The Financial Implications of Corporate Fraud*

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Abstract

This paper explores the financial implications of corporate fraud by examining the impact of corporate fraud on fraudulent firms' external financing cost and corporate cash holdings. Using a sample consist of 184 fraudulent firms that experience material litigation in securities class action, we find that firms' cost of debt significantly increases associated with corporate fraud incident. In line with the costly external financing evidence, fraudulent firms accumulate more cash to keep liquidity and avoid underinvestment issues. Consistent with the precautionary motive argument, the value of cash increases after corporate fraud. In addition, corporate fraud contributes to financial constrains in the sense that fraudulent firms display a positive cash flow sensitivity of cash after corporate fraud. Our result indicates that corporate fraud can have a real impact on corporate outcomes by affecting the external financing cost and internal cash holdings.

Keywords: Corporate fraud, Cash, Costly external finance

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1 Introduction

Corporate fraud is one of the most problematic issues for companies around the world. Based on PricewaterhouseCooper's Global Economic Survey 2009, of the 3037 corporate respondents in 54 countries, 30% reported having experienced at least one incident of fraud over the last 12 months before the survey date. In a fraud survey 2008 conducted by KPMG, survey respondents reported 222,577 incidents of corporate fraud in Australia and New Zealand during the survey period from February 2006 to January 2008. Corporate fraud is also becoming prevalent in US. In the early 2000's, triggered by Enron's bankruptcy after revealing massive accounting fraud, there was a wave of corporate fraud exposure at large companies including WorldCom, AOL Time Warner, Global Crossing, and so on. Jeffrey Sachs recently said that "Every Wall Street firm has paid significant fines during the past decade for phony accounting, insider trading, securities fraud, Ponzi schemes, or outright embezzlement by CEOs."[1] As projected in 2010 report to the nations by Association of Certificated Fraud Examiners (ACFE), a typical organization loses 5% of its annual revenue to fraud.

The nature of corporate fraud may differ in different survey, arguments, and media coverage, yet, all the above reports indicate that corporate fraud is pervasively existed and results in negative consequences. In this paper, following Dyck, Morse, and Zingales (2010), we regard corporate fraud as misconduct behavior of firms or managers, which results in material value loss to shareholders, or relevant stakeholders (like creditors, customers, suppliers, and so on), and therefore leads to legal enforcement in shareholder class action lawsuit. In particular, we pay attention to the financial implications of corporate fraud. Previous studies explore the value implications of corporate fraud and document significant value loss to firm and managers (Karpoff, Lee, and Martin, 2008 a&b). However, it has been much less clear on *whether* and *how* corporate fraud affects firm's financing costs, decisions and polices. In this study, we aim to fill the gap by investigating the effect of corporate fraud

[1] Jeffrey D. Sachs, "The Global Economy's Corporate Crime Wave", Project Syndicate, http://www.project-syndicate.org/commentary/the-global-economy-s-corporate-crime-wave

on cost of debt financing and corporate cash holdings policies because they represent the most important external and internal financing sources.

Previous studies have proposed a straightforward connection between corporate fraud and firms' ability to raise additional fund. In the model of Klein and Leffler (1981) and Jarrel and Peltzman (1985), corporate fraud damages firms' reputation in terms of changes of terms of trade by investors and stakeholders and therefore results in higher uncertainty about firms' future prospects. In the framework of Kreps and Wilson (1982) and Milgrom and Roberts (1982), corporate fraud also increases information asymmetry perceived by outsiders in the sense that outsiders will not trust the "cheater". The changes of terms of trade and information asymmetry effects will make fraudulent firms more difficult and expensive to raise additional fund. Consistent with the reputation damage argument, fraudulent firms may be difficult to issue new debt or renegotiate existing debt agreements. The fraudulent firms may also face costly financing cost in terms of higher interest rate and more covenant restrictions. Taken together, the costly and restrictive external financing caused by the fraud might force the firms to pass up valuable positive NPV projects, which would further dampen the firm perspectives. To keep the liquidity and avoid the underinvestment issues, fraudulent firms might rely more on internal sources of fund in terms of cash holdings accumulation to finance future valuable investments. We therefore anticipate that fraudulent firms will accumulate more cash and the value of cash increases associated with corporate fraud in response to costly external finance induced by corporate fraud. Moreover, if the external finance does become more costly after corporate fraud, fraudulent firms are expected to become financially more constrained and as a consequence, accumulate more cash out of cash flow (Almeida, Campello, and Weisbach, 2004).[2] We therefore expect that corporate fraud results in a higher degree of cash flow sensitivity of cash. Despite the theoretical appeal, to our knowledge, we are among the first to directly investigate the interactions between costly external finance and corporate cash holdings in the framework of corporate fraud.

The corporate fraud sample for this study consists of 184 fraudulent firms, which experienced material litigation in securities class action lawsuit from 1996 until 2008 and

[2] Almeida, Campello, and Weisbach (2004) model the precautionary demand of cash and find that financial constrained firms would accumulate more cash out of cash flow.

have issued syndicate loans both before and after corporate fraud from 1990 until 2010. In particular, we explore the effect of corporate fraud on the cost of debt in syndicate loans because bank lending is a particularly important source of external financing and plays an essential role in financing firms' investment activities (Chava and Roberts, 2008). In practice, the syndicate loan contract commonly requires the firms to disclose litigation information for cases that result in material changes only.[3]

To motivate the empirical analysis, we first explore possible channels through which corporate fraud affects borrowing cost. As in Karpoff, Lee, and Martin (2008a), corporate fraud mainly results in changes in two aspects. On one hand, discovery of fraud incident, together with subsequent corporate lawsuit, conveys possible proprietary information about fraudulent firms' prospects and therefore leads investors to readjust estimation about fraudulent firms' real situation in terms of performance, corporate governance, credit risk, and so on. On the other hand, corporate fraud damages firms' reputation and therefore results in high uncertainty about firms' future prospects. Triggered by lawsuit alleged for misconduct in some aspect, investors may question the overall big picture about fraudulent firms' situation and prospects. In other words, corporate fraud increases information asymmetry perceived by outsiders. Moreover, corporate fraud damages firms' reputation in terms of changes of terms of trade when fraudulent firms interact with other stakeholders such as creditors, customers, suppliers, and regulators (Karpoff, Lee, and Martin, 2008a; Graham, Li, and Qiu, 2008). Both effects would increase the monitoring requirements and costs of the creditors and result in a higher cost of borrowing. We therefore expect that corporate fraud increases the cost of debt.[4]

We obtain supportive evidence for our hypothesis by employing a panel regression in terms of comparing fraudulent firms' cost of debt financing before and after fraud incident as in Graham, Li, and Qiu (2008). Specifically, to estimate the exact magnitude effect of corporate fraud in event study, we create the before and after fraud sample based on the corporate fraud event trigger date instead of using the corporate fraud filing date regarding

[3] As in the handbook of loan syndications and trading edited by Allison Taylor and Alicia Sansone, Page 286, "the purpose of the litigation representation is to force the borrower to identify a material litigation or threatened litigation".
[4] Since the readjustment effect is transitory, we document that the effect of corporate fraud on cost of debt is mainly due to the information asymmetry or reputation effect in long run time period.

the date staleness issue of fraud databases as documented in Karpoff, Koester, Lee, and Martin (2012).[5] We find that the log value of loan spread increases by 29.6 percentage after corporate fraud. The effect is robust whenever we control a series of firm and macro characteristics. Moreover, following Murfin (2012), we construct proxy for contract strictness and find that probability of covenant violation increases by 15.6 percentage after corporate fraud. The result indicates that fraudulent firms face both costly and restrictive external financing due to high uncertainty risk induced by corporate fraud. To further confirm our hypothesis that it is the information asymmetry problem associated with corporate fraud that results in costly external finance, we examine the interplay of potential factor which might capture the information asymmetry issue with corporate fraud. One particular concern is the quality of corporate governance. Since corporate fraud results in information asymmetry issue, the outsiders may impose more agency cost if the shareholder right is weak and therefore can not provide sufficient monitoring for information asymmetry issue.[6] In this regard, we anticipate the costly external finance resulted by corporate fraud is more severe in weak governance firms. Using the E-index of Bebchuk, Cohen, and Ferrell (2009), we find that the impact of corporate fraud on cost of debt is more severe for firms with weak governance (E-index>=4).[7]

To further understand how corporate fraud affects the corporate policy and financial outcomes, we turn attentions to the effect of corporate fraud on internal sources of fund. Based on the precautionary motive argument (Bates, Kahle, and Stulz, 2009), firms retain cash holdings to better cope with adverse shocks when getting access to capital market is costly. Opler, Pinkowitz, Stulz, and Williamson (1999) find that firms with greater information asymmetry with outsiders tend to hold more cash. Faulkender and Wang (2006) further document that the marginal value of cash increases for firms facing financing frictions because the internal funds enable firms to invest in valuable investments projects which

[5] Karpoff, Koester, Lee, and Martin (2012) document that the corporate litigation filing date lags 150 calendar days behind the initial event date for the SCAC database.

[6] Previous studies also provide some argument and evidence regarding the interplay between corporate governance and cost of corporate fraud. For instance, Agrawal, Jaffe, and Karpoff (1999) argues that governance changes can recover lost reputation capital. Farber (2005) find that the fraudulent firms which take actions to improve governance can effectively reduce the cost of corporate fraud.

[7] One advantage using the E-index is that variation of E-index across time is slowly (Bebchuk, Cohen, and Ferrell, 2009) and therefore can effectively avoid the endogenous issue between corporate fraud and governance changes.

might forgo due to costly external finance. In addition, Almeida, Campello, and Weisbach (2004) model the precautionary demand of cash and empirically show that financial constrained firms tend to save cash out of cash flow, while unstrained firms do not. Given the findings that corporate fraud results in costly external financing, we anticipate that fraudulent firms accumulate more cash and value of cash increases associated with corporate fraud based on the precautionary motive argument. Moreover, the costly external financing evidence also indicates that the fraudulent firms are supposed to be financial constrained after corporate fraud. We therefore anticipate that fraudulent firms display positive cash flow sensitivity of cash after corporate fraud.

The empirical results confirm our anticipations. In line with the findings on the cost of debt financing, fraudulent firms accumulate more cash holdings after corporate fraud. On average, the ratio of cash scaled by net assets increase by 2.3 percentage points. The findings are robust for alternative measures of cash holdings. We also find that value of cash significantly increases after corporate fraud. On average, shareholders increase their valuation of an extra dollar of cash by $0.797 after corporate fraud. Moreover, the marginal value of excess cash to whole firm increases by 0.564 after corporate fraud. The results suggest that firms build cash to hedge costly external financing and thereby allow firms to invest in positive net present value projects, which might be passed over otherwise. We further turn attention to the effect of corporate fraud on sensitivity of cash to cash flow. Since cash flow sensitivity of cash provides a implementable measure of the importance of financial constrains (Almeida, Campello, and Weisbach, 2004), we identify financial constrains by comparing the firms' propensity to save cash out of cash flows before and after corporate fraud. Specifically, we split the sample into two groups based on the corporate fraud filing date and examine the cash flow sensitivity of cash, respectively. The estimations show that the fraudulent firms display a positive cash flow sensitivity of cash for the post fraud sample whereas do not for the before fraud sample. Our results indicate that corporate fraud is one important firm characteristic to identify financial constrains.

To confirm the precautionary saving of cash motive in response to costly external finance, we further pay attention to interaction effect of corporate fraud with potential factors

which might capture the causal effect of costly external finance on cash holdings. First, the costly external finance punishment might be more shocked for firms in great need for external capital. Thus, all the cash concerns in terms of cash accumulation, value of cash, and cash flow sensitivity of cash should be more significant for fraudulent firms in industries that are more dependent on external finance (Rajan and Zingales, 1998). Second, since cost of corporate fraud is more severe in weak governance firms as we found in cost of debt part, the corresponding cash concerns should be more pronounced in weak governance firms. By constructing and ranking the industry external finance dependence proxy as in Duchin, Ozbas, and Sensoy (2010), we find that the effect of corporate fraud on cash, value of cash and cash flow sensitivity of cash are all more pronounced for firms in industries with high external finance dependence. Moreover, in line with the findings in the external finance section that cost of corporate fraud is more severe for fraudulent firms with weak governance, we find that the effect of corporate fraud on cash accumulation, value of cash and cash flow sensitivity of cash is more pronounced for firms with weak governance. The interplay results further confirm the precautionary motive argument in the sense that fraudulent firms accumulate more cash and the value of cash is more valuable when the external finance is more costly or constrained.

Overall, our results suggest that corporate fraud increases cost of external financing in terms of higher borrowing cost. In line with the costly external financing evidence, fraudulent firms accumulate more cash to keep liquidity and avoid underinvestment issues. The value of cash increases after corporate fraud. In addition, corporate fraud contributes to financial constrains in the sense that fraudulent firms display a positive cash flow sensitivity of cash after corporate fraud. Our result indicates that corporate fraud can have a real impact on corporate outcomes by affecting the external financing cost and internal cash holdings.

Our study contributes to several strands of literature. First, we add to the corporate fraud literature (Karpoff, Lee, and Martin, 2008 a&b; Karpoff and Lou, 2010; Dyck, Morse and Zingales, 2010; Wang, Winton and Yu, 2010) by showing that corporate fraud exerts significant impacts on firm's financing costs, decisions and policies. The second contribution of the paper is to show how corporate cash holdings interact with costly external finance in

the framework of corporate fraud. By doing this, the paper adds to corporate cash holdings and liquidity management literature (e.g. Harford, 1999; Opler, Pinkowitz, Stulz, and Williamson, 1999; Almeida, Campello, and Weisbach, 2004; Faulkender and Wang, 2006; Dittmar and Mahrt-Smith, 2007; Harford, Mansi, and Maxwell, 2008) by testing the precautionary motive argument of cash holdings in the framework of corporate fraud. In this regard, we also contribute to the liquidity management literature (Campello, Graham, and Harvey, 2010; Campello, Giambona, Graham, and Harvey, 2011) by showing that how fraudulent firms manage internal sources of fund in response to costly external finance.

The remaining sections are organized as follows. Section 2 describes data construction and summary statistics. Section 3 identities cost of corporate fraud in bank loan. Section 4 further providence evidence from fraudulent firms' cash holdings. Section 5 concludes.

2 Data, variables, and summary statistics

2.1 Sample construction

We construct our fraudulent firms sample from Stanford Securities Class Action Clearinghouse (SCAC). The SCAC consists of U.S. firms, which have been filed against in a securities class action lawsuit under the provision of the federal 1033/1934 Exchange Acts since 1996. As argued by Coffee (1986) and Choi, Nelson, and Pritchard (2009), a value relevant fraud is less likely to emerge without a subsequent class action suit being filed. Indeed, this dataset has been used to obtain a sample of corporate fraud recently in some financial studies related with corporate fraud.[8] One potential disadvantage of using private class action lawsuit data is the non-meritorious (frivolous) litigation problem. Some litigation may have nothing to do with firm's operations. Moreover, litigation can be initiated by lawyers' profit-oriented incentive rather than corporate fraud (Choi, 2003). Following previous studies (see, Dyck, Morse, and Zingales, 2010; Wang, Winton, and Yu, 2010), we control for the frivolous lawsuit problem as follows. First, our sample is restricted to the

[8] See, for example, Dyck, Morse, and Zingales (2010) on corporate fraud whistler, Wang, Winton, and Yu (2010) on fraud and business condition, Lin and Paravisini (2011) and Tian, Udell, and Yu (2012) on corporate fraud and financial intermediary monitoring.

period after the passage of the Private Securities Litigation Reform Act of 1995 (PSLRA), which aims to discourage frivolous litigation (Choi, Nelson, and Pritchard, 2009; Johnson, Nelson, and Pritchard, 2007). Second, we drop cases where the judicial review process leads to their dismissal. Third, with respect to class action that settled, we keep only those cases where the settlement is no less than 2 million US dollars, a threshold level of payment, which is used to separate meritorious ones from frivolous ones as advocated by Grundfest (1995) and Choi, Nelson, and Pritchard (2009). Fourth, we exclude the cases with the nature of mutual fund timing and analyst malpractices, which are supposed to have nothing to do with corporate operation.

Since our study is to examine changes about fraudulent firms' borrowing cost and cash holdings before and after corporate fraud, we also keep only the first lawsuit case into our sample for firms with more than one lawsuit, following Graham, Li, and Qiu (2008).[9] We further hand check in the Dealscan database for available loan contract information from year 1990 to 2010 for these fraudulent firms. We also obtain cash holdings data and other control variables about fraudulent firms from Compustat. We drop observations if there are missing values for our five main firm accounting control variables in the following analysis, log firm size, leverage, profitability, tangibility, and market to book ratio. We further exclude fraudulent firms in financial industry.

One caveat here is how to establish the before and after fraud sample. Previous studies create the "post fraud" indicator mainly based on the filing date in the corporate misconduct database. For instance, Graham, Li, and Qiu (2008) construct the post event indicator based on the date in GAO dataset. Yet, as in Karpoff, Koester, Lee, and Martin (2012), the commonly used databases in corporate misconduct research typically misidentifies the initial trigger date of misconduct. Without a right event date, we might bias the accurate magnitude of the fraud event in event study. In this regard, we identify the trigger date of corporate fraud from a series of data sources including SEC filings, Factiva, and Lexis-Nexis dataset as in Karpoff, Koester, Lee, and Martin (2012). The date staleness issue is indeed significant. Given our sample, the corporate litigation filing date lags 117 days behind the trigger date.

[9] The estimation result has no material difference after we remove firms with more than one lawsuit.

The maximum lags are 1472 days. Thus, we use the corporate fraud initial trigger date instead of the litigation filing date to construct the event indicator. Further, we remove samples which have loan data only before or after fraud event trigger date. The final sample consists of 1676 facility level observations and 3090 firm-year level observations by 184 fraudulent firms. Moreover, in the cash part, to pin point the accurate effect as soon as possible, we employ estimation using the quarterly level data as in Duchin, Ozbas, and Sensoy (2010) rather than using annual data.

2.2 Variables and summary statistics

2.2.1 Key target variables

Our loan data is from Dealscan database. Our measure for loan spread is all-in-spread drawn variable, which is defined as the amount the borrowers pay in basis points over LIBOR or LIBOR equivalent for the drawn portion of the loan facility. In multivariate estimation, we use log value of loan spread as our dependent variable. Furthermore, we construct the contract strictness proxy as in Murfin (2012) to test the probability of covenant violation associated with corporate fraud. See appendix for details. Regarding the analysis of cash holdings and value of cash, we mainly use cash to net assets ratio as measure of corporate cash holdings following Opler, Pinkowitz, Stulz, and Williamson (1999), and excess return over the fiscal year and market to book ratio as proxy for value of cash as in Faulkender and Wang (2006) and Dittmar and Mahrt-Smith (2007), respectively. The remaining control variables are defined in table 1.

[Insert Table 1 here]

2.2.2 Firm characteristics and univariate analysis

In panel A of table 2, we report the summary statistics of fraudulent firms' accounting variables at quarterly firm level. In regression of cost of debt on fraud, we control a series of firm characteristics including log firm size, leverage, profitability, tangibility, and market to book ratio. In analysis of corporate cash holdings, following Opler, Pinkowitz, Stulz, and

Williamson (1999), we control log firm size, market to book ratio, cash flow to assets ratio, net working capital to assets ratio, capital expenditure to assets ratio, leverage, industry cash flow risk, dividend payout dummy, R&D to sales ratio, and acquisition to assets ratio. The detailed definition can be found in table 1.

[Insert Table 2 here]

In panel B of table 2, we construct univarate estimation by investigating changes of key loan variables and corporate cash holdings before and after fraud in order to provide some rough evidence for our expectations. We split the sample based on corporate fraud event trigger date. We assign observations into after fraud sample if observations' calendar time is on or after corporate fraud trigger date, and before fraud sample, otherwise. As in panel B of table 2, we find that log loan size, log loan spread and loan strictness significantly increases after fraud. To some extent, the univariate test results support our argument: fraudulent firms bear costly and restrictive borrowing cost due to uncertainty risk induced by corporate fraud. Moreover, fraudulent firms accumulate more cash holdings to hedge the costly external finance. On average, the cash to net assets ratio increases by 4.5 percentage points after corporate fraud.

3 Cost of debt

Section 2 outlines some predications about external financing cost of corporate fraud in bank loan contract by investigating significance of changes of loan terms around fraud event. The univariate test is potentially misleading if fraud event is related with a series of factors which affect cost of debt, too. In this section, we employ multivariate analysis by controlling variables which have been well documented in previous studies as determinants of borrowing cost. The empirical model is as follows,

Log loan spread / Contract Strictness = f(Post fraud, Loan characteristics, Borrower characteristics, Macro variables, Industry effect, Loan purpose, Loan type, Year effect, Firm effect)

(1)

The dependent variable represents log loan spread or contract strictness.[10] Our key target variable is post fraud dummy which equals one for loans issued after corporate fraud event trigger date, and zero, otherwise. We control loan contract characteristics including log loan size, performance pricing dummy, log maturity variable, number of lenders. We control a series of borrower characteristics including log firm size, leverage, profitability, tangibility, market to book ratio, and rating index. These firm factors are commonly used in previous studies (see, for example, Graham, Li, and Qiu, 2008; Lin, Ma, Malatesta, Xuan, 2011). We also add macro economic variables including GDP growth and credit spread variables.

3.1 Basic regression

[Insert Table 3 here]

Table 3 reports results about the impact of corporate fraud on log value of loan spread. In column 1, we control contract characteristics, deal purpose, industry effect, and macro economic factors. We add firm control variables including log firm size, leverage, profitability, tangibility, market to book ratio, and rating index in column 2. In column 3, we further control the Zscore and cash flow volatility value. We also control firm and year effects and report heteroscedasticity-consistent robust standard errors clustered at firm level in column 2 and 3.

Consistent with our anticipation in the sense that corporate fraud results in high cost of debt, corporate fraud significantly and positively affect cost of borrowing. Corporate fraud increases log loan spread by 31.2 percent at 1% significance level, *ceteris paribus* (column 1). After controlling firm characteristics, the impact of the post fraud dummy on log loan spread drops to 29.6 percent without change of significance level (column 2). This indicates that fraudulent firm factors capture some effects of the corporate fraud but can not fully explain it. We further add the Zscore and cash flow volatility variables into regression in column 3 and still find significant effect of corporate fraud on loan spread. The coefficient of post fraud dummy is 29.5 percent at 1% significance level in column 3.

[10] We report the results on non-price monitoring results in appendix III for details.

For the remaining loan contract variables, log loan size is negatively associated with loan spread. It may capture some scale economical lending effect or indicate that riskier firms tend to obtain smaller size of loan with higher loan spread (Graham, Li, and Qiu, 2008). We also find that maturity is positively related with loan spread. It is consistent with the argument that long term loan tends to have high liquidity risk (Diamond, 1991) and has to be compensated with high loan spread. The existence of performance pricing clause has no statistical power of explaining variation of log loan spread. Revolver loan, i.e. credit line, decreases loan spread significantly. We have not seen any significant impact of number of lenders on loan spread.

With respect to firm factors, the coefficient of log firm size is negative but has no significance (column 2 and 3). Leverage shows significant positive association with log loan spread, indicating that high credit risk firm (high leverage) obtains a high credit spread. High profitability may represent a low risk of default and therefore enjoy a low external financing cost. We find a positive relationship between tangibility and log loan spread. The predication for market to book ratio seems to be less clear. The market to book ratio can either be proxy of growth opportunity and therefore increases credit risk or represent the additional value over book assets left to creditor in default (Graham, Li, and Qiu, 2008) and decreases credit risk. We find a weak positive relationship between market to book ratio and log loan spread. This result seems to support the former argument. The S&P rating is positively related with log loan spread. The result indicates that firm with low level of credit rating borrow at high cost to compensate high credit risk captured by credit rating. In addition, firms with high Zscore (low default risk) and low cash flow volatility have a low cost of debt.

For macro factors, credit spread tends to widen when economic condition is bad. Accordingly, creditors have to be highly compensated for increased default risk in bad times. Consistent with the argument, we find that high credit spread significantly increases loan spread. A caveat here is that year effect seems to capture the variation of credit spread. After we control year effect in column 2 to 3, credit spread variable is dropped due to multicollinearity with year dummies. Finally, we find no significant result for GDP growth and 96-02 dummy.

3.4 Interaction with governance on the cost of debt

We thus far find that corporate fraud results in costly external finance by investigating the impact of corporate fraud on loan spread. To further check our hypothesis that the increases of cost of debt are mainly in response to the information asymmetry resulted by corporate fraud, we examine the interplay between corporate fraud and potential factor which might capture the information asymmetry issue. We pay attention to the corporate governance variable. If external governance can not provide sufficient monitoring for the information asymmetry issues, outsiders might perceive more agency cost for the corporate fraud. We therefore anticipate that the effect of corporate fraud on the cost of debt is more severe for fraudulent firms with weak governance. One concern is that the governance quality may change in response to corporate fraud (Agrawal, Jaffe, and Karpoff, 1999) and therefore result in endogenous issue. In this regard, we use the E-index of Bebchuk, Cohen, and Ferrell (2009) as proxy of corporate governance quality because the E-index is quite stable across time (Bebchuk, Cohen, and Ferrell, 2009) and thereby avoid the endogenous problem. Indeed, by hand-checking the changes of E-index across time in our sample, among 129 fraud cases with E-index information, only 5 cases have a slightly improvement of governance around the fraud incident. In particular, we recognize the firm-year observations with E-index>=4 to be 1, indicating the weak governance sub-sample, and 0 otherwise.[11] The interaction results between corporate fraud and governance quality are reported in table 4.

[Insert Table 4 here]

In table 4, the dependent variable is the log of loan spread. Besides the post fraud variable, we add the interaction term between post fraud and Eindex dummy variable into regression. We control contract characteristics in column 1. We find that the cost of corporate fraud increases by 18.0 percent at 10% significance level for the sample of weak governance compared with the sample of good governance. The result is robust when we add the Eindex dummy variable into regression in column 2. The results indicate that outsiders impose more

[11] As in Giroud and Mueller (2011), using a cutoff of $E \geq 4$ ensures that the weak governance subsample contains sufficiently many observation relative to the remaining.

agency cost on fraudulent firms with weak governance for their insufficient monitoring on the information asymmetry issue.

In appendix, we also provide evidence in terms of non-price loan monitoring after corporate fraud. See appendix III for details. To sum up, we obtain costly and restrictive external financing cost evidence by finding that corporate fraud significantly increases loan spread and contract strictness. This provides direct evidence of firm value loss associated with corporate misconduct as in Karpoff, Lee, and Martin (2008a). We also find that the cost of corporate fraud is more severe for firms with weak governance. Our results underline the importance of governance in mitigating the cost of corporate fraud (Agrawal, Jaffe, and Karpoff, 1999; Farber, 2005).

4 Corporate cash holdings

Section 3 outlines our basic predications on external financing cost of corporate fraud by investigating the effect of corporate fraud on cost of debt. In this section, we aim to further investigate the effect of corporate fraud on the corporate cash holdings. Given the findings that corporate fraud results in costly external financing, fraudulent firms would accumulate more cash in order to preserve liquidity and avoid underinvestment issues. We therefore anticipate that corporate cash holdings and value of cash significantly increases associated with corporate fraud. We further pay attention to sensitivity of cash to cash flow. Almeida, Campello, and Weisbach (2004) model the precautionary motive of saving cash and empirically find that financially constrained firms display a positive cash flow sensitivity of cash, while unconstrained firms do not. Regarding the costly external financing evidence as shown in section 3, we anticipate that fraudulent firms would become financially constrained after corporate fraud and therefore display significantly positive cash flow sensitivity of cash.

4.1 Corporate cash holdings

Like the analysis in cost of debt, we empirically investigate the corporate cash holdings before and after corporate fraud in panel regression. Following Opler, Pinkowitz, Stulz, and

Williamson (1999), the primary proxy for level of cash holdings is cash to net assets ratio.[12] The key target variable is post fraud dummy. Following Opler, Pinkowitz, Stulz, and Williamson (1999) and Bates, Kahle, and Stulz (2009), we control firm characteristics including log firm size, market to book ratio, cash flow to assets ratio, net working capital to assets ratio, capital expenditure to assets ratio, leverage, industry cash flow risk, dividend payout dummy, R&D to sales ratio, and acquisition to assets ratio. All the variables are defined in table 1. To make sure the estimation in event study is accurate, it is better when the data frequency is we use the quarterly data in cash holdings estimation following Duchin, Ozbas, and Sensoy (2010) rather than annual data.[13] Table 5 presents the estimation results.

[Insert Table 5 here]

We find that corporate fraud significantly increases corporate cash holdings. In column 1, we control year, quarter, and industry effect. On average, the cash to net assets ratio increases by 4.2 percent after corporate fraud at 1% significance level (column 1). In column 2, we control year, quarter and firm effects. We still find the significance level of post fraud indicator (0.023 at 1% significance level). In unreported results, we also add a 2000s indicator representing the 2000s time period to see whether the post fraud effect can be captured by the increases of cash holdings in the 2000s as in Bates, Kahle, and Stulz (2009). It turns out that the 2000s indicator variable can not explain the effect of fraud on cash. Overall, the results confirm our anticipation that fraudulent firms accumulate more cash to hedge costly external finance. The coefficients of remaining variables are consistent with findings in previous studies. Similar to those documented in Opler, Pinkowitz, Stulz, and Williamson (1999) and Bates, Kahle, and Stulz (2009), firms with large size and low growth opportunities tend to hold less cash. Leverage ratio, net working capital to assets ratio and acquisition to assets ratio is negatively associated with cash reserve. The industry cash flow risk significantly increases cash holdings.

[12] We obtain robust results when we use cash to total assets, log value of cash to net assets and log value of cash to sales ratio as an alternative measure following Bates, Kahle, and Stulz (2009) and Foley, Hartzell, Titman, and Twite (2007).
[13] In unreported estimations, we also examine using annual data, the significance results are robust.

4.2 Value of cash

We further extend by investigating the value of cash associated with corporate fraud. This helps us confirm the precautionary motive argument. Fraudulent firms accumulate more cash to hedge costly external finance and thereby can invest in valuable project which might pass by, otherwise. If so, we anticipate that the value of cash significantly increases associated with corporate fraud. Indeed, Faulkender and Wang (2006) document and find that marginal value of cash is more pronounced in financial constrained firms. We examine the impact of corporate fraud on the value of cash from perspective of both equity holders and the whole firm.

Following Faulkender and Wang (2006), we estimate the effect of corporate fraud on the value of an additional dollar of cash to equity holders as follows,

$$r_{i,t} - R_{i,t}^{B} = r_0 + r_1 \frac{\Delta C_{i,t}}{M_{i,t-1}} + r_2 post\ fraud * \frac{\Delta C_{i,t}}{M_{i,t-1}} + r_3 \frac{\Delta E_{i,t}}{M_{i,t-1}} + r_4 \frac{\Delta NA_{i,t}}{M_{i,t-1}} + r_5 \frac{\Delta RD_{i,t}}{M_{i,t-1}} + r \quad \frac{\Delta I_{i,t}}{M_{i,t-1}} + r_7 \frac{\Delta D_{i,t}}{M_{i,t-1}} + r \quad \frac{C_{i,t-1}}{M_{i,t-1}} + r_9 L_{i,t} + r_{10} \frac{NF_{i,t}}{M_{i,t-1}} + r_{11} \frac{C_{i,t-1}}{M_{i,t-1}} * \frac{\Delta C_{i,t}}{M_{i,t-1}} + r_{12} L_{i,t} * \frac{\Delta C_{i,t}}{M_{i,t-1}} + \epsilon_{i,t} \quad (2)$$

where the dependent variable is the difference between firm's stock return over fiscal year *t* and the benchmark portfolio return to which stock *i* belongs to at the beginning of fiscal year *t*. We use the 25 Fama and French portfolios formed on size and book-to-market as our benchmark portfolios. A portfolio return is a value-weighted return based on market capitalization within each of the 25 portfolios.[14] To capture the effect of fraud on the value of cash, we interact the post fraud dummy with the change of cash variable. For remaining variables, see definitions in Table 1.

We further estimate the impact of corporate fraud on the value of cash to the whole fraudulent firm. Following Pinkowitz and Williamson (2006), Dittmar and Mahrt-Smith

[14] In particular, we group every firm into one of 25 size and book-to-market portfolios based on the interaction between size and book-to-market independent sorts. A firm would change the portfolio to which it belongs to during the year because the Fama and French portfolios formation date (end of each June) differs from the fiscal year end time (any month during the year). For instance, consider a firm whose fiscal end is December in year *t*-1, then from January to June of year *t*, it belongs to the portfolio based on the size and book-to-market breakpoints of year *t*-1, and from July to December of year *t*, it belongs to the portfolio based on the size and book-to-market breakpoints of year *t*. We then get the benchmark return by annualizing the monthly portfolio returns from the portfolio it belongs to each month.

(2007), and Fresard and Salva (2010), we regress market to book ratio on the level of corporate cash holdings and a series of control variables. The estimation is as follows,

$$\frac{MV_{i,t}}{NA_{i,t}} = \beta_0 + \beta_1 \frac{C_{i,t}}{NA_{i,t}} + \beta_2 post\ fraud * \frac{C_{i,t}}{NA_{i,t}} + \beta_3 \frac{E_{i,t}}{NA_{i,t}} + \beta\ \frac{dE_{i,t}}{NA_{i,t}} + \beta\ \frac{dE_{i,t+2}}{NA_{i,t}} + \beta\ \frac{RD_{i,t}}{NA_{i,t}} + \beta\ \frac{dRD_{i,t}}{NA_{i,t}} + \beta\ \frac{dRD_{i,t+2}}{NA_{i,t}} + \beta\ \frac{D_{i,t}}{NA_{i,t}} + \beta\ \frac{dD_{i,t}}{NA_{i,t}} + \beta\ \frac{dD_{i,t+2}}{NA_{i,t}} + \beta\ \frac{I_{i,t}}{NA_{i,t}} + \beta\ \frac{dI_{i,t}}{NA_{i,t}} + \beta\ \frac{dI_{i,t+2}}{NA_{i,t}} + \beta\ \frac{dNA_{i,t}}{NA_{i,t}} + \beta\ \frac{dNA_{i,t+2}}{NA_{i,t}} + \beta\ \frac{dMV_{i,t+2}}{NA_{i,t}} + \beta\ \frac{dC_{i,t}}{NA_{i,t}} + \beta\ \frac{dC_{i,t+2}}{NA_{i,t}} + \epsilon_{i,t} \quad (3)$$

where dX_t denotes a change in X from time *t-2* to *t*. See table 1 for definitions of X variables. The dependent variable is market value of equity at year *t* plus the total liabilities divided by the net assets. We add the interaction term between the post fraud indicator and the level of cash holdings to examine the effect of corporate fraud on the firm value of cash holdings. In particular, following Dittmar and Mahrt-Smith (2007), we use excess cash holdings as proxies of cash holdings.[15] The calculation of excess cash holdings is described in appendix II. We report the estimation results of value of cash in table 6.

[Insert Table 6 here]

In panel A of table 6, we report the results of value of cash to equity holders. We first split the sample based on the fraud detection date into before fraud and post fraud sample and report the value of cash in column 1 and 2, respectively. We find no significant effect of changes of cash on the equity value in the before fraud sample. The result changes dramatically for the post fraud sample. In column 2, investors value an additional dollar of cash at 0.874$ at 1% significance level. We further run estimation using the whole sample by adding the interaction term between post fraud and change of cash into regression in column 3.The results show that, on average, the valuation of an additional dollar of cash by equity holders increases by 0.797 after corporate fraud. We also find that the equity value decrease by 0.202 after corporate fraud (column 3). In column 4, we add the interactions between change of cash and leverage and interactions between change of cash and level of cash as in Faulkender and Wang (2006). We still find the positive association between corporate fraud

[15] We get robust results by using the actual cash holdings as in Pinkowitz and Williamson (2006).

and value of cash. The value of cash increases by 0.656 at 1% significance level after corporate fraud (column 4). The result is consistent with the findings in Faulkender and Wang (2006) in the sense that marginal value of cash is more valuable for financially constrained firms (fraudulent firms here). In addition, the level of cash holdings significantly increases the equity value. However, the effect mainly exists for the post fraud sample. The marginal value of cash is less valuable for shareholders in highly levered firms. The marginal value of cash is also less valuable for firms with a high cash position. Both are consistent with the document in Faulkender and Wang (2006). We also find that marginal increase of earnings and marginal increase of net assets significantly increases equity value, while marginal increase of leverage significantly decreases equity value.

We further examine the value of cash holdings from perspective of total firm valuation in panel B of table 9. The dependent variable is the market to book value. Similar to the estimation in panel A, we first split the sample into two groups based on the fraud detection date and investigate the value of cash, respectively. We find no significant marginal value of cash for the before fraud sample in column 1. By contrast, the marginal value of cash is 1.272 at 1% significance level for the post fraud sample. In the whole sample, we find that marginal value of cash increases by 0.564 at 1% significance level after fraud (column 3). Yet, corporate fraud itself has no significant effect on firm value. For remaining variables, high level of earnings increase the firm value, while large increase of market value in the future two years lower the firm value. Both are consistent with the findings in Dittmar and Mahrt-Smith (2007).

As a whole, we find that corporate fraud significantly increases the marginal value of cash whenever we use equity value or firm value as dependent variable. The results confirm the argument of precautionary motive to save cash in response to costly external finance resulted by corporate fraud. Fraudulent firms accumulate more cash to ease the external finance constrains and thereby allow the firms to invest in positive net present value project which might pass by, otherwise.

4.3 Cash flow sensitivity

In section 4.1, we obtain supportive evidence for the precautionary motive to save cash in response to costly external finance in corporate fraud. In this section, we further examine the sensitivity of cash holdings to cash flow associated with corporate fraud. Almeida, Campello, and Weisbach (2004) model the liquidity demand in an imperfect capital market and find a positive cash flow sensitivity of cash for financially constrained firms. Given the costly external financing evidence in terms of costly price and restrictive non-price loan items in section 3, the fraudulent firms are supposed to be more financially constrained after corporate fraud. In this regard, we anticipate the fraudulent firms would display positive cash flow sensitivity of cash after corporate fraud. Following Almeida, Campello, and Weisbach (2004), we estimate the cash flow sensitivity of cash as follows,

$$\begin{aligned}\Delta CashHoldings_{i,t} &= \alpha_0 + \alpha_1 CashFlow_{i,t} + \alpha_2 post\ fraud * Cash\ Flow_{i,t} + \alpha_3 Q_{i,t} + \alpha_4 Size_{i,t} \\ &+ \alpha_5 Expenditures_{i,t} + \alpha_6 Acquisitions_{i,t} + \alpha_7 \Delta NWC_{i,t} + \alpha_8 \Delta ShortDebt_{i,t} \\ &+ \varepsilon_{i,t}\end{aligned} \tag{4}$$

where the dependent variable is the change of cash to assets ratio. We interact post fraud dummy with cash flow to proxy the effect of fraud on the cash flow sensitivity of cash. See table 1 for definitions of other control variables. We report estimations in table 7.

[Insert Table 7 here]

In table 7, we split the sample into two groups based on the fraud detection date and estimate the cash flow sensitivity of cash before and after fraud, respectively. In column 1, we find that no significant association between cash flow and change of cash before corporate fraud. By contrast, we find a significantly positive cash flow sensitivity of cash after corporate fraud in column 2. On average, the sensitivity estimate in post fraud sample is 0.266 at 1% significance level. We further estimate using the whole sample by adding the interaction term between post fraud and cash flow variable into the regression and report results in column 3. We find that the cash flow sensitivity increase by 0.119 after corporate

fraud in column 3. Since the estimation model of cash flow sensitivity of cash is essentially an estimation of change of cash on cash flow, we also add the lag of cash holdings and lag of change of cash holdings following the change of cash estimation in Bates, Kahle, and Stulz (2009) and Harford, Mansi, and Maxwell (2008) into the cash flow sensitivity estimation in column 4. The coefficient of the interaction term is 0.222 at 1% significance level, indicating that corporate fraud incident contributes to financial constrains. One caveat here is that the effect of post fraud on change of cash is negative after we add the interaction term between corporate fraud and cash flow. Considering the findings in section 4.1 that corporate fraud results in cash accumulation, it might indicate that the post fraud magnitude increase of cash is mainly driven by the post fraud cash savings out of cash flow. In other words, the post fraud cash accumulation might come from the post fraud saving cash out of cash flow activities, which is indeed the model implication of Almeida, Campello, and Weisbach (2004). Overall, the result indicates that corporate fraud incident contributes to financial constraints. It is also consistent with the costly external finance in section 3. In addition, consistent with Almeida, Campello, and Weisbach (2004), we also find significantly positive *Q* sensitivity of cash.

4.4 Interaction with external finance dependence and governance

We obtain the precautionary saving evidence by finding that corporate fraud results in increases of cash, value of cash, and cash flow sensitivity of cash in response to the costly external finance. In this subsection, to further enhance the understanding of precautionary savings of cash motive in response to the costly external finance, we investigate the interaction effect between corporate fraud and potential factors on cash, value of cash, and cash flow sensitivity. We first consider the industry-level external finance dependence. The costly external finance should be more shocked for fraudulent firms in industries that are more dependent on external finance (Rajan and Zingales, 1998). Thus, the effect of corporate fraud on cash accumulation, the value of cash, and cash flow sensitivity of cash should be more pronounced for firms in great need of capital. We also pay attention to the interaction effect between corporate fraud and governance as we did in cost of debt part. Since the effect

of corporate fraud on cost of debt is more pronounced in firms with weak governance, we therefore anticipate that the firms with weak governance become more financially constrained after corporate fraud. Thus, the increases of cash and value of cash should be more significant for firms with weak governance based on the precautionary hypothesis. Moreover, the effect of fraud on the cash flow sensitivity of cash should be more pronounced for the firms with weak governance (more financially constrained). In detail, we construct the industry external finance dependence proxy following Duchin, Ozbas, and Sensoy (2010) and create the Ex. Depend. indicator based on the industry median value of our sample (Ex. depend.=1 for high dependence, 0, otherwise).[16] Regarding the construction of the governance indicator, to avoid endogenous issue between governance and cash, we use the initial value of Eindex to construct the O. Eindex dum. as in Dittmar and Mahrt-Smith (2007) (O. Eindex dum.=1 for initial Eindex>=4, 0, otherwise).[17] We estimate the interplay results on cash, value of cash, and cash flow sensitivity of cash in table 8.

[Insert Table 8 here]

In panel A of table 8, we re-estimate the model of the determinants of cash in section 4.1 by adding post fraud interaction with finance dependence and governance indicators into regression.[18] The interplay results further confirm the precautionary hypothesis. The cash accumulation associated with corporate fraud is more pronounced in firms with high external finance dependence. The effect of corporate fraud on cash to net assets ratio increases by 0.030 more for the high dependence firms than the low dependence ones (column 1). This might indicate that fraudulent firms with high external finance dependence have to accumulate more cash to release the external financial constraints. We also find that the effect of corporate fraud on cash accumulation is more pronounced in weak governance firms. On average, the weak governance firms accumulate cash holdings 5.2 percent higher than the good governance ones (column 2).

[16] Following Raddatz (2006), the industry external finance dependence is as follows, first, the media value of external finance dependence is computed for each firm from 2000 to 2005. Second, the median ratio across firms in the same four-digit SIC industry is assigned to that industry.

[17] As in Dittmar and Mahrt-Smith (2007) and Bebchuk, Cohen, and Ferrell (2009), the governance changes only slowly across time and the initial value is clearly exogenous to the firm value. Thus, using the initial value as in Dittmar and Mahrt-Smith (2007) can effectively reduce the endogenous issue between governance and firm value.

[18] Since the industry dependence and governance indicators are constant across time for individual firm, the indicator impact is absorbed by the firm effects.

We further estimate the interplay effect on the value of cash to equity holders in panel B of table 8. As shown in panel B of table 8, the effect of corporate fraud on value of cash is more pronounced in high external finance dependence firms (coefficient of interaction term among post fraud, change of cash, and Ex. Depend. in column 1). In column 2, we also find that the increase of value of cash associated with corporate fraud in weak governed firms is higher than that in good governed ones. The magnitude increase of value of cash associated with corporate fraud in weak governance firms is 2.162 higher than the effect in good governance ones (coefficient of interaction term among post fraud, change of cash, and O. Eindex dum. in column 2). This might occur because the weak governance firms become more financially constrained after corporate fraud and therefore the value of cash is more pronounced (Faulkender and Wang, 2005). In addition, we also find that the value of cash decrease by 2.326 at 1% significance level for the weak governance firms (coefficient between change of cash and O. Eindex dum. in column 2). This is consistent with Dittmar and Mahrt-Smith (2007) in the sense that the value of cash is higher in good governance firms.

Finally, we examine whether the interaction effect holds for the cash flow sensitivity of cash. Panel C of table 8 reports the results. In column 1, the cash flow sensitivity of cash associated with corporate fraud in high dependence firms increases 0.028 more than the firms in low dependence ones (the coefficient of interaction term among post fraud, cash flow, and Ex. depend.).[19] In column 2, we also find that the cash flow sensitivity of cash associated with corporate fraud is more pronounced for the weak governance firms. The coefficient of the interaction term between corporate fraud and cash flow is 0.182 at 5% significance level. The effect further increases by 0.997 at 1% significance level for the weak governance firms. We therefore conclude that weak governance firms become more financially constrained after corporate fraud based on the findings in cash flow sensitivity estimation. This is consistent

[19] The coefficient in this estimation is not significant. In unreported results, we split the sample into two groups based on the industry median external finance dependence degree, and estimate the effect of corporate fraud on the cash flow sensitivity in the high and low dependence groups, respectively. We find that, first, the effect of corporate fraud on cash flow sensitivity are both significant for the two groups, second, the magnitude difference between the two groups are statistically not equal to zero. Consistent with our anticipation, the magnitude effect for the high dependence group is higher than the low dependence group.

with the findings in section 3.2 in the sense that weak governance firms face a higher external cost of debt after corporate fraud.

Overall, our results suggest that fraudulent firms retain more cash in response to costly external finance. It empirically supports the precautionary motive argument (Opler, Pinkowitz, Stulz, and Williamson, 1999). Consistent with the argument, the value of cash significantly increases after fraud. We also show a significantly positive cash flow sensitivity of cash after corporate fraud. The examinations show that fraudulent firms become more financially constrained due to costly and restrictive external financing. We further confirm the precautionary hypothesis by examining the interaction effect of fraud with external finance dependence and governance on the cash, value of cash, and cash flow sensitivity of cash. Consistent with the findings in section 3.4 that external cost of debt associated with corporate fraud is more severe for firms with weak governance, we also find that the effect of corporate fraud on cash, value of cash, and cash flow sensitivity of cash is more pronounced for firms with weak governance.

5 Conclusion

Corporate fraud is one important issue in corporate finance studies. The fraud incident can result in reputation damage for both firm and managers (Karpoff, Lee, and Martin, 2008 a&b). In this paper, we examine channels through which corporate fraud affects corporate values. Through comparing the differences of cost of debt before and after corporate fraud, we find that corporate fraud significantly increases the external financing cost. We also find that fraudulent firms face more covenant restrictions. In line with the costly and restrictive external finance, fraudulent firms retain more cash to better cope with adverse shocks. Consistent with the precautionary motive argument, shareholders and outsiders value more for an additional dollar of cash after corporate fraud. Additionally, we document that corporate fraud contribute to financial constrains by finding that fraudulent firms save more cash out of cash flow.

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Table 1. Definitions of variables

This table provides detailed definitions for all the variables used in the paper.

Variables names	Variable definitions	Sources
Loan characteristics		
Log loan size	Log value of loan amount (facility level), measured in millions of US dollars	Dealscan
Log maturity	Log value of maturity (facility level), measured in months	Dealscan
Log loan spread	Log value of loan spread. Loan spread is the all-in-spread drawn, defined as the amount the borrowers pays in basis points over LIBOR or LIBOR equivalent for the drawn portion of the loan facility	Dealscan
Price grid	A dummy variable equal to one if the loan facility has at least a performance pricing clause, zero, otherwise	Dealscan
Revolver	A dummy variable equal to one for the credit line type loan, zero, otherwise	Dealscan
Num. of lenders	The number of lenders participating into loan facility syndication.	Dealscan
Firm characteristics		
Log firm size	Log value of firm assets measured in millions of US dollars	Compustat
Leverage	(Long-term debt + debt in current liabilities)/firm assets	Compustat
Profitability	Net income/ firm assets	Compustat
Tangibility	Net property, plant, and equipment / firm assets	Compustat
Market to book	(Market value of equity + Book value of debt)/ firm assets. Market value of equity equals price per share times total number of shares outstanding. Book value of debt equals total assets minus book value of equity	Compustat
Cash flow volatility	Standard deviation of yearly cash flows from operations over the five fiscal years prior to the loan initiation scaled by firm assets	Compustat
S&P ratings	S&P firm credit ratings are converted to an index from 1 to 7 as follows: 1=Aaa, 2=Aa, 3=A, 4=Bbb, 5=Bb, 6=B or worse, and 7=no rating	Compustat
Zscore	Modified Altman's (1968) Z-score= (1.2*working capital +1.4*retained earnings +3.3*EBIT +0.999*sales)/firm assets. Following Graham, Li, and Qiu (2008), we exclude the ratio of market to book ratio in Zscore calculation because Market to book ratio itself also enters regression estimations.	Compustat
Cash holdings	Holdings of cash and marketable securities/firm assets	Compustat
Lag of cash holdings	Lagged value of cash holdings	Compustat
Lag of change of cash holdings	Change of cash holdings from year t-2 to t-1	Compustat
Cash flow	Earnings after interest, dividends, and taxes but before depreciation scaled by firm assets	Compustat
NWC	Following Bates, Kahle, and Stulz (2009), we subtract cash from net working capital and use the remaining scaled by firm assets	Compustat
Change of NWC	Change of NWC from year t-1 to t	Compustat
Capex	Capital expenditure to firm assets. For the quarterly data calculation, because capital expenditure is reported on a year-to-date basis in quarterly financial statements, we subtract the previous quarter's capital expenditure from the current quarter's capital expenditure for fiscal quarters 2, 3, and 4 following Duchin, Ozbas, and Sensoy (2010).	Compustat
Dividend dum.	Equal to one in years or quarters a firm pays a common dividend, zero otherwise	Compustat
R&D/sales	R&D/sales, and set equal to zero if R&D is missing	Compustat
Acquisition activity	Acquisitions/firm assets	Compustat
Industry sigma	Standard deviation of industry cash flow to firm assets. The calculation method follows Bates, Kahle, and Stulz (2009). For each firm-year-quarter observations, we compute the standard deviation of cash flow to assets for the previous 16 quarters. We require at least three observations. We then average the firm cash flow standard deviation each quarter across each two-digit SIC code	Compustat
Change of cash	The change of cash holdings from fiscal year t-1 to t divided by market value of equity in year t-1	Compustat
Change of earnings	The change of earnings from fiscal year t-1 to t divided by market value of equity in year t-1. Earnings are calculated earnings before extraordinary items plus interest, deferred tax credits, and investment tax credits	Compustat

(Continued on the next page)

Table 1. Definitions of variables (Continued)

Change of net assets	The change of net assets from fiscal year t-1 to t divided by market value of equity in year t-1. Net assets are calculated as firm total assets minus cash and marketable securities	Compustat
Change of R&D	The change of R&D expenditures from fiscal year t-1 to t divided by market value of equity in year t-1. R&D expenditures are set to zero if missing	Compustat
Change of interest expense	The change of interest expense from fiscal year t-1 to t divided by market value of equity in year t-1	Compustat
Change of div	The change of common dividends paid from fiscal year t-1 to t divided by market value of equity in year t-1	Compustat
Cash	Holdings of cash and marketable securities in fiscal year t-1divided by market value of equity in year t-1	Compustat
Market leverage	Market debt ratio, calculated as total debt over the sum of total debt and the market value of equity	Compustat
Net financing	Net financing during fiscal year t divided by the market value of equity in year t-1. Net financing is total equity issuance minus repurchase plus debt issuance minus debt redemption	Compustat
Excess cash/NA	The excess cash divided by net assets. The excess cash is calculated as cash holdings minus the optimal cash level estimated from the appendix II	Compustat
Earnings/NA	Earnings divided by net assets. Earnings are calculated earnings before extraordinary items plus interest, deferred tax credits, and investment tax credits	Compustat
∆2(∆L2) Earnings/NA	The two-year future (lagged) change of earnings divided by net assets	Compustat
R&D/NA	R&D expenditures divided by net assets	Compustat
∆2(∆L2) R&D/NA	The two-year future (lagged) change of R&D expenditures divided by net assets	Compustat
Dividends/NA	Common dividends paid divided by net assets	Compustat
∆2(∆L2) Dividends/NA	The two-year future (lagged) change of Common dividends paid divided by net assets	Compustat
Interests/NA	Interests expenses divided by net assets	Compustat
∆2(∆L2) Interests/NA	The two-year future (lagged) change of interests expenses divided by net assets	Compustat
∆2(∆L2) NA/NA	The two-year future (lagged) change of net assets divided by net assets	Compustat
∆2 Market value/NA	The two-year future change of market value divided by net assets. Market value is calculated as price times shares plus total liabilities	Compustat
Short debt	Debt in current liabilities scaled by firm assets	Compustat
Change of short debt	Change of short debt from t-1 to t	Compustat
Macro situations		
GDP growth	Annual GDP growth rate of US	The Federal Reserve Board of Governors
Credit spread	The difference between Moody's Seasoned Baa Corporate Bond Yield and Aaa Corporate Bond Yield	The Federal Reserve Board of Governors
96-02 dummy	A dummy variable that equals one if loan issue between year 1996 and 2002, zero otherwise	Author calculation
Others		
Post fraud	A dummy variable that equals one if loan or firm observation is on or after fraud trigger event date, zero otherwise	SCAC
Eindex dum.	A dummy variable that equals one if firm-year Eindex no less than 4, zero otherwise	Bebchuk, Cohen, and Ferrell (2009)
O. Eindex dum.	A dummy variable that equals one if firm original E-index no less than 4, zero otherwise	Bebchuk, Cohen, and Ferrell (2009)
External finance dependence	(Capital expenditures-funds from operations)/capital expenditures. Funds from operations is replaced as the sum of the followings variables: income before extraordinary items, depreciation and amortization, deferred taxes, equity in net loss/earnings, sale of property, plant, and equipment and investments-gain/loss, and funds from operations – other, if it is missing	Compustat
Ex. Depend.	A dummy variable that equals one if firm's industry external finance dependence is greater than the industry median, zero, otherwise.	Author calculation

Table 2. Summary Statistics on fraudulent firms and their loans

In this table, panel A presents quarterly firm level statistics on fraudulent firm ratios including number of observations (N), mean and standard deviation (sd). Panel B presents mean value for loans originated before and after fraud, respectively. We also report the difference value (mean) and t statistics between variables after fraud and before fraud. Definitions of all variables are reported in Table 1. Significance at 10%, 5%, and 1% level is indicated by *, **, and ***, respectively.

Panel A Firm variables

	N	mean	sd
Log firm Size	11746	7.111	1.974
Market to book	11176	2.071	1.205
Leverage	11270	0.311	0.193
Cash flow	10865	0.037	0.029
NWC	11335	0.068	0.161
Capex	10772	0.017	0.015
Dividend dum.	12421	0.166	0.372
R&D/sales	12176	0.023	0.044
Acquisitions	10335	0.005	0.012
Industry sigma	12421	0.310	0.384

Panel B Univariate analysis

	After fraud	Before fraud	Difference	
	mean	mean	mean	T Statistics
Log loan size	19.157	18.888	0.270***	3.39
Log loan spread	4.990	4.678	0.312***	6.18
Strictness	0.618	0.489	0.128***	4.28
Cash holdings	0.149	0.104	0.045***	15.27

Table 3. The effect of corporate fraud on loan pricing

This table presents the regression results on the effect of corporate fraud on loan pricing. The dependent variable is the log loan spread for a single bank loan (facility level). The post fraud dummy is defined to be equal 1 for facilities which originate after corporate fraud and 0, otherwise. Definitions of all the other variables are reported in Table 1. Heteroscedasticity-consistent robust standard errors are reported in brackets in column 1. Heteroscedasticity-consistent robust standard errors clustered at firm level are reported in brackets in column 2 and 3. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively.

	(1)	(2)	(3)
Post fraud	0.312	0.296	0.295
	[0.041]***	[0.060]***	[0.070]***
Log loan size	-0.282	-0.071	-0.061
	[0.016]***	[0.021]***	[0.020]***
Log maturity	0.163	0.065	0.055
	[0.033]***	[0.028]**	[0.031]*
Price grid	-0.024	-0.022	-0.034
	[0.040]	[0.037]	[0.033]
Revolver	-0.234	-0.121	-0.117
	[0.040]***	[0.027]***	[0.026]***
Num. of lenders	-0.002	-0.002	-0.001
	[0.002]	[0.002]	[0.001]
Log firm size		-0.047	-0.035
		[0.063]	[0.071]
Leverage		0.635	0.911
		[0.197]***	[0.246]***
Profitability		-1.329	-1.239
		[0.319]***	[0.531]**
Tangibility		0.545	0.875
		[0.314]*	[0.327]***
Market to book		0.030	0.053
		[0.017]*	[0.028]*
S&P ratings		0.191	0.177
		[0.030]***	[0.030]***
Zscore			-0.122
			[0.057]**
Cash flow volatility			1.750
			[0.890]*
GDP growth	0.038	0.071	-0.077
	[0.023]	[0.129]	[0.057]
Credit spread	0.831		
	[0.125]***		
96-02 dummy	-0.032		
	[0.044]		
Constant	8.883	4.719	2.866
	[0.372]***	[0.778]***	[0.772]***
Deal purpose	Yes	Yes	Yes
Industry	Yes	Yes	Yes
Year	No	Yes	Yes
Firm	No	Yes	Yes
Observations	1366	1366	1134
Adjusted R-squared	0.496	0.825	0.854

Table 4. The interaction effect of corporate fraud and governance on loan pricing

This table presents the regression results on the interaction effect of corporate fraud and governance on loan pricing. The dependent variable is the log loan spread for a single bank loan (facility level). The post fraud dummy is defined to be equal 1 for facilities which originate after corporate fraud and 0, otherwise. Definitions of all the other variables are reported in Table 1. Heteroscedasticity-consistent robust standard errors clustered at firm level are reported in brackets. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively.

	(1)	(2)
Post fraud	0.198	0.191
	[0.084]**	[0.086]**
Post fraud * Eindex dum.	0.180	0.240
	[0.099]*	[0.122]*
Eindex dum.		-0.113
		[0.113]
Log loan size	-0.075	-0.074
	[0.025]***	[0.025]***
Log maturity	0.081	0.081
	[0.038]**	[0.038]**
Price grid	-0.021	-0.023
	[0.046]	[0.046]
Revolver	-0.096	-0.095
	[0.036]***	[0.036]***
Num. of lenders	-0.003	-0.003
	[0.002]	[0.002]
Log firm size	0.051	0.051
	[0.086]	[0.085]
Leverage	0.892	0.906
	[0.312]***	[0.313]***
Profitability	-2.099	-2.113
	[0.652]***	[0.657]***
Tangibility	0.744	0.743
	[0.350]**	[0.350]**
Market to book	0.019	0.021
	[0.045]	[0.045]
S&P ratings	0.236	0.234
	[0.029]***	[0.030]***
GDP growth	0.025	0.026
	[0.069]	[0.069]
Constant	3.801	3.801
	[0.783]***	[0.776]***
Deal purpose	Yes	Yes
Industry	Yes	Yes
Year	Yes	Yes
Firm	Yes	Yes
Observations	812	812
Adjusted R-squared	0.853	0.853

Table 5. The effect of corporate fraud on corporate cash holdings

The table presents the regression results on the effect of corporate fraud on corporate cash holdings. The dependent variable is the cash to net assets ratio. The post fraud dummy is defined to be equal 1 for firm observations which are on or after corporate frauds and 0, otherwise. Definitions of all the other variables are reported in Table 1. The estimation is reported year, quarter, and industry effects in column 1, and is reported year, quarter, and firm fixed effects in column 2. Heteroscedasticity-consistent robust standard errors is reported in brackets in column 1 and heteroscedasticity-consistent robust standard errors clustered at firm level is reported in brackets in column 2. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively.

	(1)	(2)
Post fraud	0.042	0.023
	[0.004]***	[0.009]***
Log firm size	-0.023	-0.032
	[0.001]***	[0.006]***
Market to book	0.063	0.046
	[0.002]***	[0.005]***
Leverage	-0.095	-0.008
	[0.010]***	[0.026]
Cash flow	-0.393	-0.049
	[0.062]***	[0.132]
NWC	-0.133	-0.063
	[0.013]***	[0.040]
Capex	0.292	0.099
	[0.111]***	[0.209]
Dividend dum.	0.013	0.022
	[0.003]***	[0.011]*
R&D/sales	0.559	0.479
	[0.047]***	[0.171]***
Acquisition activity	-0.405	-0.172
	[0.105]***	[0.113]
Industry sigma	0.020	0.009
	[0.005]***	[0.010]
Constant	0.201	0.239
	[0.013]***	[0.045]***
Observations	8789	8789
Adjusted R-squared	0.522	0.229

Table 6. The effect of corporate fraud on value of cash

The table presents the regression results on the effect of corporate fraud on the value of cash holdings. In panel A, the dependent variable is the abnormal return using the size and book to market 25 portfolios as benchmark to proxy the value to equity holders. In panel B, the dependent variable is the market to book ratio as a measure of firm value. The post fraud dummy is defined to be equal 1 for firm observations which are on or after corporate frauds and 0, otherwise. Definitions of all the other variables are reported in Table 1. All the estimations are reported firm and year fixed effects. Heteroscedasticity-consistent robust standard errors clustered at firm level are reported in brackets. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively.

Panel A: The effect of corporate fraud on value of cash to equity holders

	(1)	(2)	(3)	(4)
	Before	After	Whole	Whole
Post fraud			-0.202	-0.225
			[0.056]***	[0.053]***
Post fraud * change of cash			0.797	0.656
			[0.280]***	[0.192]***
Change of cash	0.414	0.874	-0.166	0.719
	[0.273]	[0.207]***	[0.298]	[0.231]***
Change of earnings	0.342	0.041	0.100	0.096
	[0.116]***	[0.041]	[0.033]***	[0.027]***
Change of net assets	0.082	0.124	0.073	0.084
	[0.050]	[0.044]***	[0.042]*	[0.044]*
Change of R&D	-1.547	-1.347	-0.809	-0.736
	[2.132]	[0.905]	[0.872]	[0.870]
Change of interest expense	3.557	-1.194	-0.706	-0.311
	[1.776]**	[0.447]***	[0.487]	[0.445]
Change of div	1.767	-1.039	0.552	0.805
	[3.216]	[1.593]	[1.740]	[1.600]
Cash	0.070	0.403	0.161	0.253
	[0.181]	[0.129]***	[0.087]*	[0.071]***
Market leverage	-0.594	-0.114	-0.268	-0.245
	[0.278]**	[0.101]	[0.098]***	[0.101]**
Net financing	-0.009	-0.205	-0.054	-0.067
	[0.161]	[0.115]*	[0.080]	[0.082]
Change of cash * cash				-0.319
				[0.074]***
Change of cash * market leverage				-0.431
				[0.150]***
Constant	0.385	-0.196	0.284	0.222
	[0.204]*	[0.090]**	[0.190]	[0.173]
Observations	455	725	1180	1180
Adjusted R-squared	0.131	0.263	0.133	0.180

Table 6. The effect of corporate fraud on value of cash (Continued)

Panel B: The effect of corporate fraud on value of cash to total firm

	(1)	(2)	(3)
	Before	After	Whole
Post fraud			0.424
			[0.273]
Post fraud * Excess cash/NA			0.564
			[0.275]**
Excess cash/NA	0.473	1.272	0.437
	[0.425]	[0.413]***	[0.288]
Earnings/NA	6.810	3.903	5.341
	[1.668]***	[0.946]***	[0.996]***
ΔL2 Earnings/NA	2.404	-0.037	0.388
	[0.795]***	[0.528]	[0.572]
Δ2 Earnings/NA	0.679	1.456	1.456
	[0.457]	[0.428]***	[0.371]***
R&D/NA	-14.426	9.297	-1.543
	[10.603]	[5.643]	[5.313]
ΔL2 R&D/NA	1.572	-17.332	-13.934
	[16.529]	[9.468]*	[9.739]
Δ2 R&D/NA	-3.306	12.566	6.167
	[7.812]	[6.430]*	[6.672]
Dividends/NA	-0.375	-7.897	5.602
	[14.930]	[10.403]	[12.784]
ΔL2 Dividends/NA	-38.874	-36.315	-19.700
	[23.550]	[16.435]**	[13.353]
Δ2 Dividends/NA	-43.354	-2.205	-3.105
	[17.090]**	[12.483]	[12.815]
Interests/NA	6.166	7.472	3.964
	[6.270]	[6.103]	[4.483]
ΔL2 Interests/NA	0.830	0.609	0.292
	[5.808]	[3.735]	[3.250]
Δ2 Interests/NA	5.420	1.218	1.079
	[4.668]	[5.042]	[3.341]
ΔL2 NA/NA	-0.313	-0.046	0.023
	[0.253]	[0.185]	[0.135]
Δ2 NA/NA	0.704	0.479	0.480
	[0.126]***	[0.121]***	[0.081]***
Δ2 Market value/NA	-0.274	-0.327	-0.310
	[0.060]***	[0.046]***	[0.037]***
Constant	1.894	1.932	1.495
	[0.660]***	[0.392]***	[0.519]***
Observations	248	343	591
Adjusted R-squared	0.555	0.532	0.511

Table 7. The effect of corporate fraud on cash flow sensitivity of cash

This table presents impact of corporate fraud on cash flow sensitivity of cash. The dependent variable is the changes of cash to assets ratio. The post fraud dummy is defined to be equal 1 for firm observations which are on or after corporate frauds and 0, otherwise. Definitions of all the other variables are reported in Table 1. All estimations include year, quarter, and firm fixed effects and report heteroskesticity-consistent robust standard errors clustered at firm level in brackets. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively.

	(1)	(2)	(3)	(4)
	Before	After	Whole	Whole
Post fraud			-0.007	-0.009
			[0.002]***	[0.002]***
Lag of cash holdings				-0.203
				[0.015]***
Lag of change of cash holdings				-0.080
				[0.015]***
Post fraud * cash flow			0.119	0.222
			[0.052]**	[0.058]***
Cash flow	0.047	0.266	0.090	-0.053
	[0.069]	[0.057]***	[0.045]**	[0.052]
Market to book	0.006	0.000	0.003	0.007
	[0.002]***	[0.002]	[0.001]***	[0.001]***
Log firm size	-0.001	-0.001	-0.002	-0.004
	[0.002]	[0.002]	[0.001]*	[0.001]***
Capex	-0.637	-0.629	-0.550	-0.566
	[0.107]***	[0.107]***	[0.067]***	[0.072]***
Acquisition activity	-0.692	-1.254	-0.902	-0.747
	[0.096]***	[0.134]***	[0.080]***	[0.074]***
Change of NWC	-0.562	-0.578	-0.571	-0.498
	[0.049]***	[0.048]***	[0.037]***	[0.033]***
Change of short debt	-0.723	-0.466	-0.593	-0.506
	[0.083]***	[0.058]***	[0.051]***	[0.046]***
Constant	0.009	0.020	0.013	0.052
	[0.012]	[0.013]	[0.006]**	[0.008]***
Observations	3784	4961	8745	8648
Adjusted R-squared	0.175	0.254	0.201	0.305

Table 8. The interaction effect of corporate fraud with governance and external finance dependence on cash, value of cash, and cash flow sensitivity

The table presents the regression results on the interaction effect of corporate fraud with governance and external finance dependence on cash, value of cash, and cash flow sensitivity in panel A, panel B, and panel C, respectively. In panel A, the dependent variable is cash to net assets ratio. In panel B, the dependent variable is abnormal return using the size and book to market 25 portfolios as benchmark to proxy the value to equity holders. In panel C, the dependent variable is the change of cash to assets ratio. The post fraud dummy is defined to be equal 1 for firm observations which are on or after corporate frauds and 0, otherwise. Definitions of all the other variables are reported in Table 1. All the estimations are reported firm and year fixed effects. Quarter effect is also controlled in estimations of Panel A and Panel C. Heteroscedasticity-consistent robust standard errors clustered at firm level are reported in brackets. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively.

Panel A: The interaction effect on cash

	(1)	(2)
Post fraud	0.009	0.004
	[0.012]	[0.011]
Post fraud * Ex. depend.	0.030	
	[0.014]**	
Post fraud * O. Eindex dum.		0.052
		[0.022]**
Log firm size	-0.032	-0.036
	[0.006]***	[0.010]***
Market to book	0.046	0.040
	[0.005]***	[0.006]***
Leverage	-0.006	0.029
	[0.027]	[0.038]
Cash flow	-0.053	0.128
	[0.132]	[0.202]
NWC	-0.063	-0.120
	[0.039]	[0.052]**
Capex	0.110	-0.041
	[0.208]	[0.316]
Dividend dum.	0.021	0.026
	[0.011]*	[0.016]
R&D/sales	0.479	0.253
	[0.169]***	[0.115]**
Acquisition activity	-0.224	-0.347
	[0.115]*	[0.137]**
Industry sigma	0.005	0.026
	[0.010]	[0.015]*
Constant	0.234	0.302
	[0.045]***	[0.076]***
Observations	8789	4464
Adjusted R-squared	0.234	0.290

Table 8. The interaction effect of corporate fraud with governance and external finance dependence on cash, value of cash, and cash flow sensitivity (Continued)

Panel B: The interaction effect on value of cash

	(1)	(2)
Post fraud	-0.260	-0.219
	[0.060]***	[0.068]***
Post fraud * Ex. depend.	0.051	
	[0.072]	
Ex. depend. * change of cash	-0.358	
	[0.337]	
Post fraud * O. Eindex dum.		-0.193
		[0.109]*
Change of cash * O. Eindex dum.		-2.326
		[0.666]***
Post fraud * change of cash	0.275	0.528
	[0.241]	[0.353]
Post fraud * change of cash * Ex. depend.	0.862	
	[0.355]**	
Post fraud * change of cash * O. Eindex dum.		2.162
		[0.806]***
Change of cash	0.885	1.574
	[0.227]***	[0.480]***
Change of earnings	0.110	0.096
	[0.029]***	[0.091]
Change of net assets	0.084	0.243
	[0.047]*	[0.061]***
Change of R&D	-0.605	0.517
	[0.892]	[1.591]
Change of interest expense	-0.290	-3.030
	[0.411]	[0.882]***
Change of div	0.417	1.677
	[1.609]	[3.216]
Cash	0.278	0.947
	[0.072]***	[0.190]***
Market leverage	-0.248	-0.113
	[0.101]**	[0.150]
Net financing	-0.075	-0.317
	[0.093]	[0.196]
Change of cash * cash	-0.299	0.195
	[0.075]***	[0.154]
Change of cash * market leverage	-0.509	-1.221
	[0.175]***	[0.451]***
Constant	0.225	0.051
	[0.176]	[0.087]
Observations	1180	621
Adjusted R-squared	0.187	0.257

Table 8. The interaction effect of corporate fraud with governance and external finance dependence on cash, value of cash, and cash flow sensitivity (Continued)

Panel C: The interaction effect on cash flow sensitivity

	(1)	(2)
Post fraud	-0.011	-0.005
	[0.003]***	[0.003]
Lag of cash holdings	-0.204	-0.202
	[0.015]***	[0.020]***
Lag of change of cash holdings	-0.079	-0.051
	[0.015]***	[0.021]**
Post fraud * Ex. depend.	0.005	
	[0.003]	
Post fraud * O. Eindex dum.		-0.030
		[0.009]***
Post fraud * cash flow * Ex. depend.	0.028	
	[0.087]	
Post fraud * cash flow * O. Eindex dum.		0.997
		[0.255]***
Post fraud * cash flow	0.208	0.182
	[0.075]***	[0.085]**
Cash flow	-0.057	0.044
	[0.051]	[0.079]
Market to book	0.007	0.004
	[0.001]***	[0.001]**
Log firm size	-0.004	-0.004
	[0.001]***	[0.002]**
Capex	-0.566	-0.503
	[0.071]***	[0.086]***
Acquisition activity	-0.760	-0.922
	[0.076]***	[0.106]***
Change of NWC	-0.499	-0.561
	[0.033]***	[0.045]***
Change of short debt	-0.506	-0.441
	[0.046]***	[0.065]***
Constant	0.052	0.063
	[0.008]***	[0.013]***
Observations	8648	4402
Adjusted R-squared	0.306	0.365

Appendix I Measuring Contract Strictness

As in Murfin (2012), we construct the contract strictness proxy to capture the number, slackness, scale, and covariance of covenants. Consider contracts with $N \times 1$ vector of financial ratios $\boldsymbol{r}$ which receives an N dimensional shock, migrating to $\boldsymbol{r}'$,

$$\boldsymbol{r}' = \boldsymbol{r} + \boldsymbol{\epsilon} \sim \boldsymbol{N}_N(\boldsymbol{0}, \boldsymbol{\Sigma}) \tag{A.1}$$

Suppose the n^{th} element of $\boldsymbol{r}$ is written such that that $r_n' < \underline{r}_n$ allocates control to the lender, then

$$STRICTNESS \equiv p = 1 - F_N(\boldsymbol{r} - \underline{\boldsymbol{r}}) \tag{A.2}$$

where F_N is the multivariate normal CDF with mean $\boldsymbol{0}$ and variance $\boldsymbol{\Sigma}$.

We estimate the strictness using loan covenant ratios in Dealscan and the borrowers' real financial ratios at the time of issuance from Compusta. We first calculate the slack in the first period of the contract as the difference between log value of observed ratio and the log value of minimum covenant ratio (or the negative of the difference in the case of maximum ratio) specified in the contract. We take 10 commonly used covenants ratios as follows, minimum EBITDA/debt, current ratio, quick ratio, tangible net worth, total net worth, EBITDA, fixed charge coverage, and interest coverage, and maximum debt/equity ratio, and capital expenditure. We then estimate $\boldsymbol{\Sigma}$ as the covariance matrix associated with quarterly changes in the log value of financial ratios of US firms which have borrowed from Dealscan since 1990. To allow for variation from the correlation structure of ratios, we estimate a separate covariance matric for each one-digit SIC industry.

Several caveats are as follows, first, since the covenants are reported at the package level, we use the package as the unit of observation when estimating the probability of covenant violation. Since our measure is based on the 10 commonly used covenant ratios, we keep only the package observations with at least one recording of 10 covenant ratios. Second, examining the ratios in log value of financial ratios can extend the support of otherwise constrained ratios to more closely approximate a multivariate normal distribution for changes

in ratios. Third, the proxy of strictness may be subject to measurement error. The covenant ratio calculation methodology may differ from different contracts. Some may also refer non-GAAP accounting data presented and certified by the CFO by not available with Compusta or public. Yet, as argued in Murfin (2012), as long as the contract strictness is treated as dependent variable, measurement error can be absorbed into the model's error term. Moreover, the measurement error is largely driven by borrower-specific factors and therefore can be subsumed by borrower fixed effects used in the analysis.

Appendix II Measuring Excess cash

Following Opler, Pinkowitz, Stulz, and Williamson (1999) and Dittmar and Mahrt-Smith (2007), we estimate the excess cash of US firms. We first employ the determinants of cash holdings to determine the normal level of cash holdings. We then define the excess cash as the difference between actual cash holdings and the fitted value estimated from the regression model. Specifically, we mainly use the following regression to compute the excess cash,

$$Ln\left(\frac{Cash_{i,t}}{NA_{i,t}}\right) = \beta_0 + \beta_1 Ln(NA_{i,t}) + \beta_2 \frac{FCF_{i,t}}{NA_{i,t}} + \beta_3 \frac{NWC_{i,t}}{NA_{i,t}} + \beta_4 (IndustrySigma)_{i,t} + \beta_5 \left(\frac{MV_{i,t}}{NA_{i,t}}\right) + \beta_6 \frac{RD_{i,t}}{NA_{i,t}} + Year\ Dummies + Firm\ Fixed\ Effects + \varepsilon_{i,t} \quad (A.3)$$

Where $Cash_{i,t}$ is the cash and cash equivalents at time *t*, $NA_{i,t}$ is the net assets which is equal to the total assets minus the cash and cash equivalents at time *t*, $FCF_{i,t}$ is defined as current assets minus current liabilities minus cash at time *t*, $Industry\ Sigma_{i,t}$ is computed as the standard deviation of cash flow to assets for the previous 10 years, $MV_{i,t}$ is the market value at time *t* plus the total liabilities, and $RD_{i,t}$ is the R&D expenditure, set to zero if missing, over year *t*.

Several caveats are as follows, first, as in Dittmar and Mahrt-Smith (2007) and Fresard and Salva (2010), we examine the value of firm cash holdings using the market to book ratio as proxy for firm value. Thus, it is potentially biased if we use this measure as an additional determinant of firm cash holdings. To avoid the endogenous issue, we use the three year lagged sales growth as an instrument variable for the market to book ratio following Dittmar and Mahrt-Smith (2007). Second, we add the firm effects in the estimation to solve potential bias caused by unobservable constant firm factors which may correlate with cash holdings. We do not deduct the estimated specific firm effects when estimating the excess cash. As argued in Dittmar and Mahrt-Smith (2007), firm fixed effects do not capture the economic determinants of firm cash holdings such as investment, hedging, operation needs, and so on.

We employ two stage OLS regressions to calculate the excess cash. We first examine the effect of sales growth and other control variables on the market to book ratio. We further

use the fitted value estimated from the first stage as the instrument proxy for market to book ratio and estimate the determinants of firm cash holdings using model (A.3). The excess cash level are calculated as the difference between the actual cash holding level and the fitted level estimated from the second stage excluding the firm fixed effects. The detailed estimation results are available on request.

Appendix III Additional tests

We investigate the impact of corporate fraud on non-price loan monitoring.

A3 Contract Strictness

We find costly external financing cost evidence from the changes of loan spread around fraud incident in section 3.1. In this subsection, we aim to further obtain restrictive external financing evidence by testing the changes of non-price loan items associated with corporate fraud. In particular, we construct the contract strictness proxy as in Murfin (2012) to capture the probability of covenant violation.[20] Since corporate fraud results in information asymmetry and uncertainty issue, we anticipate that banks increase their monitoring in terms of strict contract ratios.

[Insert Table A.1 here]

In table A.1, we report the effect of corporate fraud on the contract strictness. The dependent variable is the probability of covenant violation constructed as in Murfin (2012). See appendix I for details about measure construction. Since the measure is calculated at package level, we test using package level observations. Following Murfin (2012), we use the maximum maturity among the facilities as the maturity of the package and use the total loan amount of all the facilities in one package as the loan size. In column 1, we report the results by controlling contract features, deal purpose, industry, and year effect. In column 2, we further add the firm variables into regression. In column 3, we control firm effect. Since the proxy is a continuous variable between 0 and 1, we further do Tobit regression censoring left at 0 and right at 1 in column 4. All the estimations are reported robust standard errors clustered at firm level.

In column 1, we find that the probability of covenant violation increase by 10.7 percentage after corporate fraud. The significance level remains unchanged after we add firm characteristics in column 2. After we control firm fixed effect in column 3, the effect of

[20] Previous studies mainly use the number of covenants to proxy the monitoring role of banks (see Graham, Li, and Qiu, 2008). As discussed in Murfin (2012), the contract strictness measure captures four dimensions of financial covenants including the number, slackness, scale, and the covariance of covenants. Moreover, the measure has a stronger predictive power for covenant violation compared with number of financial covenants.

corporate fraud on contract strictness increases to 15.6 percentage. The result is more significant when we use the Tobit model regression in column 4. The results might indicate that corporate fraud not only result in costly external finance, but also cause to restrictive external finance.

For remaining variables, banks tend to increase monitoring for large amount loan contracts. We also find that firms with high credit risk characterized by small firm size, high leverage, low profitability, low tangibility, and low investment grade are more likely to face strict monitoring (the result in column 2). In addition, in the Tobit regression, we also find that the loan contract strictness is negatively related with credit spread (column 4). To some degree, high contract strictness might increase the default risk of firms when the economy is in recessions (high credit spread). Thus, banks may loose their contract strictness to reduce the default risk of firms.

Table A.1 The effect of corporate fraud on contract strictness

This table presents the regression results on the effect of corporate fraud on contract strictness. The dependent variable is the contract strictness proxy as in Murfin (2012) (package level). The post fraud dummy is defined to be equal 1 for packages which originate after corporate fraud and 0, otherwise. Definitions of all the other variables are reported in Table 1. Heteroscedasticity-consistent robust standard errors clustered at firm level are reported in brackets. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively.

	(1)	(2)	(3)	(4)
Post fraud	0.107	0.091	0.156	0.156
	[0.043]**	[0.038]**	[0.068]**	[0.054]***
Log loan size (package)	0.003	0.053	0.048	0.049
	[0.016]	[0.016]***	[0.029]*	[0.023]**
Log maturity	0.049	0.018	-0.016	-0.016
	[0.037]	[0.031]	[0.044]	[0.035]
Price grid	-0.006	0.029	0.053	0.053
	[0.037]	[0.035]	[0.051]	[0.040]
Revolver	-0.104	-0.076	-0.021	-0.022
	[0.034]***	[0.034]**	[0.043]	[0.034]
Num. of lenders	-0.002	-0.001	0.001	0.001
	[0.002]	[0.001]	[0.002]	[0.001]
Log firm size		-0.064	-0.075	-0.076
		[0.017]***	[0.060]	[0.048]
Leverage		0.363	0.302	0.295
		[0.108]***	[0.198]	[0.159]*
Profitability		-0.331	-0.568	-0.572
		[0.200]	[0.338]*	[0.268]**
Tangibility		-0.175	-0.189	-0.181
		[0.089]*	[0.372]	[0.297]
Market to book		-0.009	-0.004	-0.003
		[0.008]	[0.007]	[0.006]
S&P ratings		0.039	0.006	0.006
		[0.018]**	[0.030]	[0.024]
GDP growth	0.020	0.033	0.038	-0.051
	[0.032]	[0.031]	[0.041]	[0.045]
Credit spread				-1.169
				[0.382]***
Constant	0.065	-0.608	-0.012	1.382
	[0.276]	[0.304]**	[0.745]	[0.853]
Deal purpose	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
Firm	No	No	Yes	Yes
Observations	476	476	476	476
Adjusted R-squared	0.143	0.251	0.408	