Bank Soundness and Cash Holdings: Evidence from a Bank- Centered Financial Market

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Abstract

We examine the relationship between the bank's soundness and cash holdings in Japan, which is a bank-centered market. We find that the deterioration of a bank's soundness makes firms increase their cash holdings and the cash flow sensitivity of cash. The increase in cash mitigates underinvestment problems when their banks face serious bad-loan problems. Furthermore, the value of cash in firms with unsound banks is more valuable than in the firms with sound banks. These relations are not found in high rated firms. There results imply that the bank's soundness affects firms' cash holdings in a bank-centered market and are consistent with pre-cautionary motive.

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1. Introduction

The balance between raising funds and cash holdings is an important issue for firms. If firms can easily raise funds, cash holdings are needless, but firms often have constraints in raising funds. The literature shows that firms with financial constraints tend to have more cash because of precautionary motivations (e.g., Almeida, Campello, Weisbach, 2004; Harford, Klasa and Maxwell, 2014). The main source of raising funds for firms differs based on the financial system of each country. In countries such as Japan and Germany with bank-dependent financial systems, the role of banks in raising funds is larger than that in market-oriented countries, and there are long-term ties between banks and industrial firms. The deterioration of banks' soundness restricts firms from raising funds and makes firms financially constrained, especially in a bank-dependent economy (e.g., Peek and Rosengren, 1997; Woo, 2003; Watanabe, 2007). However, most of the literature that has investigated the relationship between cash holdings and raising funds focuses not on the soundness of banks but on the characteristics of firms themselves, such as profitability and growth. We focus on the effect of bank soundness on firms' cash holdings using Japanese firms' data.

First, we identify the relationship between the soundness of banks and the cash holdings of firms. If the deterioration of a bank's soundness makes firms financially constrained, firms would save more cash to mitigate underinvestment problems. By using the bad loan ratio and the equity ratio of a main bank as the proxy for the soundness of the bank, we find that when the bank's soundness has deteriorated, firms significantly increase their cash holdings. Furthermore, the relationship is more obvious for firms that have no investment-grade bond rating and that heavily depend on banks, which we call high-bank-dependent firms.

Second, we predict that the cash holdings of financially constrained firms mitigate the problem of underinvestment. To investigate whether this prediction is correct or not, we use the framework of Faulkender and Petersen (2012). We find that cash holdings of firms that depend on financially

unsound banks mitigate underinvestment problems. In particular, the effect of cash on mitigating underinvestment is stronger in high-bank-dependent firms.

Third, we examine the valuation of cash by the market using the approach developed by Faulkender and Wang (2006). We predict that the value of cash increases in financially constrained firms because investors know that the cash mitigates underinvestment problems in such firms. The results show that the value of cash is larger for firms with financially unsound banks than others. Furthermore, the valuation of cash by the market is higher for high-bank-dependent firms than for low-bank-dependent firms.

Finally, we examine the cash flow sensitivity of cash using the framework of Almeida, Campello and Weisbach (2004). We predict that financially constrained firms increase cash holdings because of precautionary motives, so cash flow sensitivity of cash for such firms is significantly higher than that for other firms. We find that the bad loan ratio of a bank increases the cash flow sensitivity of cash, but we find no relation between the equity ratio of a bank and cash flow sensitivity of cash of firms. Moreover, we find no difference between cash flow sensitivity of cash of high-bank-dependent firms and that of low-dependent firms.

On the whole, these results are consistent with our predictions. We find that the soundness of banks affects firms' cash holdings, especially when the firms heavily depend on banks. Furthermore, these results imply that firms' cash holdings are rational when firms face financial constraints.

Our paper contributes to the literature in several ways. First we contribute to the determinants of cash holdings. The literature has mainly focused on the characteristics of firms themselves and investigating the effect of firms' financial constraints on firms' cash holdings. Instead, we discuss how the financial constraints associated with the soundness of banks affect firms' cash holdings and show the importance of the soundness of banks for firms' financial policies. Second, we provide insights into the literature on the soundness of banks. Much literature discusses how the soundness of a bank

affects the bank's lending activities or firms' activities. This paper shows that the deterioration of bank soundness affects firms' cash holdings and also affects investments and firm value indirectly. Finally, this paper contributes to the research on financial systems. The research on financial systems has focused on the efficiency and inefficiency in both bank-centered financial systems and market-centered financial systems. We provide a new implication about how firms deal with the inefficiency of bank-centered financial systems, by showing that firms increase cash holdings when banks' soundness is damaged to mitigate underinvestment problems. We hope to investigate how the difference in financial systems affects cash holdings of firms in the future.

The remainder of the paper is organized as follows. Section 2 reviews the literature and develops our hypotheses. Section 3 describes our sample and research design. Section 4 provides our empirical results. Finally, section 5 concludes this paper.

2. Literature and hypotheses

2.1 Bank-centered financial system and soundness of bank

The importance of banks when a firm is funding has been an important research theme in corporate finance (e.g., Diamond, 1984). The importance of banks in countries with bank-centered financial systems such as Japan and Germany is greater than that in other countries because banks play the main role in funding firms in such countries. In Japan, there are unique types of banks called "main banks", which have very close ties to firms. Main banks have more power over firms than other banks, and those close bank-firm relationships can solve agency problems of managerial behavior as well as problems of asymmetric information between lenders and borrowers (e.g., Hoshi et al., 1990; 1991)).[1]

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[1] Hoshi et al. (1990) investigates how financial distress and a main bank affects firm's investment and their performance in Japan. They find that Japanese firms which have very close ties to a main bank invest more and sell more after the occurrence of financial distress than other firms. This implies that the close bank relationship reduces the costs of financial distress, because the main bank is well informed about that firm and know whether it is profitable or not. Hoshi et al. (1991) investigates the role of main banks in firm's investment. They hypothesize that when there are information and incentive problems in the capital market, the close relationship between a bank and a firm mitigates such problems and the liquidity sensitivity of investment would be decreased. They examine two sets

As described above, the role of banks is greater in bank-centered financial systems, but when the soundness of banks is deteriorated, the bank-centered financial system does not work well. Some researchers report that banks which have suffered a financial difficulties reduced lending, the so-called credit crunch hypothesis. The credit crunch is often caused by "the capital crunch". For example, the adoption of the rigorous self-assessment of assets requested by the regulator in Japan have made bank's capital ratio decrease, and banks have cut back on their lending supply to satisfy the capital adequacy requirements (e.g., Woo, 2003; Watanabe, 2005). And, after the injection of public capital, banks' lending has increased (e, g., Watanabe, 2005). The decline in Japanese stock values between 1989 and 1992 also caused the severe decrease of Japanese lending activities. Because, in those days, banks had large cross-holdings of Japanese corporate stocks to maintain close ties to firms and the decline in Japanese stock values declined banks' tier 2 capital and total risk-based capital ratio. Thus, banks decreased their lending to satisfy the capital adequacy requirements (e, g., Peek and Rosengren, 1997).

Consequently, we expect that the decrease in a bank's lending behavior which is caused by the decline of the bank's soundness affects firms' activities, especially in a country with a bank-centered financial system. We investigate the effect of the soundness of banks on firms' cash holdings in Japan because Japan has a bank-centered financial system.

2.2 Cash Holdings and hypothesis

2.2.1   The reason of cash holdings

Much literature discusses the reason for firms' cash holdings. One of main hypotheses as to why firms hold cash is the precautionary motive hypothesis. This hypothesis states that firms increase their cash holdings to prepare for adverse cash flow shocks when access to the capital markets is expensive. For example, Opler et al. (1999) tested some hypotheses about cash holdings and concluded that the

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of firms, one have close ties to a main bank, another don't have, and find that investment by firms with a close bank relationship is much less sensitive to their liquidity than firms with a close bank relationships.

precautionary motive, which they called the "static tradeoff model", is more reasonable than the agency cost of managerial discretion hypothesis and the financing hierarchy hypothesis. Almeida et al. (2004) modeled the precautionary motive hypothesis and investigated cash flow sensitivity of cash in financially constrained firms and that in others. Other authors tested the relationship between cash holdings and various factors, such as R&D and the maturity structure of debt, and found results consistent with the precautionary motive hypothesis (e.g., Bates et al., 2009; Harford et al. 2014).[23]

As described above, there is much literature discussing the precautionary motive for cash holdings, but most has investigated the relationship between cash holdings and firms' characteristics. In this paper, we focus on the soundness of banks and investigate the effect of a main bank on cash holdings of firms that borrow money from the main bank.[4]

If the soundness of a main bank is deteriorated, it is difficult for firms to borrow money from the main bank and firms' difficulty of fundraising is increased. Although the increase in difficulty of fundraising raises the possibility of underinvestment problems for firms, large cash holdings could mitigate the difficulty of fundraising and reduce the possibility of underinvestment problems.

Thus, we hypothesize that firms would hold more cash to mitigate underinvestment problems when the soundness of a main bank is deteriorated.

Hypothesis 1：When the soundness of a main bank is deteriorated, cash holdings of borrowing firms would increase.

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[2]Surveys of cash holdings also support the precautionary motive hypothesis. Lins et al.(2010) found that cash as a buffer against future cash flow shortfalls is the most important factor in deciding how much excess cash to hold for US firms. Also, Sasaki et al. (2015) found that not only a buffer against future cash flow shortfalls but also the level of uncertainty about future investment opportunities are important for Japanese firms when they decide the level of excess cash holdings.

[3]Nakajima and Sasaki (2016) divided firms into bank-dependent firms and firms with access to the bond markets and found that the precautionary motive hypothesis is supported only with firms with access to the bond markets.

[4] Pinkowitz and Williamson (2001) find that the cash holdings of Japanese firms is larger than that of the United States and Germany. They advocate that the bank which have strong power on Japanese firms make them hold the cash on deposit at the bank, and the bank can lend it to other firms and receive interest. This is called "rent extraction hypothesis".

2.2.2 Cash holding and investment

The probability of underinvestment problems caused by the shortage of investment funds is higher in financially constrained firms.[5] However, larger cash holdings should mitigate such problems even in financially constrained firms, so the coefficient on cash holdings to investment in financially constrained firms would be significantly positive. Some literature confirms the positive relationship between cash holdings and investment in such firms (e.g., Faulkender and Petersen (2012), Harford et al. (2014))

Therefore, we hypothesize as follows:

Hypothesis 2：If the soundness of a main bank is deteriorated, cash holdings of firms borrowing from that bank would increase the investment in such firms.

2.2.3 Value of cash holding

We have discussed the usefulness of cash holdings from a pre-cautionary motive for firms whose main bank is financially constrained. If these hypotheses are true, the value of cash should be more valuable, when the soundness of a main bank is deteriorated.

The literature report that the value of cash is affected by the various firms' characteristics. For example, Faulkender and Wang(2006) report that the marginal value of cash in the mean firm is 0.94 dollars and is even higher for firms that have less cash and less debts than for others. Further, the marginal value of cash for dividend paying firms is also higher than that for repurchasing firms. Pinkowitz et al (2006) focus on the agency cost between controlling shareholders and minority shareholders and the country-level investor protection to estimate the value of cash. They find that the

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[5] Gibson (1995) reports that Japanese firms that had been borrowing from a low rating main bank decreased their investment from 1991 to 1992 after the collapse of the bubble economy.

value of cash is lower in country with weak investor protection, because weak investor protection can't prevent controlling shareholders from extracting private benefits. Harford et al. (2014) investigate the relationship between the precautionary motive and the value of cash and find that the value of cash for firms with higher refinancing is higher than other firms.

Hypothesis 3：If the soundness of a main bank is deteriorated, the value of cash for firms borrowing from that bank would be more valuable than for other firms.

2.2.4　Cash holdings and cash flow sensitivity of cash

Almeida et al.(2004) modeled that firms with financial constraints save more cash from their cash flows and demonstrated that cash flow sensitivity of cash (CFSC) was actually significantly positive in constrained firms. Similar results are reported by Harford et al. (2014). They also find that firms with shorter maturity debt, and thus more severe difficulty of fundraising, save more cash out of current cash flows. Nakajima and Sasaki (2016) compare the cash flow sensitivity of cash for bank-dependent firms and that for firms with access to the bond market. They find that only the latter has significant sign and this result implies the probability that pre-cautionary motives is not always supported.

In this paper, we also hypothesize that when the soundness of a bank is deteriorated, firms' difficulty of fundraising will be more severe, and they will save more cash out of current cash flows.

Hypothesis 4：If the soundness of a main bank is deteriorated, the CFSC of firms that are borrowing from the main bank would be higher than other firms.

3.　Data and research design

Our sample is based on the Nikkei NEEDS Financial QUEST database for all listed or delisted non-financial companies in Japan for the period 2000-2014 after the application of consolidated statements and cash flow statements.

First, we define a main bank to test the effect of the soundness of a main bank on firms' cash holdings. In this paper, the definition of a main bank is the ordinary bank from which the firm has been borrowing most. To determine the soundness of a main bank, we use the ratio of bad loans and the equity ratio of the main bank. We use this information as a proxy for the soundness of banks from the Nikkei NEEDS Financial Quest. If there are several main banks, we use the average.

We collect firms' financial and industrial data from the Nikkei NEEDS Financial Quest. We also collect firms' M&A and stock data from the Recof MARR database and the NPM Portfolio Master, respectively. Furthermore, we collect bond rating data for each firm from Nihon Keizai Shinbun. We exclude firms whose fiscal period is less than twelve months. Our final sample of 26,464 firm-years excludes firms that do not have loans from banks or firms that have unavailable data about main banks, loans, and so on.

4. Empirical results

4.1. The effect of soundness of a main bank on cash holdings

First, we investigate the effect of the soundness of a main bank on firms' cash holdings. The deterioration of banks' soundness restricts firms from raising funds and makes firms financially constrained in bank-centered country such as Japan. Thus we expect that firms will hold more cash to mitigate underinvestment problems in such circumstance.

We follow the regression model of Opler et al. (1999) to estimate this relationship.

$$Cash\ Holdings_{i,t} = \alpha + \beta_1 BK\ Bad\ Loan_{i,t-1}(BK\ Equity\ Ratio_{i,t-1}) + \beta_2 \ln(Asset_{i,t-1})$$

$$+ \beta_3 MTB_{i,t-1} + \beta_4 CapEx_{i,t-1} + \beta_5 Cashflow_{i,t-1} + \beta_6 DivDummy_{i,t-1}$$

$$+ \beta_7 NWC_{i,t-1} + \beta_8 Leverage_{i,t-1} + \beta_9 R\&D_{i,t-1} + \beta_{10} Acquisition$$

$$+ \beta_{11} Industry\sigma_{i,t-1} + \varepsilon_{i,t} \qquad\qquad (1)$$

The dependent variable is Cash Holdings, which is measured as the sum of cash and marketable securities divided by book assets. To investigate the effect of the soundness of a main bank on firms' cash holdings, we focus on two proxies for soundness of a main bank. One is BK Bad Loan, which is defined as the natural logarithm of bad loan/total lending of a main bank. Another is BK Equity Ratio, which is defined as the natural logarithm of the equity ratio and is calculated by BIS definition. If the loss of the soundness of a main bank increases firms' cash holdings, BK Bad Loan (BK Equity Ratio) would be significant and have positive (negative) signs. Independent variables are as follows: ln(Asset) is the natural logarithm of book assets, and MTB is the sum of market value of equity and book value of debt divided by book assets. CapEx is the difference between fixed assets of t and t-1 plus depreciation scaled by book assets. Cashflow is defined as the sum of ordinary profits and depreciation less tax and dividends scaled by book assets. DivDummy is a variable set to one if the firm paid a dividend in the year and is set to 0 for others. NWC is measured as net working capital scaled by book assets. Leverage is calculated as the sum of short-term debt and long-term debt divided by book assets. R&D and Acquisition are research and development expense and acquisition expense both scaled by book assets, respectively. Finally, Industryσ is the mean of the standard deviations of ROA for firms in the same industry, as defined by Nikkei Industry Code. In this model, the dependent variable is the value of t period, and the other variable is t-1 period.

Table 1 shows descriptive statistics of each variable. The average of Cash Holdings is 13.9%, and

the median is 11.4%. ΔCash Holdings is the difference of cash holdings between t and t-1.

Insert Table1

Insert Table2

Table 2 reports the results of whether the soundness of a main bank affects firms' cash holdings.

The first model in this table includes only control variables, and the second and third models include not only control variables but also BK Bad Loan and BK Equity Ratio as the proxy for the soundness of a main bank, respectively. In Model 2, BK Bad Loan has a significantly positive sign. This implies that the increase of bad loans makes the soundness of a main bank worse and increases the cash holdings of borrowing firms.

In Model 3, BK Equity Ratio shows a significantly negative sign on cash holdings. Because the decline of BK Equity Ratio means the deterioration of bank soundness, this negative sign also implies that the deterioration of bank soundness makes firms' cash holdings higher. These results in Model 2 and Model 3 are consistent with our hypothesis.

As an aside, coefficients on most of the control variables show significantly expected signs. For example, Cash flow $_{t-1}$ has significantly positive signs, which suggests that the cash flow firms have acquired is an important source of cash holding. The result that the increase of CapEx and NWC causes the decrease of firms' cash holdings is also consistent with other literature.

In Table 2, we test the effect of the soundness of a main bank on firms' cash holdings, but this effect may be affected by whether firms are heavily dependent on banks in raising funds. That is, firms that can finance from the bond market easily are less dependent on main banks, so they might not necessarily save more cash due to the deterioration of soundness of a main bank. Thus, we control the dependence of firms on banks in raising funds by using the existence of an investment grade bond

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rating which is not less than BBB. If firms have an investment grade rating, they can raise funds from

the bond market with low cost, so they would be less dependent on banks than others.[6]

Insert Table3

In Table 3, we divide firms between low-bank-dependent firms, which have more than BBB bond

rating (model 1~model 3) and high-bank-dependent firms, which have no bond rating or less than BB

(model 4~model 6). From Table 3, it is apparent that the soundness of a main bank affects firms' cash

holdings only in high-bank-dependent firms, and the coefficients on these variables are significantly

consistent with our hypothesis.

As mentioned above, the soundness of a bank affects cash holdings of borrowing firms, especially

firms which are dependent on banks in raising funds. The worse the soundness of a bank is, the higher

firms' cash holdings are. This result is a new implication for cash holding theories.

4.2. The effect of soundness of a main bank on investment

Our prediction that the deterioration of bank soundness should drive firms to hold more cash is

based on the pre-cautionary motive theory, which insists that financially constrained firms hold more

cash to mitigate underinvestment. Thus, we test whether the cash holdings of financially constrained

firms actually mitigate underinvestment or not, using the framework of Faulkender and

Petersen(2012). Table 4 provides the results of empirical tests.

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[6] We do not consider equity issuance in raising funds because most of Japanese firms' managers think equity
issuance is constrained (Sasaki et al. (2016)). Further, because the use of commitment lines in Japan is not as familiar
as in the USA (Hanaeda et al. (2015)), we also do not consider the use of commitment lines.

$$Investment_{i,t} = \alpha + \beta_1 \text{Cash Holdings}_{i,t-1} + \beta_2 \text{BK Bad Loan}_{i,t-1}(BK \; Equity \; Ratio_{i,t-1})$$

$$+ \beta_3 Cash \; Holdings_{i,t-1} \times \text{BK Bad Loan}_{i,t-1}(BK \; Equity \; Ratio_{i,t-1}) \qquad (2)$$

$$+ \beta_4 \ln(Asset_{i,t-1}) + \beta_5 MTB_{i,t-1} + \beta_6 Preinvestment \; Earnings_{i,t-1} + \varepsilon_{i,t}$$

Investment is defined as the sum of capital expenditures and research and development and advertising expenses divided by book assets. Preinvestment Earnings is measured as earnings before interest, taxes, and depreciation plus research and development and advertising expenses divided by book assets. Other variables are the same as mentioned above.

In this model, we focus on the interaction variables of cash holdings and the soundness of a main bank. If the cash holdings of financially constrained firms mitigate underinvestment problems, the interaction variable of Cash Holdings and BK Bad Loan (BK Equity Ratio) would have a significantly positive (negative) sign. We use lagged rather than current-year cash holdings in the investment model to address the potential endogeneity of cash holdings and investment

Insert Table4

The result that the interaction variable of Cash Holdings and BK Bad Loan is significantly positive in model 2 is consistent with our hypothesis that cash holdings of financially constrained firms mitigate underinvestment problems. Additionally, the interaction variable of Cash Holdings and BK Equity Ratio is significantly negative in model 4, which is also consistent with our hypothesis.

Insert Table5

Furthermore, to control the degree of each firm's dependence on a main bank, we divide firms

between low-bank-dependent firms and high-bank-dependent firms and investigate again in Table 5. The effect of cash holdings to mitigate underinvestment when the soundness of a bank is deteriorated is confirmed only in high-bank-dependent firms in Table 5. This result is consistent with our hypothesis.

As described above, having a large cash balance can be useful for financially constrained firms to mitigate underinvestment problems, and this result provides new implications that the cash holdings of such firms are economically rational for stakeholders, as well as for firms.

4.3. The effect of soundness of a main bank on the contribution of cash holdings to firm value

Next, we compare the value of cash for financially constrained firms with that for unconstrained firms. We hypothesize that the deterioration of bank soundness increases the needs and usefulness of cash to mitigate underinvestment, so the value of cash for financially constrained firms is larger than that for unconstrained firms. We follow the regression model of Faulkender and Wang(2006) to estimate this relation.

$$
\begin{aligned}
ABReturn_{i,t} = {} & \alpha + \beta_1 \Delta Cash\ Holdings_{i,t} + \beta_2 BK\ Bad\ Loan_{i,t-1}\big(BK\ Equity\ Ratio_{i,t-1}\big) \\
& + \beta_3 \Delta Cash\ Holdings_{i,t} \times BK\ Bad\ Loan_{i,t-1}\big(BK\ Equity\ Ratio_{i,t-1}\big) \\
& + \beta_4 \Delta Earnings_{i,t} + \beta_5 \Delta Net\ Assets_{i,t} + \beta_6 \Delta R\&D_{i,t} + \beta_7 \Delta Interests_{i,t} \\
& + \beta_8 \Delta Dividends_{i,t} + \beta_{10} Cash\ Holdings_{i,t-1} + \beta_{11} Leverage_{i,t} \\
& + \beta_{12} Net\ Finance_{i,t} + \beta_{13} Cash\ Holdings_{i,t-1} \times \Delta Cash\ Holdings_{i,t} \\
& + \beta_{14} Leverage_{i,t} \times \Delta Cash\ Holdings_{i,t} + \varepsilon_{i,t}
\end{aligned}
$$

(3)

The dependent variable is the abnormal return which is calculated as the annual stock return of firm i at time t (fiscal year-end) minus the stock return of matched Fama-French 5×5 portfolio. Earnings is ordinary profit. NetAssets is book assets minus cash and marketable securities. Interests is interest expense. Dividends is measured as common dividend paid. NetFinance is net cash used in financing activities. These variables are scaled by market value of equity. The definitions of other variables are the same as mentioned above, except that they are also divided by market value of equity instead of book assets. ΔX_t is a compact notation for the 1-year change, $X_t - X_{t-1}$.

In this model, we focus on the interaction variables of cash holdings and the soundness of main banks. If markets recognize that the cash holdings of financially constrained firms mitigate underinvestment problems, the interaction variable of Cash Holdings and BK Bad Loan (BK Equity Ratio) would have a significantly positive (negative) sign.

Insert Table6

The first model in Table 6 is the same as a model of Faulkender and Wang(2006). The coefficients on ΔCash Holdings are significantly positive, which means the marginal value of an extra yen of cash is positive. This result is consistent with Faulkender and Wang(2006).

The second and third models investigate whether the value of cash is larger for financially constrained firms than for others. The coefficient on the interaction variable of Cash Holdings and BK Bad Loan (BK Equity Ratio) is significantly positive (negative), which implies that the value of cash is larger for financially constrained firms.

Insert Table7

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As an additional test, we control the degree of dependence of firms on banks and conduct the same analysis used in Table 6 in Table 7. The coefficient on the interaction variable of Cash Holdings and BK Bad Loan (BK Equity Ratio) is significantly positive (negative) only for high-bank-dependent firms. These results are also consistent with our predictions because the deterioration of bank soundness causes financial constraints only to high-bank-dependent firms.

4.4. The effect of soundness of a main bank on cash flow sensitivity of cash

In our hypothesis, firms that depend on financially unsound main banks hold more cash because of the precautionary motive. If this prediction is true, the worse the soundness of a bank is, the more firms will save cash from their cash flows.[7]

We test this prediction using the framework of Almeida et al (2004). The results are described in Table 8.

$$\Delta Cash\ Holdings_{i,t}$$

$$= \alpha + \beta_1 Cashflow_{i,t} + \beta_2 BK\ Bad\ Loan_{i,t}\big(BK\ Equity\ Ratio_{i,t}\big)$$

$$+ \beta_3 Cashflow_{i,t}\ \times BK\ Bad\ Loan_{i,t}\big(BK\ Equity\ Ratio_{i,t}\big) + \beta_4 \ln\big(Asset_{i,t}\big)$$

$$+ \beta_5 MTB_{i,t} + \beta_6 CapEx_{i,t} + \beta_7 Acquisition_{i,t} + \beta_8 \Delta NWC_{i,t} + \beta_{10} \Delta Leverage_{i,t}$$

$$+ \varepsilon_{i,t}$$

(4)

ΔCash holdings is measured as the difference of Cash Holdings between t and t-1. The definitions of Cashflow, BK Bad Loan, BK Equity Ratio, ln(Asset), MTB, CapEx, Acquisition are the same as described above. ΔNWC is the difference of NWC. In this paper, we use the difference of Leverage,

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[7] Ogawa(2008) investigated the effect of bank soundness by using the data of small and medium-sized enterprises. However, that paper included only the analysis of bad loan and equity ratios of banks on cash holdings, not cash flow sensitivity of cash and other.

as ΔLeverage, instead of ΔShortDebt..

In this model, we focus on the interaction variables of cash flow and the soundness of main banks. If the deterioration of bank soundness would increase the cash flow sensitivity of cash, the interaction variable of Cashflow and BK Bad Loan (BK Equity Ratio) would have a significantly positive (negative) sign.

Insert Table8

The first model in Table 8 is the result of equation (4) without variables related to the soundness of the bank, and it shows that firms save approximately 0.2 yen out of every yen of cash flow. The second and third models in Table 8 contain variables related to the soundness of the bank. We find that the coefficient on the interaction variables of Cashflow and BK Bad Loan is significantly positive, consistent with our predictions. However, the coefficient on the interaction variables of Cashflow and BK Equity Ratio is not significant. Moreover, we find no difference between cash flow sensitivity of cash of high-bank-dependent firms and that of low-dependent-firms in Table 9. These results are not consistent with our predictions.

Insert Table9

5. Conclusion

We discuss the determinants of cash holdings by focusing on the soundness of banks. We hypothesize that because the role of the bank is larger for bank-dependent firms in raising funds, the deterioration of bank soundness makes firms financially constrained, and such firms would have more

cash to mitigate underinvestment problems.

Supporting this hypothesis, we find that when the soundness of a main bank on which firms depend is deteriorated, firms increase their cash holdings, and such cash holdings mitigate underinvestment problems. Furthermore, the value of cash for financially constrained firms is more valuable than that for others in the market. These relationships are stronger in firms that depend heavily on banks because they cannot raise funds from bond markets at low cost. However, whether firms save more cash from their cash flows when the soundness of a bank is deteriorated is unclear.

In spite of the importance of banks for firms' activities, especially in bank-centered economies, little literature has investigated the effect of banks' soundness on cash holdings of firms. The results of this paper provide new implications for cash holding theory. Additionally, this paper discusses Japanese firms in a bank-centered economy, but it is still unclear whether such hypotheses also apply in a market-centered economy, such as the United States.

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Table 1 Descriptive statistics

	Cash Holdings	Investment	ABReturn	ΔCash Holdings	BK Bad Loan	BK Equity Ratio	ln(Asset)	MTB	CapEx
Mean	0.143	0.055	-0.011	-0.001	-3.273	2.439	10.336	1.066	0.036
Std.dev	0.106	0.080	0.359	0.053	0.591	0.174	1.445	0.515	0.070
Min	0.013	-0.147	-0.967	-0.540	-4.779	1.966	5.361	0.492	-0.165
Median	0.117	0.043	-0.034	-0.001	-3.280	2.416	10.175	0.954	0.027
Max	0.674	0.400	1.544	0.646	-2.066	2.881	16.677	5.270	0.322
N	22994	22948	22220	23256	23334	23287	23296	23180	23296

	NetCap	Cashflow	Dividend	Leverage	R&D	Acquisition	Industry σ	Net Finance
Mean	0.194	0.021	0.805	0.290	0.010	0.001	0.022	-0.080
Std.dev	0.138	0.041	0.397	0.184	0.017	0.006	0.007	0.300
Min	-0.143	-0.187	0.000	0.000	0.000	0.000	0.007	-1.301
Median	0.190	0.022	1.000	0.267	0.003	0.000	0.020	-0.046
Max	0.597	0.129	1.000	0.848	0.086	0.040	0.062	0.849
N	23296	23180	23334	23296	23296	23296	23334	22623

This table reports descriptive statistics for 26,464 firm-years for all listed or delisted non-financial companies in Japan for the period 2000-2014, which excludes firms that do not have loans from banks or firms that have unavailable data about main banks, loans, and so on.

Table 2 The effect of banks' soundness on cash holdings

	Model 1	Model 2	Model 3
BK Bad Loan$_{t-1}$		0.003**	
		(2.52)	
BK Equity Ratio$_{t-1}$			-0.014***
			(-3.58)
ln(Asset$_{t-1}$)	-0.018***	-0.018***	-0.018***
	(-7.01)	(-6.98)	(-6.94)
MTB$_{t-1}$	-0.006***	-0.006***	-0.006***
	(-3.44)	(-3.39)	(-3.42)
CapEx$_{t-1}$	-0.036***	-0.036***	-0.036***
	(-4.54)	(-4.53)	(-4.61)
CashFlow$_{t-1}$	0.073***	0.073***	0.074***
	(3.48)	(3.48)	(3.53)
Dividend$_{t-1}$	-0.002	-0.002	-0.002
	(-1.12)	(-1.06)	(-1.05)
NetCap$_{t-1}$	-0.052***	-0.052***	-0.052***
	(-4.57)	(-4.56)	(-4.59)
Leverage$_{t-1}$	-0.023***	-0.024***	-0.024***
	(-2.96)	(-3.02)	(-3.00)
R&D$_{t-1}$	-0.138	-0.137	-0.139
	(-1.26)	(-1.25)	(-1.27)
Acquisition$_{t-1}$	-0.086	-0.086	-0.085
	(-1.13)	(-1.12)	(-1.12)
Industryσ$_{t-1}$	0.261	0.256	0.249
	(1.20)	(1.18)	(1.15)
Constant	0.343***	0.351***	0.375***
	(12.67)	(12.86)	(13.12)
Year fixed effects	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes
Observations	22,171	22,171	22,171
Adjusted R-squared	0.782	0.782	0.783

This table presents panel regression estimates examining the effect of banks' soundness on firm's cash holdings (equation(1)). The sample firms are same as Table 1. Robust t-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

Table 3 The effect of banks' soundness on cash holdings for low-bank-dependent firms and high-bank-dependent firms

	Low-Bank-Dependent			High-Bank-Dependent		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
BK Bad Loan$_{t-1}$		0.001			0.004***	
		(0.24)			(2.81)	
BK Equity Ratio$_{t-1}$			-0.010			-0.015***
			(-0.93)			(-3.53)
ln(Asset$_{t-1}$)	0.019**	0.019**	0.019**	-0.019***	-0.019***	-0.019***
	(2.54)	(2.52)	(2.51)	(-6.99)	(-6.94)	(-6.90)
MTB$_{t-1}$	-0.016***	-0.016***	-0.016***	-0.006***	-0.006***	-0.006***
	(-2.83)	(-2.83)	(-2.83)	(-3.31)	(-3.26)	(-3.29)
CapEx$_{t-1}$	-0.034	-0.034	-0.034	-0.037***	-0.037***	-0.037***
	(-1.62)	(-1.61)	(-1.61)	(-4.37)	(-4.37)	(-4.45)
CashFlow$_{t-1}$	0.107	0.108	0.110	0.071***	0.070***	0.071***
	(1.28)	(1.28)	(1.32)	(3.24)	(3.23)	(3.28)
Dividend$_{t-1}$	-0.006	-0.006	-0.006	-0.002	-0.002	-0.002
	(-1.14)	(-1.13)	(-1.12)	(-1.05)	(-0.99)	(-0.97)
NetCap$_{t-1}$	-0.122***	-0.122***	-0.123***	-0.048***	-0.048***	-0.048***
	(-3.61)	(-3.62)	(-3.65)	(-4.03)	(-4.02)	(-4.04)
Leverage$_{t-1}$	-0.038	-0.038	-0.038	-0.024***	-0.025***	-0.024***
	(-1.26)	(-1.25)	(-1.26)	(-2.93)	(-2.99)	(-2.95)
R&D$_{t-1}$	0.371*	0.369*	0.369*	-0.201	-0.200	-0.202
	(1.82)	(1.82)	(1.81)	(-1.64)	(-1.63)	(-1.64)
Acquisition$_{t-1}$	0.003	0.005	0.008	-0.089	-0.089	-0.089
	(0.02)	(0.02)	(0.04)	(-1.08)	(-1.08)	(-1.08)
Industryσ$_{t-1}$	2.247***	2.245***	2.248***	0.115	0.111	0.103
	(3.51)	(3.51)	(3.51)	(0.50)	(0.49)	(0.45)
Constant	-0.102	-0.099	-0.077	0.351***	0.361***	0.384***
	(-1.10)	(-1.06)	(-0.78)	(12.71)	(12.94)	(13.14)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,448	2,448	2,448	19,723	19,723	19,723
Adjusted R-squared	0.807	0.807	0.807	0.781	0.781	0.781

This table presents panel regression estimates examining the effect of banks' soundness on firm's cash holdings (equation(1)). The sample firms are same as Table 1, but divided into two sub-groups. Firms which have more than BBB bond rating are classified as Low-Bank-Dependent ,while other firms which have no bond rating or less than BB bond rating are classified as High-Bank-Dependent. Robust t-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

Table 4 The effect of banks' soundness on investment

	Model 1	Model 2	Model 3
Cash holdings$_{t-1}$	0.165***	0.234***	0.373***
	(19.44)	(8.25)	(5.44)
BK Bad loan$_{t-1}$		-0.003	
		(-1.50)	
Cash holdings$_{t-1}$ x BK Bad loan$_{t-1}$		0.021**	
		(2.56)	
BK Equity ratio$_{t-1}$			0.016***
			(2.83)
Cash holdings$_{t-1}$ x BK Equity ratio$_{t-1}$			-0.086***
			(-3.06)
ln(Asset$_{t-1}$)	-0.039***	-0.039***	-0.039***
	(-22.95)	(-22.93)	(-22.97)
MTB$_{t-1}$	0.024***	0.023***	0.023***
	(16.97)	(16.43)	(16.68)
Preinvestment Earnings$_{t-1}$	0.251***	0.251***	0.250***
	(21.03)	(21.01)	(20.99)
Constant	0.409***	0.401***	0.372***
	(22.26)	(21.03)	(16.49)
Year fixed effects	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes
Observations	22,795	22,795	22,795
Adjusted R-squared	0.472	0.472	0.472

This table presents panel regression estimates examining the effect of banks' soundness on firm's investment (equation(2)). The sample firms are same as Table 1. Robust t-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

Table 5 The effect of banks' soundness on investment for low-bank-dependent firms and high-bank-dependent firms

	Low-Bank-Dependent			High-Bank-Dependent		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Cash holdings$_{t-1}$	0.114***	0.125	-0.142	0.170***	0.239***	0.382***
	(3.88)	(1.45)	(-0.64)	(19.07)	(7.85)	(5.24)
BK Bad loan$_{t-1}$		-0.003			-0.002	
		(-0.59)			(-0.83)	
Cash holdings$_{t-1}$ x BK Bad loan$_{t-1}$		0.003			0.021**	
		(0.13)			(2.36)	
BK Equity ratio$_{t-1}$			0.007			0.015**
			(0.46)			(2.42)
Cash holdings$_{t-1}$ x BK Equity ratio$_{t-1}$			0.101			-0.087***
			(1.17)			(-2.92)
ln(Asset$_{t-1}$)	-0.060***	-0.060***	-0.060***	-0.039***	-0.039***	-0.039***
	(-8.68)	(-8.64)	(-8.63)	(-21.57)	(-21.51)	(-21.56)
MTB$_{t-1}$	0.026***	0.026***	0.025***	0.024***	0.024***	0.024***
	(4.07)	(4.07)	(3.93)	(16.62)	(16.10)	(16.34)
Preinvestment Earnings$_{t-1}$	0.290***	0.289***	0.286***	0.244***	0.244***	0.244***
	(5.94)	(5.92)	(5.86)	(19.61)	(19.60)	(19.58)
Constant	0.760***	0.750***	0.741***	0.397***	0.391***	0.362***
	(8.79)	(8.52)	(7.86)	(20.87)	(19.71)	(15.29)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,455	2,455	2,455	20,340	20,340	20,340
Adjusted R-squared	0.541	0.541	0.542	0.469	0.469	0.469

This table presents panel regression estimates examining the effect of banks' soundness on firm's investment (equation(2)). The sample firms are same as Table 1, but divided into two sub-groups. Firms which have more than BBB bond rating are classified as Low-Bank-Dependent ,while other firms which have no bond rating or less than BB bond rating are classified as High-Bank-Dependent. Robust t-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

Table 6 The effect of banks' soundness on the contribution of cash holdings to firm value

	Model 1	Model 2	Model 3
ΔCash Holdings	0.267***	0.477***	0.719***
	(10.66)	(6.13)	(3.52)
BK Bad loan$_{t-1}$		-0.000	
		(-0.01)	
ΔCash Holdings x BK Bad Loan$_{t-1}$		0.064***	
		(2.85)	
BK Equity ratio$_{t-1}$			0.019
			(0.76)
ΔCash Holdings x BK Equity ratio$_{t-1}$			-0.186**
			(-2.23)
ΔEarnings	0.492***	0.492***	0.492***
	(23.88)	(23.87)	(23.88)
ΔNetAsset	0.068***	0.068***	0.068***
	(10.81)	(10.77)	(10.81)
ΔR&D	-0.418*	-0.421*	-0.410*
	(-1.68)	(-1.69)	(-1.65)
ΔInterest	-0.938***	-0.915***	-0.935***
	(-3.10)	(-3.02)	(-3.09)
ΔDividend	0.446*	0.443*	0.432
	(1.68)	(1.67)	(1.63)
Cash Holdings$_{t-1}$	0.230***	0.231***	0.230***
	(21.79)	(21.88)	(21.85)
Leverage	0.017***	0.017***	0.017***
	(5.31)	(5.30)	(5.27)
Net finance	-0.061***	-0.061***	-0.061***
	(-5.22)	(-5.21)	(-5.26)
Cash Holdings$_{t-1}$ x ΔCash Holdings	-0.005	-0.005	-0.004
	(-0.22)	(-0.24)	(-0.18)
Leverage x ΔCash Holdings	-0.007	-0.008	-0.007
	(-1.35)	(-1.56)	(-1.36)
Constant	-0.182***	-0.183***	-0.227***
	(-8.20)	(-5.55)	(-3.60)
Year fixed effects	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes
Observations	22,095	22,095	22,095
Adjusted R-squared	0.134	0.134	0.134

This table presents panel regression estimates examining the effect of banks' soundness on the value of cash (equation(3)). The sample firms are same as Table 1. Robust t-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

Table 7 The effect of banks' soundness on the contribution of cash holdings to firm value for low-bank-dependent firms and high-bank-dependent firms

	Low-Bank-Dependent			High-Bank-Dependent		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
ΔCash Holdings	0.033	0.129	-0.803	0.281***	0.506***	0.775***
	(0.44)	(0.54)	(-1.17)	(10.56)	(6.11)	(3.58)
BK Bad loan$_{t-1}$		-0.048**			0.002	
		(-2.22)			(0.24)	
ΔCash Holdings x BK Bad Loan$_{t-1}$		0.028			0.069***	
		(0.42)			(2.86)	
BK Equity ratio$_{t-1}$			0.136*			0.022
			(1.92)			(0.84)
ΔCash Holdings x BK Equity ratio$_{t-1}$			0.335			-0.204**
			(1.23)			(-2.30)
ΔEarnings	0.648***	0.643***	0.649***	0.486***	0.485***	0.486***
	(8.41)	(8.36)	(8.44)	(22.43)	(22.43)	(22.43)
ΔNetAsset	0.081***	0.082***	0.080***	0.066***	0.066***	0.066***
	(3.77)	(3.82)	(3.74)	(9.95)	(9.87)	(9.95)
ΔR&D	-1.028	-1.079	-1.072	-0.399	-0.402	-0.387
	(-1.42)	(-1.49)	(-1.48)	(-1.50)	(-1.51)	(-1.46)
ΔInterest	-1.147	-1.241	-1.233	-0.881***	-0.859***	-0.878***
	(-1.04)	(-1.12)	(-1.12)	(-2.76)	(-2.69)	(-2.75)
ΔDividend	-0.381	-0.403	-0.414	0.485*	0.479*	0.467*
	(-0.46)	(-0.48)	(-0.49)	(1.72)	(1.70)	(1.66)
Cash Holdings$_{t-1}$	0.232***	0.234***	0.229***	0.234***	0.235***	0.235***
	(5.89)	(5.92)	(5.79)	(20.95)	(21.02)	(21.01)
Leverage	0.018*	0.018*	0.018*	0.015***	0.015***	0.015***
	(1.69)	(1.73)	(1.74)	(4.57)	(4.56)	(4.52)
Net finance	-0.107***	-0.111***	-0.109***	-0.059***	-0.059***	-0.060***
	(-2.69)	(-2.81)	(-2.75)	(-4.83)	(-4.81)	(-4.89)
Cash Holdings$_{t-1}$ x ΔCash Holdings	0.185**	0.195**	0.184**	-0.014	-0.015	-0.013
	(2.17)	(2.28)	(2.17)	(-0.66)	(-0.67)	(-0.61)
Leverage x ΔCash Holdings	-0.015	-0.020	-0.011	-0.005	-0.006	-0.005
	(-0.85)	(-1.07)	(-0.64)	(-1.00)	(-1.17)	(-0.99)
Constant	-0.019	-0.162*	-0.347*	-0.195***	-0.189***	-0.249***
	(-0.30)	(-1.80)	(-1.91)	(-8.13)	(-5.26)	(-3.65)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,446	2,446	2,446	19,649	19,649	19,649
Adjusted R-squared	0.189	0.190	0.190	0.132	0.132	0.132

This table presents panel regression estimates examining the effect of banks' soundness on the value of cash (equation(3)). The sample firms are same as Table 1, but divided into two sub-groups. Firms which have more than BBB bond rating are classified as Low-Bank-Dependent ,while other firms which have no bond rating or less than BB bond rating are classified as High-Bank-Dependent. Robust t-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

Table 8 The effect of banks' soundness on cash flow sensitivity of cash

	Model 1	Model 2	Model 3
Cash flow	0.207***	0.389***	0.285**
	(19.52)	(7.30)	(2.34)
BK Bad Loan		-0.002	
		(-1.53)	
Cash flow x BK Bad Loan		0.054***	
		(3.48)	
BK Equity ratio			-0.003
			(-0.94)
Cash flow x BK Equity ratio			-0.032
			(-0.64)
ln(Asset)	0.008***	0.009***	0.008***
	(6.39)	(6.79)	(6.46)
MTB	0.007***	0.007***	0.007***
	(6.81)	(6.84)	(6.83)
CapEx	-0.365***	-0.365***	-0.365***
	(-64.68)	(-64.71)	(-64.68)
Acquisition	0.100*	0.096*	0.099*
	(1.87)	(1.81)	(1.86)
ΔNWC	-0.558***	-0.559***	-0.558***
	(-79.84)	(-79.94)	(-79.80)
Leverege	0.080***	0.081***	0.080***
	(14.89)	(15.00)	(14.90)
Constant	-0.081***	-0.093***	-0.075***
	(-5.95)	(-6.52)	(-4.69)
Year fixed effects	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes
Observations	23,094	23,094	23,094
Adjusted R-squared	0.329	0.329	0.329

This table presents panel regression estimates examining the effect of banks' soundness on the cash flow sensitivity of cash (equation(4)). The sample firms are same as Table 1. Robust t-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

Table 9 The effect of banks' soundness on cash flow sensitivity of cash for low-bank-dependent

firms and high-bank-dependent firms

	Low-Bank-Dependent			High-Bank-Dependent		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Cash flow	0.269***	0.617***	0.828*	0.204***	0.373***	0.247*
	(7.10)	(3.88)	(1.67)	(18.23)	(6.56)	(1.92)
BK Bad Loan		-0.003			-0.001	
		(-1.03)			(-1.01)	
Cash flow x BK Bad Loan		0.102**			0.050***	
		(2.25)			(3.03)	
BK Equity ratio			0.009			-0.004
			(0.83)			(-1.12)
Cash flow x BK Equity ratio			-0.224			-0.017
			(-1.13)			(-0.33)
ln(Asset)	0.017***	0.019***	0.018***	0.008***	0.009***	0.008***
	(3.65)	(3.92)	(3.76)	(5.96)	(6.31)	(6.02)
MTB	-0.004	-0.003	-0.003	0.007***	0.007***	0.007***
	(-0.87)	(-0.74)	(-0.76)	(6.39)	(6.42)	(6.41)
CapEx	-0.328***	-0.327***	-0.328***	-0.368***	-0.368***	-0.368***
	(-20.45)	(-20.33)	(-20.43)	(-60.87)	(-60.91)	(-60.86)
Acquisition	-0.076	-0.081	-0.080	0.128**	0.125**	0.128**
	(-0.66)	(-0.70)	(-0.69)	(2.20)	(2.15)	(2.19)
ΔNWC	-0.591***	-0.590***	-0.590***	-0.556***	-0.557***	-0.556***
	(-24.18)	(-24.17)	(-24.15)	(-75.43)	(-75.51)	(-75.38)
Leverege	0.262***	0.262***	0.261***	0.070***	0.071***	0.070***
	(14.82)	(14.82)	(14.77)	(12.31)	(12.42)	(12.32)
Constant	-0.200***	-0.228***	-0.230***	-0.079***	-0.089***	-0.070***
	(-3.38)	(-3.73)	(-3.44)	(-5.54)	(-5.96)	(-4.19)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,466	2,466	2,466	20,628	20,628	20,628
Adjusted R-squared	0.402	0.403	0.402	0.326	0.326	0.326

This table presents panel regression estimates examining the effect of banks' soundness on the cashflow sensitivity of cash (equation(4)). The sample firms are same as Table 1, but divided into two sub-groups. Firms which have more than BBB bond rating are classified as Low-Bank-Dependent ,while other firms which have no bond rating or less than BB bond rating are classified as High-Bank-Dependent. Robust t-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.