scaled by one year lagged market value of equity except leverage which is scaled by non-lagged market value of equity plus debt. The symbol Δ indicates that a variable is given in terms of a one year change (e.g. ΔCash(t) = Cash(t) - Cash(t-1)). The numerators of the individual variables are as follows: "Cash" is total cash holdings given as sum of cash and short-term investments, "OpProf" is earnings before interest and tax, "NetAssets" is total book assets less cash, "R&D" is total research and development expenditure, "IntExp" is total interest rate expenditure, "Dividend" is total dividends paid to shareholders, "Cash(t-1)" is one year lagged cash holdings given as the sum of cash and short-term investments., "Issue" is net debt issuance. "Leverage" is total debt divided by total assets. "HighRisk" is a dummy variable set to one for firms with the highest refinancing risk attributable to non-bank debt and zero for all other firms. "Cash(t-1) × ΔCash", "Leverage × ΔCash" and "HighRisk × ΔCash" are interaction variables.

Our refinancing risk dummy is based on the non-bank debt proportion of each firm in each year. It is set to one if the firm is in the last quintile of non-bank debt proportions. Quintiles are calculated on a yearly basis. The "HighRisk" variable design follows Harford et al. (2014)

[6] The Fama-French (5x5) portfolios are available on Kenneth French's website. The 25 portfolios are constructed based on the first to fifth quintiles of book equity to market equity (BEME) and market equity (ME). As a rationale for the construction Fama and French (1992) elaborates on the explanatory power of BEME and ME on returns.

although they use the last quintile of long-term debt due within three years. We note however that the 80th percentile breakpoint in our sample is a non-bank debt proportion of 1 for each year in our sample. This means that the "HighRisk" variable in practice signifies firms with only non-bank debt.

As both the dependent and independent variables (except "Leverage") are scaled by market value of equity the interpretation is straight-forward. The sign of the coefficient of each variable translates directly into its effect on market value from a marginal change in the variable. For example, a positive (negative) coefficient for the "ΔCash" variable means that an extra dollar held as cash increases (decreases) the market value of the firm by more than one dollar. The interaction variables isolate the effect of changes in cash that are correlated with other firm-specific characteristics. The "HighRisk × ΔCash" variable for example isolates the changes in cash for firms with a high refinancing risk.

Table 12 – The Effect of Non-Bank Debt on the Market Valuation of Cash Holdings

This table reports the coefficient estimates of the regressions estimating changes in market value. The first model corresponds to the basic market value of cash model in Harford et al. (2014) and Faulkender and Wang (2006). The second model incorporates proxies for refinancing risk based on non-bank debt proportions following Harford et al. (2014).

	Model 1			**Model 2**		
	Coefficient	**Std. Err.**	**Significance**	**Coefficient**	**Std. Err.**	**Significance**
Intercept	-13.289	0.291	<1%	-13.643	0.348	<1%
ΔCash	0.735	0.619	24%	1.008	0.640	12%
ΔOpProf	0.460	0.147	<1%	0.539	0.151	<1%
ΔNetAssets	0.010	0.023	68%	-0.026	0.037	48%
ΔR&D	2.271	1.667	17%	1.950	1.864	30%
ΔIntExp	-0.801	0.784	31%	-0.583	0.896	52%
ΔDiv	-1.721	0.212	<1%	-1.480	0.247	<1%
Cash(t-1)	2.000	0.849	2%	2.390	0.844	1%
Leverage	10.036	0.918	<1%	10.665	0.988	<1%
Issue	-1.668	0.568	<1%	-1.625	0.573	1%
Cash(t-1) × ΔCash	0.000	0.000	85%	-0.001	0.000	6%
Leverage × ΔCash	-2.106	0.910	2%	-3.155	1.190	1%
HighRisk				0.625	0.449	16%
HighRisk × ΔCash				-1.297	0.765	9%
Observations	9847			9847		
R^2-adjusted	19%			19%		

The main variable of interest in Model 1 is the change in cash ("ΔCash") which takes a positive but not statistically significant coefficient. The predicted coefficient of 0.735 is close to the coefficient of 0.751 observed by Faulkender and Wang (2006) but less than the 1.201 coefficient predicted by Harford et al. (2014). The fact that the coefficient estimated by Faulkender and Wang (2006) is significant at the 5% level implies that our coefficient standard error is higher. We find it reasonable that the statistical power of our model suffers from the relatively small number of observations and the limited time span of our data[7].

However, in Model 2 the p-value approaches the 10% level when we single out firms with high expected refinancing risk by including the interaction variable "HighRisk × ΔCash". This interaction variable isolates the variation in excess returns explained by increases in cash holdings in firms with high expected refinancing risk and takes a negative coefficient with a p-value of 9%. The negative direction of the variable "HighRisk × ΔCash" is opposite to what we would have expected based on the potential benefits of hedging in high-risk firms.

Given that our hypothesis and findings (that refinancing risk is higher in non-bank debt than in bank debt and that firms hold cash to offset this risk) hold, there are at least three explanations for the negative coefficient. First, the markets may be penalizing firms with high refinancing risk unfairly. If, for example, refinancing risk attributable to non-bank debt is not recognized and two firms differ only in their non-bank debt proportion and hence also in their cash holdings the firm with more non-bank debt and larger cash holdings would seem to hold excess cash for no reason. If market participants perceive this firm to be handling cash in an inefficient way it would be logical if they also place a lower value on the cash (and potentially the cash flows) of that firm. Hence, this firm would be underprized without reason. A second alternative explanation is that we could be failing to control for important variables that correlate both with our "HighRisk × ΔCash" variable and excess returns. The effect that could explain our results would be positively (negatively) correlated with the non-bank debt proportions and negatively (positively) with excess returns in the time period. A third option is that the hedging of refinancing risk actually results in a negative value to the shareholders of the firm. A negative value of non-bank debt hedging could make sense from the perspective that at least part of the refinancing risk we study is firm-specific. Investors could potentially diversify away that firm-specific risk free by holding a broad portfolio of investments.

[7] Faulkender and Wang (2006) base their analysis on more than 80,000 observations and Harford et al. (2014) include almost 60,000 observations. Both data series span over three decades.

5 Conclusion

Based on previously observed inefficiencies in the handling of financial distress by non-bank lenders as documented in the literature we hypothesize that the refinancing risk associated with non-bank debt is higher than the refinancing risk associated with bank debt. We find evidence supporting our hypothesis by employing a methodology similar to that used by Harford et al. (2014) in their analysis of the effect of debt maturity on refinancing risk approximated by cash holdings.

We find that the effect of non-bank debt financing on cash holdings is both statistically and economically significant. Our results indicate that there are significant advantages to bank debt compared to non-bank debt, taking into consideration only the effects of refinancing risk. Upon further breakdown, we also find that the refinancing risk seems especially important for firms with high leverage and high proportions of non-bank debt. We also find evidence indicating that the hedging behavior we observe could be either of negative value to shareholders or mispriced.

In our opinion, our findings are valuable from several perspectives. First of all, incorporating refinancing risk into models of the choice between bank and non-bank sources could, based on our findings, contribute significant explanatory power. Including refinancing risk in these models would complement existing concepts of already known importance such as adverse selection, moral hazard and flotation costs. Furthermore, the concept of refinancing risk from the perspective of the firm is still a research area in its infancy and we hope that our extension of the concept from the debt maturity studied by Harford et al. (2014) to non-bank debt proportions can add to the relevance of the concept at such. However, we also like to point out limitations of our analysis and provide an overview of further research ideas.

First, the data used for this analysis is limited to the ten year period from 2003 to 2013 due to S&P Capital IQ's limited historical coverage provided on WRDS. There could be significant upside to sampling over a longer period of time. This is especially true considering the unique events taking place in the financial markets around the time of the financial crisis of 2008. Furthermore, more detailed databases such as Mergent's Fixed Income Securities Database (FISD) could provide further relevant data and allow for more detailed analyses.

Second, our analysis relies on a model that is intentionally similar to that previously used by Harford et al. (2014). This research design makes certain assumptions about the relationships between refinancing risk, its determinants and the response of firms that may not be accurate. First of all, we assume a linear relationship between the change in the proportion of non-bank debt and refinancing risk. Second, we assume a linear relationship between refinancing risk and cash holdings. As we observed in the subsample analyses, however, it seems reasonable to believe that these effects may not be linear, at least not in the entire range of observed values. In fact, we see signs of an increasing effect at higher leverage levels and increasing proportions of non-bank debt. We believe that studying the functional form of the effect of non-bank debt on refinancing risk and refinancing risk on cash holdings could deepen the understanding of refinancing risk. Furthermore, we measure refinancing risk as cash scaled by assets. The methodology has the upside of being lenient from a statistical perspective and resulting in a clear and easy to interpret result. However, except for incorporating leverage as a control variable this measurement produces predictions that are not based on the total debt of a firm. Hence, a next step could be to build a model where the dependent variable is cash scaled by debt.

Third, a more distinct differentiation of the various forms of debt financing could prove to be of value for further research. Throughout this paper we have focused on contrasting bank debt with non-bank debt and treated the non-bank debt as public debt because it is the most common alternative to bank debt. There is however a third reasonable common form of debt financing: borrowing from non-bank private lenders as, for example, analyzed in the study by Denis and Mihov (2003) on the choice of new corporate borrowing. According to the authors, this form of private debt offers more flexible contracting and renegotiation and low regulatory requirements and is used primarily by firms with the lowest credit quality that have been refused by traditional lenders We would be interested in exploring the refinancing risk in non-bank private debt in isolation and also relative to bank debt and public debt and how the specific characteristics of this private debt form would affect cash holdings and refinancing risk.

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Appendix 1 – Summary Statistics Winsorised Sample

This appendix presents an alternative way of handling outliers in our initial data sample. In the main text we handle extreme values seen as outliers by excluding the smallest firms (less than one $ million of book assets) from our inital data sample. In this appendix we instead winsorise the values on the two-tailed 95% level. The treatment essentially means that values further away from the mean than 1.96 standard deviations are set at the mean plus or minus 1.96 standard deviations. The primary reason for showing the alternative approach is to provide a robustness test of our results. We also note that winsorisation at lower levels than 95% generally tends to further increase the significance of the variables in the model including that of the predicted non-bank debt proportion.

Table 13 – Summary Statistics Winsorised Sample

This table reports summary statistics for the winsorised sample of 16,543 firm-years of 3,138 Compustat U.S. incorporated firms with non-zero sales, total assets and non-bank debt over the period 2003 to 2013. All firm specific data is obtained from Compustat and S&P Capital IQ. All market data is obtained from Bloomberg. Winsorisation on the 95% level is presented as the main alternative to the reduced final sample excluding the smallest firms by assets. Definitions of the variables are provided in Section 3.

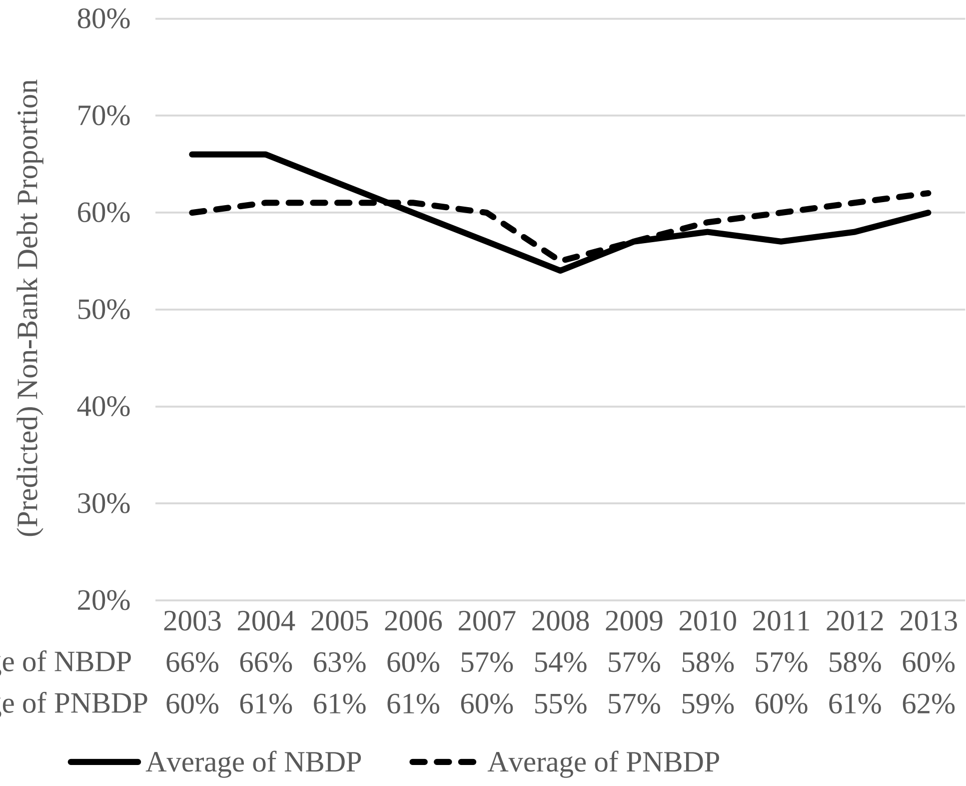
					Distribution	
Variable	**Obs.**	**Mean**	**Median**	**Std. Dev.**	**5%**	**95%**
NBDP	16543	0.646	0.788	0.373	0.009	1.000
ln(AvgIssueSize)	16543	3.118	3.958	2.570	-1.359	6.257
VIX	16543	20.492	18.365	6.733	12.833	33.697
BondYield	16543	5.732	5.258	1.592	3.494	9.780
Cash	16543	0.162	0.088	0.192	0.003	0.606
DD3	16543	0.428	0.307	0.389	0.000	1.000
Size	16543	6.065	6.344	2.311	2.036	9.488
MtB	16543	2.509	1.872	11.583	-2.394	10.277
R&D	16543	1.363	0.000	18.999	0.000	0.748
CapEx	16543	0.050	0.033	0.049	0.003	0.185
AcqEx	16543	0.020	0.000	0.042	0.000	0.147
Div	16543	0.361	0.000	0.480	0.000	1.000
OpProf	16543	-0.059	0.060	0.518	-0.637	0.206
Leverage	16543	0.412	0.269	0.910	0.005	0.954
Issue	16543	0.025	-0.001	0.162	-0.124	0.271
CFRisk	16543	0.263	0.284	0.156	0.059	0.652
NWC	16543	0.016	0.152	2.113	-0.214	0.152
IPO	16543	0.181	0.000	0.385	0.000	1.000

Appendix 2 – Actual and Predicted Non-Bank Debt Proportions

This appendix presents a comparison of actual and predicted non-bank debt proportions for the final sample of 3,081 Compustat U.S. incorporated firms in our final sample. In relative terms the actual non-bank debt proportion is decreasing over the time period.

Figure 3 – Actual and Predicted Proportions of Non-Bank Debt over Time

This figure illustrated the relationship between actual and predicted non-debt proportions for the 3,081 Compustat U.S. incorporated firms in our final sample.



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Average of NBDP	66%	66%	63%	60%	57%	54%	57%	58%	57%	58%	60%
Average of PNBDP	60%	61%	61%	61%	60%	55%	57%	59%	60%	61%	62%

Appendix 3 – First Stage Regression Initial Sample

Table 14 – First Stage Regression of Non-Bank Debt (Initial Sample)

This table reports coefficient estimates of the first stage regression estimating non-bank debt proportions based on the initial sample of 16,543 firm-years of 3,138 Compustat U.S. incorporated firms. Definitions of the variables are provided in Section 3.3.

Variable	**Coefficient**	**Std. Err.**	**T-Score**	**Significance**
Intercept	0.820	0.085	9.690	<1%
ln(AvgIssueSize)	0.059	0.004	13.630	<1%
VIX	-0.002	<0,001	-4.950	<1%
BondYield	-0.002	0.002	-0.950	34%
DD3	-0.023	0.011	-2.170	3%
Size	-0.034	0.005	-7.370	<1%
MtB	<0,001	<0,001	0.330	74%
R&D	<0,001	<0,001	2.090	4%
CapEx	-0.145	0.055	-2.620	1%
AcqEx	-0.508	0.040	-12.580	<1%
Div	0.036	0.011	3.420	<1%
OpProf	-0.006	0.002	-3.410	<1%
Leverage	<0,001	<0,001	0.530	60%
Issue	-0.007	0.009	-0.820	41%
CFRisk	0.100	0.050	2.030	4%
NWC	0.000	<0,001	-1.920	6%
IPO	-0.036	0.013	-2.830	1%
Industry fixed effects	Yes			
Observations	16543			
R^2-adjusted	12%			

Appendix 4 – First Stage Regression Winsorised Sample

Table 15 – First Stage Regression of Non-Bank Debt (Winsorised Sample)

This table reports the coefficient estimates of the first stage regression estimating non-bank debt proportions based on the winsorised sample of 16,543 firm-years of 3,138 Compustat U.S. incorporated firms. Definitions of the variables are provided in Section 3.3.

Variable	**Coefficient**	**Std. Err.**	**T-Score**	**Significance**
Intercept	0.806	0.087	9.290	<1%
ln(AvgIssueSize)	0.059	0.004	13.280	<1%
VIX	-0.002	<0,01	-4.870	<1%
BondYield	-0.002	0.002	-1.000	32%
DD3	-0.030	0.012	-2.480	1%
Size	-0.026	0.005	-5.130	<1%
MtB	0.001	<0,01	2.040	4%
R&D	<0,01	<0,01	-1.250	21%
CapEx	-0.214	0.101	-2.110	4%
AcqEx	-0.837	0.081	-10.310	<1%
Div	0.035	0.010	3.320	<1%
OpProf	-0.122	0.012	-10.150	<1%
Leverage	-0.044	0.007	-6.440	<1%
Issue	0.009	0.021	0.420	68%
CFRisk	0.126	0.071	1.790	7%
NWC	-0.004	0.002	-1.870	6%
IPO	-0.035	0.013	-2.780	1%
Industry fixed effects	Yes			
Observations	16543			
R^2-adjusted	14%			

Appendix 5 – Second Stage Regression Summary of Effects on Cash

Table 16 – Second Stage Regression Summary of Effects on Cash

This table presents the effect of the determinants for a one standard deviation as estimated in the second stage main regression based on the final sample of 16,352 firm-years of 3,081 Compustat U.S. incorporated firms. Note that the standard deviation measure is reported for the respective variables and not the regression standard error. Definitions of the variables are provided in Section 3.3.

Variable	**Coefficient**	**Significance**	**Variable Std. Dev.**	**Change Scaled Cash**
Intercept	0.020	60%	n/a	n/a
PNBDP	0.109	<1%	0.122	0.013
DD3	0.027	<1%	0.414	0.011
Size	-0.010	<1%	2.187	-0.022
MtB	<0,001	2%	52.386	0.003
R&D	<0,001	54%	229.969	0.001
CapEx	-0.083	<1%	0.077	-0.006
AcqEx	-0.207	<1%	0.075	-0.016
Div	-0.020	<1%	0.481	-0.010
OpProf	-0.035	<1%	0.478	-0.017
Leverage	-0.032	<1%	0.727	-0.023
Issue	0.075	<1%	0.186	0.014
CFRisk	0.104	<1%	0.187	0.020
NWC	0.002	21%	2.477	0.006
IPO	0.055	<1%	0.386	0.021

Appendix 6 – Second Stage Regression Initial Sample

Table 17 – Second Stage Regression of Cash Holdings (Initial Sample)

This table reports the coefficient estimates from the second stage regression estimating cash scaled by book assets based on the initial sample of 16,543 firm-years of 3,138 Compustat U.S. incorporated firms. The standard errors of the coefficients are adjusted for clustering of observations at the firm level. Definitions of the variables are provided in Section 3.3.

Variable	**Coefficient**	**Std. Err.**	**T-Score**	**Significance**
Intercept	0.033	0.040	0.820	41%
PNBDP	0.070	0.032	2.180	3%
DD3	0.028	0.005	5.410	<1%
Size	-0.010	0.001	-7.040	<1%
MtB	<0,001	<0,001	2.240	3%
R&D	<0,001	<0,001	0.950	34%
CapEx	-0.067	0.026	-2.610	1%
AcqEx	-0.198	0.023	-8.810	<1%
Div	-0.020	0.005	-4.410	<1%
OpProf	0.002	0.001	1.930	5%
Leverage	<0,001	<0,001	-0.240	81%
Issue	0.006	0.005	1.080	28%
CFRisk	0.111	0.020	5.650	<1%
NWC	<0,001	<0,001	-1.300	20%
IPO	0.054	0.006	9.020	<1%
Industry fixed effects	Yes			
Observations	16543			
R^2-adjusted	36%			

Appendix 7 – Second Stage Regression Winsorised Sample

Table 18 – Second Stage Regression of Cash Holdings (Winsorised Sample)

This table reports the coefficient estimates from the second stage regression estimating cash scaled by book assets based on the winsorised sample of 16,543 firm-years of 3,138 Compustat U.S. incorporated firms. The standard errors of the coefficients are adjusted for clustering of observations at the firm level. Definitions of the variables are provided in Section 3.3.

Variable	**Coefficient**	**Std. Err.**	**T-Score**	**Significance**
Intercept	0.013	0.037	0.360	72%
PNBDP	0.115	0.031	3.720	<1%
DD3	0.033	0.005	6.280	<1%
Size	-0.009	0.002	-5.460	<1%
MtB	<0,01	<0,01	4.830	<1%
R&D	<0,01	<0,01	3.000	<1%
CapEx	-0.166	0.040	-4.110	<1%
AcqEx	-0.389	0.041	-9.550	<1%
Div	-0.021	0.004	-4.920	<1%
OpProf	-0.038	0.008	-4.450	<1%
Leverage	-0.035	0.004	-8.970	<1%
Issue	0.086	0.013	6.560	<1%
CFRisk	0.145	0.025	5.700	<1%
NWC	0.001	0.002	0.480	63%
IPO	0.055	0.006	9.840	<1%
Industry fixed effects	Yes			
Observations	16543			
R^2-adjusted	40%			

Appendix 8 – Random-Effects Model and Fixed-Effects Model

Table 19 – Random Effects Model

This table reports the coefficient estimates for a Random-Effects model based on the final sample of 16,352 firm-years of 3,081 Compustat U.S. incorporated firms. The standard errors of the coefficients are adjusted for clustering of observations at the firm level. Definitions of the variables are provided in Section 3.3.

Variable	**Coefficient**	**Std. Err.**	**T-Score**	**Significance**
Intercept	0.051	0.041	1.230	22%
NBDP	0.058	0.003	20.320	<1%
DD3	0.008	0.002	3.620	<1%
Size	-0.012	0.001	-11.150	<1%
MtB	0.000	0.000	1.430	15%
R&D	0.000	0.000	2.390	2%
CapEx	-0.042	0.014	-3.100	<1%
AcqEx	-0.150	0.011	-14.240	<1%
Div	0.002	0.003	0.830	41%
OpProf	0.012	0.003	4.720	<1%
Leverage	-0.018	0.002	-9.660	<1%
Issue	0.039	0.005	7.770	<1%
CFRisk	0.125	0.025	5.000	<1%
NWC	0.000	0.000	-0.540	60%
IPO	0.024	0.003	8.060	<1%
Industry fixed effects	Yes			
Observations	16352			

Table 20 – Fixed Effects Model

This table reports the coefficient estimates for a Fixed-Effects model based on the final sample of 16,352 firm-years of 3,081 Compustat U.S. incorporated firms. The standard errors of the coefficients are adjusted for clustering of observations at the firm level. Definitions of the variables are provided in Section 3.3.

Variable	**Coefficient**	**Std. Err.**	**T-Score**	**Significance**
Intercept	0.218	0.011	19.530	<1%
NBDP	0.047	0.003	15.610	<1%
DD3	0.004	0.002	1.880	6%
Size	-0.013	0.002	-7.510	<1%
MtB	0.000	0.000	0.970	33%
R&D	0.000	0.000	2.510	1%
CapEx	-0.040	0.014	-2.850	<1%
AcqEx	-0.144	0.011	-13.550	<1%
Div	0.007	0.003	2.610	<1%
OpProf	0.025	0.003	9.070	<1%
Leverage	-0.025	0.003	-9.780	<1%
Issue	0.031	0.005	6.070	<1%
CFRisk	N.A.*			
NWC	-0.001	0.000	-1.620	11%
IPO	0.013	0.003	3.860	<1%
Industry fixed effects	N.A.*			
Year fixed effects	Yes			
Observations	16352			

* Dropped due to time invariance.

Appendix 9 – Second Stage Regressions of Cash Accounts and Short-Term Investments

Table 21 – Second Stage Regression of Cash Accounts

This table reports the coefficient estimates of the second stage regression using cash accounts as dependent variable based on the final sample of 16,352 firm-years of 3,081 Compustat U.S. incorporated firms. The standard errors of the coefficients are adjusted for clustering of observations at the firm level. Definitions of the variables are provided in Section 3.3.

Variable	**Coefficient**	**Std. Err.**	**T-Score**	**Significance**
Intercept	0.070	0.027	2.600	1%
PNBDP	0.043	0.027	1.610	11%
DD3	0.018	0.005	3.330	<1%
Size	-0.011	0.001	-7.920	<1%
MtB	<0,001	<0,001	1.660	10%
R&D	<0,001	<0,001	2.890	<1%
CapEx	-0.047	0.021	-2.200	3%
AcqEx	-0.160	0.019	-8.390	<1%
Div	-0.004	0.004	-1.070	29%
OpProf	-0.032	0.008	-4.210	<1%
Leverage	-0.026	0.008	-3.250	<1%
Issue	0.056	0.014	4.160	<1%
CFRisk	0.071	0.014	4.930	<1%
NWC	0.001	0.001	0.420	68%
IPO	0.029	0.004	6.450	<1%
Industry fixed effects	Yes			
Observations	16352			
R^2-adjusted	28%			

Table 22 – Second Stage Regression of Short-Term Investments

This table reports the coefficient estimates of the second stage regression using short-term investments as dependent variable based on the final sample of 16,352 firm-years of 3,081 Compustat U.S. incorporated firms. The standard errors of the coefficients are adjusted for clustering of observations at the firm level. Definitions of the variables are provided in Section 3.3.

Variable	**Coefficient**	**Std. Err.**	**T-Score**	**Significance**
Intercept	-0.050	0.021	-2.310	2%
PNBDP	0.065	0.018	3.550	<1%
DD3	0.009	0.003	3.050	<1%
Size	0.001	0.001	1.050	29%
MtB	<0,001	<0,001	2.310	2%
R&D	<0,001	<0,001	-7.050	<1%
CapEx	-0.035	0.012	-2.920	<1%
AcqEx	-0.048	0.013	-3.710	<1%
Div	-0.016	0.002	-6.630	<1%
OpProf	-0.003	0.004	-0.720	47%
Leverage	-0.006	0.003	-2.250	3%
Issue	0.019	0.006	2.980	<1%
CFRisk	0.033	0.010	3.220	<1%
NWC	0.002	0.001	2.520	1%
IPO	0.026	0.004	6.960	<1%
Industry fixed effects	Yes			
Observations	16352			
R^2-adjusted	19%			