The Effects of Bank Monitoring on Firm's Cash Holding Policy and Value of Cash

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ABSTRACT

This paper explores the role of creditors in firm's cash holding policy. We test whether creditors affect firm's cash reserves and the value of cash via covenants of bank loan contracts. The results show that the tightness of cash-related covenant limits firm's attempt to accumulate cash, causing firms use their cash more efficiently. Borrowers tend to hold more cash reserves for precautionary motive since they might not be able to borrow from banks when they violate covenants. By separating the sources of cash, we show that firms liquidate net working-capital and reduce payout ratio to retain more cash after violating covenants. Finally, we find that the effects of covenant violations on cash are significant for high M/B firms, and the violation help low M/B firms increase the value of cash since firms save cash mainly for precautionary motive after covenant violations.

Key words: Bank loan; Cash holdings; Covenants; Value of cash

JEL codes: G21, G34, G39

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1. Introduction

Cash holdings usually play an important role affecting firm's investment, capital expenditure, and M&A decisions. There are a number of reasons for holding cash proposed by prior research. Opler, Pinkowitz, Stultz, and Williams (1999) indicate that firms with riskier cash flows and poor access to external capital hold more cash for precautionary purposes.[1] For agency concerns, Dittmar, Mahrt-Smith, and Servaes (2003) find that, to reserve cash rather than to pay dividends to shareholders, firms in countries where shareholders rights are not well protected hold more cash than others. Dittmar and Mahrt-Smith (2007) and Pinkowitz, Stulz, and Williamson (2006) show that cash is worth less when agency problem between insiders and outside shareholders are greater.[2]

In this paper, we investigate the relationship between cash holdings and creditors' actions. There are a few papers, discussing the effect of bank on firm's cash policies. However, numerous papers have shown that banks can influence firm's decisions through lending relationship. For example, Nini, Smith, and Sufi (2009) show that bank are more likely to impose a capital restriction as a borrower's credit quality deteriorates, and the capital expenditure restrictions cause a reduction in firm investment. Ahn and Choi (2009) indicate that borrowers' earnings management behavior generally decreases as the strength of bank monitoring increases. Chava and Roberts (2008) show that capital investment declines sharply following a financial covenant violation, when creditors use the threat of accelerating the loan to intervene in management.

[1] The precautionary motive for cash savings is also supported by Almeida, Campello and Weisbach (2004), Bates, Kahle, and Stulz (2009), and McLean (2011).

[2] The agency motive for cash savings is also supported by Harford (1999), Harford, Mansi, and Maxwell (2008), Oler (2008), and Gao, Harford, and Li (2013).

How creditors might affect borrowers' cash holding policies? First, the monitoring mechanism, induced by the conflict of interest between creditors and their borrowers, provides incentives for creditors to monitor their borrowers with capital restrictions or requirement of financial covenants (Diamend, 1984; Holmstrom and Tirole, 1997). Through this channel, bank's monitor should induce borrowers to improve their performance to meet the requirement of financial covenants (Demiroglu and James, 2010). It will also predict that firms are more likely to reduce their cash reserves after the intervention of banks, and this incentive will be much stronger if they receive more pressure from banks. On the other hand, the value of cash for the firms monitored by banks should be higher than the value of cash hold by firms without monitored by banks, since these firms should use cash in a more efficient way to meet the financial requirements by banks (Faulkender and Wang, 2006).[3]

Second, bank may also encourage their borrowers to hold cash to reduce bank's exposure. Pinkowitz and Williamson (2001) argue that Japanese firms' cash ratios are positively related to bank power in Japan, conjecturing that banks with monopoly power prefer firms holding more cash, which not only reduces the probability of technical default but protects the right of creditors. Liu and Mauer (2011) find that the positive relation between CEO compensation incentives and corporate cash holdings is at least in part driven through the imposition of liquidity covenants in debt contracts. They conjecture that this result is consistent with the concept that bank encourages firms to hold cash to prevent their default risk. In the second channel, banks might use the financial covenants to induce borrowers reserve their cash in order to decrease the default risk which should hurt the right of creditor. It predicts

[3] According to Faulkender and Wang (2006), the marginal value of cash should be positive for much of firms, but it declines with larger cash holdings since firms might miss-use the amount of cash exceeding their need in the foreseeable future.

that firms are more likely to increase their cash reserves after the intervention of banks, and the value of cash might decrease after firms stockpile their cash, since firms might abuse the amount of cash exceeding their need in the foreseeable future. Overall, the effect of bank loan covenant on firms' cash policies is an unresolved issues and it is an empirical question that we try to address in this study.

To capture the effect of creditor's monitoring, we use initial tightness of financial covenants as our proxy of bank power. The initial tightness of financial covenants is measured by the strictness of covenants while banks establish the loan agreement with borrowers. Previous literature shows that borrowers will improve their performance related to covenant, especially when they got tighter covenants (Demiroglu and James, 2010). We estimate covenants tightness following the procedures of both Demiroglu and James (2010) and Murfin (2012) to calculate the loan contract strictness. We also examine the effect of violation on firm's cash holding policies. According to Sufi (2009), a covenant violation is associated with a 15 to 25% drop in the availability of lines of credits, and it also means firms need to retain their cash or cash-flow to prevent the unpredictable shocks in the future. Therefore, we expect that violation should induce borrowers retain their cash-flow and increase the cash holdings. We estimate loan's violation using the data from Nini et al. (2009), which identified 16,530 of loan's violation event from 1996 to 2008.

In our empirical works, we first examine whether the tightness of loan and violation alter firm's cash reserves. Our results show that only the initial tightness of current ratio covenant, which is related to firm's cash reserves, alters firm's cash holding policies, while the tightness of Debt/EBITDA do not change firm's tendency to hold cash. The results of tightness of current ratios are consistent with the monitoring mechanism predicting that firms will reduce their cash holdings after they

got tighter covenant. Loan' violation, the signal of dropping in the availability of credit lines, induces firms to increase their cash reserves. In order to investigate how borrowers will act on their sources of cash after they got tight covenant or after they violation, we further separate firms' cash into three primary sources. The results show that borrowers indeed reduce their borrowings from banks after loan's violation, and they try to liquidate their net working capital and reduce cash dividends to increase their cash reserves, yet tight covenants do not have the similar effects.

Second, the initial tightness of covenants has no impact on the value of cash, and violation effect the value of cash and excess cash in various ways. The initial tightness of current ratio covenant significantly reduces firm's value, but its tightness does not alter the value of cash and excess cash. Similar with tightness of covenants, loan's violations are significantly and negatively related to firm's value. For cash, the cash owned by borrowers is negatively related to firm's value if firms violated in the previous quarter, but the excess cash owned by borrowers is positively related to firm's value.

Third, as indicated by Demiroglu and James (2010), the tightness of covenants is significantly altered by firm's growth opportunities. We further split our sample into firms with high growth opportunities (M/B) and firms with low grow opportunities (M/B), and we re-examine our tests to see whether our proxies have different impact on firms that have different growth opportunities. The results show that the negative relationship between tightness of covenants and cash policies are similar for different groups of firms, but the positive effect of violation on cash policies only holds for firms with high growth opportunities, which are more likely to save cash for future in needs. For value of cash, the cash owned by firms with high growth opportunities

that also has tightness of current ratio covenant is negatively related to firm's value, implying that these firms might miss-use their cash and decrease the value of cash.

Finally, there might be some omitted factors interacting between covenants tightness, violation, and cash policies. To further check, we estimate the propensity of covenants tightness as our instrumental variable and re-test all the regressions regarding covenants tightness. Most of the results are consistent with our previous findings, except that the tightness of current ratio covenant does not alter borrower's cash holding policies. However, we do not measure the propensity of violation since we are unable to identify what determinants impact the propensity of violation.

This paper proceeds as follow. Section 2 introduces the data and the estimating procedures of our measures. Section 3 examines the effect of the initial tightness of covenants and loan's violation on firm's cash holdings policies. Section 4 tests the effect of the initial tightness of covenants and loan's violation on the value of cash, and we present the results of robustness check. Section 5 provides conclusions.

2. Data and variables

2.1 Data and sample selection criteria

We construct the sample from three databases including Loan Pricing Corporation's (LPC) DealScan files from 1990 to 2010, Compustat quarterly files from 1970 to 2010 and data of loan's violation provided from Nini et al. (2009) from 1996 to 2008.[4] LPC provides details of syndicated loan for distinguishing covenant tightness and Compustat files contain financial statement items for estimating excess cash and other primary measures in our paper. Our sample includes both survivor and non-survivor firms, and we require that firms have positive assets (Compustat

[4] Since we need the data of cash flow from year t-1 to t-10 to calculate industry sigma in each year, and we also need the average coefficient of our equation (1) from year t-1 to t-10 to calculate the expected cash ratio, our Compustat data start from 1970 which prior to 1990 for 20 years.

quarterly data item #44) and positive sales (#2). Further, we exclude financial firms (SIC codes between 6000 and 6999) and utility firms (SIC code between 4900 and 4999), and we restrict our sample to firms incorporated in the United States. We exclude financial firms since they might carry cash for their capital requirement rather than for economic reasons, and we exclude utility firms because their cash holdings might be subject to regulatory requirements. To address the potential problem of outliers, all accounting variables are winsorized at the 1st and 99th percentiles.

The sample period of LPC data is between 1987 and 2013. According to Carey and Nini (2007), LPC's data collection efforts focused primarily on the U.S. loan market until the 1990s, so we limit our sample period from 1990 to avoid potential sample bias. To get the final sample, we first link Compustat database and LPC database by the connecting files provided by Chava and Roberts (2008), which provides the connecting information from 1982 to 2012. After deleting the observation with missing value for any financial variable we used, our sample of covenant tightness contains 13,847 facility level data and 190,937 firm observations.

To calculate the tightness of covenants, however, we might suffer from the problem of lack of uniformity in how loan covenants are defined. As indicated by previous papers, the definition of covenant variables should be different between GAAP-based Compustat financials and covenant thresholds reported by DealScan (Chava and Roberts, 2008; Demiroglu and James, 2010; Murfin, 2012). This measurement error problem causes much of covenants violate immediately while loan agreement established, and it also reduce the credibility of tightness measure. To overcome this problem, we follow previous literature by limiting our facilities to those with information in TearSheets, which provide detailed definitions for covenants. We further choose the covenants which have more standard definition and commonly

used in loan agreement to minimize the measurement problem. Based on these criteria, we choose current ratio covenant and Debt/EBITDA covenant as our targets. However, the above procedure also limits our sample to 691 and 751 observations with clearly identified tightness data of current ratio and Debt/EBITDA, respectively. It also restrict our sample period to 1990 to 2010. On the other hand, to combine the non-missing Compustat data with violation information in Nini et al. (2009), our data with violation information contains 94,984 firm observations.

2.2 Excess cash measure

In this section, we briefly introduce the estimating procedure of how we calculate the excess cash ratio, which is an important measure of cash policy suggested by previous papers (Opler et al., 1999; Bates et al., 2009). To measure excess cash, we follow Bates et al. (2009). First, we estimate the expected cash ratios of each firm from the following Fama-MacBeth regression model:

$$C_{i,t} = \alpha + \beta_1 (M/B)_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 CF_{i,t} + \beta_4 NWC_{i,t} + \beta_5 CAPX_{i,t} + \beta_6 LEV_{i,t} + \beta_7 IS_{i,t} + \beta_8 R\&D_{i,t} + \beta_9 D_{i,t} + \beta_{10} AQ_{i,t} + \beta_{11} NE_{i,t} + \beta_{12} ND_{i,t} + \varepsilon_{i,t}, \quad (1)$$

where C is cash ratio defined as cash and marketable securities (#36) divided by book assets (#44); M/B is market-to-book ratios, defined as book assets (#44) minus book equity (#59) plus market equity (#12*#61) all divided by book assets (#44); $SIZE$ is size defined as the logarithm of book assets (#44); CF is cash flow measured as earnings after interests, dividends, and taxes but before depreciation (#21-#22-#6-#20); NWC is net working-capital net of cash; $CAPX$ is capital expenditures (#90); LEV is leverage measured as long-term debt plus debt in current liabilities (#51+#45); IS is industry sigma measured as the standard deviation of industry cash flow to assets in the previous 10 years for each firm-year; $R\&D$ is

R&D measured as R&D (#4) / sales (#2), and is set equal to zero when R&D is missing. Alternative measure is R&D/ assets; D is a dummy variable which equals one in years in which a firm pays a common dividend (#20) and zero otherwise; AQ is acquisitions (#94); NE is net equity measured as equity sales minus equity purchases (#84-#93); and ND is net debt measured as debt issuance minus debt retirement (#86-#92). All of the independent variables except for *SIZE* and *M/B* are divided by book assets (#44). The definition of all variables used in this paper is shown in Appendix.

Firms' demand function of cash might be time-varying during our sample period, so we use a rolling window to estimate the cash demand function. At year t, we run the annual cross-sectional cash demand regression from year t-1 to year t-10 and calculate the time series average coefficients. Excess cash at year t is then calculated as the difference between firms' actual cash ratios and expected cash ratios predicted by Equation (1), i.e., residuals from the equation.

2.3 Covenants tightness measure

Similar to the measure of proxy for cash holding policies, the measure of covenants tightness is another important measure used in our empirical tests. Demiroglu and James (2010), show that the initial ratio of financial covenant are usually clustered at discrete levels from 0.25 from each other, and borrowers that have similar financial ratios at the time of the loan agreement select from similar covenant menus. Following Demiroglu and James (2010), we measure the tightness of financial covenants by these discrete numbers to separate our covenant sample in order to form clusters in which borrowers have the same covenant threshold choices. We first distribute our covenant sample in different cluster by their covenant variable

(current ratio or Debt/EBITDA), then we further sort these borrowers by their covenant choices, i.e., the covenant ratios. Finally, we define covenant as "tight" when the covenant ratio is higher than the median of covenant ratio in each cluster and loose otherwise.

Alternatively, we also follow the approach established by Murfin (2012) to estimate the tightness of covenants. According to Murfin (2012), we derive the slack for each covenant threshold which is the difference between the observed accounting ratio and the covenant threshold that is specified in the loan contract. For example, since current ratio (Debt/EBITDA) covenant gives the minimum (maximum) threshold for accounting ratio, we use the accounting ratio (covenant threshold) subtracted by covenant threshold (accounting ratio) as the slack of covenants. In order to control for the different scale of each covenant slack, each slack is further normalized by its respective standard deviation. This measure is calculated by the slack of covenants, so a larger number of this measure indicates a loose covenant.

3. Empirical test

3.1 Summary statistics

Table 1 presents the summary statistics of our sample. Results of Panel A show the distribution of borrower's characteristics, indicating that some firms have negative EBITDA and the range of Debt/EBITDA is widely. Since the covenant threshold of Debt/EBITDA must be positive, we limit our sample only include the firms with positive Debt/EBITDA. The average cash ratio is 15.8%, but in unreported results, we find that the average cash ratio has a steady and increasing trend from 1990 to 2007, which is consistent with the results found in Bates et al. (2009). However, this increasing trend changed during the 2007 to 2008 and it shows up again afterward,

but in a slower increasing speed. The excess cash ratio on average is modest, because there are few firms hold excess cash before 2001, and the excess cash ratio is sharply increasing starting from 2003, but its increasing trend turns down after 2007.

Panel B of Table 1 presents the characteristics of loan. The average maturity of loan in our sample is about four years, and the longest maturity is thirty-five years. We require our sample has maturity that longer than a year, since we conjecture that the tightness of loan that is shorter than a year should not has much power to restrict firm's decisions. Average covenant number is 2.48, which usually include the limit of cash flow or the minimum interest coverage.[5] We do not consider interest coverage as our target since the definition of interest might differ in different contracts, and the concept of interest coverage is similar to Debt/EBITDA. Panel C of Table 1 further reports the distribution of our each proxy of covenant tightness and violation. From the proxies estimated based on Demiroglu and James (2010), the ratio of tight covenant is about 60% and 66% for current ratio covenant and Debt/EBITDA covenant, respectively. On the other hand, about 7% of sample firms had violated covenants during our sample period.

[Insert Table 1 here]

In order to test whether the initial tightness of covenants includes information about borrowers, we next use the tightness of our two major covenants as cutoff point to perform the univariate test. Results of Panel A of Table 2 show that borrowers with tight current covenant on average have significantly lower cash reserves and excess cash holdings. Although these borrowers have lower current ratio implying worse quality of the borrowers with tight current covenant, the difference is

[5] In our total sample of LPC data from 1987 to 2010, there are 10,728 of contracts include Debt/EBITDA covenant, 44% of total facilities. On the other hand, there are 9,254 of contracts include interest coverage covenant, 38% of total facilities.

insignificant. In terms of loan characteristics, borrowers which have tight current covenant on average have larger loan size, longer loan maturity, smaller lead arranger shares, lower all-in-spreads and less covenants. We also compare the characteristics of our alternative proxies for tightness, showing that firms got tight current ratio covenant calculated by Demiroglu and James (2010) usually has tighter covenants of current ratio that calculated by Murfin (2012).

From the results partitioned by Debt/EBITDA covenant, the firms with tight Debt/EBITDA covenant on average are smaller, and they usually have higher ratio of Debt/EBITDA. Further, firms with tight Debt/EBITDA covenant do not have significantly different inclination of cash holding policies with firms with loose Debt/EBITDA covenant. In the results of loan characteristics, the tight covenants on average have much slack contract but shorter maturity. Similar to the results of current ratio covenant, firms got tighter covenant defined from Demiroglu and James (2010) also has tighter number defined by Murfin (2012).

In panel B of Table 2, we further examine the fraction of tightness by industry, which is defined by two-digit SIC code. Results indicate that much of the industries have more than forty percent of firms have loan including these two kinds of covenants. Firms belonging to agriculture, minerals and construction industries are most likely limited by tight covenants, and firms in manufacturing industry also on average have tighter covenants. The distribution of the fraction of tightness of these two covenants is similar to the trade-retail and services. Firms belonging to trade-retail usually have more contracts with tight current ratio covenants but less contracts with tight Debt/EBITDA covenants. In Panel C of Table 2, we also test the correlation between our five proxies for covenants tightness. Results show that the

tightness of current ratio covenant is irrelevant to the tightness of Debt/EBITDA covenant, indicating the independent relationship between these two covenants.

[Insert Table 2 here]

3.2 Effect of covenant tightness and violation on the tendency to hold cash

In the multivariate test, we first explore the impact of covenant tightness on tendency to hold cash. We employ following model adapted from Bates et al. (2009) to examine the relationship between covenant tightness and cash holding inclination:

$$\Delta C_{i,t}\ (\Delta XC_{i,t}) = \alpha + \beta_1 Current\_tight(D/EBITDA\_tight)_{i,t-1} + \beta_2 \Delta \mathbf{X}_{i,t} + \varepsilon_{i,t}, \quad (2)$$

where *Current_tight* and *Debt/EBITDA_tight* are defined in Section 2.3; ΔC is the change in cash ratio defined as cash and marketable securities divided by book assets; ΔXC is change in excess cash defined as Section 2.2. In our specification we control for the other variables **X** that have been found to affect cash holdings in the literature. These variables include market-to-book ratios (M/B), firm size, cash flow(CF), net working capital (NWC), capital expenditures ($CAPX$), leverage (LEV), industry sigma (IS), R&D (RD), an indicator variable of dividend (D), acquisitions(AQ), net equity (NE), and net debt (ND). All of these control variables, except industry sigma, are used as delta term to reflect the influence of change in financial condition on cash reserves. We do not take the industry sigma as the delta term since industry sigma is measured as standard deviation of industry cash flow to assets in the previous ten years for each firm-year, which is a constant item within a year and should not be taken as delta term.

The results of specification (2) in Table 3 show that tightness of current ratio is significantly and negatively related to firms' cash ratios, indicating the pressure given

by tightness of liquidity covenant force firms to reduce their inclination to hold cash.[6] The tightness of Debt/EBITDA, however, does not alter firms' decision of cash policies. Thus, these results imply that only the tightness of current ratio covenant, the covenant most related to firms' cash holding policies, alters firms' tendency to hold cash.

Additionally, we also test the regressions using firms' excess cash as dependent variable, showing the results in the right column of Table 3. Similarly, the results indicate that only the tight current ratio covenant will impact firms' cash holding inclination, and the tightness of Debt/EBITDA has no effect on ratio of excess cash. In sum, tight current ratio covenant not only induce firms to tilt toward holding less cash, it also reduce stock piling of excess cash from firms. These results are consistent with some findings of Demiroglu and James (2010). It shows that tightness of covenant induce firms improve their covenant variable, and the improvement is only induced by related covenant. In addition, these results also support the monitoring hypothesis. The monitor provided by creditors will induce firms to use their cash more efficiently, and they are more likely to reduce holding of excess cash.

[Invert Table 3 here]

We next test the effect of violation on firms' cash holding decisions. Different to initial tightness, after loan's violation, creditors might withdraw their existing capital for borrowers to avoid losses. After banks withdraw sources of capital, firms should stock cash for precautionary motive in order to deal with unpredictable shocks

[6] To save space, we do not report results estimated by the approach of Murfin (2010). The unreported results are similar to the results calculated by Demiroglu and James (2010) and we are delighted to provide the empirical results if required.

in the future. Thus, we predict that violation of loans should induce borrowers accumulate their cash to prevent any potential shocks in the future.

As shown in Table 4, after controlling the variables which are close to cash ratios, violation is significantly and positively related to firms' cash ratio. Similarly, violation also induce firms to increase their holding of excess cash. Consistent with our prediction, creditors might withdraw the capital after borrowers violate covenants. In that case, borrowers need to retain their cash-flow and to reserve cash in order to prevent unpredictable shocks in the future.

[Invert Table 4 here]

In order to see how borrowers change their distribution of sources to response to tight covenant or violation, we next split sources of cash into three different parts. We estimate the three major sources of cash following definition of McLean (2011), and we also examine the distributions of other sources such as net working-capital and cash dividends.[7] As mentioned by DeAngelo, DeAngelo, and Wruck (2002), firms might liquidate their working-capital to meet requirement of covenant. We review the change in net working-capital to test if firms liquidate their net working-capital after receiving tighter covenant or violating covenants. Results shown in Table 5 present that firms significantly reduce the source of debt after they got a tight covenant of current ratio compared to the firms which have loose one, and these firms also increase their net working-capital at the same time. The tightness of Debt/EBITDA covenant, a limitation on cash-flow, does not alter firms' behavior except firms might save their operating income to meet the requirement of cash flow.

[7] According to McLean (2011), the cash flow contributed by issue includes SEOs, private placements, rights of offerings, stock sales through direct purchase plans, preferred stock, and employment options, grants, and benefit plans. The cash flow contributed by debt is the cash proceeds from debt sales. The cash contributed by cash flow is the net income plus amortization and depreciation.

Finally, consistent with our prediction, borrowers significantly reduce the sources of debt and liquidate the net working-capital after violating covenants. Borrowers also significantly reduce their cash dividends to reserve cash for future needs. Thus, after the violation of loan, borrowers indeed try to liquidate their net working-capital and reduce the payout ratio to retain their cash for precautionary motive. The tightness of covenant, however, does not cause firms to liquidate the net working-capital, which implies that borrowers might not face an immediately demand to save cash since they still have not close to the edge of violation.

[Invert Table 5 here]

3.3 Effect of covenant tightness and violation on value of cash

We next examine the impact of tightness of covenants on value of cash. Based on the monitoring hypothesis, firms should use their cash in more efficient way after bank intervene their governance, otherwise banks may not have power to improve firms management. To test this hypothesis, we use the following equation as our model for testing the relationship between covenant tightness and value of cash according to Bates et al. (2009):

$$\begin{aligned} MV_{i,t} = {} & \alpha + \beta_1 Current\_tight(E/EBITDA\_tight)_{i,t-1} + \beta_2 C(XC)_{i,t} \\ & + \beta_3 Current\_tight(E/EBITDA\_tight)_{i,t-1} * C(XC)_{i,t} + \beta_4 E_{i,t} + \beta_5 dE_{i,t} \\ & + \beta_6 dE_{i,t+2} + \beta_7 dNA_{i,t} + \beta_8 dNA_{i,t+2} + \beta_9 RD_{i,t} + \beta_{10} dRD_{i,t} + \beta_{11} dRD_{i,t+2} \\ & + \beta_{12} I_{i,t} + \beta_{13} dI_{i,t} + \beta_{14} dI_{i,t+2} + \beta_{15} Div_{i,t} + \beta_{16} dDiv_{i,t} + \beta_{17} dDiv_{i,t+2} \\ & + \beta_{18} dMV_{i,t+2} + \varepsilon_{i,t}, \end{aligned} \quad (3)$$

where X_t is level of variable *X* in year t divided by the level of total assets in year t; dX_t is the change in the level of *X* from year t-2 to year t, $X_t - X_{t-2}$; dX_{t+2} is the change in the level of *X* from year t to year t+2, $X_{t+2} - X_t$; *Current_tight* and *Debt/EBITDA_tight* are defined in Section 2.3, which taken as lag term to estimate the impact of covenant on firm's value; *MV* is market value defined as book assets minus book equity plus market equity ((#61*#12)+#51+#45); *E* is firm's EBITDA (#21); *NA* is net assets defined as total assets minus cash (#44-#36); *RD* is research and

development (R&D) expense (#4); *I* is interest expense (#22); and *Div* is dividends defined as common dividend paid (#20).

Modifying the specification of Bates et al. (2009), we include *Current_tight* and *Debt/EBITDA_tight* to test how the tightness of different covenants affect value of cash in the next quarter. We also use an interaction term $Current\_tight(E/EBITDA\_tight)_{i,t-1} * C(XC)_{i,t}$ to test the difference between the value of cash (excess cash) owned by firms with tight covenant last quarter and the value of cash (excess cash) owned by firms with loose covenant last quarter.

According to the results of Table 6, tightness of current ratio covenant is negatively related to firm's market value, showing that additional limits on cash might shrink the value of firm. The interaction between tightness of current ratio covenant and cash ratio does not changes firm's value, indicating that initial tightness of covenant does not alter the value of cash. But, tightness of D/EBITDA covenant has insignificant effect on firm's value. In terms of excess cash, tightness of current ratio covenant does not alter firm's value neither by itself nor by its interaction with excess cash. Similarly, tightness of D/EBITDA covenant also have insignificant effect on firm's value after controlling for its interaction term with excess cash. To summarize, although the tightness of cash-related covenant significantly impact firm's cash holding policies, the tightness of covenant does not alter the value of cash. Consistent with DeAngelo et al. (2002), even creditors use covenants to improve firm's management and to protect their right, borrowers still able to use some strategies like liquidating their working-capital to meet the requirement of covenant but does not improve their management simultaneously.

[Invert Table 6 here]

Similarly, we also test the impact of loan's violation using the same base model as Equation (3). As shown in Table 7, violation of loan also has significantly negative effect on firm's value, implying that violation of loan is a bad signal for borrowers. In addition, the impact of violation on firm's value is larger than tightness of covenant, reflecting that violation is a worse signal which will significantly hurt firm's reputation. The value of cash decreased after violation of covenant, but the value of excess cash will be increase at the same time. According to the results of Table 4, firms usually stock their cash after covenant violations since they probably loss capital source from banks. The decreased value of cash is consistent with our prediction, implying that firms' cash has less value when they retain much cash.

However, their excess cash becomes much valuable, which might be attributed to two possible reasons. First, if excess cash is more likely be the cash saved as precautionary motive against to agency motive, excess cash should be valuable for firm. Second, the effect of loan's violation will depends on types of firms, causing a mixable result if we use specification supposed all firms have the same reaction after violating covenants. Since it is difficult to test whether cash holdings by firms is attributed to precautionary motive or agency motive, we test the second hypothesis by partitioning all firms into different kinds of borrowers and examine our model on each of them. The results are shown in the next Section.

[Invert Table 7 here]

3.4 The effect on firms with different growth opportunities

In this section, we further partition all firms into two subsamples using median of market-to-book ratio as cutoff point. According to Demiroglu and James (2010),

market-to-book ratio significantly and consistently reduce the probability of tight covenant, which implies that banks might give firms with high growth opportunities a loose covenant to permit them a larger space for violation. Their findings hypothesize that firms with different growth opportunities should be regarded as different groups of borrowers by bank, and the firms with different growth opportunities might act in a different way when they got pressure from covenant or violation.

We show the results using base model Equations (3) and (4) in Table 8, which only report the results of our central variables to save space. In Panel A of Table 8, the results show that tightness of current ratio covenant significantly reduces the firm's incentives of holding cash no matter for firms with high growth opportunities or with low growth opportunities. The tightness of Debt/EBITDA covenant, in a different way, causing high M/B firms to increase the cash reserves. Interestingly, from the effect of loan's violation on different types of firms, results indicate that the violation only induce high M/B firms increase their cash reserves, which result does not be found from the low M/B firms. These results indicate that firms with high growth opportunities are much care about their cash reserves and will be more likely to stock cash for precautionary motive after losing the capital source from debt. In contrary, the firms with low growth opportunities do not require such amount of cash to prevent the unpredictable shocks.

In panel B of Table 8, we also test the effect of covenant tightness and covenant violation on value of cash by different groups. The results show that the tightness of current ratio covenant only signal a bad information for high M/B firms, implying that tightness of covenant might be an alert for the firms with high growth opportunities. Additionally, reducing cash caused by tight covenant does not increase the value of

cash for high M/B firms but further shrink its value. It seems that the cash-related covenant has much more effect on the firms with high growth opportunities, and its will be a bad signal for these firms that should much aware about their cash.

On the other hand, the violation of loan for high M/B firms has more serious effect on their firms' value than the effect on low M/B firms. The effect of violation of loan also is larger than the effect of tightness of current ratio covenant no matter we focus on cash or excess cash. Finally, the results of Table 7 show that the value of excess cash will be increase after violating covenant. After splitting firms into different groups, results show that only the excess cash hold by firms with low growth opportunities becomes much valuable after violation of loan, and this impact is insignificant for the high M/B firms. Thus, although violation of covenant significantly reduce the value of cash no matter hold by which types of firms, the violation of covenant might induce low M/B firms decrease their excess cash reserves that should further increase the value of excess cash.

[Invert Table 8 here]

3.5 Robustness check

The tests discussed thus far show the effects of loan tightness and loan violation on firms' cash policies and the value of cash. In this section we perform two robustness checks on our results. First, we use some alternative proxies for covenant tightness to test the sensitivity to measure of tightness. We use the approach of Murfin (2012) to calculate a normalized distance between covenant threshold and accounting ratio, and we also use the number of covenants in each contract as the other alternative measure of tightness. All of the results are qualitatively similar to our findings reported above.

Second, we cannot conclude that tightness of covenants does not altered by borrowers' cash reserves, i.e., creditors also might use firm's cash reserves as their criteria for the tightness of covenants. In order to address this endogenous concern, we estimate the propensity of covenant tightness by the specification of Table 3 of Demiroglu and James (2010).[8] For current ratio covenant, we employ the following equation to estimate the propensity score of tightness of each covenant, then we use these propensity tightness as instrumental variable to re-test our model.

$$
\begin{aligned}
Current_{tight_{i,t}} = \\
&0.8072 + 0.0117\ Size_{i,t} - 0.0329\ Debt_{i,t} - 0.0625\ EBITDA_{i,t} - 0.1734\ CF\ vol._{i,t} \\
&-0.0509\ M/B_{i,t} - 0.0070\ Current_{i,t} - 0.0086\ Current\ vol._{i,t} - 0.0299\ Age_{i,t} \\
&+0.0553\ S\&P\ rated_{i,t} - 0.0332\ Numeber\ of\ past\ loans\ with\ arranger_{i,t} \\
&-0.0018\ Net\ percentage\ of\ banks\ tightening\ standards_{i,t} \\
&-0.0420\ Number\ of\ lenders_{i,t} - 0.0002\ Loan\ amount_{i,t} - 0.0053\ Maturity_{i,t} \\
&+0.0648\ Performance\ pricing\ grid_{i,t} + \varepsilon_{i,t},
\end{aligned}
\tag{4}
$$

where $Size$ is log of total assets; $EBITDA$ is EBITDA/Sales; $CF\ vol.$ is cash flow volatility measured as standard deviation of annual cash flow; $Current$ is current ratio; $Current\ vol.$ is current ratio volatility measured as standard deviation of quarterly current ratio; $S\&P\ rated$ is an indicator variable which equals one if firms are rated by S&P and zero otherwise; *Net percentage of banks tightening standards* is quarterly data estimated by Federal reserve bank of ST. Louis; $Performance\ pricing\ grid$ is an indicator variable which equals to one if contract has performance pricing grid and zero otherwise. *Age*, *Number of past loans with arranger*, *Number of lenders*, and *Maturity* are taken as log term, and *Debt* and *Loan amount* are divided by assets. The fixed effect of covenant and collateral are controlled in the model. The propensity of tightness of Debt/EBITDA covenant is estimated by a similar model except including current ratio volatility.

[8] We do not calculate the propensity of violation since we cannot identify major determinants of violation, which would be further test in the future studies.

Using propensity of tightness, results of Table 9 show that there has no significant relationship between the propensity of covenant tightness and cash holding policies except that the propensity Debt/EBITDA tightness will induce borrowers increase cash reserves. However, the propensity of current ratio tightness still retains a positive relationship with firms' cash ratios. The insignificant results might be driven by lack of observations or lack of representative of our instrumental variable, which need further tests to make sure that we use a property measure.

Next, from the results of Table 10, the propensity of tightness of current ratio covenant has significantly negative effect on firm's value, which is consistent with our previous findings. The excess cash hold by firms with tight covenant in the last quarter will be much valuable, which has the same direction with previous findings and it might be caused by the effect on low M/B firms according to Table 8. Finally, the propensity of tightness of Debt/EBITDA covenant will reduce value of cash hold by borrowers, which might primary be caused by the effect on high M/B firms. To summarize, most of our results used propensity tightness as proxies are consistent with the results found in the previous table.

4. Conclusion

In this paper, we test the impact of creditors on firms' cash policies. We employ initial tightness of covenants and loan's violation as our two proxies for intervene mechanisms of creditors, testing the impact of creditors' intervention on firms' tendency of holding cash and value of cash. The results show that only the tightness of cash-related covenant limits firms' inclination for cash stock. Violation of loan greatly increase firm's tendency to hold cash, which indicates that borrowers stock cash for precautionary motive after they lose capital from banks. Next, we

separate sources of cash to see how firm will react after getting tight covenant or violating covenant. Results indicate that, after violation of loan, borrowers lose capital from banks, try to liquidate their net working-capital, and reduce payout ratio. These findings are consistent with DeAngelo et al. (2002).

The tightness of tight cash-related covenant and violation are bad signals that reduce firms' value. However, the tightness of covenants does not alter the value of cash, and violation of covenants will increase the value of excess cash that is inconsistent with our prediction. We further split firms into two types of firms by the median of M/B ratio, and we find that violation of covenant only induce high M/B firms increase their cash reserves and it only improve the value of excess cash hold by firms with low growth opportunities. In sum, our results show that tightness of cash-related covenant significantly alter firm's cash holding policies but its effect on the value of cash differs for different types of firms. Violation of loan induce firms to retain their cash, liquidate the net working-capital, and reduce the payout ratio for precautionary motive.

Table 1 Summary statistics

This table reports the summary statistics of our sample from 1990 to 2010. Current ratio is defined as current assets divided by current liabilities. Debt/EBITDA is measured as long-term debt plus debt in current liabilities all divided by EBITDA. The estimating procedure of excess cash is shown in Section 2.2, and all definition of the other accounting variables are shown in Appendix. Lead arranger is the bank with ''Yes'' in ''Lead Arranger Credit'' item in LPC data. If lead banks have missing value, we equally distribute the remained shares to these banks. The definition of both Current_tight and D/EBITDA_tight are defined in 2.3, which are calculated by two approaches according to Demiroglu and James (2010) and Murfin (2012). Average_tight is an indicator variable which equals to one if the current_tight or Debt/EBITDA_tight is one and zero otherwise. All of the accounting variables are winsorized at the 1st and 99th percentiles to address potential problem of outliers.

	Mean	StD	Min	Max	N
Panel A: Borrower characteristics					
Total assets (millions)	1491.04	6056.19	0.0010	243,564	190,937
Current ratio	1.8786	1.2009	0.2369	8.4987	190,937
Debt/EBITDA	10.1931	24.5844	-97.8924	153.627	190,937
Market-to-Book ratio	2.6274	4.3426	0.5497	29.7747	190,937
Cash/Assets	0.1581	0.2115	0.0000	0.9220	190,937
Excess cash ratio	0.0007	0.0652	-0.1282	0.1897	190,937
Panel B: Loan characteristics					
Loan amount (millions)	257.67	6563.36	0.05	30,000	13,847
Loan maturity (in months)	50.3420	29.3299	12.0000	420.000	13,847
Lead arranger shares	74.2872	33.8447	0.0000	100.000	13,847
All-in-drawn spreads (bps)	173.284	120.602	8.5000	1500.00	13,847
Covenant number	2.4754	1.0544	1.0000	8.0000	13,847
Panel C: Proxies for covenant tightness and violation					
Current_tight (DJ)	0.6036	0.4895	0.0000	1.0000	691
D/EBITDA_tight (DJ)	0.6586	0.4745	0.0000	1.0000	751
Current_tight (Murfin)	0.0000	1.0000	-1.5391	1.8053	691
D/EBITDA_tight (Murfin)	0.0000	1.0000	-1.9758	2.1846	751
Average_tight (Murfin)	-0.1306	1.0037	-5.5391	1.8053	1,344
Violation	0.0721	0.2587	0.0000	1.0000	94,984

Table 2 Summary statistics grouped by covenant tightness, correlation

Panel A Summary statistics by covenant tightness (DJ)

	Current ratio covenant			Debt/EBITDA covenant		
	Tight	Loose	Difference	Tight	Loose	Difference
Variables	(1)	(2)	(1) - (2)	(1)	(2)	(1) - (2)
Borrower characteristics						
Total assets	859.5	370.4	489.1	1093.1	1273.8	-180.7
Current ratio	2.1756	2.2900	-0.1144	2.2078	2.1370	0.0707
Debt/EBITDA	7.4194	9.1233	-1.7040	2.5748	2.3996	0.1752
Cash/Assets	0.0544	0.0848	-0.0304***	0.0985	0.0950	0.0035
Excess cash/Assets	-0.0452	-0.0270	-0.0182**	-0.0505	-0.0448	-0.0057
Loan characteristics						
Loan amount (millions)	107.37	106.32	1.05	180.7	258.3	-77.55
Loan maturity (in months)	49.8295	47.2785	2.5510	52.4510	63.2149	-10.7639***
Lead arranger shares	77.3166	77.7479	-0.4313	75.2242	73.1068	2.1174
All-in-drawn spreads (bps)	193.6	225.0	-31.4233*	178.7	220.3	-41.5706***
Covenant number	3.1186	3.3099	-0.1912	2.6138	2.9912	-0.3774***
Current_tight (Murfin)	-0.7945	-0.0620	-0.7325***	-0.2815	-0.3691	0.0876
D/EBITDA_tight (Murfin)	0.0244	-0.4004	0.4248	-0.2179	0.7462	-0.9641***
Average_tight (Murfin)	-0.7823	-0.0807	-0.7017***	-0.2157	0.7240	-0.9397***
N	417	274		493	258	

Table 2 Continued

Panel B Fraction of tightness by industry (DJ)

	Current ratio covenant	Debt/EBITDA covenant
Agriculture, minerals, construction	0.720	0.796
Manufacturing	0.618	0.660
Transportation, communication	0.520	0.647
Trade-wholesale	0.628	0.722
Trade-retail	0.548	0.431
Services	0.406	0.669

Panel C Correlation of tightness

	Current_tight (DJ)	D/EBITDA_tight (DJ)	Current_tight (Murfin)	D/EBITDA_tight (Murfin)
Current_tight (DJ)				
D/EBITDA_tight (DJ)	0.2067			
Current_tight (Murfin)	-0.3454***	-0.0846		
D/EBITDA_tight (Murfin)	0.0219	-0.4652***	-0.1522	
Average_tight (Murfin)	-0.3457***	-0.4599***	0.9747***	0.9815***

This table reports the summary statistics grouped by covenant tightness. Panel A presents summary statistics by different criteria of tightness for all merged Compustat/LPC sample for 1990 to 2010. Current ratio is defined as current assets divided by current liabilities. Debt/EBITDA is measured as long-term debt plus debt in current liabilities all divided by EBITDA. Lead arranger is bank with ‘‘Yes’’ in the ‘‘Lead Arranger Credit’’ item in LPC data, while lead banks have missing value, we equally distribute the remained shares to these banks. The definition of both Current_tight and D/EBITDA_tight are defined in Section 2.3, which are calculated by two approaches according to Demiroglu and James (2010) and Murfin (2012). Average_tight is an indicator variable which equals to one if the current_tight or Debt/EBITDA_tight is one and zero otherwise. Panel B presents fraction of tightness by industry which category refers to 2-Degit SIC codes. Panel C presents correlation of our measures of covenant tightness. ***, **, and * stand for significance at the 1%, 5%, and 10% levels, respectively.

Table 3

Effect of covenant tightness on the tendency to hold cash

We explore the impact of covenant tightness on the tendency of holding cash in this set of regressions defined in Section 3.2. Dependent variable are the change in cash ratios (ΔC) and the change in excess cash (ΔXC) which calculated procedure is shown in Section 2.2. Current_tight and D/EBITDA_tight are defined in Section 2.3, and all definition of the other variables are shown in Appendix. T-statistics employed robust individual standard errors are reported in parentheses. ***, **, and * stand for significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable	ΔC_t		ΔXC_t	
Intercept	-0.0082**	0.0009	-0.0045	0.0004
	(-2.36)	(0.32)	(-1.39)	(0.12)
$Current\_tight_{t-1}$	-0.0124***		-0.0100**	
	(-2.69)		(-2.40)	
$D/EBITDA\_tight_{t-1}$		-0.0033		-0.0017
		(-0.79)		(-0.43)
$\Delta M/B_t$	0.0028	0.0149**	0.0066	0.0087
	(0.25)	(2.30)	(0.68)	(1.39)
$\Delta SIZE_t$	-0.0329	-0.0120	-0.0284	0.0148
	(-1.14)	(-0.73)	(-1.06)	(0.94)
ΔCF_t	-0.0145	0.0281	0.0348	0.0426
	(-0.15)	(0.30)	(0.39)	(0.49)
ΔNWC_t	-0.0828	-0.1939***	-0.0318	-0.1702***
	(-1.37)	(-3.67)	(-0.60)	(-3.07)
$\Delta CAPX_t$	-0.0158	-0.0236	-0.2604***	-0.4288***
	(-0.23)	(-0.57)	(-0.2604)	(-8.33)
ΔLEV_t	-0.2248***	-0.1808***	-0.0129	-0.0514
	(-4.06)	(-4.33)	(-0.23)	(-1.36)
ΔIS_t	0.1044	1.7247	2.1956	0.3994
	(0.05)	(0.66)	(1.24)	(0.15)
$\Delta R\&D_t$	0.0489	0.3431	0.2228	0.6787
	(0.19)	(0.29)	(1.30)	(0.67)
ΔD_t	-0.0088	0.0096***	0.0086	0.0080**
	(-1.58)	(2.74)	(1.64)	(2.34)
ΔNE_t	0.1324**	0.1393*	0.0288	0.0384
	(2.17)	(1.91)	(0.55)	(0.83)
ΔND_t	0.0871	-0.0066	0.0714	0.0013
	(1.57)	(-0.99)	(1.33)	(0.34)
N	669	742	669	742
Adj-R^2	0.17	0.20	0.10	0.16

Table 4

Effect of violation on the tendency to hold cash

We show the impact of loan's violation on the tendency of holding cash in this set of regressions defined in Section 3.2. Dependent variables are the change in cash ratios (ΔC) and the change in excess cash (ΔXC) which calculated procedure is shown in Section 2.2. The information of violation is collected from Nini et al. (2009), and all definition of the other variables are shown in Appendix. T-statistics employed robust individual standard errors are reported in parentheses. ***, **, and * stand for significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable	ΔC_t	ΔXC_t
Intercept	-0.0025***	-0.0009***
	(-10.86)	(-3.86)
$Violation_{t-1}$	0.0056***	0.0027***
	(7.90)	(3.73)
$\Delta M/B_t$	-0.0009	0.0078***
	(-1.64)	(14.27)
$\Delta SIZE_t$	0.0359***	0.0291***
	(8.08)	(6.81)
ΔCF_t	0.0137	0.0018
	(1.48)	(0.18)
ΔNWC_t	-0.0582***	-0.0358***
	(-10.61)	(-7.00)
$\Delta CAPX_t$	-0.0470***	-0.3155***
	(-5.84)	(-32.20)
ΔLEV_t	-0.0929***	-0.1652***
	(-12.55)	(-22.06)
ΔIS_t	0.5949**	1.6361***
	(2.39)	(6.82)
$\Delta R\&D_t$	0.0001***	0.0001***
	(2.84)	(-6.05)
ΔD_t	0.0012***	0.0015***
	(4.37)	(-4.94)
ΔNE_t	0.1339***	0.0781***
	(18.63)	(10.27)
ΔND_t	0.0695***	0.0700***
	(10.10)	(9.73)
N	94,984	94,984
Adj-R^2	0.04	0.12

Table 5

The trends of the primary sources of cash

This table presents the change in major sources of cash from year t-1 to year t. We follow the definition of McLean (2011) to separate different kinds of sources of cash, and we further estimate the net working-capital and cash dividends. All the results are divided by total assets. To save space, we only report the results which Current_tight and D/EBITDA_tight are defined as the procedure of Demiroglu and James (2010), since the results estimated by measures defined from Murfin (2012) is qualitatively similar. ***, **, and * stand for significance at the 1%, 5%, and 10% levels, respectively.

Grouped by:	Tight	Loose	Difference
$Current\_tight_{t-1}$ *(DJ)*	(1)	(2)	(1) – (2)
Issuance	-0.0013	-0.0001	-0.0012
Debt	0.0039	0.0246	-0.0207*
Cash flow	-0.0023	0.0473	-0.0065*
Net working capital	-0.0057	-0.0283	0.0226***
Cash dividends	-0.0004	0.0006	-0.0011
N	417	274	
Grouped by:	Tight	Loose	Difference
$D/EBITDA\_tight_{t-1}$ *(DJ)*	(1)	(2)	(1) - (2)
Issuance	0.0004	0.0001	0.0003
Debt	0.0229	0.0174	0.0055
Cash flow	-0.0068	-0.0080	0.0012
Net working capital	-0.0111	-0.0231	0.0120*
Cash dividends	0.0006	-0.0002	0.0008
N	493	258	
Grouped by:	Violated	Not violated	Difference
$Violation_{t-1}$	(1)	(2)	(1) – (2)
Issuance	-0.0001	0.0005	-0.0006
Debt	-0.0132	0.0004	-0.0136***
Cash flow	0.0073	-0.0266	0.0340
Net working capital	-0.0179	-0.0087	-0.0091**
Cash dividends	-0.0005	-0.0002	-0.0003***
N	7,002	94,561	

Table 6
Effect of covenant tightness on value of cash

In this table we examine the impact of covenant tightness on the value of cash and of excess cash by the specification defined in Section 3.3. Dependent variable of each regression is logarithm of market value, which is defined as book assets minus book equity plus market equity. Current_tight and D/EBITDA_tight are defined in Section 2.3, and all the definition of the other variables are shown in Appendix. X_t is level of variable X in year t divided by level of total assets in year t; dX_t is the change in level of X from year t-2 to year t, $X_t - X_{t-2}$; dX_{t+2} is the change in the level of X from year t to year t+2, $X_{t+2} - X_t$. T-statistics employed robust individual standard errors are reported in parentheses. ***, **, and * stand for significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable	$Ln(MV)_t$		$Ln(MV)_t$	
Intercept	7.5369***	6.5232***	7.4878***	6.5138***
	(6.99)	(6.77)	(6.53)	(6.72)
$Current\_tight_{t-1}$	-0.1678		-0.0961**	
	(-1.38)		(-2.11)	
$D/EBITDA\_tight_{t-1}$		0.1012		0.0627
		(0.85)		(1.03)
$Current\_tight_{t-1} * C_t$	-0.0190			
	(-0.65)			
$D/EBITDA\_tight_{t-1} * C_t$		0.0091		
		(0.30)		
$Current\_tight_{t-1} * XC_t$			0.0873	
			(0.17)	
$D/EBITDA\_tight_{t-1} * XC_t$				-0.2622
				(-0.52)
$Ln(C)_t$	0.0469***	12.9927		
	(2.76)	(0.31)		
$Ln(XC)_t$			0.7118**	0.5427
			(2.02)	(1.41)
$Ln(CF)_t$	34.2288	3.5248	28.9944	11.5126
	(1.44)	(0.11)	(1.27)	(0.28)
ΔCF_t	2.6544	3.5248	0.2429	4.3438
	(0.16)	(0.11)	(0.02)	(0.13)
ΔCF_{t+2}	18.5789	6.0936	12.2208	5.6103
	(0.80)	(0.23)	(0.55)	(0.22)
ΔNA_t	0.7185***	0.3552**	0.6947***	0.3045*
	(4.49)	(2.19)	(4.34)	(1.92)
ΔNA_{t+2}	0.3482***	0.3120***	0.3575***	0.3175***
	(4.46)	(4.02)	(4.48)	(4.06)
$Ln(R\&D)_t$	39.3477***	50.7051	39.8600***	66.0652
	(2.70)	(0.66)	(2.79)	(0.85)
$\Delta R\&D_t$	-69.5772	-76.7293	-63.0656	-83.7709
	(-1.43)	(-0.99)	(-1.41)	(-1.05)
$\Delta R\&D_{t+2}$	-9.0100	-14.8461	-0.1909	-12.0554
	(-0.54)	(-0.88)	(-0.01)	(-0.73)
$Ln(XINT)_t$	-0.0240	-0.0164	-0.0543**	-0.0317
	(-1.02)	(-0.68)	(-2.26)	(-1.36)
$\Delta XINT_t$	-6.4610	-9.3151**	-2.9626	-8.8872*
	(-1.01)	(-2.02)	(-0.46)	(-1.94)
$\Delta XINT_{t+2}$	-4.9814*	-11.3448***	-4.6029*	-11.0461***
	(-1.95)	(-3.07)	(-1.77)	(-3.06)
$Ln(Div)_t$	2.8032	9.0199***	1.8682	8.2809***
	(1.41)	(2.94)	(0.88)	(2.73)
ΔDiv_t	-0.6506***	-1.1069	-0.6631***	-0.8997
	(-4.03)	(-1.07)	(-4.16)	(-0.86)

ΔDiv_{t+2}	1.1705	3.5247*	0.7323	3.4619*
	(0.85)	(1.93)	(0.52)	(1.84)
ΔMV_{t+2}	-3.2242***	-2.7134***	-3.3367***	-2.8203***
	(-7.00)	(-6.80)	(-6.90)	(-6.95)
N	622	706	622	706
Adj-R^2	0.33	0.25	0.33	0.24

Table 7

Effect of violation on value of cash

In this table we examine the impact of loan's violation on the value of cash and of excess cash. Dependent variable is logarithm of market value, which is defined as book assets minus book equity plus market equity. The information of violation is collected from Nini et al. (2009), and all the definition of the other variables are shown in Appendix. X_t is the level of variable X in year t divided by the level of total assets in year t; dX_t is the change in the level of X from year t-2 to year t, $X_t - X_{t-2}$; dX_{t+2} is the change in the level of X from year t to year t+2, $X_{t+2} - X_t$. T-statistics employed robust individual standard errors are reported in parentheses. ***, **, and * stand for significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable	$Ln(MV)_t$	$Ln(MV)_t$
Intercept	2.0137***	8.6837***
	(8.11)	(4.57)
$Violation_{t-1}$	-0.4461***	-0.2488***
	(-9.31)	(-12.78)
$Violation_{t-1} * C_t$	-0.0519***	
	(-5.09)	
$Violation_{t-1} * XC_t$		0.5272***
		(3.03)
$Ln(C)_t$	0.1007***	
	(19.59)	
$Ln(XC)_t$		0.7934***
		(12.05)
$Ln(CF)_t$	-1.1311***	-3.1507***
	(-7.95)	(-3.93)
ΔCF_t	0.6377***	0.0156
	(6.12)	(0.13)
ΔCF_{t+2}	-0.7530***	-0.8679***
	(-6.43)	(-7.95)
ΔNA_t	0.2355***	0.2047***
	(12.38)	(10.22)
ΔNA_{t+2}	0.3360***	0.3224***
	(17.71)	(15.15)
$Ln(R\&D)_t$	2.6582***	3.2226***
	(8.72)	(11.03)
$\Delta R\&D_t$	-0.4396***	-0.7368***
	(-2.93)	(-4.31)
$\Delta R\&D_{t+2}$	0.2920***	0.2261*
	(2.64)	(1.83)
$Ln(XINT)_t$	0.0017	-0.0221***
	(0.24)	(-3.21)
$\Delta XINT_t$	1.0820***	0.7642**
	(3.62)	(2.45)
$\Delta XINT_{t+2}$	0.0430	-0.1727
	(0.21)	(-0.79)
$Ln(Div)_t$	0.1315	-0.1231
	(0.81)	(-0.86)
ΔDiv_t	-0.1121	-0.1184
	(-1.40)	(-1.30)
ΔDiv_{t+2}	-0.149	-0.3042***
	(-1.62)	(-3.30)
ΔMV_{t+2}	-0.6566***	-0.5867***
	(-5.96)	(-5.95)
N	78,502	78,502
Adj-R^2	0.18	0.16

Table 8

Effect of covenant tightness and violation on cash policies and value of cash

(By different groups)

This table presents the impact of covenant tightness and loan's violation both on cash policies and on value of cash by different groups of firms. We partition firms into two groups by median of M/B, and re-run the Equation (3) and Equation (4) for different types of firms. To save space, we only report the results of central variables. T-statistics employed robust individual standard errors are reported in parentheses. ***, **, and * stand for significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Effect of covenant tightness and violation on cash policies (by different groups)				
Dependent variable	ΔC_t		ΔXC_t	
	High M/B	Low M/B	High M/B	Low M/B
Panel A.1: Covenant tightness				
$Current\_tight_{t-1}$	-0.0186***	-0.0083**	-0.0145**	-0.0085**
	(-2.82)	(-2.07)	(-2.24)	(-2.15)
$D/EBITDA\_tight_{t-1}$	0.0056*	-0.0035	0.0042	0.0002
	(1.74)	(-0.79)	(1.28)	(0.03)
Panel A.2: Covenant violation				
$Violation_{t-1}$	0.0127***	0.0008	0.0094***	-0.0012*
	(7.16)	(1.29)	(5.61)	(-1.73)
Panel B: Effect of covenant tightness and violation on value of cash (by different groups)				
Dependent variable	$Ln(MV)_t$ (C_t)		$Ln(MV)_t$ (XC_t)	
	High M/B	Low M/B	High M/B	Low M/B
Panel B.1: Covenant tightness				
$Current\_tight_{t-1}$	-0.1772*	-0.0438	-0.1029**	-0.0218
	(-1.70)	(-0.45)	(-2.13)	(-0.59)
$D/EBITDA\_tight_{t-1}$	0.0246	-0.0212	0.0737	0.0025
	(0.21)	(-0.17)	(1.18)	(0.04)
$Current\_tight_{t-1}$*C_t (XC_t)	-0.0408*	-0.0032	-1.2131**	0.2096
	(-1.66)	(-0.15)	(-2.37)	(0.45)
$D/EBITDA\_tight_{t-1}$*C_t (XC_t)	-0.0222	0.0118	-0.4259	1.0464*
	(-0.72)	(0.39)	(-0.82)	(1.86)
Panel B.2: Covenant violation				
$Violation_{t-1}$	-0.4122***	-0.2024***	-0.2376***	-0.0872***
	(-6.64)	(-4.35)	(-6.95)	(-5.29)
$Violation_{t-1}$ * C_t (XC_t)	-0.0540***	-0.0204**	0.2542	0.2899*
	(-3.12)	(-2.13)	(1.09)	(1.82)

Table 9

Robustness test - Effect of propensity of covenant tightness on cash policies

In this table we estimate the effect of propensity of covenant tightness on cash policies following the procedure defined in Section 3.5. Dependent variable of each regression is the change in cash ratios (ΔC) and the change in excess cash (ΔXC) which calculated procedure is shown in Section 2.2. All the definition of variables are shown in Appendix. T-statistics employed robust individual standard errors are reported in parentheses. ***, **, and * stand for significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable	ΔC_t		ΔXC_t	
Intercept	0.0196	0.0009	0.0191	-0.0034
	(0.74)	(0.32)	(0.64)	(-0.42)
$Current\_tight_{t-1}$	-0.00388		-0.0342	
	(-1.05)		(-0.84)	
$D/EBITDA\_tight_{t-1}$		0.0218*		0.0177
		(1.76)		(1.41)
$\Delta M/B_t$	0.0032	0.0110*	-0.0087	0.0158***
	(0.39)	(1.69)	(-1.17)	(2.65)
$\Delta SIZE_t$	-0.0321	-0.0677***	0.0415	-0.0634***
	(-0.86)	(-3.10)	(1.23)	(-2.97)
ΔCF_t	0.0547	0.1391	-0.0588	0.0479
	(0.27)	(1.43)	(-0.30)	(0.50)
ΔNWC_t	-0.1176	-0.4580***	-0.0122	-0.3891***
	(-0.80)	(-6.34)	(-0.08)	(-5.37)
$\Delta CAPX_t$	-0.1042**	0.0273	-0.3542***	-0.5474***
	(-2.40)	(0.58)	(8.21)	(-10.79)
ΔLEV_t	-0.1765*	-0.3820***	0.1151	-0.1207*
	(-1.85)	(-5.77)	(1.19)	(-1.89)
ΔIS_t	0.0775	-0.1009	0.0264	-0.1094
	(0.57)	(-1.16)	(0.17)	(-1.27)
$\Delta R\&D_t$	0.6267***	1.4225	0.2775	0.6831
	(3.35)	(1.07)	(1.50)	(0.55)
ΔD_t	0.0036	-0.0020	0.0006	-0.0036
	(1.00)	(-0.68)	(0.16)	(-1.17)
ΔNE_t	0.1756**	0.0844*	-0.0187	0.1137*
	(2.23)	(1.88)	(-0.25)	(1.77)
ΔND_t	0.1293**	0.2431***	-0.0342	0.0177
	(2.13)	(3.81)	(-0.84)	(1.41)
N	657	723	657	723
Adj-R^2	0.17	0.33	0.18	0.37

Table 10

Robustness test - Effect of propensity of covenant tightness on the value of cash

In this table we estimate the propensity of covenant tightness following the procedure defined in Section 3.5. Dependent variable of each regression is logarithm of market value, which is defined as book assets minus book equity plus market equity. All definition of the other variables are shown in Appendix. X_t is the level of variable X in year t divided by the level of total assets in year t; dX_t is the change in the level of X from year t-2 to year t, $X_t - X_{t-2}$; dX_{t+2} is the change in the level of X from year t to year t+2, $X_{t+2} - X_t$. T-statistics employed robust individual standard errors are reported in parentheses. ***, **, and * stand for significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable	$Ln(MV)_t$		$Ln(MV)_t$	
Intercept	6.6433***	6.8326***	6.5843***	6.4314***
	(7.08)	(7.75)	(6.77)	(6.92)
$Current\_tight_{t-1}$	-1.4361*		-1.3647***	
	(-1.90)		(-3.50)	
$D/EBITDA\_tight_{t-1}$		-0.4374		0.1244
		(-1.00)		(0.55)
$Current\_tight_{t-1} * C_t$	0.0364			
	(0.19)			
$D/EBITDA\_tight_{t-1} * C_t$		-0.2116*		
		(-1.89)		
$Current\_tight_{t-1} * XC_t$			4.8626*	
			(1.76)	
$D/EBITDA\_tight_{t-1} * XC_t$				-2.2988
				(-1.21)
$Ln(C)_t$	0.0016	0.1906***		
	(0.01)	(2.62)		
$Ln(XC)_t$			-0.2486	1.8677
			(-1.20)	(1.48)
$Ln(CF)_t$	55.5114**	12.4264	55.2659***	9.9444
	(2.51)	(0.30)	(2.68)	(0.25)
ΔCF_t	-2.1050	8.3991	-4.7552	8.7535
	(-0.13)	(0.24)	(-0.33)	(0.25)
ΔCF_{t+2}	10.7467	7.1454	4.7540	9.2981
	(0.49)	(0.25)	(0.24)	(0.34)
ΔNA_t	0.5918***	0.3716**	0.5610***	0.2917*
	(3.44)	(2.16)	(3.35)	(1.76)
ΔNA_{t+2}	0.3500***	0.2812***	0.3768***	0.2820***
	(4.96)	(3.82)	(5.23)	(3.87)
$Ln(R\&D)_t$	25.5518	50.8723	28.8160*	62.8345
	(1.40)	(0.65)	(1.68)	(0.80)
$\Delta R\&D_t$	-61.3304	-81.0519	-60.6871	-82.7551
	(-1.44)	(-1.03)	(-1.47)	(-1.04)
$\Delta R\&D_{t+2}$	-31.7001	-15.5924	-29.9563*	-11.1716
	(-1.59)	(-0.88)	(-1.67)	(-0.65)
$Ln(XINT)_t$	-0.0205	-0.0163	-0.0501**	-0.0327
	(-0.93)	(-0.66)	(-2.26)	(-1.36)
$\Delta XINT_t$	-4.0669	-9.6636**	-1.9462	-9.4417**
	(-0.52)	(-2.02)	(-0.25)	(-2.07)
$\Delta XINT_{t+2}$	-5.2055*	-11.7855***	-4.9946*	-11.3795***
	(-1.93)	(-3.08)	(-1.81)	(-3.19)
$Ln(Div)_t$	4.9481**	9.5982***	4.6822**	7.9160***
	(2.47)	(3.26)	(2.33)	(2.71)
ΔDiv_t	-0.6406***	-2.0715	-0.7057***	-0.7101
	(-2.93)	(-0.92)	(-2.76)	(-0.32)

ΔDiv_{t+2}	1.0251	3.0774	0.7277	3.3811
	(0.67)	(1.54)	(0.47)	(1.55)
ΔMV_{t+2}	-2.5083***	-2.6924***	-2.5947***	-2.7818***
	(-5.25)	(-6.98)	(-5.70)	(-7.00)
N	602	692	602	692
Adj-R^2	0.40	0.25	0.42	0.24

Appendix

Definition of variables

Variable	Definition
All-in drawn spreads	Describes the amount the borrower pays in basis points over LIBOR for each dollar drawn down. It adds the spread of the loan with any annual (or facility) fee paid to the bank group.
Acquisitions	Acquisitions (#94).
Cash ratio	Cash ratio is defined as cash and marketable securities (#36) divided by book assets (#44).
Capital expenditures	Capital expenditures (#90).
Cash flow	Cash flow is measured as earnings after interests, dividends, and taxes but before depreciation (#21-#22-#6-#20).
Credit rating	Standard & Poor's (S&P) firm credit rating, converted to an index from one to six as follows: 1 = Aaa or Aa, 2 = A, 3 = Bbb, 4 = Bb, 5 = B, 6 = Cc or worse, and 7 = no rating.
Current ratio	Current ratio is defined as current assets (#40) divided by current liabilities (#49).
Dividends (Indicator)	Dividend, a dummy variable which equals one in years in which a firm pays a common dividend (#20) and zero otherwise.
Debt/EBITDA	Debt/EBITDA is measured as long-term debt (#51) plus debt in current liabilities (#45) all divided by EBITDA (#21).
Dividends	Dividend is defined as common dividend (#20) divided by book assets (#44).
Industry sigma	Industry sigma, measured as the standard deviation of industry cash flow to assets in the previous 10 years for each firm-year.
Lead arranger shares	Lead arranger is the bank with ''Yes'' in ''Lead Arranger Credit'' item in LPC data. If lead banks have missing value, we equally distribute the remained shares to these banks.

Leverage	Leverage is measured as long-term debt plus debt in current liabilities (#51+#45).
Market-to-book ratios	Market-to-book ratios, defined as book assets (#44) minus book equity (#59) plus market equity (#12*#61) all divided by book assets (#44).
Market value	Market value defined as book assets (#44) minus book equity (#59) plus market equity (#12*#61).
Net asset	Net asset measured as total assets minus cash (#44-#36).
Net debt	Net debt is measured as debt issuance minus debt retirement (#86-#92).
Net equity	Net equity is measured as equity sales minus equity purchases (#84-#93).
Net working capital	Net working capital net of cash.
R&D	R&D (#4) / sales (#2), and is set equal to zero when R&D is missing. Alternative measure is R&D/ assets.
ROA	Cash flow (#21-#22-#6-#20) divided by size (#44).
Size	The logarithm of book assets (#44).
Excess cash	Excess cash which calculated process follows Bates et al. (2009). Detailed procedure is shown in Section 2.2.
Interest expense	Interest expense (#22).

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