Enterprise Risk Management and Financial Stability

in Dual-Board Corporate Governance System

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Abstract

This study investigates the effectiveness of the dual-board corporate governance mechanism on enterprise risk management and financial stability in emerging markets. Taking into account both market risk and total risk, we find activities of both boards, board of directors and the supervisory board, in these companies affect corporate risk-taking behaviors significantly, but shed light on different aspects. These findings are of interest and counter-intuitive since prior research concludes ineffectiveness of the dual-board system in China. More detailed issues, such as the endogeneity of board activities and characteristics, reciprocal causality between board behaviors and risk-taking issues, effects of political/governmental policies and ownership structure of controlling shareholders on board behaviors, asymmetrical monitoring effects of two boards on companies with various levels of financial risk, and non-linear effects of meeting frequencies of two boards, are addressed to help better understand the corporate governance-enterprise risk management relationship.

Key words: Corporate governance, enterprise risk management, corporate risk-taking, dual-board system

JEL Classification: G34, G38

1   Introduction

Late November 2004, a loss of US$554 million of China Aviation Oil (Singapore) was released, and the president of SASAC (State-owned Assets Supervision and Administration Commission of the State Council), Mr. Xiaonan Ji, claimed that this financial scandal rooted in the lack of effective financial supervision and the dysfunctional risk management. It was a wake-up call for various groups of stakeholders by bringing up the importance of strengthen the effectiveness of corporate governance in managing enterprise risk.

"Corporate governance deals with the ways in which suppliers of finance to corporations assure themselves of getting a return on their investment", and it "is of enormous practical importance" in both mature and emerging markets (Shleifer and Vishny, 1997, page 737). Advanced market economies, such as the United States and Germany, provide some of the best corporate governance mechanisms. A unitary board system is implemented in the U.S., while a two-tier board system is dominant in Germany.

With the increasing importance of globalization, international investments in emerging markets become popular, and understanding corporate governance mechanisms in those markets is of interest. Given the successes of mature financial markets, emerging markets usually learn from these "best practice" and adopt one or more successful mechanisms. One of the typical emerging markets is the Chinese market in which a unique setting, with two monitoring organs such as supervisory board and independent directors, has

been used to help maintain financial stability.

While there is a rich literature on the effectiveness and efficiency of corporate governance in both industrialized economies and emerging markets, enterprise risk management is a new component merging into the paradigm (Necco and Stulz, 2006). It has received growing attention under recent market situations following the Sarbanes-Oxley Act of 2002 and the changed NYSE Corporate Governance Rules (Beasley, Clune, and Hermanson, 2005), and has also been considered critical in the emerging markets. To the best of our knowledge, however, no study has systematically examined the unique monitoring effects of supervisory boards, coexisting with independent directors, on enterprise risk management in China, such as the risk-taking behaviors of board of directors and those of the management team.

Using corporate governance and financial data in Chinese publicly listed companies from 2001 to 2006 which saw the newly amended Corporate Law becoming effective, we take into account the monitoring effects of both supervisory board and independent directors on the board of directors in the dual-board corporate governance mechanism. Major indicators of risk-taking behaviors adopted in this study include the market risk measured by beta and the total risk measured by standard deviation, both of which are market information-based. After showing the results about monitoring effects of two boards and independent directors from preliminary tests, we further investigate the effects of endogeneity of board activities, reciprocal causality between board behaviors and risk-taking issues, effects of politi-

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cal/governmental policies and ownership structure of controlling shareholders on board behaviors, and asymmetric monitoring effects of two boards on companies with various levels of financial risk.

Empirical results show that both boards, board of directors and supervisory board, are active and effective in affecting the risk-taking behaviors in Chinese public companies, but they behave differently. First, meeting frequency of board of directors affects both total and market risk, while that of supervisory board affects the total risk through firm-specific risk under most circumstances. Second, more frequent board meetings usually motivate the management team to take higher risk, while more frequent supervisory board meetings often result in lower risk. The former phenomenon can be explained by a potential future growth or an experience of difficulty, both of which lead to more board meetings, while the latter is interpreted as better investor protection if a high frequency of supervisory board meetings is a signal of a better corporate governance system. Surprisingly, therefore, conclusions made in this study are counter-intuitive as extant literature shows that the dual-board corporate governance mechanism in Chinese listed companies is dysfunctional.

This study is expected to make multiple contributions to the corporate governance literature. First, our findings on the functioning of supervisory boards have important policy implications for Chinese authorities who have been using a trial by error to improve governance systems. Since supervisory boards and independent directorship are part of the two best governance

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practices around the world, many implications of our study can be generalized to other countries, especially economies in transition that are eager to look for effective governance. Second, La Porta, Lopez-de Silanes, Shleifer, and Vishny (2000) pointed out that the legal approach was a more "fruitful way" to understand corporate governance. Our sample period covered the 1993 Corporate Law, which was amended in 2004 and 2005 by the National People's Congress Standing Committee, the Guidelines for Introducing Independent Directors to Listed Companies (CSRC, 2001), and the Guidelines for Corporate Governance of Listed Companies (CSRC, 2002). Based on our year-by-year analysis, we are able to provide insights on how the legal approach was implemented in China to refine the corporate governance reform. Third, the 2006 Chinese Corporate Law strengthened the role of supervisory boards and codified the requirement of independent directors, but its passing was facing strong opposition. Our findings on the functioning of two boards shed light on the "political dynamics of corporate governance" (Shleifer and Vishny, 1997). Fourth, we apply the agency theory to examine the monitoring effects of supervisory boards on risk-taking behaviors in Chinese corporate governance mechanism, and this study is among the first to examine supervisory boards' role in this regard.

The article is organized as follows: in Section 2, we discuss the background for the study. Data and methodology are introduced in Section 3, followed by section 4 which presents and discusses the results. Conclusions are made in section 5.

2 Background and Research Motivations

2.1 Dual-Board Corporate Governance Mechanism in China

In the Chinese markets, publicly listed companies are required to adopt a dual-board corporate governance mechanism, which is different from the two-tier mechanism in the German economy. While Germany uses an "insider control system" and the U.S. adopts an "outsider control system", the Chinese system employs both by including a board of directors with independent directors and a supervisory board. One issue which needs to be pointed out is the difference between supervisory board in Germany and that in China; the supervisory board in Germany has similar functions to the board of directors in the U.S. economy, while that in China only monitors the behaviors of the board of directors and those of the management team.

According to the history of Chinese financial markets, the 1993 Corporate Law imposed this dual-board structure, and the China Securities Regulatory Commission (CSRC) then regulated in 2001 that all Chinese listed companies have independent directors, besides supervisory board, for monitoring. This was considered a big convergence step toward the American style. Monitoring functions and legal power of both supervisory board and independent directors were strengthened by the major amendments made to the 1993 Corporate Law in 2005; the new Corporate Law then became effective on Jan 1, 2006. As a result, each listed company in China has been required to

simultaneously have two monitoring organs that have been proved effective in two different governance systems. We believe that the Chinese governance pattern represents a bold yet worthwhile attempt toward strengthening corporate governance, and offers an excellent quasi-experimental setting to examine the effectiveness of this hybrid governance arrangement.

Whereas the agency effects of independent directors have been extensively investigated in the literature, similar examination on supervisory boards under agency theory is rare. To some extent, several studies examining corporate governance in China have addressed the roles played by supervisory boards. For instance, Dahya, Karbhari, Xiao, and Yang (2003) interviewed 16 Chinese listed companies in 1999 and investigated the role of supervisory boards. In another study, Firth, Fung, and Rui (2007) examined the role of supervisory boards, among other governance elements, on the quality of earnings using data up to 2003. Both studies are good attempts to shed light on the functioning of corporate governance mechanisms in China at different stages.

2.2 Enterprise Risk Management and Corporate Governance

There is a rich literature on the relationship between investor protection and corporate governance in the field of corporate finance (e.g., La Porta, et al., 2000; Morck, Wolfenzon and Yeung, 2000; Wurgler, 2000; Lombardo and

Pagano, 2002; Shleifer and Wolfenzon, 2002; Burkart, Panunzi and Shleifer, 2003; Castro, Clementi and MacDonald, 2004; Durnev, Li, Morck and Yeung, 2004a,b). As pointed out by John, Litov and Yeung (2007), however, most of the previous studies on this topic focus on the financing structure issues, while very few of them emphasize on corporate investment, especially the corporate risk-taking behaviors.

In prior research on investor protection, empirical results show that generally, there is a positive relationship between the level of investor protection and that of corporate risk taken by firms; in other words, higher investor protection results in choosing value-enhancing projects with higher risk. This conclusion has also been supported by cross-country studies (e.g., La Porta, Lopez-de Silanes and Shleifer, 1999; Leuz, Nanda and Wysocki, 2003; John, et al., 2007) in this field using the variation of cash flow-total assets ratios as proxies for corporate risk (La Porta, Lopez-de Silanes, Shleifer, and Vishny, 1997, 1998).

John, et al. (1997) summarize three major interpretations presented in previous studies. One of them is that a better corporate governance mechanism helps protect investors' benefits by mitigating management team's career concerns (Holmstrom and Ricart I Costa; 1986; Hirshleifer and Thakor, 1992). Another interpretation is through the controlling ownership which induces corporate decision makers to choose projects with lower risk (e.g., Berglof and Perotti, 1994; La Porta et al., 1999; Claessens, Djankov and Lang, 2000; Faccio and Lang, 2002; Rajan and Zingales, 1995; Morck, et

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al., 2005; Stulz, 2005). The third possible reason is that powerful creditors and government-owned stakeholders in locations and countries with poor investor protection tend to take lower corporate risk (e.g., Roe, 2003; Faleye, Mehrotra and Morck, 2006).

In China's dual-board corporate governance system, all three possible reasons stated above may apply due to relatively poor investor protection. This is further worsened by the special features of dominant shareholders and the power of state-owned shareholders and creditors in public companies. Recently, policy makers in the Chinese government have made significant efforts to improve the effectiveness of corporate governance so as to better protect investors' benefits. One of the significant examples of these efforts is the multiple amendments of China's Corporate Law in the past fifteen years.

According to the Corporate Law which became newly effective early 2006, responsibilities of the two boards, board of directors and supervisory board, have been clearly specified, and the monitoring functions of different organs in the dual-board corporate governance system are also characterized respectively. In this unique corporate governance mechanism, board of directors, together with the top management team, is responsible for daily operations of a public company, and the supervisory board is one of the two monitoring organs. The other monitoring organ is the independent directors on the board of directors.

Thus, when we expect the investor protection has been improved in the Chinese economic environment, a more effective corporate governance mech-

anism in Chinese publicly listed companies proxied by a higher monitoring-induced meeting frequency of board of directors is expected to result in a higher level of corporate risk. In addition, most of the previous studies conclude that supervisory board is dysfunctional (Dahya, et al., 2003; Xi, 2006). Using data up to date, however, some recent studies (Ding, et al., 2008) have shown opposite results, and the effectiveness of supervisory board has been highlighted. Wu, Li, Ding and Jia (2008) also show the significant influences of supervisory board on financial leverage based on accounting information. In the current study focusing on corporate risk-taking behaviors based on market returns, we expect the supervisory board meeting frequency to have a negative effect on the risk level under certain circumstance, especially when the risk is sufficiently high and when companies experience financial difficulty.

In short, the major research questions that are expected to be answered by the current research include:

- Do meeting frequencies of two boards affect the risk-taking behaviors in Chinese publicly listed firms? If yes, how?

- What are the interactions between meeting frequencies of two boards and risk-taking behaviors in Chinese publicly listed firms?

- What are the effects of governmental policies and ownership structure of controlling shareholders on board activities and characteristics?

- Are the effects of board activities and characteristics on risk-taking behaviors symmetric in companies with various levels of financial risk?

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- Are there non-linear effects of meeting frequencies of two boards in Chinese publicly listed firms with different levels of stock performance-based risk measures?

3 The Methodology

3.1 Data and Variables

Data used for the current study include information about the corporate governance mechanisms of Chinese publicly listed companies, their performance in stock markets, and their accounting information from 2001 to 2006. The sources of our data are GuoTaiAn (GTA) and SINOFIN, two leading companies in the industry of publishing financial market data in China. Studies based on their products, such as Firth, et al. (2007), Sun and Tong (2003), Bai, Liu, Lu, Song and Zhang (2004), Wei, Xie and Zhang (2005), Haw, Qi, Wu and Wu (2005), Kato and Long (2006), and Jia (2008), have been published on leading finance and accounting journals. The sample adopted for this study to answer the research questions has 8,742 observations, and this sample provides robust results due to the reliability of the information carried in the data sets and the validity of methodologies used in this study.

In this subsection, we also provide a brief description of the dependent, key independent variables, and control variables adopted to answer the research questions proposed above.

3.1.1 Dependent Variables: Risk-Taking Behaviors

In the traditional finance literature, two types of information can be used to measure corporate risk-taking behaviors; one is the accounting information about capital structure used for estimating financial leverage based on variables such as debt-to-equity ratio and total liabilities-total assets ratio, and the other is the market information about stock returns used for estimating total risk measured by sigma (standard deviation) and the market component of risk measured by beta.

Instead of investigating the relationship between corporate governance and corporate financing, this study emphasizes on the influence of governance structure on corporate investment. Therefore, we take into account the two market-return-based risk measures, the standard deviation of daily stock returns (σ) measuring a firm's total risk, and the market beta estimated by daily returns of a firm (β) measuring its market component of risk[1].

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[1]σ and *beta* are estimated using

$$\sigma = \sqrt{\frac{\sum_{t=1}^{n} R_t^2 - \frac{1}{n}(\sum_{t=1}^{n} R_t)^2}{n-1}}$$

$$\beta = \frac{\sum_{t=1}^{n}\left(R_t R_{m,3t}\right) - \frac{1}{n}\left(\sum_{t=1}^{n} R_t \cdot \sum_{t=1}^{n} R_{m,3t}\right)}{\sum_{t=1}^{n}\left(R_{m,t} R_{m,3t}\right) - \frac{1}{n}\left(\sum_{t=1}^{n} R_{m,t} \cdot \sum_{t=1}^{n} R_{m,3t}\right)}$$

where $R_t = \ln(1+r_t)$, $R_{m,t} = \ln(1+r_{m,t})$, and $R_{m,3t} = R_{m,t-1} + R_{m,t} + R_{m,t+1}$. n is the total number of trading days within a year. r_t is a stock's daily return including capital gain and dividends at date t, and $r_{m,t}$ is the market daily return weighted by market value at date t.

3.1.2 Independent Variables: Meeting Frequencies of Two Boards

Particularly, we investigate the relationship between firm's risk-taking behaviors and the functionalities of the two boards, board of directors and supervisory board, in Chinese corporate governance system. Following the literature (e.g., Vafeas, 1999; Ding, Wu, Li and Jia, 2008), we proxy boards' functionalities by their annual meeting frequencies, board meeting frequency ($bdmeet$) and supervisory board meeting frequency ($sbmeet$), respectively.

3.1.3 Control Variables

We also include six groups of control variables in the analysis for further demonstrating various aspects of the whole big picture. These six groups include characteristics of board of directors ($BDCHARACT$), characteristics of supervisory board ($SBCHARACT$), characteristics of controlling shareholders ($OWNER$), other corporate governance variables ($OCORPGOV$), firm-specific factors such as firm performance, financial risk, and growth potential ($PERF$), and other control variables ($COVATS$).

The first two groups, $BDCHARACT$ and $SBCHARACT$, have similar factors such as the size of board of directors ($bdsize$) and that of the supervisory board ($sbsize$), the gender of two board chairs ($gender_{bc}$ and $gender_{sbc}$), the age of them (age_{bc} and age_{sbc}), whether they are paid by the listed company ($paid_{bc}$ and $paid_{sbc}$), and the percentage of shares held by them ($pctshare_{bc}$ and $pctshare_{sbc}$). Subscripts bc and sbc stand for board chair and supervisory board chair, respectively. $paid_{bc}$ and $paid_{sbc}$ are dummy

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variables, with a value of one if the answer is yes and zero otherwise. The tenure and turnover of two board chairs, denoted as $tenure_{bc}$, $turnover_{bc}$, $tenure_{sbc}$, and $turnover_{sbc}$ respectively, are also included.

Four variables are included in the group of control variables characterizing controlling shareholders, and they are $foreignContrl, soe3contl, float2total$, and $herfindahl$. The first two variables are dummies; $foreignContrl$ indicates whether the largest shareholder is a foreign investor, and $soe3contl$ measures whether at least one of the ten largest shareholders is state-owned. In addition, one of the special features of Chinese public companies is that a large portion of their shares are non-tradeable since a lot of them were converted from state-owned enterprises. Therefore, the percentage of shares that are tradeable may have effects on the corporate investment behaviors of the management team. Therefore, we include a variable to $float2total$ capture this effect by indicating the percentage of tradeable shares. To characterize ownership concentration of controlling shareholders, we follow Chen, Firth, Gao and Rui (2006) and Ding, et al. (2008) and include the Herfindahl index ($herfindahl$) in the analysis.

Other corporate governance variables, such as the number of independent board members ($ibsize$), the size of the top management team ($exesize$), a dummy of whether CEO also holds the position of board chair ($bcceodual$), and a dummy measuring the CEO turnover ($turn_{ceo}$), are adopted by the current study to further illustrate the agency issues. Previous studies have shown that the existence and size of independent directors have significant

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monitoring effects on the behaviors of management team, and that agency costs could be alleviated if the chairman of the board is also the CEO due to a lower level of ownership-management separation (Xi, 2006; Firth, Fung and Rui, 2006).

To control for firm specific characteristics, we include two performance variables, the accounting return measured by return on assets (roa) and the market return measured by capital gain plus the dividends ($CapDiv$). Three other variables are financial leverage indicated by the total liabilities-total assets ratio (lta), firm's growth potential shown by Tobin's Q ($TobinQ$), and the natural logarithm of firm size based on total assets ($lnta$). Other control variables characterize industry-specific heterogeneity ($indcd$) and time-series effects ($year_t$). 12 industry dummies are included in the empirical analysis according to the 13 industries categorized by the CSRC.

3.2   The Main Structural Model

Prior research (e.g., Vafeas, 1999) shows that board meeting frequency is negatively related to the lagged firm performance; in other words, firms with poor performance in the year before tend to hold more board meetings. This issue can be investigated in a broader view; firms with more issues to deal with are more likely to hold more meetings. In the Chinese corporate governance mechanism, as discussed before, board of directors is mainly responsible for daily operations of a firm, while supervisory board is a monitoring organ. Thus, it is reasonable to have a reciprocal causality between the corporate

risk-taking behaviors and meeting frequencies of two boards.

To make it clear, we expect to see risk affected by the meeting frequencies of two boards, as well as more meetings caused by lagged performance and risk-taking behaviors, both lagged and current. Technically, the above reciprocal causality can be expressed by the following structural model with a system of equations, which defines the relationship between risk measures, firms' total risk σ and market risk β, and their corporate governance characteristics with focus on meeting frequencies:

$$
\begin{aligned}
\sigma = {}& \alpha_1 + \alpha_2 bdmeet + \alpha_3 sbmeet + \alpha_4 \sigma_{lag} + \alpha_5 \beta_{lag} + \alpha_6 PERF_{lag} \\
& + \alpha_7 BDCHARACT + \alpha_8 SBCHARACT + \alpha_9 OWNER \quad (1) \\
& + \alpha_{10} OCORPGOV + \alpha_{11} COVATS + \epsilon_1
\end{aligned}
$$

$$
\begin{aligned}
\beta = {}& \gamma_1 + \gamma_2 bdmeet + \gamma_3 sbmeet + \gamma_4 \sigma_{lag} + \gamma_5 \beta_{lag} + \gamma_6 PERF_{lag} \\
& + \gamma_7 BDCHARACT + \gamma_8 SBCHARACT + \gamma_9 OWNER \quad (2) \\
& + \gamma_{10} OCORPGOV + \gamma_{11} COVATS + \epsilon_2
\end{aligned}
$$

$$
\begin{aligned}
bdmeet = {}& \theta_1 + \theta_2 sbmeet + \theta_3 \sigma + \theta_4 \beta + \theta_5 \sigma_{lag} + \theta_6 \beta_{lag} + \theta_7 PERF_{lag} \\
& + \theta_8 BDCHARACT + \theta_9 OWNER + \theta_{10} OCORPGOV \quad (3) \\
& + \theta_{11} COVATS + \epsilon_3
\end{aligned}
$$

$$sbmeet = \eta_1 + \eta_2 bdmeet + \eta_3\sigma + \eta_4\beta + \eta_5\sigma_{lag} + \eta_6\beta_{lag} + \eta_7 PERF_{lag}$$
$$+ \eta_8 SBCHARACT + \eta_9 OWNER + \eta_{10} OCORPGOV \quad (4)$$
$$+ \eta_{11} COVATS + \epsilon_4$$

Unfortunately, this simple OLS regression system is not enough to address the simultaneity issues between board meeting frequency and supervisory board meeting frequency, or the endogeneity and reciprocal causality issues between meeting frequency and firm-specific features, such as firm risk, lagged performance and lagged firm risk. In the next section, therefore, we will construct multi-stage least-square models to fully account for these concerns.

3.3 Four-stage multivariate least square regressions

In this section, we present a four-stage multivariate least square (namely 4SMLS) regression to estimate and analyze the structural equation system. The first stage uses $tenure_{bc}$ as an instrumental variable for $bdmeet$, and $tenure_{sbc}$ as an instrument for $sbmeet$, to resolve the simultaneity issues between the two variables $bdmeet$ and $sbmeet$:

$$bdmeet = \delta_1 + \delta_2 tenure_{bc} + \delta_3\sigma_{lag} + \delta_4\beta_{lag} + \delta_5 PERF_{lag}$$
$$+ \delta_6 BDCHARACT + \delta_7 OWNER + \delta_8 OCORPGOV \quad (5)$$
$$+ \delta_9 COVATS + \mu_1$$

$$sbmeet = \varphi_1 + \varphi_2 tenure_{sbc} + \varphi_3 \sigma_{lag} + \varphi_4 \beta_{lag} + \varphi_5 PERF_{lag}$$

$$+ \varphi_6 SBCHARACT + \varphi_7 OWNER + \varphi_8 OCORPGOV \quad (6)$$

$$+ \varphi_9 COVATS + \nu_1$$

Fitted values, $bdmf_{fit1}$ and $sbmf_{fit1}$, are estimated respectively for the next stage.

To address the unobserved heterogeneity in explaining the variation of two meeting frequencies, $bdmeet$ and $sbmeet$, we design the second stage regression which calculates the residuals for the usage in the third stage. The second stage uses $turnover_{bc}$ and $turnover_{sbc}$ as the additional instrumental variable for $bdmeet$ and $sbmeet$, respectively, to resolve the endogeneity concerns between these two meeting frequencies and the risk variables, σ and β. It also includes the first stage fitted value $bdmf_{fit1}$ and $sbmf_{fit1}$ as explanatory variables. Thus, residuals from the second stage are expected to capture the unobserved heterogeneity (Greene, 2002). Stage 2 regression is written as:

$$bdmeet = \rho_1 + \rho_2 turnover_{bc} + \rho_3 sbmf_{fit1} + \rho_4 \sigma + \rho_5 \beta + \rho_6 \sigma_{lag} + \rho_7 \beta_{lag}$$

$$+ \rho_8 PERF_{lag} + \rho_9 BDCHARACT + \rho_{10} OWNER$$

$$+ \rho_{11} OCORPGOV + \rho_{12} COVATS + \mu_2$$

$$(7)$$

$$sbmeet = \varrho_1 + + \varrho_2 turnover_{sbc} + \varrho_3 bdmf_{fit1} + \varrho_4 \sigma + \varrho_5 \beta$$
$$+ \varrho_6 \sigma_{lag} + \varrho_7 \beta_{lag} + \varrho_8 PERF_{lag} + \varrho_9 SBCHARACT \qquad (8)$$
$$+ \varrho_{10} OWNER + \varrho_{11} OCORPGOV + \varrho_{12} COVATS + \nu_2$$

The disturbances μ_2 and ν_2 reflect the impact of various unmeasured factors on meeting frequency and firm risk.

The third stage regression therefore needs to include these two second-stage residuals, $bdmf_{res} = \mu_2$ and $sbmf_{res} = \nu_2$, as explanatory variables to capture the unobserved heterogeneity in $bdmeet$ and $sbmeet$. Instrumental variables, $turnover_{bc}$ and $turnover_{sbc}$, and the first-stage fitted values, $bdmf_{fit1}$ and $sbmf_{fit1}$ are also included. At Stage 3, regressions can be presented as:

$$bdmeet = \psi_1 + \psi_2 turnover_{bc} + \psi_3 sbmf_{fit1} + \psi_4 sbmf_{res} + \psi_5 \sigma + \psi_6 \beta$$
$$+ \psi_7 \sigma_{lag} + \psi_8 \beta_{lag} + \psi_9 PERF_{lag} + \psi_{10} BDCHARACT$$
$$+ \psi_{11} OWNER + \psi_{12} OCORPGOV + \psi_{13} COVATS + \mu_3$$
$$(9)$$

$$sbmeet = \chi_1 + \chi_2 turnover_{sbc} + \chi_3 bdmf_{fit1} + \chi_4 bdmf_{res} + \chi_5 \sigma + \chi_6 \beta$$
$$+ \chi_7 \sigma_{lag} + \chi_8 \beta_{lag} + \chi_9 PERF_{lag} + \chi_{10} SBCHARACT$$
$$+ \chi_{11} OWNER + \chi_{12} OCORPGOV + \chi_{13} COVATS + \nu_3$$
$$(10)$$

To resolve the simultaneity between meeting frequencies and firm's risk variables, σ and β, the fitted value from the third stage, $bdmf_{fit2}$ and $sbmf_{fit2}$ are included in the fourth stage as explanatory variables. Therefore, Stage 4 regressions are

$$
\begin{aligned}
\sigma = \alpha_1 + \alpha_2 bdmf_{fit2} + \alpha_3 sbmf_{fit2} + \alpha_4 \sigma_{lag} + \alpha_5 \beta_{lag} + \alpha_6 PERF_{lag} \\
+ \alpha_7 BDCHARACT + \alpha_8 SBCHARACT + \alpha_9 OWNER \quad (11) \\
+ \alpha_{10} OCORPGOV + \alpha_{11} COVATS + \epsilon_1
\end{aligned}
$$

$$
\begin{aligned}
\beta = \ \gamma_1 + \gamma_2 bdmf_{fit2} + \gamma_3 sbmf_{fit2} + \gamma_4 \sigma_{lag} + \gamma_5 \beta_{lag} + \gamma_6 PERF_{lag} \\
+ \gamma_7 BDCHARACT + \gamma_8 SBCHARACT + \gamma_9 OWNER \quad (12) \\
+ \gamma_{10} OCORPGOV + \gamma_{11} COVATS + \epsilon_2
\end{aligned}
$$

Equations (5)-(12) together define a structural simultaneous equations system, and this system resolves relevant empirical issues, such as simultaneity, heteroscedasticity, and endogeneity, that may cause potential bias. Adopting such a system of models ensures the validity of the empirical analysis which yields robust results.

4 Empirical Results

4.1 Descriptive Statistics

Table 1 reports sample statistics for all the public firms listed in two stock markets in China, Shanghai Stock Exchange and Shenzhen Stock Exchange, from 2001 to 2006. In the pooled sample, firms' average total risk is standard deviation 2.42% and average market risk is beta 1.1. In 2005 and 2006, we observe a significant increase in corporate risk taken by these firms. Firms' leverage ratio increased continuously from 0.49 in year 2001 to 1.27 in 2006. Firms' average equity return, including capital gain and dividend return, stayed negative from 2001 to 2005, but jumped to positive 39% in 2006. Accordingly, we observe a significant increase in Tobin's Q but a large drop in return on assets (ROA) in 2006.

Most characteristics of the corporate governance were stable from 2001 to 2006 except for some major corporate governance structure variables, such as the meeting frequencies of boards of directors and supervisory boards (*bdmeet* and *sbmeet*), the number of independent board members (*ibsize*), and the percentage ownership held by board and supervisory board chairs (*pctshare_bc* and *pctshare_sbc*). On average, the corporate boards met 7.55 times per year and supervisory boards met 3.59 time per year with an increase in both 2002 and 2006. The average number of independent board members was 0.62 in 2001, then kept increasing to 3.3 in 2006. These changes in the features of corporate governance systems from 2001 to 2006 demonstrate

the significant improvement of monitoring efficiency and the effectiveness of governance structure in Chinese publicly listed companies.

The average percentage ownership held by board chairs increased from 0.02% in 2001 to 0.94% in 2006, and the average percentage ownership held by supervisory board chairs increased from virtually none in 2001 to 0.03% in 2006. This increase in average percentage shares held by these two board chairs indicates the fact that at least part of their economic benefits are becoming more closely related to the firm performance, and of course the associated risk. Therefore, we believe that, from 2001 and 2006, both corporate board and supervisory board became at least more economically motivated to monitoring their firms'equity risk, if not motivated by other factors such as legislative requirements.

To spare space, we do not repeat the descriptive statistics of other variables presented in Table 1.

4.2   Pooled Sample Regressions

Table 2 reports the results of the 4SMLS regression using the pooled sample. Panel A in Table 2 shows the results of the first three stages of auxiliary regressions that focus on how corporate board and supervisory board meeting frequencies are affected by firms risk and by performance while controlling other corporate governance characteristics. Panel B in Table 2 presents the results of the fourth stage regression which focuses on how firm risk is affected by corporate board and supervisory board meeting frequency while

controlling firm performance and other covariates. Not surprisingly, after purging out the endogeneity and heterogeneity between board meeting frequency (*bdmeet*) and supervisory board meeting frequency (*sbmeet*) in the first two stage regressions[2], we observe a significant relationship between firm risk and board/supervisory board meeting frequency.

4.2.1 The Variation of Meeting Frequencies (Stages 1-3)

Empirical analysis at Stages 1 to 3 whose results are presented in Panel A of Table 2 provides us with the following interesting views. First, corporate risk-taking behaviors significantly affect the meeting frequencies of the two boards. We observe that current total risk (σ) has a significant positive relation with board meeting frequency, but not with supervisory board meeting frequency. As a firm's total risk increases, its board would tend to meet more often but its supervisory board would not do so. We also observe that both current market risk (β) and lagged market risk (β_L) have significant negative relation with board meeting frequency but not with supervisory board meeting frequency. This implies that if a firm's past market risk increased, and/or current market risk increases, its board would tend to meet less but its supervisory board seems not to care about the change in market risk.

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[2]Please note that the t-statistics for the coefficient estimates on the two sets of instrumental variables, $tenure_{bc}$ and $tenure_{sbc}$ in stage 1 regression, $turnover_{bc}$ and $turnover_{sbc}$ in stage 2 are all above 2.58 which indicates they are partially correlated with the endogenous variables once the other exogenous variables have been netted out, i.e., $cov(z, X) \neq 0$. Hence, they are not weak instruments. We also test the condition of whether the instruments are exogenous in stage 3, i.e., $cov(z, u) = 0$ using Hausman specification test. It turns out they are valid instruments.

These differences illustrate the fact that resulting from the legal require-
ments stated in the Corporate Law, board of directors manages the daily
operations of the companies while supervisory board does not react actively
unless extreme/special circumstances occur.

Second, we find that supervisory board meeting frequency and board
meeting frequency are positively correlated with each other at 1% signifi-
cance level, which means in those firms whose boards meet more frequently,
the supervisory boards also tend to meet more, and vice versa. These, to
some degree, show the effectiveness of the Chinese dual-board corporate gov-
ernance system. Third, in the regression of the board meeting frequency, firm
size, government ownership, CEO turnover dummy, board size, supervisory
board size, top management team size, and gender and age of the chair of
board are statistically significant. In the regression of the supervisory board
meeting frequency, similarly, supervisory board size, the dummy of whether
supervisory board chair gets paid, and the number of independent board
members are statistically significant. What is different from the results pre-
sented in prior research is that lagged firm performance does not affect the
meeting frequencies of two boards significantly.

Overall, the stage 3 regressions of board meeting frequency and supervi-
sory board meeting frequency have a good explanatory power as the R^2 being
15.3% and 23.2%, respectively. These three stages of the empirical analysis
pave the road for our main test for investigating the corporate risk-corporate
governance relationship, since they deal with the endogeneity, heteroscedas-

ticity, and simultaneity issues which could result in inaccurate estimate.

4.2.2   The Variation of Firm Risk (Stage 4)

In Stage 4 regression, whose results are presented in Panel B of Table 2, we observe significantly positive effects of board meeting frequency on firm's total risk and market risk. These results suggest that a better corporate governance mechanism, if a higher board meeting frequency is a signal of more effective governance, generally results in higher corporate risk. In the meantime, supervisory board meeting frequency has a significant negatively effect on total risk but no significant effect on market risk. This suggests that supervisory boards tend to monitor corporate risk-taking behaviors through reducing the firm-specific component of total risk, but they do not affect the market-component risk directly. On average, if a firm's board members meet one more time in a year, its total risk would increase by 15.54%, but its market risk would only increase by 2.14%. One of the interpretations is that the financial market absorbs part of the changes in total risk, i.e., the idiosyncratic-risk component. On the other hand, if supervisory board members meet one more time in a year, a firm's total risk decreases by 7.32%.

The sizes of two boards (corporate board and supervisory board) play a significantly positive role in explaining the variation of firms' total risk, but none of them is a significant predictor of market risk. Adding one board member increases the firms' total risk by 1.47%, and adding one to the supervisory board increases it by 1.97%. These indicate that a larger board of

directors or a larger supervisory board tend to take higher total risk. The economic impact of the dummy variable $paid\_sbc$, whether a supervisory board chair gets paid, is noteworthy here. If the supervisory board chair gets paid, the firm's market risk drops by 1.82% at the 5% significance level and the total risk drops by 2.45% only at the 10% significance level. Paid supervisory board chairs tend to be economically motivated to lower risk. Meanwhile, the number of independent board members also has a significantly negative impact on the total risk. This suggests that, like supervisory board member, independent directors on the board are also interested in reducing, rather than increasing, total risk. As a firm gets more and more independent board members, they become more effective in monitoring the board's risk taking behavior.

The CEO turnover dummy and the ratio of tradeable shares to total outstanding shares are both significantly related to the variation of total risk, but none of them are related to the variation of market risk. If there is a CEO turnover, total risk will decrease by 10.16% since a new CEO is more likely to be cautious in taking risk. In addition, if the ratio of tradeable shares to total outstanding shares ($float2total$) increases by one unit, the total risk decreases by 17.08%. This is mainly because more tradeable shares available in the market potentially help controlling shareholders from manipulating share price.

Additionally, we find a highly, significantly positive effect of government controlling ownership on total risk and market risk, and a significantly pos-

itive influence of ownership concentration on firm's total risk. For instance, the controlling ownership of government increases the total risk by 8.91% and the market risk by 2.26%, respectively. These results can be explained by the so-called "tunneling distortion" since dominant shareholders could benefit from transferring cash flows to other units.

Another interesting phenomenon is that most of the year dummies, those from 2004 to 2006, have significantly positive effects on firm's total risk, and these show the improvement of investor protection over time. In addition, firm size is always significant for explaining risk variations. In summary, the effectiveness of the China's dual-board corporate governance mechanism, including the investor protection functions of board of directors and the monitoring functions of supervisory board, has been illustrated by the empirical results.

4.3   Year-Based Subsamples

As stated above, corporate governance-corporate risk relationship is of significance over time, especially in Years 2004-2006. To further illustrate the increasing effectiveness of corporate governance systems in Chinese publicly listed companies, we also run Stage 4 regression using sub-samples based on years. Results are presented in Table 3.

4.3.1 Year-Based Regressions for Total Risk and Market Risk

Panel A of Table 3 presents the results of total risk regressions. The overall significance of these year-based regressions are generally high, as he F-statistics is always below 5% and the adjusted R^2 varies between 33% and 51%. We find that the impact of board meeting frequency is always significant and positive over years. The coefficients on board meeting frequency increase from 7.53% in 2001 to 30% in 2006, which indicate that corporate boards become a more effective risk taker by meeting more. The impact of supervisory board meeting frequency is not always significant. Only in 2002, 2005 and 2006, the supervisory board meeting frequency has a significantly negative relation with the total risk. One interpretation is that the monitoring function of supervisory board was strengthened due to the enforcement of newly-amended Chinese Corporate Law.

Panel B of Table 3 presents the results of market risk regressions. Although the overall significance of these year-based regressions are also good, the explanatory power of both board and supervisory board meeting frequencies have dropped. Board meeting frequency is significantly and positively related to market risk only in 2005 and 2006. Supervisory board meeting frequency is significantly and negatively related to market risk only in 2002. Again this is consistent with our previous observation that corporate board and supervisory board either do not care about or have less control of market risk.

4.3.2 Subsamples Based on Macroeconomic Changes

As Chinese stock markets experienced a dramatic turnaround starting early 2005, we divide our full sample into two subsamples: 2001 to 2004 and 2005 to 2006. The results are reported in Panel C of Table 3.

Similar to the pooled sample regression results, we observe significantly positive effects of board meeting frequency on firm's total risk and market risk in both subsamples. Supervisory board meeting frequency has a significantly negative effect on total risk in both subsamples, but no effect on market risk in either one. The coefficient estimates of two meeting frequency variables are more significant and of larger magnitude in 2005-2006 subsample than in 2001-2004 subsample. This also verifies our observation about the tendency that corporate boards became a more effective risk taker by meeting more, but that supervisory boards became a more effective risk controller by meeting more. Both of these two aspects of the conclusions again show the improvement of investor protection through effective corporate governance mechanism in Chinese public companies.

Other significant explanatory variables, including board/supervisory board size, the number of independent board directors, the dummy of CEO turnover, the dummy of whether supervisory board gets paid, the ownership structure variables, are all exhibiting the same type of strengthening tendency from the 2005-2006 subsample to 2001-2004 subsample.

4.4 Financial Leverage-Based Subsample

It is also of interest to explore patterns of the relationship between the board / supervisory board meeting frequency and corporate risk-taking across groups stratified by firm's financial leverage. Table 4 presents results of Stage 4 regressions for two subsamples based on firm leverage ratio. One is the high leverage subsample which includes those firms with leverage ratio greater than industry average leverage ratio. The other is the low leverage subsample which includes those firms with leverage ratio less than industry average leverage ratio. For each of these two leverage subsamples, we run Stage 4 regressions using the pooled, year 2001-2004 and year 2005-2006 data.

4.4.1 High Leverage Firms

In the regression of total risk for high leverage firms (the left half in Panel A of Table 4), board meeting frequency is always significantly positive, but supervisory board meeting frequency is always significantly negative. Board size is only marginally significantly positive in the pooled sample, which suggests that increase in the number of board members increases firms' total risk, i.e., a larger board tends to take more risk in high leverage firms. Supervisory board size is significantly positive in the pooled sample, which suggests that, in high leverage firms, increase in the number of supervisory board members increases firms' total risk as well, potentially because a larger supervisory board is less efficient in controlling firm's total risk. The number of independent board members is not significant anymore. The dummy of

CEO turnover, government controlling ownership and ownership concentration are also significant and of the same sign as being expected. However, the dummy of whether supervisory board gets paid and the ratio of tradeable shares to total outstanding shares are insignificant predictors of total risk in high leverage firms.

In the regression of market risk for high leverage firms (the right half in Panel A of Table 4), on the other hand, board meeting frequency is significantly positive in the pooled subsample and in the 2001-2004 subsample, whereas supervisory board meeting frequency is only significantly negative in the pooled subsample. Supervisory board size is still significantly positive in the pooled sample, but board size and the number of independent board members become insignificant. Government controlling ownership is significantly positive, while other variables, such as the dummy of CEO turnover, ownership concentration, the dummy of whether supervisory board gets paid, and the ratio of tradeable shares to total outstanding shares, become insignificant.

4.4.2   Low Leverage Firms

In the regression of total risk for low leverage firms (the left half in Panel B of Table 4), board meeting frequency is always significantly positive but supervisory board meeting frequency is always significantly negative; these are similar to the results of high leverage firms. Sizes of both boards have significantly positive effects on total risk, but the number of independent

board directors has significantly negative effect on it. All other variables of interests, including the dummy of CEO turnover, government controlling ownership, ownership concentration, the ratio of tradeable shares to total outstanding shares and the dummy of whether supervisory board gets paid, are significant and of the same sign as being expected.

In the regression of market risk for low leverage firms (the right half in Panel B of Table 4), in addition, only board meeting frequency is significantly positive in the pooled subsample and the 2005-2006 subsample. Most other corporate governance variables, except for the dummy of CEO turnover, do not have significant explanatory power on the variation of market risk in low leverage firms.

In a word, the effects of board meeting frequency on corporate risk-taking, both total risk and market risk, are symmetric between firms with high level of financial leverage and those with low level. However, the influences of supervisory board meeting frequency on market risk are asymmetric, but those on total risk are symmetric.

4.5 Total Risk- and Market Risk-Based Subsamples

To help further understand the behaviors of board members and supervisory board members in companies with different firm risk level, we split the full sample into three subsamples based on risk level and rerun Stage 4 regressions in each of them. Panel A of Table 5 reports the results for three (low, medium and high) different total risk subsamples, and those from the three market

risk-based subsamples are presented in Panel B of Table 5.

4.5.1   Total Risk-Based Subsamples

According to the empirical results based on three total risk-based subsamples, the coefficients on board meeting frequency are always positive and significant across three subsamples. More interestingly, the significance level and the magnitude of the effect of board meeting frequency increase across subsamples; the impact of board meeting frequency on total risk is much smaller in firms with lower total risk than in firms with higher total risk. Increasing board meetings by one more time would increase the total risk by 2.56% for low total risk firms versus 15.71% for high total risk firms. There might be two explanations for this phenomenon. One is that the board of high total risk firms are more efficient and effective in taking risk by making risky investment decisions in board meetings. The other is that shareholders of these high total risk firms may be more alert and acute in perceiving risks, and their perceptions about risk are going to be reelected in the daily changes of share price, which enlarges the total risk measured by the standard deviation of daily share price.

The coefficients on supervisory board meeting frequency are significantly negative in low and high total risk firms, but not in medium-level total risk firms. This suggests that the objective of supervisory board meetings is always to control the risk for low and high total risk firms. In medium-level total risk firms, however, the function of supervisory board about risk control

is not activated.

Other significant explanatory variables also exhibit a similar pattern — either the significance level or the magnitude of the coefficient estimates increases across three subsamples. Board size, supervisory board size, and government controlling ownership have positive effects on total risk. The size of management team, the dummy of CEO turnover, and the ratio of tradeable shares to total outstanding shares have negative effects on total risk.

4.5.2 Market Risk-Based Subsamples

As shown by the empirical results presented in Panel B of Table 5 based on different market risk subsamples, the effect of board meeting frequency on market risk is only significant and positive in high market risk firms. It could be that board members are not interested in raising firms' market risk if it is not sufficiently high. After all, any increase in market risk will have repercussion on firms' share price. If a firm's market risk is rising, the market will use larger discount rate to value the firm. Ideally, therefore, the board would want to increase the firm's idiosyncratic risk without affecting the market risk, and as a result, the expected cash flow increases but the discount rate does not. Thus, shareholders get benefits from higher share prices.

4.6 Government Controlling Ownership-Based Subsamples

In Chinese capital markets, a large portion of the publicly listed companies were converted from state-owned enterprises, and they have become more and more market-driven over years. To further investigate how government controlling ownership might affect the relationship between corporate risk-taking and board/supervisory board meeting frequency, we construct two subsamples using the dummy of whether government is a controlling shareholder. The results are presented in Table 6.

In the regression of total risk, coefficients on two meeting frequency variables are always significant and of the same sign as before in both government/nongoverment controlling subsample. Except for the number of independent board members, other variables such as board size, supervisory board size, the dummy of CEO turnover, ownership concentration, the ratio of tradeable shares to total outstanding shares, and the dummy of whether supervisory board gets paid are all significant and of the same sign as being expected in the government controlling subsample (Table 6 Panel A). However, in the nongovernment controlling subsample (Table 6 Panel B), only board size, the dummy of CEO turnover, and the ratio of tradeable shares to total outstanding shares are significant and of the expected sign. None of the rest of the explanatory variables are significant.

In the regression of market risk, in addition, we find four significant

explanatory variables, including board meeting frequency, the dummy of whether supervisory board gets paid, the dummy of CEO turnover, and supervisory board size, based on government controlling subsample. However, there is only one significant explanatory variable, board meeting frequency, in nongovernment controlling subsample. Roughly speaking, the relations between risk and meeting frequencies, as well as that between risk and other corporate governance variables, are stronger in firms with government controlling ownership than in firms without it.

4.7 Robustness Tests

To ensure the validity of the above analysis and the reliability of corresponding results, we construct two alternative meeting frequency specifications, $bdmf_{dev}$ and $sbmf_{dev}$, defined as

$$bdmf_{dev} = bdmeet - \text{industry average } bdmeet \tag{13}$$

$$sbmf_{dev} = sbmeet - \text{industry average } sbmeet \tag{14}$$

These two variables measure the deviations of individual firm's (board or supervisory board) meeting frequency from industry average (board or supervisory board) meeting frequency, respectively. We use these two variables to replace the original observed meeting frequency variables, $bdmeet$ and $sbmeet$, and rerun the 4SMLS model. The results from Stage 4 regression are presented in Table 7 Panel A for total risk σ and Panel B for market

risk β.

In the pooled sample, the meeting frequency deviations are still significant in explaining the variations of firms' total risk and market risk. The board meeting frequency deviation has significant and positive effect on firms' total risk and market risk, but the supervisory board meeting frequency deviation has significant and negative effect on these two categories of firm risk.

We also examine the effects of meeting frequency deviations in subsamples based on $bdmf_{dev}$ and $sbmf_{dev}$, and results are also presented in two panels of Table 7. We find that the positive effect of board meeting frequency deviation is of larger magnitude in firms with meeting frequencies higher than the industry average ($bdmf_{dev} > 0$, or $sbmf_{dev} > 0$) than in firms with meeting frequencies lower than the industry average ($bdmf_{dev} \leq 0$ and $sbmf_{dev} \leq 0$). Similarly, the negative effect of supervisory board meeting frequency deviation is also of larger magnitude in firms with meeting frequencies higher than industry average ($bdmf_{dev} > 0$, or $sbmf_{dev} > 0$) than in firms with meeting frequencies lower than the industry average ($bdmf_{dev} \leq 0$ and $sbmf_{dev} \leq 0$). These say that board meetings and supervisory board meetings have opposite effects on firms' total risk and market risk. When board members meet more to increase the risk, supervisory board members may also meet more to reduce or control the risk, and vise-versa.

4.8 Risk-Meeting Frequency Sensitivity Analysis

To further test risk-meeting frequency sensitivities in Chinese public firms, we examine the effects of changes in corporate governance characteristics on the changes in firms' total risk and market risk. We partition our results on the basis of ownership. Changes in risks ($d\sigma$ and $d\beta$) are regressed on monitoring-induced board/supervisory board meetings ($bdmf_{fit2}$ and $sbmf_{fit2}$), or changes in two meeting frequencies ($dbdmeet$ and $dsbmeet$). Changes in lagged performance, changes in lagged risk, and changes in sizes of three boards (board, supervisory board and independent board) are also included in the model, as our previous results indicate that they are important in explaining risk levels.

Table 8 reports the results of risk-meeting frequency sensitivities. We find that there are no significant risk-meeting frequency sensitivities, even after controlling firm ownership. However, risk sensitivity is statistically significant for monitoring-induced board/supervisory board meetings. Also, the effects of board/supervisory board meetings are of larger magnitude on firms' total risk than on market risk, which again verifies our conjecture that board/supervisory board meetings are more effective in controlling total risk rather than market risk.

5 Concluding Remarks

John, et al. (2007) indicate that while the literature on investor protection is rich, most of studies in this field focus on corporate financing decision and capital structure but few have investigated the effects of corporate governance on corporate investment decisions. As one of the pioneer studies focusing on the corporate governance-risk taking relationship, John, et al. (2007) confirm a positive relationship between better investor protection and corporate risk-taking. Unfortunately, this relationship, especially that in emerging markets, has not been extensively addressed in the literature. It is widely accepted that Chinese markets have been one of the most fast-growing emerging markets in the global economy, and have attracted dramatic attention from academic researchers and international investors.

This study helps add to the literature on corporate governance mechanism in emerging markets, and examines the determinants and interrelationships among enterprise risk management and board activities using a sample of Chinese public firms from 2001 to 2006. In Chinese corporate governance mechanism, one of the unique characteristics is the dual-board system with both board of directors and supervisory board. According to the statements in the Chinese Corporate Law, board of directors is mainly responsible for daily operations of firms, and supervisory board is one of the two monitoring organs. Whereas prior research (e.g., Xi, 2006) has concluded the ineffectiveness of the monitoring function of supervisory board in the Chi-

nese corporate governance system using past data, other studies (e.g., Wu, et al., 2008; Ding, et al., 2008) use data up to date and find opposite results, which provide empirical evidence to show the functional effectiveness of supervisory board.

Dealing with endogeneity, heteroskadasticity, and simultaneity issues in the empirical analysis, the current research makes use of a 4-stage multivariate least square model and conclude the effectiveness of two boards in the Chinese corporate governance mechanism. More detailed issues, such as the effects of political/governmental policies and ownership structure of controlling shareholders on board behaviors, and asymmetrical monitoring effects of two boards on companies with various levels of financial risk, are addressed to help better understand the corporate governance-risk relationship in China.

Our findings indicate that firm risk and corporate board / supervisory board behaviors are related, and that there are significant interrelationships among firm risk, board/supervisory board meeting frequency, and other corporate governance structures while controlling firm specific heterogeneities. Empirical results tell that meeting frequencies of board of directors help increase the risk taken by the top management team, while supervisory board meeting frequencies only affect the corporate risk-taking behaviors through firm-specific risk under certain circumstances, such as high level of financial leverage and government-controlling shares. Furthermore, these effects have become stronger over years with the improvement of the Chinese legal environment, and they show a significant improvement of investor protection

and a better investment environment in Chinese markets. These findings are of interest and counter-intuitive since prior research concludes ineffectiveness of the dual-board system in China.

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Table 1. Summary statistics

The table reports the summary statistics of all 31 interested variables in the pooled sample and in the yearly samples. N denotes the sample size and Std. denotes the standard deviation. The firm's total risk (σ) is computed as the standard deviation of the stock's daily return in percentage terms within a fiscal year including the capital gain and dividends. The firm's market risk (β) is estimated as the stock's daily market beta within a fiscal year. *bdmeet* and *sbmeet* denote the number of meetings held within a year by board of directors or the supervisory board respectively. The stock's market performance (CapDiv) is computed as the sum of capital gain and dividends within a year. Return on assets (roa) is calculated as net income divided by total assets. Tobin's Q (TobinQ) is calculated as the sum of book value of liabilities and market value of equity divided by the book value of total assets. Financial leverage (lta) is measured by the ratio of total liabilities over total assets. Firm size (lnta) is the natural log of the book value of total assets. Board size (bdsize) is the total number of board members. Supervisory board size (sbsize) is the total number supervisory board members. *ibsize* measures the number of independent board members, and *exesize* measures the number of people working in the top management team. *bcceodual* is the dummy of whether CEO also holds the position of board chair. *turnceo* is the dummy of whether there is a CEO turnover in that year. *paidbc* and *paidsbc* are the dummy of whether the chairman of board or the chairman of supervisory board get paid. Managerial ownership (pctsharebc) and (pctsharesbc) are calculated as the ratio (in percentage terms) of total number of shares held by the chairman of board or the chairman of supervisory board over the total number of outstanding shares. *soe3contl* is the dummy of whether government is the controlling shareholder. *foreigncontrl* is the dummy of whether foreigners or foreign firms are the controlling shareholder. *herfindahl* measures the ownership concentration and is computed as the ratio of total number of shares held by the largest shareholders (from 2nd to 10th) over the total number shares outstanding. *float2total* is the ratio of tradeable shares to total outstanding shares. *genderbc, agebc, gendersbc, and agesbc* represent the gender and age of the chairman of board and the chairman of the supervisory board respectively. The tenure and turnover of board chair and supervisory board chair are denoted as *tenurebc, turnoverbc*, and *tenuresbc, turnoversbc* respectively.

Variable	Pooled			year 2001			year 2002			year 2003			year 2004			year 2005			year 2006		
	N	Mean	Std.	N	Mean	Std.	N	Mean	Std.	N	Mean	Std.	N	Mean	Std.	N	Mean	Std.	N	Mean	Std.
σ	6987	2.42	0.59	1067	2.10	0.32	1108	2.29	0.43	1180	1.96	0.39	1242	2.40	0.48	1316	2.72	0.49	1074	3.06	0.60
β	7418	1.10	0.31	1094	1.08	0.27	1149	1.09	0.32	1214	1.09	0.32	1298	1.13	0.30	1342	1.19	0.30	1321	1.03	0.30
bdmeet	7682	7.55	3.21	1121	6.24	2.91	1188	8.46	3.17	1266	7.51	3.08	1353	7.33	3.05	1346	7.52	3.11	1408	8.12	3.45
sbmeet	7685	3.59	1.69	1134	3.49	1.43	1187	4.26	1.76	1258	3.51	1.82	1353	3.17	1.55	1348	3.12	1.61	1405	4.02	1.62
CapDiv	7358	-0.17	0.49	1060	-0.35	0.39	1135	-0.30	0.26	1199	-0.26	0.43	1262	-0.31	0.61	1350	-0.26	0.40	1352	0.39	0.23
TobinQ	7650	2.52	34.38	1129	3.13	2.30	1190	2.51	2.15	1251	2.04	1.96	1340	1.72	1.62	1341	1.50	1.78	1399	4.22	80.28
roa	7654	-0.25	21.09	1129	-0.02	0.52	1191	-0.02	0.44	1251	0.00	0.23	1341	-0.02	0.58	1342	-0.02	0.32	1400	-1.31	49.31
lta	7654	0.68	10.08	1129	0.49	0.63	1191	0.51	0.53	1251	0.54	0.82	1341	0.57	0.86	1342	0.62	1.34	1400	1.27	23.48
lnta	7654	21.14	1.02	1129	20.97	0.88	1191	21.03	0.92	1251	21.13	0.96	1341	21.17	1.01	1342	21.22	1.06	1400	21.27	1.17
bdsize	7723	9.70	2.25	1138	9.42	2.53	1204	9.94	2.34	1267	9.93	2.23	1353	9.84	2.25	1351	9.62	2.07	1410	9.46	2.03
ibsize	7717	2.75	1.27	1137	0.62	1.07	1203	2.31	0.76	1262	3.22	0.85	1354	3.34	0.84	1351	3.32	0.77	1410	3.30	0.75
sbsize	7723	4.24	1.44	1138	4.36	1.40	1204	4.29	1.40	1267	4.29	1.46	1353	4.24	1.47	1351	4.19	1.47	1410	4.11	1.41
gender_bc	7692	0.96	0.20	1132	0.95	0.21	1198	0.95	0.21	1260	0.96	0.20	1351	0.96	0.19	1347	0.96	0.20	1404	0.96	0.19
age_bc	7668	49.49	7.66	1123	49.69	7.95	1198	49.32	7.88	1255	49.15	7.86	1351	49.31	7.70	1343	49.60	7.46	1398	49.82	7.17
paid_bc	7514	0.61	0.49	1107	0.56	0.50	1140	0.59	0.49	1205	0.60	0.49	1324	0.64	0.48	1345	0.61	0.49	1393	0.63	0.48
pctshare_bc	7483	0.42	3.21	1125	0.02	0.41	1191	0.07	0.90	1253	0.23	2.36	1348	0.58	3.91	1266	0.60	3.78	1300	0.94	4.77
gender_sbc	7145	0.84	0.37	1045	0.86	0.35	1131	0.85	0.36	1192	0.84	0.37	1259	0.83	0.38	1249	0.83	0.37	1269	0.83	0.37
age_sbc	7122	49.84	7.77	1037	50.01	7.62	1131	50.05	7.69	1189	49.89	7.87	1258	49.62	7.87	1244	49.66	7.81	1263	49.89	7.71
paid_sbc	6973	0.50	0.50	1020	0.49	0.50	1077	0.50	0.50	1138	0.50	0.50	1235	0.52	0.50	1245	0.46	0.50	1258	0.52	0.50
pctshare_sbc	6935	0.02	0.26	1038	0.00	0.05	1124	0.01	0.12	1185	0.02	0.22	1258	0.04	0.41	1160	0.03	0.25	1170	0.03	0.31
foreigncontrl	7724	0.01	0.12	1138	0.01	0.10	1204	0.01	0.10	1267	0.01	0.11	1354	0.01	0.12	1351	0.02	0.13	1410	0.02	0.14
soe3contl	7724	0.61	0.49	1138	0.67	0.47	1204	0.70	0.46	1267	0.65	0.48	1354	0.57	0.50	1351	0.49	0.50	1410	0.58	0.49
herfindahl	7724	203.37	281.55	1138	180.63	272.24	1204	192.56	282.41	1267	208.02	289.56	1354	224.09	302.27	1351	220.66	285.07	1410	190.32	253.48
float2total	7755	0.41	0.13	1139	0.39	0.12	1206	0.40	0.12	1266	0.40	0.12	1362	0.40	0.12	1365	0.42	0.12	1417	0.49	0.14
bcceodual	7678	0.11	0.32	1138	0.11	0.31	1204	0.10	0.30	1267	0.10	0.31	1354	0.12	0.32	1318	0.11	0.32	1397	0.13	0.33
exesize	7717	6.07	2.32	1136	5.96	2.21	1203	6.03	2.15	1265	6.04	2.17	1352	6.09	2.23	1351	6.19	2.74	1410	6.07	2.31
turnceo	8742	0.21	0.41	1457	0.21	0.41	1457	0.23	0.42	1457	0.22	0.41	1457	0.21	0.41	1457	0.21	0.41	1457	0.20	0.40
tenure_bc	7603	564.25	363.97	1081	557.78	347.02	1183	671.63	354.74	1251	511.19	327.81	1350	562.51	367.81	1339	535.81	365.13	1399	554.78	391.84
tenure_sbc	7066	579.17	369.02	1002	575.00	355.92	1116	682.54	366.06	1183	533.02	334.03	1259	577.76	371.40	1242	553.74	374.00	1264	560.81	389.08
turn_bc	8742	0.18	0.38	1457	0.17	0.38	1457	0.19	0.39	1457	0.18	0.38	1457	0.16	0.37	1457	0.18	0.38	1457	0.17	0.38
turn_sbc	7066	0.38	0.48	1002	0.34	0.47	1116	0.45	0.50	1183	0.39	0.49	1259	0.34	0.47	1242	0.39	0.49	1264	0.36	0.48

Table 2 Panel A. Pooled regressions for board meeting frequency (*bdmeet*) and supervisory board meeting frequency (*sbmeet*)

This panel reports the regression results from first three stages. The left block is the regression of board meeting frequency (*bdmeet*). The right block is the rgression of supervisory board meeting frequency (*sbmeet*). Instrumental variable, the tenure and turnover of board chair and supervisory board chair are denoted as *tenure_bc, turn_bc* , and *tenure_sbc, turn_sbc* respectively. *sbmf_fit1* and *bdmf_fit1* are the fitted values of meeting frequencies from first stage regressions. *sbmf_res* and *bdmf_res* are the residuals from second stage regressions. The capital letter "L" is attached to the original variable name to denote the lagged value of variables. The firm's total risk (σ) is computed as the standard deviation of the stock's daily return in percentage terms within a fiscal year including the capital gain and dividends. The firm's market risk (β) is estimated as the stock's daily market beta within a fiscal year. The stock's market performance (CapDiv) is computed as the sum of capital gain and dividends within a year. Return on assets (roa) is calculated as net income divided by total assets. Tobin's Q (TobinQ) is calculated as the sum of book value of liabilities and market value of equity divided by the book value of total assets. Financial leverage (lta) is measured by the ratio of total liabilities over total assets. Firm size (lnta) is the natural log of the book value of total assets. Board size (bdsize) is the total number of board members. Supervisory board size (sbsize) is the total number supervisory board members. *ibsize* measures the number of independent board members, and *exesize* measures the number of people working in the top management team. *bcceodual* is the dummy of whether CEO also holds the position of board chair. *turn_ceo* is the dummy of whether there is a CEO turnover in that year. *paid_bc* and *paid_sbc* are the dummy of whether the chairman of board or the chairman of supervisory board get paid. Managerial ownership (pctshare_bc) and (pctshare_sbc) are calculated as the ratio (in percentage terms) of total number of shares held by the chairman of board or the chairman of supervisory board over the total number of outstanding shares. *soe3contl* is the dummy of whether government is the controlling shareholder. foreigncontrl is the dummy of whether foreigners or foreign firms are the controlling shareholder. *herfindahl* measures the ownership concentration and is computed as the ratio of total number of shares held by the largest shareholders (from 2nd to 10th) over the total number shares outstanding. *float2total* is the ratio of tradeable shares to total outstanding shares. *gender_bc, age_bc, gender_sbc,* and *age_sbc* represent the gender and age of the chairman of board and the chairman of the supervisory board respectively. *indcd* is the 13 industry dummies, and *year_t* is the 6 year dummies. Heteroskedasticity robust t-statistics are reported in the column to the right of the coefficient column. *, **, *** denote significance at the 10%, 5%, and 1% level respectively.

Variable bdmeet	Stage 1 Estimate	t-Statistic	Stage 2 Estimate	t-Statistic	Stage 3 Estimate	t-Statistic	Variable sbmeet	Stage 1 Estimate	t-Statistic	Stage 2 Estimate	t-Statistic	Stage 3 Estimate	t-Statistic
tenure_bc	-0.001***	-9.36	0.698***	5.63			tenure_sbc	-0.001***	-16.97	1.015***	16.62		
turn_bc					0.629***	5.18	turn_sbc					1.003***	16.73
sbmf_fit1			0.840***	7.53	0.841***	7.64	bdmf_fit1			0.189***	2.96	0.173***	2.76
sbmf_res					0.411***	12.85	bdmf_res					0.114***	8.91
σ			0.800***	5.28	0.801***	5.51	σ			0.085	1.1	0.085	1.15
σL	0.567***	3.77	0.164	0.94	0.172	1.02	σL	0.049	0.59	-0.100	-1.06	-0.091	-1.00
β			-0.567**	-2.57	-0.576***	-2.67	β			-0.006	-0.05	-0.007	-0.06
βL	-0.491**	-2.46	-0.444**	-1.97	-0.449**	-2.04	βL	0.176	1.42	0.248*	1.87	0.242*	1.87
CapDivL	-0.052	-0.51	-0.101	-0.85	-0.099	-0.85	CapDivL	0.104	1.59	0.104	1.38	0.103	1.38
TobinQL	0.025	0.56	-0.060	-0.78	-0.057	-0.66	TobinQL	0.067	1.63	0.065	1.58	0.065	1.37
roaL	-0.028	-0.14	0.053	0.19	0.000	0.00	roaL	0.153	0.97	0.214	1.47	0.219	1.59
ltaL	-0.006	-0.07	0.163	1.06	0.158	0.94	ltaL	-0.029	-0.38	-0.035	-0.48	-0.036	-0.43
lnta	0.316***	5.69	0.260***	3.73	0.264***	3.66	lnta	0.057*	1.71	-0.002	-0.05	0.001	0.03
bdsize	-0.077***	-2.64	-0.048	-1.59	-0.047	-1.59	bdsize	-0.033**	-2.02	-0.015	-0.85	-0.017	-1.00
ibsize	0.120	1.57	0.014	0.17	0.012	0.15	ibsize	0.119***	2.62	0.104**	2.28	0.108**	2.43
gender_bc	0.419**	2.38	0.313*	1.66	0.387**	2.00	gender_sbc	0.068	1.11	0.056	0.9	0.062	1.03
age_bc	-0.013**	-2.28	-0.012**	-2.14	-0.015***	-2.60	age_sbc	0.004	1.12	0.003	0.86	0.004	1.10
paid_bc	0.095	1.10	0.020	0.22	0.036	0.41	paid_sbc	0.151***	3.18	0.162***	3.36	0.159***	3.36
pctshare_bc	-0.023	-1.39	-0.023	-1.26	-0.020	-1.14	pctshare_sbc	-0.086	-1.22	-0.044	-0.65	-0.071	-1.34
foreigncontrl	0.565	1.42	0.796*	1.77	0.806*	1.76	foreigncontrl	0.038	0.18	-0.141	-0.62	-0.135	-0.58
soe3contl	-0.305***	-3.14	-0.368***	-3.55	-0.359***	-3.53	soe3contl	0.040	0.77	0.082	1.44	0.073	1.32
turn_ceo	0.941***	8.86	0.601***	4.95	0.614***	5.15	turn_ceo	0.240***	4.27	-0.005	-0.06	0.016	0.18
float2total	0.976***	2.69	0.615	1.59	0.642*	1.67	float2total	0.292	1.47	0.109	0.51	0.122	0.58
sbsize	-0.092***	-3.03	-0.135***	-4.26	-0.136***	-4.39	sbsize	0.045**	2.40	0.061***	3.13	0.059***	3.09
exesize	0.048***	2.63	0.053***	2.74	0.052***	2.72	exesize	-0.008	-0.81	-0.013	-1.25	-0.012	-1.18
indcd	Mixed						indcd	Mixed					
year_t	Mixed						year_t	Mixed					
constant	1.523	1.11	-1.482	-0.87	-1.556	-0.89	constant	2.660	3.2	0.929	1.04	0.828	0.91
N	5383		4728		4717		N	5027		4720		4717	
Robust F-statistic	15.47		13.95		18.43		Robust F-statistic	27.69		32.61		36.69	
F-statistic p-value	0.000		0.000		0.000		F-statistic p-value	0.000		0.000		0.000	
Adj. R-squared	0.100		0.111		0.153		Adj. R-squared	0.159		0.195		0.232	

Table 2 Panel B. Pooled main regression for σ and β

This panel reports the results of stage 4 regression using the pooled sample. *sbmf_fit2* and *bdmf_fit2* are the fitted values of meeting frequencies from third stage regressions. Hetero-skedasticity robust t-statistics are reported in the column to the right of the coefficient column. *, **, *** denote significance at the 10%, 5%, and 1% level respectively.

Variable	Stage 4 for σ		Stage 4 for β	
	Estimate	t-Statistic	Estimate	t-Statistic
bdmf_fit2	0.155***	14.34	0.021***	3.62
sbmf_fit2	-0.07***	-6.60	-0.012*	-1.77
σL	0.384***	15.88	0.140***	8.39
βL	-0.059*	-1.66	0.157***	5.11
CapDivL	-0.027	-1.27	-0.061**	-2.51
TobinQL	-0.025	-1.54	-0.034	-1.51
roaL	-0.118	-1.28	-0.051	-1.02
ltaL	-0.019	-0.68	-0.010	-0.28
lnta	-0.112***	-9.25	-0.037***	-2.74
bdsize	0.015***	3.77	0.002	0.63
ibsize	-0.030***	-2.84	-0.010	-1.33
gender_bc	-0.010	-0.34	0.012	0.62
age_bc	0.002*	1.80	0.000	0.72
paid_bc	-0.014	-0.98	0.009	0.93
pctshare_bc	-0.001	-0.44	0.001	0.31
gender_sbc	0.007	0.46	-0.004	-0.37
age_sbc	0.001	0.79	0.000	0.63
paid_sbc	-0.025*	-1.88	-0.018**	-2.02
pctshare_sbc	0.003	0.13	0.005	0.39
foreigncontrl	-0.078	-1.40	-0.005	-0.16
soe3contl	0.089***	6.41	0.023**	2.40
turn_ceo	-0.102***	-5.67	-0.015	-1.31
herfindahl	0.000***	2.89	0.000	1.22
bcceodual	-0.038*	-1.91	-0.027**	-2.03
float2total	-0.171***	-3.34	-0.012	-0.31
sbsize	0.020***	3.88	0.005*	1.70
exesize	-0.004	-1.74	-0.001	-0.37
indcd		Mixed		
year_t		Mixed		
constant	2.742	9.25	1.322	3.81
N	4688		4688	
Robust F-statistic	124.38		24.26	
F-statistic p-value	0.000		0.000	
Adj. R-squared	0.566		0.227	

Table 3 Panel A Stage 4 regression for firm total risk (σ) in the yearly subsamples

This table reports the results of the 4th stage regression. Panel A is the regression of firm total risk σ using yearly samples. Plane B is the regression of market risk β using yearly sample. Panel C is the regression of σ and β using two grouped samples, 2001-2004 and 2005-2006. *sbmf_fit2* and *bdmf_fit2* are the fitted values of meeting frequencies from third stage regressions. The capital letter "L" is attached to the original variable name to denote the lagged value of variables. The firm's total risk (σ) is computed as the standard deviation of the stock's daily return in percentage terms within a fiscal year including the capital gain and dividends. The firm's market risk (β) is estimated as the stock's daily market beta within a fiscal year. The stock's market performance (CapDiv) is computed as the sum of capital gain and dividends within a year. Return on assets (roa) is calculated as net income divided by total assets. Tobin's Q (TobinQ) is calculated as the sum of book value of liabilities and market value of equity divided by the book value of total assets. Financial leverage (lta) is measured by the ratio of total liabilities over total assets. Firm size (lnta) is the natural log of the book value of total assets. Board size (bdsize) is the total number of board members. Supervisory board size (sbsize) is the total number supervisory board members. *ibsize* measures the number of independent board members, and *exesize* measures the number of people working in the top management team. *bcceodual* is the dummy of whether CEO also holds the position of board chair. *turn_ceo* is the dummy of whether there is a CEO turnover in that year. *paid_bc* and *paid_sbc* are the dummy of whether the chairman of board or the chairman of supervisory board get paid. Managerial ownership (pctshare_bc) and (pctshare_sbc) are calculated as the ratio (in percentage terms) of total number of shares held by the chairman of board or the chairman of supervisory board over the total number of outstanding shares. *soe3contl* is the dummy of whether government is the controlling shareholder. *foreigncontrl* is the dummy of whether foreigners or foreign firms are the controlling shareholder. *herfindahl* measures the ownership concentration and is computed as the ratio of total number of shares held by the largest shareholders (from 2nd to 10th) over the total number shares outstanding. *float2total* is the ratio of tradeable shares to total outstanding shares. *gender_bc, age_bc, gender_sbc,* and *age_sbc* represent the gender and age of the chairman of board and the chairman of the supervisory board respectively. *indcd* is the 13 industry dummies, and *year_t* is the 6 year dummies. Heteroskedasticity robust t-statistics are reported in the column to the right of the coefficient column. *, **, *** denote significance at the 10%, 5%, and 1% level respectively.

Variable	year 2002		year 2003		year 2004		year 2005		year 2006	
	Estimate	t-Statistic	Estimate	t-Statistic	Estimate	t-Statistic	Estimate	t-Statistic	Estimate	t-Statistic
bdmf_fit2	0.075***	4.78	0.084***	4.64	0.131***	6.20	0.143***	7.61	0.300***	9.85
sbmf_fit2	-0.082***	-4.02	-0.023	-1.12	-0.041*	-1.81	-0.064***	-3.09	-0.143***	-4.40
σL	0.402***	7.93	0.576***	9.52	0.469***	6.63	0.521***	11.75	0.202***	3.85
βL	0.075	0.88	-0.428***	-5.29	-0.136**	-2.34	-0.092	-1.07	0.100	1.05
CapDivL	-0.357***	-4.93	-0.221***	-3.53	-0.012	-0.27	0.058***	2.79	0.171***	2.83
TobinQL	-0.060	-1.51	-0.011	-0.50	0.033	1.09	-0.083***	-3.36	-0.006	-0.18
roaL	-0.617*	-1.73	-0.058	-0.24	-0.299	-1.02	-0.053	-0.36	-0.094*	-1.83
ltaL	-0.215*	-1.71	0.037	0.66	0.004	0.09	0.068	1.59	-0.110**	-2.42
lnta	-0.134***	-3.10	-0.034	-1.58	-0.101***	-4.97	-0.180***	-10.76	-0.093***	-3.69
bdsize	-0.003	-0.59	0.008	1.06	0.034***	3.36	-0.005	-0.46	0.043***	2.70
ibsize	-0.021	-1.15	-0.028	-1.52	-0.062**	-2.32	0.035	1.20	-0.099**	-2.33
gender_bc	-0.023	-0.49	0.049	0.81	-0.034	-0.58	0.002	0.02	-0.084	-0.87
age_bc	0.000	-0.27	0.003*	1.76	-0.002	-1.16	0.001	0.57	0.005**	2.10
paid_bc	0.015	0.59	0.020	0.78	-0.031	-1.09	-0.061**	-2.09	-0.035	-0.84
pctshare_bc	-0.015	-0.03	-0.040	-0.18	0.008	0.60	0.002	0.39	0.002	0.47
gender_sbc	0.009	0.33	-0.028	-0.88	0.050*	1.67	-0.064**	-1.98	0.051	1.21
age_sbc	0.001	0.82	-0.001	-0.39	0.003	1.60	0.000	-0.19	0.001	0.48
paid_sbc	0.009	0.34	-0.004	-0.17	-0.034	-1.21	0.014	0.49	-0.053	-1.45
pctshare_sbc	-2.048	-1.05	0.113	0.04	0.019	1.04	-0.029	-0.38	-0.020	-0.35
foreigncontrl	-0.021	-0.19	0.035	0.40	-0.261**	-2.43	0.066	0.56	-0.085	-0.56
soe3contl	0.069**	2.27	0.039	1.48	0.080***	2.79	0.089***	3.48	0.163***	3.85
turn_ceo	-0.019	-0.54	-0.039	-1.18	-0.049	-1.26	-0.148***	-4.16	-0.223***	-4.41
herfindahl	0.000*	1.87	0.000	1.01	0.000***	2.33	0.000	0.79	0.000	0.78
bcceodual	-0.036	-0.74	-0.047	-1.23	-0.032	-0.80	0.003	0.08	-0.100**	-1.99
float2total	0.088	0.70	-0.302***	-2.98	-0.062	-0.57	-0.169*	-1.66	-0.318**	-2.46
sbsize	0.024***	2.61	0.014*	1.66	0.001	0.13	0.019**	2.01	0.042***	2.58
exesize	-0.002	-0.48	-0.003	-0.60	-0.008	-1.28	-0.003	-0.64	-0.011	-1.24
indcd					Mixed					
constant	3.953	3.84	1.113	2.10	2.606	6.14	4.559	11.84	2.206	3.80
N	888		943		1036		979		842	
Robust F-statistic	10.91		9.95		16.44		25.12		9.53	
F-statistic p-value	0		0		0		0		0	
Adj. R-squared	0.474		0.345		0.382		0.506		0.329	

Table 3 Panel B   Stage 4 regression for market risk (β) in the yearly subsamples

Variable	year 2002		year 2003		year 2004		year 2005		year 2006	
	Estimate	t-Statistic	Estimate	t-Statistic	Estimate	t-Statistic	Estimate	t-Statistic	Estimate	t-Statistic
bdmf_fit2	0.019	1.55	0.007	0.63	0.031***	2.90	0.028**	2.44	0.006	0.43
sbmf_fit2	-0.041***	-2.84	-0.005	-0.33	0.001	0.04	-0.016	-1.09	0.013	0.80
σL	0.139***	3.72	0.248***	5.82	0.212***	4.47	0.178***	5.24	0.047	1.36
βL	0.300***	4.24	0.062	1.03	0.055	1.41	0.163***	2.59	0.129**	2.11
CapDivL	-0.244***	-5.01	-0.416***	-8.04	-0.062**	-2.15	0.011	0.37	0.150***	4.19
TobinQL	-0.047	-1.25	-0.028**	-1.96	-0.034	-1.61	-0.077***	-2.88	0.009	0.28
roaL	-0.503*	-1.77	-0.058	-1.39	0.031	0.36	0.074	0.68	0.019	0.08
ltaL	-0.212*	-1.79	-0.013	-0.22	0.032	1.06	0.068	1.37	-0.055	-1.40
lnta	-0.049	-1.19	0.003	0.18	-0.059***	-4.54	-0.071***	-5.06	0.006	0.36
bdsize	-0.005	-1.23	-0.006	-1.02	0.011*	1.81	0.005	0.57	-0.010	-1.00
ibsize	-0.005	-0.38	-0.009	-0.62	-0.023	-1.34	-0.006	-0.22	0.029	1.11
gender_bc	0.018	0.42	-0.054	-1.16	0.011	0.32	0.023	0.65	-0.006	-0.11
age_bc	0.001	0.55	0.001	1.13	-0.002	-1.61	0.000	0.29	0.002	1.21
paid_bc	0.041**	2.15	0.022	1.05	-0.006	-0.36	-0.022	-1.12	-0.022	-0.99
pctshare_bc	-0.018	-0.03	-0.008	-0.03	0.004	0.46	0.003	1.01	-0.003	-0.98
gender_sbc	0.016	0.73	-0.029	-1.25	0.025	1.32	-0.033	-1.45	-0.004	-0.16
age_sbc	0.000	-0.16	0.000	0.40	0.001	0.55	0.001	0.44	0.000	0.06
paid_sbc	-0.007	-0.36	-0.043**	-2.23	-0.024	-1.42	0.010	0.52	-0.005	-0.25
pctshare_sbc	-1.051	-0.64	-0.148	-0.05	0.012	1.12	-0.013	-0.30	-0.009	-0.34
foreigncontrl	-0.033	-0.32	-0.045	-0.59	-0.040	-0.56	0.081	1.30	0.068	1.16
soe3contl	0.010	0.44	0.032	1.50	0.028	1.62	0.022	1.21	0.022	0.92
turn_ceo	0.001	0.05	-0.004	-0.17	0.001	0.06	-0.042*	-1.80	-0.040	-1.44
herfindahl	0.000	1.58	0.000	1.36	0.000**	1.96	0.000	0.29	-0.000***	-2.66
bcceodual	-0.015	-0.42	-0.027	-0.97	-0.030	-1.17	-0.005	-0.17	-0.049	-1.59
float2total	0.021	0.21	-0.077	-1.00	-0.053	-0.82	-0.026	-0.39	0.019	0.24
sbsize	0.020***	2.98	0.007	1.02	-0.004	-0.63	0.013**	2.03	0.002	0.20
exesize	0.000	0.05	-0.003	-0.68	-0.004	-1.02	-0.002	-0.70	0.000	0.02
indcd					Mixed					
constant	1.570	1.61	0.423	1.10	1.678	5.89	1.968	6.11	0.583	1.59
N	888		943		1036		979		842	
Robust F-statistic	13.25		13.58		12.28		11.05		2.89	
F-statistic p-value	0.000		0.000		0.000		0.000		0.000	
Adj. R-squared	0.432		0.405		0.324		0.309		0.130	

Table 3 Panel C   Stage 4 regression in subsample of 2001-2004 and 2005-2006

Variable	Dependent variable: σ				Dependent variable: β			
	year 2001-2004		year 2005-2006		year 2001-2004		year 2005-2006	
	Estimate	t-Statistic	Estimate	t-Statistic	Estimate	t-Statistic	Estimate	t-Statistic
bdmf_fit2	0.104***	9.02	0.233***	12.61	0.020***	2.78	0.024**	2.57
sbmf_fit2	-0.044***	-3.53	-0.112***	-5.61	-0.012	-1.38	-0.008	-0.73
σL	0.422***	11.79	0.322***	9.14	0.186***	7.62	0.103***	4.38
βL	-0.126***	-3.07	0.049	0.78	0.144***	3.94	0.142***	3.34
CapDivL	-0.151***	-4.79	0.065***	3.30	-0.180***	-5.94	0.023	1.64
TobinQL	-0.026	-1.59	-0.026	-1.23	-0.036	-1.43	-0.030**	-1.96
roaL	-0.200	-1.43	-0.027	-0.32	-0.166*	-1.68	0.048	0.60
ltaL	0.019	0.61	-0.026	-0.74	-0.024	-0.52	0.005	0.17
lnta	-0.093***	-6.39	-0.131***	-8.41	-0.033	-1.62	-0.034***	-3.57
bdsize	0.011**	2.54	0.021**	2.11	0.001	0.18	0.001	0.07
ibsize	-0.024**	-2.16	-0.030	-1.16	-0.012	-1.43	0.008	0.46
gender_bc	0.000	-0.01	-0.040	-0.71	0.001	0.04	0.015	0.46
age_bc	0.000	0.34	0.003**	2.18	0.000	0.10	0.001	0.93
paid_bc	-0.003	-0.20	-0.037	-1.45	0.017	1.54	-0.016	-1.09
pctshare_bc	0.008	0.56	0.001	0.28	0.004	0.42	0.001	0.24
gender_sbc	0.012	0.64	-0.004	-0.15	0.006	0.44	-0.017	-1.02
age_sbc	0.001	1.09	0.001	0.37	0.000	0.51	0.001	0.66
paid_sbc	-0.015	-0.98	-0.027	-1.14	-0.025**	-2.27	-0.001	-0.04
pctshare_sbc	0.010	0.37	-0.023	-0.67	0.005	0.46	-0.001	-0.04
foreigncontrl	-0.111*	-1.74	-0.072	-0.77	-0.063	-1.30	0.060	1.44
soe3contl	0.069***	4.10	0.125***	5.32	0.024**	2.04	0.025*	1.71
turn_ceo	-0.047**	-2.29	-0.192***	-6.06	-0.006	-0.41	-0.038**	-2.06
herfindahl	0.000***	2.97	0.000	1.10	0.000***	2.61	0.000	-1.07
bcceodual	-0.031	-1.32	-0.046	-1.32	-0.025	-1.46	-0.027	-1.22
float2total	-0.092	-1.45	-0.291***	-3.47	-0.031	-0.60	-0.026	-0.51
sbsize	0.012**	2.33	0.030***	3.12	0.006	1.60	0.006	1.12
exesize	-0.005	-1.30	-0.005	-1.35	-0.002	-0.77	0.000	-0.07
indcd		Mixed				Mixed		
year_t		Mixed				Mixed		
constant	2.876	8.42	3.278	9.12	1.216	2.54	1.157	5.32
N	2867		1821		2867		1821	
Robust F-statistic	50.66		25.21		22.94		11.73	
F-statistic p-value	0.000		0.000		0.000		0.000	
Adj. R-squared	0.432		0.409		0.316		0.194	

Table 4 Panel A Stage 4 regression for the subsample of firms with greater than industry average leverage risk.

This table reports the results of 4th stage regression of firm total risk σ and market risk β. We first calculate the average leverage ratio for all 13 industries, then form a dummy variable based on whether the firm's leverage ratio is greater than the industry average leverage ratio. Panel A is for the subsample of firms with greater than industry average leverage risk. Panel B is for the subsample of firms with smaller than industry average leverage risk. *sbmf_fit2* and *bdmf_fit2* are the fitted values of meeting frequencies from third stage regressions. The capital letter "L" is attached to the original variable name to denote the lagged value of variables. The firm's total risk (σ) is computed as the standard deviation of the stock's daily return in percentage terms within a fiscal year including the capital gain and dividends. The firm's market risk (β) is estimated as the stock's daily market beta within a fiscal year. The stock's market performance (CapDiv) is computed as the sum of capital gain and dividends within a year. Return on assets (roa) is calculated as net income divided by total assets. Tobin's Q (TobinQ) is calculated as the sum of book value of liabilities and market value of equity divided by the book value of total assets. Financial leverage (lta) is measured by the ratio of total liabilities over total assets. Firm size (lnta) is the natural log of the book value of total assets. Board size (bdsize) and supervisory board size (sbsize) are the total number of board members and supervisory board members respectively. *ibsize* and *exesize* measure the number of independent board members and the number of people in the top management team respectively. *bcceodual* is the dummy of whether CEO holds the position of board chair. *turn_ceo* is the dummy of whether there is a CEO turnover. *paid_bc* and *paid_sbc* are the dummies of whether the chairman of board or the chairman of supervisory board get paid. Managerial ownership (pctshare_bc) and (pctshare_sbc) are calculated as the ratio (in percentage terms) of total number of shares held by the chairman of board or the chairman of supervisory board over the total number of outstanding shares. *soe3contl* and *foreigncontrl* are the dummy of whether government or foreigners (foreign firms) are the controlling shareholder correspondingly. *herfindahl* measures the ownership concentration and is computed as the ratio of total number of shares held by the largest shareholders (from 2nd to 10th) over the total number shares outstanding. *float2total* is the ratio of tradeable shares to total outstanding shares. *gender_bc, age_bc, gender_sbc,* and *age_sbc* represent the gender and age of the chairman of board and the chaird of the supervisory board respectively. *indcd* is the 13 industry dummies, and *year_t* is the 6 year dummies. Heteroskedasticity robust t-statistics are reported in the column to the right of the coefficient column. *, **, *** denote significance at the 10%, 5%, and 1% level respectively.

Variables	Dependent variable: σ						Dependent variable: β					
	Pooled		Year 2001-2004		Year 2005-2006		Pooled		Year 2001-2004		Year 2005-2006	
	Estimate	t-Statistic	Estimate	t-Statistic	Estimate	t-Statistic	Estimate	t-Statistic	Estimate	t-Statistic	Estimate	t-Statistic
bdmf_fit2	0.148***	8.55	0.130***	7.08	0.196***	4.45	0.031***	3.28	0.038***	3.70	0.012	0.58
sbmf_fit2	-0.072***	-3.58	-0.056***	-2.74	-0.113**	-2.12	-0.027**	-2.24	-0.023*	-1.70	-0.037	-1.44
σL	0.354***	7.93	0.322***	5.23	0.382***	5.06	0.123***	3.82	0.127***	3.05	0.101*	1.91
βL	-0.076	-1.42	-0.093	-1.47	0.043	0.34	0.162***	4.17	0.147***	3.33	0.249***	2.97
CapDivL	0.000	0.02	-0.102***	-2.67	0.108**	2.25	-0.024	-0.62	-0.106***	-3.39	0.038**	1.96
TobinQL	-0.049**	-2.52	-0.056***	-2.65	-0.047	-0.74	-0.049***	-3.84	-0.062***	-4.56	0.013	0.35
roaL	-0.108	-1.62	-0.184	-1.61	-0.039	-0.52	-0.027	-0.81	-0.094**	-2.26	0.050	0.89
ltaL	-0.021	-0.65	0.001	0.03	-0.014	-0.15	0.024	1.10	0.039	1.21	-0.035	-0.61
lnta	-0.139***	-8.29	-0.144***	-7.64	-0.114***	-3.46	-0.051***	-4.80	-0.062***	-4.66	-0.015	-0.92
bdsize	0.012*	1.94	0.012*	1.74	0.000	-0.02	0.000	-0.08	-0.002	-0.36	-0.001	-0.08
ibsize	-0.009	-0.53	-0.015	-0.84	0.051	0.90	0.004	0.35	-0.003	-0.28	0.049	1.31
gender_bc	-0.001	-0.01	0.013	0.22	-0.080	-0.63	0.028	0.75	0.037	0.78	-0.053	-0.78
age_bc	0.002	1.27	0.003*	1.80	-0.001	-0.35	0.001	1.17	0.002	1.59	0.000	-0.19
paid_bc	0.005	0.2	0.009	0.37	-0.013	-0.20	0.025	1.56	0.019	1.06	0.029	0.90
pctshare_bc	0.001	0.16	-0.987	-0.66	-0.002	-0.43	-0.001	-0.27	0.027	0.04	-0.002	-0.48
gender_sbc	-0.019	-0.69	0.003	0.10	-0.083	-1.47	-0.009	-0.44	0.012	0.50	-0.070*	-1.74
age_sbc	0.001	0.78	0.001	0.78	-0.002	-0.50	0.000	-0.41	-0.001	-1.02	0.001	0.60
paid_sbc	-0.010	-0.46	-0.003	-0.14	0.011	0.20	-0.018	-1.21	-0.021	-1.24	0.009	0.30
pctshare_sbc	0.007	0.03	1.006	0.61	-0.187	-0.65	0.012	0.14	-0.016	-0.02	-0.048	-0.19
foreigncontrl	-0.054	-0.47	-0.047	-0.38	-0.063	-0.13	-0.016	-0.21	-0.056	-0.59	0.024	0.10
soe3contl	0.118***	4.62	0.101***	3.42	0.139**	2.40	0.062***	3.52	0.054***	2.65	0.074**	2.20
turn_ceo	-0.086***	-2.94	-0.091***	-2.69	-0.086	-1.43	0.003	0.15	-0.014	-0.64	0.029	0.69
herfindahl	0.000**	2.27	0.000**	2.55	0.000	0.75	0.000*	1.72	0.000**	2.34	0.000	-0.55
bcceodual	-0.044	-1.25	-0.055	-1.40	0.010	0.12	-0.021	-0.86	-0.031	-1.12	0.021	0.39
float2total	-0.057	-0.66	-0.075	-0.70	-0.042	-0.23	0.088	1.48	-0.016	-0.22	0.182	1.62
sbsize	0.017**	2.01	0.010	1.10	0.033*	1.76	0.012**	2.02	0.008	1.24	0.012	1.10
exesize	-0.004	-0.97	-0.005	-0.85	-0.003	-0.31	-0.002	-0.72	-0.004	-0.97	0.001	0.35
indcd	Mixed						Mixed					
year_t	Mixed						Mixed					
constant	4.036	9.73	3.991	8.99	3.273	3.62	1.287	4.73	1.877	5.75	0.618	1.44
N	1567		1132		435		1567		1132		435	
Robust F-statistic	38.36		21.94		8.10		10.00		11.09		4.78	
F-statistic p-value	0.00		0.00		0.00		0.00		0.00		0.00	
Adj. R-squared	0.527		0.442		0.414		0.255		0.302		0.327	

Table 4 Panel B Stage 4 regression for the subsample of firms with less than industry average leverage risk.

	Dependent variable: σ						Dependent variable: β					
Variables	Pooled		Year 2001-2004		Year 2005-2006		Pooled		Year 2001-2004		Year 2005-2006	
	Estimate	t-Statistic	Estimate	t-Statistic	Estimate	t-Statistic	Estimate	t-Statistic	Estimate	t-Statistic	Estimate	t-Statistic
bdmf_fit2	0.160***	11.56	0.088***	6.17	0.241***	11.63	0.018**	2.37	0.013	1.47	0.029***	2.78
sbmf_fit2	-0.082***	-6.04	-0.046***	-2.98	-0.113***	-5.04	-0.007	-0.85	-0.010	-0.97	0.002	0.18
σL	0.350***	11.44	0.453***	9.88	0.230***	5.41	0.150***	6.51	0.234***	7.57	0.120***	4.25
βL	-0.039	-0.88	-0.164***	-3.07	0.115	1.61	0.130***	3.70	0.087**	2.34	0.089*	1.81
CapDivL	-0.025	-1.04	-0.178***	-4.64	0.049	1.63	-0.079***	-3.32	-0.220***	-7.59	0.003	0.12
TobinQL	-0.018	-1.15	-0.025	-1.06	0.052*	1.77	-0.039	-1.52	-0.049***	-3.81	-0.064***	-3.39
roaL	-0.544**	-2.26	-0.579	-1.08	-0.588**	-2.03	-0.340	-0.82	-0.651**	-2.25	0.356**	2.11
ltaL	0.087	1.48	0.155*	1.9	0.030	0.36	-0.076	-1.53	-0.045	-0.87	-0.044	-0.84
lnta	-0.112***	-7.88	-0.080***	-3.37	-0.129***	-7.18	-0.032*	-1.73	-0.034**	-2.44	-0.047***	-4.08
bdsize	0.015***	3.12	0.008	1.48	0.030***	2.60	0.001	0.29	-0.001	-0.14	0.000	0.03
ibsize	-0.036***	-2.67	-0.023	-1.56	-0.062**	-2.05	-0.010	-1.10	-0.008	-0.81	0.000	-0.02
gender_bc	-0.037	-1.03	-0.033	-0.88	-0.048	-0.74	0.004	0.19	-0.024	-0.83	0.039	1.06
age_bc	0.002	1.61	-0.001	-0.53	0.005***	2.82	0.000	-0.02	-0.001	-1.08	0.001	1.1
paid_bc	-0.029*	-1.70	-0.007	-0.36	-0.056**	-2.00	-0.001	-0.06	0.017	1.14	-0.032*	-1.85
pctshare_bc	-0.001	-0.36	0.012	0.77	0.002	0.38	0.002	0.71	0.006	0.54	0.001	0.49
gender_sbc	0.021	1.14	0.014	0.64	0.021	0.68	0.001	0.12	0.007	0.45	-0.003	-0.15
age_sbc	0.000	0.30	0.000	0.12	0.001	0.55	0.000	0.74	0.001	1.08	0.000	0.22
paid_sbc	-0.032**	-2.02	-0.030	-1.47	-0.034	-1.29	-0.017	-1.54	-0.033**	-2.32	0.000	0
pctshare_sbc	0.013	0.38	-0.001	-0.01	0.008	0.18	0.000	-0.02	0.007	0.15	-0.003	-0.15
foreigncontrl	-0.075	-1.15	-0.125*	-1.8	-0.059	-0.61	-0.002	-0.04	-0.050	-0.83	0.047	1.08
soe3contl	0.084***	4.96	0.051**	2.45	0.130***	4.84	0.007	0.58	0.008	0.54	0.015	0.9
turn_ceo	-0.121***	-5.42	-0.031	-1.24	-0.226***	-6.30	-0.028**	-2.08	-0.010	-0.56	-0.058***	-2.78
herfindahl	0.000**	2.00	0.000*	1.8	0.000	0.83	0.000	0.45	0.000	1.28	0.000	-0.62
bcceodual	-0.039	-1.63	-0.011	-0.38	-0.071*	-1.82	-0.034**	-2.10	-0.019	-0.96	-0.040*	-1.66
float2total	-0.225***	-3.68	-0.096	-1.23	-0.323***	-3.37	-0.068	-1.62	-0.048	-0.93	-0.117*	-1.94
sbsize	0.021***	3.37	0.017**	2.52	0.024**	2.09	0.003	0.88	0.006	1.29	0.003	0.52
exesize	-0.006*	-1.66	-0.006	-1.28	-0.006	-1.10	-0.001	-0.20	-0.001	-0.35	-0.002	-0.56
indcd	Mixed						Mixed					
year_t	Mixed						Mixed					
constant	3.410	11.28	2.721	5.52	3.168	8.18	1.190	3.15	1.308	4.45	1.504	5.9
N	3121		1735		1386		3121		1735		1386	
Robust F-statistic	94.77		30.96		22.01		17.88		18.52		9.23	
F-statistic p-value	0.00		0.00		0.00		0.00		0.00		0.00	
Adj. R-squared	0.599		0.440		0.442		0.232		0.361		0.188	

Table 5 Panel A Stage 4 regression for the subsamples of different total risk (σ) level.

This table reports the results of 4th stage regressions of firm total risk σ and market risk β for subsamples based on firms' total risk level and market risk level. Panel A reports the results for three subsamples: (1) firms with total risk less than 1.8%; (2) firms with total risk between 1.8% and 2.5%; (3) firms with total risk greater than 2.5%. *sbmf_fit2* and *bdmf_fit2* are the fitted values of meeting frequencies from third stage regressions. The capital letter "L" is attached to the original variable name to denote the lagged value of variables. The firm's total risk (σ) is computed as the standard deviation of the stock's daily return in percentage terms within a fiscal year including the capital gain and dividends. The firm's market risk (β) is estimated as the stock's daily market beta within a fiscal year. The stock's market performance (CapDiv) is computed as the sum of capital gain and dividends within a year. Return on assets (roa) is calculated as net income divided by total assets. Tobin's Q (TobinQ) is calculated as the sum of book value of liabilities and market value of equity divided by the book value of total assets. Financial leverage (lta) is measured by the ratio of total liabilities over total assets. Firm size (lnta) is the natural log of the book value of total assets. Board size (bdsize) and supervisory board size (sbsize) are the total number of board members and supervisory board members respectively. *ibsize* and *exesize* measure the number of independent board members and the number of people in the top management team respectively. *bcceodual* is the dummy of whether CEO holds the position of board chair. *turn_ceo* is the dummy of whether there is a CEO turnover. *paid_bc* and *paid_sbc* are the dummies of whether the chairman of board or the chairman of supervisory board get paid. Managerial ownership (pctshare_bc) and (pctshare_sbc) are calculated as the ratio (in percentage terms) of total number of shares held by the chairman of board or the chairman of supervisory board over the total number of outstanding shares. *soe3contl* and *foreigncontrl* are the dummy of whether government or foreigners (foreign firms) are the controlling shareholder correspondingly. *herfindahl* measures the ownership concentration and is computed as the ratio of total number of shares held by the largest shareholders (from 2nd to 10th) over the total number shares outstanding. *float2total* is the ratio of tradeable shares to total outstanding shares. *gender_bc, age_bc, gender_sbc,* and *age_sbc* represent the gender and age of the chairman of board and the chairman of the supervisory board respectively. *indcd* is the 13 industry dummies, and *year_t* is the 6 year dummies. Heteroskedasticity robust t-statistics are reported in the column to the right of the coefficient column. *, **, *** denote significance at the 10%, 5%, and 1% level respectively.

Variables	Dependent variable: σ						Dependent variable: β					
	Low (σ<1.8)		Medium (1.8<=σ<=2.5)		High (σ>2.5)		Low (σ<1.8)		Medium (1.8<=σ<=2.5)		High (σ>2.5)	
	Estimate	t-Statistic	Estimate	t-Statistic	Estimate	t-Statistic	Estimate	t-Statistic	Estimate	t-Statistic	Estimate	t-Statistic
bdmf_fit2	0.026**	2.16	0.025***	4.72	0.157***	10.18	-0.014	-1.31	-0.013**	-2.04	-0.007	-0.89
sbmf_fit2	-0.031**	-2.18	-0.008	-1.13	-0.083***	-5.16	-0.011	-0.76	0.008	1.02	0.005	0.50
σL	0.278***	5.55	0.158***	8.58	0.161***	6.13	0.077*	1.70	0.044*	1.89	0.055***	2.62
βL	0.056	0.95	-0.051**	-2.16	-0.079**	-2.21	0.288***	4.38	0.148***	4.99	0.063**	2.21
CapDivL	-0.111**	-2.17	-0.029	-1.53	0.044***	2.81	-0.260***	-4.79	-0.160***	-6.79	0.007	0.56
TobinQL	-0.043***	-2.60	-0.019***	-3.13	0.008	0.97	-0.065***	-4.88	-0.053***	-6.70	0.000	-0.05
roaL	0.540	1.19	-0.058	-0.29	-0.070	-1.10	0.606*	1.72	-0.043	-0.21	-0.001	-0.05
ltaL	-0.062	-0.93	0.035***	2.59	-0.069***	-3.72	-0.084	-1.20	0.010	0.26	-0.033	-1.60
lnta	-0.015	-0.97	-0.033***	-4.96	-0.055***	-4.31	0.001	0.06	-0.025***	-3.42	0.007	0.82
bdsize	-0.005	-0.94	0.005*	1.68	0.011**	2.06	-0.013***	-2.79	0.002	0.55	-0.003	-0.77
ibsize	0.014	0.99	-0.009	-1.22	-0.015	-1.09	0.011	0.83	-0.004	-0.47	0.004	0.31
gender_bc	0.044	0.92	0.029	1.29	-0.048	-1.13	0.019	0.40	-0.002	-0.11	0.062**	2.06
age_bc	0.001	0.58	0.000	0.17	0.003**	2.27	0.003**	2.17	-0.001	-0.91	0.000	0.53
paid_bc	-0.018	-0.85	0.010	1.03	-0.040**	-2.05	0.004	0.20	0.008	0.74	-0.001	-0.11
pctshare_bc	-0.009	-1.36	-0.005	-0.43	-0.004*	-1.87	-0.004	-0.56	-0.004	-0.27	-0.001	-0.78
gender_sbc	-0.013	-0.65	0.007	0.64	0.034*	1.70	-0.033	-1.36	0.013	1.10	-0.001	-0.07
age_sbc	0.001	0.61	0.000	0.51	-0.001	-0.75	0.001	0.96	0.000	0.31	-0.001	-0.75
paid_sbc	0.017	0.85	-0.018**	-1.99	-0.011	-0.66	-0.026	-1.32	-0.020*	-1.95	-0.004	-0.37
pctshare_sbc	-2.143	-1.35	-0.048	-1.28	-0.011	-0.66	-2.333*	-1.74	-0.027	-0.57	-0.002	-0.20
foreigncontrl	0.079	0.91	-0.005	-0.17	-0.084	-1.15	-0.067	-0.89	0.002	0.04	0.028	0.72
soe3contl	0.048**	2.28	0.014	1.50	0.075***	4.10	0.000	0.01	0.007	0.64	-0.007	-0.58
turn_ceo	-0.014	-0.55	-0.017	-1.57	-0.088***	-3.62	0.017	0.64	0.009	0.72	0.001	0.05
herfindahl	0.000	-0.15	0.000	0.93	0.000	1.54	0.000	0.41	0.000	0.79	0.000	-0.78
bcceodual	-0.047	-1.59	-0.030**	-2.30	-0.004	-0.15	-0.038	-1.38	-0.017	-1.12	-0.012	-0.65
float2total	-0.093	-1.21	-0.078**	-2.25	-0.154**	-2.33	-0.023	-0.32	-0.014	-0.36	0.014	0.30
sbsize	0.000	0.04	0.003	1.09	0.022***	2.67	0.009	1.45	0.002	0.47	0.002	0.41
exesize	0.003	0.69	0.000	0.16	-0.009***	-2.90	0.001	0.29	-0.001	-0.39	0.000	-0.07
indcd			Mixed						Mixed			
year_t			Mixed						Mixed			
constant	1.209	3.01	2.504	16.91	2.354	8.46	0.294	0.82	1.290	7.98	1.037	5.08
N	542		2029		2117		542		2029		2117	
Robust F-statistic	5.04		.		16.25		23.07		21.75		14.68	
F-statistic p-value	0.000		.		0.000		0.000		0.000		0.000	
Adj. R-squared	0.470		0.221		0.279		0.632		0.319		0.230	

Table 5 Panel B Stage 4 regression for the subsamples of different market risk (β) level.

Panel B reports the results for three subsamples: (1) firms with market risk less than 0.8%; (2) firms with market risk between 0.8% and 1.2%; (3) firms with market risk greater than 1.2%.

Variables	Dependent variable: σ						Dependent variable: β					
	Low (β<0.8)		Medium (0.8<=β<=1.2)		High (β>1.2)		Low (β<0.8)		Medium (0.8<=β<=1.2)		High (β>1.2)	
	Estimate	t-Statistic	Estimate	t-Statistic	Estimate	t-Statistic	Estimate	t-Statistic	Estimate	t-Statistic	Estimate	t-Statistic
bdmf_fit2	0.178***	8.04	0.12***	9.48	0.131***	8.31	-0.007	-0.83	-0.001	-0.36	0.012**	2.14
sbmf_fit2	-0.086***	-3.30	-0.069***	-5.82	-0.053***	-3.01	-0.013	-1.21	-0.002	-0.49	-0.005	-0.73
σL	0.275***	4.50	0.337***	11.17	0.279***	8.26	0.038	1.60	0.015*	1.68	0.099***	6.07
βL	0.119	1.53	-0.281***	-6.43	-0.260***	-5.96	0.162***	4.48	0.026**	2.06	-0.096***	-4.75
CapDivL	0.028	0.55	0.027	1.08	0.016	1.06	-0.045*	-1.93	-0.013	-1.53	-0.002	-0.13
TobinQL	-0.009	-0.54	-0.003	-0.25	0.005	0.26	-0.030***	-3.67	-0.013***	-3.52	0.002	0.38
roaL	0.001	0.02	-0.276**	-2.32	-0.105	-1.25	0.015	0.09	-0.036	-1.19	-0.038	-1.04
ltaL	-0.016	-0.48	-0.018	-0.35	-0.018	-0.54	0.038**	2.35	0.010	1.15	-0.025*	-1.88
lnta	-0.076***	-4.22	-0.083***	-7.77	-0.080***	-4.37	0.003	0.34	-0.017***	-4.81	-0.005	-0.85
bdsize	0.016*	1.78	0.012***	2.70	0.009*	1.73	-0.003	-0.79	0.001	0.35	-0.002	-0.77
ibsize	-0.059**	-2.36	-0.006	-0.49	-0.025*	-1.75	0.009	0.98	-0.001	-0.32	0.000	-0.02
gender_bc	0.125*	1.89	0.007	0.19	-0.016	-0.38	-0.005	-0.15	0.020	1.56	0.047**	2.43
age_bc	0.003	1.43	0.000	-0.05	0.002*	1.91	0.001	1.62	0.000	0.26	0.000	-0.19
paid_bc	-0.006	-0.17	-0.017	-1.11	-0.024	-1.20	0.019	1.29	0.001	0.18	-0.010	-1.19
pctshare_bc	0.006	0.34	-0.002	-0.57	-0.005	-0.92	-0.003	-0.32	0.001	0.78	-0.001	-0.52
gender_sbc	-0.022	-0.53	0.008	0.49	0.034	1.58	-0.018	-1.20	0.001	0.18	0.015	1.49
age_sbc	0.005**	2.33	0.000	-0.49	0.001	0.80	0.001	1.05	0.000	0.31	0.000	0.43
paid_sbc	0.009	0.28	-0.021	-1.41	-0.010	-0.55	-0.018	-1.25	-0.001	-0.28	0.001	0.10
pctshare_sbc	0.043	0.21	-0.022	-0.71	0.009	0.46	-0.023	-0.04	-0.022**	-2.02	0.002	0.33
foreigncontrl	0.055	0.49	-0.045	-0.67	-0.124	-1.51	0.116***	2.69	0.014	0.65	-0.040	-1.42
soe3contl	0.119***	3.56	0.061***	3.90	0.060***	3.03	0.016	1.12	0.007	1.33	0.010	1.08
turn_ceo	-0.099**	-2.36	-0.086***	-4.14	-0.086***	-3.58	0.003	0.20	0.000	-0.01	-0.009	-0.83
herfindahl	0.000	-0.80	0.000**	2.45	0.000**	2.29	-0.000**	-2.14	0.000*	1.77	0.000	1.40
bcceodual	-0.098**	-2.15	-0.026	-1.25	0.027	0.92	-0.016	-0.75	-0.013*	-1.70	0.008	0.62
float2total	-0.256**	-2.34	-0.144**	-2.39	-0.065	-0.82	-0.043	-0.93	0.025	1.29	0.025	0.70
sbsize	0.020*	1.86	0.007	1.26	0.028***	3.47	-0.004	-0.94	-0.002	-1.07	0.006*	1.93
exesize	0.004	0.67	-0.001	-0.48	-0.011**	-2.56	0.002	0.79	0.002**	1.92	-0.002	-0.93
indcd			Mixed						Mixed			
year_t			Mixed						Mixed			
constant	1.667	3.75	2.738	10.96	2.759	6.40	0.428	2.08	1.343	16.30	1.217	8.15
N	679		2234		1775		679		2234		1775	
Robust F-statistic	34.39		73.57		63.47		15.54		4.4		4.11	
F-statistic p-value	0.000		0.000		0.000		0.000		0.000		0.000	
Adj. R-squared	0.714		0.640		0.615		0.375		0.082		0.094	

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Table 6 Panel A Stage 4 regression for the subsample of government controlling firms.

This table reports the results of 4th stage regression of firm total risk σ and market risk β. We form two subsamples based on the dummy variable, *soe3contl* . Panel A is for the subsample of government controlling firms (*soe3contl=1*). Panel B is for the subsample of non-government controlling firms (soe3contl=0). *sbmf_fit2* and *bdmf_fit2* are the fitted values of meeting frequencies from third stage regressions. The capital letter "L" is attached to the original variable name to denote the lagged value of variables. The firm's total risk (σ) is computed as the standard deviation of the stock's daily return in percentage terms within a fiscal year including the capital gain and dividends. The firm's market risk (β) is estimated as the stock's daily market beta within a fiscal year. The stock's market performance (CapDiv) is computed as the sum of capital gain and dividends within a year. Return on assets (roa) is calculated as net income divided by total assets. Tobin's Q (TobinQ) is calculated as the sum of book value of liabilities and market value of equity divided by the book value of total assets. Financial leverage (lta) is measured by the ratio of total liabilities over total assets. Firm size (lnta) is the natural log of the book value of total assets. Board size (bdsize) and supervisory board size (sbsize) are the total number of board members and supervisory board members respectively. *ibsize* and *exesize* measure the number of independent board members and the number of people in the top management team respectively. *bcceodual* is the dummy of whether CEO holds the position of board chair. *turn_ceo* is the dummy of whether there is a CEO turnover. *paid_bc* and *paid_sbc* are the dummies of whether the chairman of board or the chairman of supervisory board get paid. Managerial ownership (pctshare_bc) and (pctshare_sbc) are calculated as the ratio (in percentage terms) of total number of shares held by the chairman of board or the chairman of supervisory board over the total number of outstanding shares. *soe3contl* and *foreigncontrl* are the dummy of whether government or foreigners (foreign firms) are the controlling shareholder correspondingly. *herfindahl* measures the ownership concentration and is computed as the ratio of total number of shares held by the largest shareholders (from 2nd to 10th) over the total number shares outstanding. *float2total* is the ratio of tradeable shares to total outstanding shares. *gender_bc, age_bc, gender_sbc,* and *age_sbc* represent the gender and age of the chairman of board and the chairman of the supervisory board respectively. *indcd* is the 13 industry dummies, and *year_t* is the 6 year dummies. Heteroskedasticity robust t-statistics are reported in the column to the right of the coefficient column. *, **, *** denote significance at the 10%, 5%, and 1% level respectively.

	Dependent variable: σ						Dependent variable: β					
Variables	Pooled		Year 2001-2004		Year 2005-2006		Pooled		Year 2001-2004		Year 2005-2006	
	Estimate	t-Statistic	Estimate	t-Statistic	Estimate	t-Statistic	Estimate	t-Statistic	Estimate	t-Statistic	Estimate	t-Statistic
bdmf_fit2	0.151***	10.68	0.105***	7.53	0.229***	8.58	0.022***	3.23	0.027***	3.49	0.017	1.22
sbmf_fit2	-0.080***	-5.64	-0.056***	-3.81	-0.118***	-4.07	-0.016*	-1.85	-0.017*	-1.68	-0.002	-0.14
σL	0.403***	13.55	0.417***	10.11	0.341***	6.91	0.152***	7.47	0.201***	7.56	0.121***	3.70
βL	-0.123***	-2.86	-0.186***	-3.62	0.028	0.33	0.095***	3.15	0.068**	2.02	0.102*	1.74
CapDivL	-0.008	-0.33	-0.161***	-4.58	0.107***	2.58	-0.065***	-2.99	-0.186***	-6.61	0.026	1.04
TobinQL	-0.053***	-3.99	-0.047***	-2.92	-0.039	-1.10	-0.078***	-8.92	-0.079***	-8.65	-0.070***	-3.34
roaL	-0.607***	-3.71	-0.550***	-3.00	-0.787**	-2.32	-0.230**	-2.51	-0.305***	-3.67	0.245	1.20
ltaL	0.000	0.00	0.016	0.27	-0.029	-0.32	0.020	0.70	0.019	0.58	0.014	0.35
lnta	-0.117***	-9.56	-0.093***	-6.48	-0.127***	-6.17	-0.055***	-7.37	-0.057***	-6.22	-0.048***	-3.97
bdsize	0.011**	2.50	0.005	1.00	0.036***	2.70	-0.002	-0.66	-0.003	-1.03	0.004	0.39
ibsize	-0.021*	-1.78	-0.007	-0.55	-0.069**	-1.99	0.000	0.05	0.001	0.13	0.001	0.06
gender_bc	-0.048	-1.04	-0.022	-0.48	-0.099	-1.10	0.017	0.63	-0.002	-0.08	0.028	0.53
age_bc	0.002**	2.02	0.001	0.45	0.005**	2.20	0.000	0.37	0.000	0.46	0.000	-0.18
paid_bc	-0.008	-0.48	0.000	0.00	-0.024	-0.68	0.004	0.31	0.010	0.72	-0.021	-1.04
pctshare_bc	-0.116	-1.02	-1.386	-1.27	-0.107	-0.94	-0.010	-0.20	0.189	0.22	-0.032	-0.62
gender_sbc	-0.013	-0.66	0.007	0.30	-0.042	-1.06	0.002	0.15	0.015	0.97	-0.027	-1.11
age_sbc	0.000	0.08	0.001	0.85	-0.001	-0.39	0.000	0.00	0.000	0.49	0.000	-0.34
paid_sbc	-0.042**	-2.55	-0.020	-1.01	-0.073**	-2.27	-0.030***	-2.74	-0.029**	-2.07	-0.022	-1.14
pctshare_sbc	0.083	0.36	1.846	0.44	-0.044	-0.13	0.104	1.32	-0.076	-0.02	0.076	0.77
foreigncontrl	(dropped)						(dropped)					
turn_ceo	-0.131***	-5.80	-0.088***	-3.59	-0.217***	-4.95	-0.034**	-2.48	-0.041**	-2.56	-0.030	-1.14
herfindahl	0.000***	2.88	0.000***	2.65	0.000	1.39	0.000	1.24	0.000**	2.29	0.000	-0.87
bcceodual	-0.043*	-1.67	-0.040	-1.34	-0.052	-1.04	-0.030*	-1.72	-0.032	-1.57	-0.013	-0.40
float2total	-0.156**	-2.40	-0.085	-1.05	-0.227*	-1.91	-0.049	-1.13	-0.098*	-1.76	-0.028	-0.38
sbsize	0.022***	3.50	0.017***	2.82	0.025*	1.93	0.008**	2.10	0.012**	2.56	0.001	0.11
exesize	-0.002	-0.66	-0.005	-1.41	0.002	0.26	0.000	-0.15	-0.002	-0.88	0.000	0.04
indcd	Mixed						Mixed					
year_t	Mixed						Mixed					
constant	3.690	13.24	2.862	8.67	3.370	6.81	1.712	9.66	1.815	8.25	1.670	5.78
N	2915		1885		1030		2915		1885		1030	
Robust F-statistic	84.96		35.82		17.84		18.37		19.88		7.2	
F-statistic p-value	0.000		0.000		0.000		0.000		0.000		0.000	
Adj. R-squared	0.579		0.432		0.434		0.244		0.339		0.195	

Table 6 Panel B Stage 4 regression for the subsample of non-government controlling firms.

Variables	Dependent variable: σ						Dependent variable: β					
	Pooled		Year 2001-2004		Year 2005-2006		Pooled		Year 2001-2004		Year 2005-2006	
	Estimate	t-Statistic	Estimate	t-Statistic	Estimate	t-Statistic	Estimate	t-Statistic	Estimate	t-Statistic	Estimate	t-Statistic
bdmf_fit2	0.165***	10.27	0.104***	5.42	0.234***	8.92	0.024**	2.54	0.016	1.18	0.033***	2.58
sbmf_fit2	-0.069***	-3.90	-0.026	-1.16	-0.103***	-3.56	-0.010	-0.85	-0.005	-0.33	-0.008	-0.43
σL	0.340***	8.23	0.413***	5.94	0.263***	4.78	0.137***	4.79	0.183***	3.77	0.106***	2.95
βL	0.007	0.14	-0.065	-1.02	0.067	0.70	0.195***	4.70	0.188***	3.61	0.151**	2.40
CapDivL	-0.022	-0.63	-0.115***	-2.70	0.032	1.06	-0.042	-1.04	-0.141***	-3.57	0.018	0.81
TobinQL	-0.005	-0.30	-0.013	-0.72	0.012	0.40	-0.010	-0.41	-0.015	-0.59	-0.011	-0.47
roaL	-0.061	-0.91	-0.124	-1.43	0.006	0.08	-0.014	-0.34	-0.113**	-1.97	0.056	0.71
ltaL	-0.050	-1.64	-0.022	-0.53	-0.068	-1.41	-0.032	-0.83	-0.057	-1.24	-0.007	-0.17
lnta	-0.108***	-5.99	-0.096***	-4.27	-0.126***	-5.04	-0.020	-1.07	-0.020	-0.77	-0.020	-1.20
bdsize	0.017**	2.29	0.022**	2.39	0.001	0.08	0.007	1.33	0.008	1.35	-0.007	-0.62
ibsize	-0.035*	-1.66	-0.060**	-2.35	0.029	0.70	-0.029**	-1.97	-0.042**	-2.46	0.020	0.67
gender_bc	0.007	0.18	0.001	0.03	-0.006	-0.09	0.010	0.33	0.005	0.12	0.012	0.31
age_bc	0.001	0.70	-0.001	-0.35	0.003	1.18	0.001	0.77	-0.001	-0.53	0.002*	1.67
paid_bc	-0.024	-1.07	-0.007	-0.23	-0.044	-1.19	0.011	0.70	0.023	1.11	-0.011	-0.44
pctshare_bc	-0.001	-0.36	0.008	0.53	0.000	-0.07	0.000	0.21	0.003	0.31	0.000	0.05
gender_sbc	0.041*	1.77	0.029	0.92	0.057	1.58	-0.010	-0.61	-0.006	-0.25	-0.007	-0.28
age_sbc	0.001	1.10	0.001	0.67	0.002	1.26	0.001	0.88	0.001	0.61	0.001	1.01
paid_sbc	-0.001	-0.03	-0.007	-0.24	0.019	0.56	-0.002	-0.12	-0.017	-0.88	0.027	1.18
pctshare_sbc	0.007	0.27	0.004	0.09	0.003	0.07	0.001	0.05	0.002	0.08	0.000	0.01
foreigncontrl	-0.065	-1.12	-0.096	-1.37	-0.042	-0.44	-0.007	-0.18	-0.052	-0.96	0.043	0.90
turn_ceo	-0.072**	-2.53	0.008	0.24	-0.180***	-3.75	0.006	0.33	0.038	1.53	-0.048*	-1.73
herfindahl	0.000	0.76	0.000	0.91	0.000	0.04	0.000	0.28	0.000	1.17	0.000	-0.65
bcceodual	-0.049	-1.63	-0.044	-1.09	-0.075	-1.50	-0.029	-1.35	-0.023	-0.80	-0.037	-1.16
float2total	-0.228***	-2.88	-0.081	-0.78	-0.379***	-3.08	-0.030	-0.55	0.013	0.18	-0.082	-1.04
sbsize	0.012	1.37	-0.001	-0.13	0.028**	2.02	0.001	0.25	-0.006	-0.74	0.014	1.56
exesize	-0.007*	-1.84	-0.002	-0.27	-0.010**	-2.35	-0.001	-0.28	-0.001	-0.30	-0.001	-0.31
indcd			Mixed						Mixed			
year_t			Mixed						Mixed			
constant	2.592	6.09	3.032	5.83	3.137	5.75	0.814	1.79	0.960	1.57	0.653	1.85
N	1773		982		791		1773		982		791	
Robust F-statistic	48.08		20.77		.		11.03		9.86		5.92	
F-statistic p-value	0.000		0.000		.		0.000		0.000		0.000	
Adj. R-squared	0.565		0.468		0.414		0.245		0.339		0.223	

Table 7 Panel A   Stage 4 regression using meeting frequency deviation from industry average

This table reports the results of 4th stage regression of firm total risk σ (**Panel A**) and market risk β (**Panel B**). We form subsamples based on two deviation variables, *bdmf_dev* and *bmf_dev*, which are defined as the individual firm's board/supervisory board meeting frequency minus the industry average board/supervisory board meeting frequency respectively. *sbmfdev_fit2* and *bdmfdev_fit2* are the fitted values of deviation of meeting frequencies from third stage regressions. The capital letter "L" is attached to the original variable name to denote the lagged value of variables. The firm's total risk (σ) is computed as the standard deviation of the stock's daily return in percentage terms within a fiscal year including the capital gain and dividends. The firm's market risk (β) is estimated as the stock's daily market beta within a fiscal year. The stock's market performance (CapDiv) is computed as the sum of capital gain and dividends within a year. Return on assets (roa) is calculated as net income divided by total assets. Tobin's Q (TobinQ) is calculated as the sum of book value of liabilities and market value of equity divided by the book value of total assets. Financial leverage (lta) is measured by the ratio of total liabilities over total assets. Firm size (lnta) is the natural log of the book value of total assets. Board size (bdsize) and supervisory board size (sbsize) are the total number of board members and supervisory board members respectively. *ibsize* and *exesize* measure the number of independent board members and the number of people in the top management team respectively. *bcceodual* is the dummy of whether CEO holds the position of board chair. *turn_ceo* is the dummy of whether there is a CEO turnover. *paid_bc* and *paid_sbc* are the dummies of whether the chairman of board or the chairman of supervisory board get paid. Managerial ownership (pctshare_bc) and (pctshare_sbc) are calculated as the ratio (in percentage terms) of total number of shares held by the chairman of board or the chairman of supervisory board over the total number of outstanding shares. *soe3contl* and *foreigncontrl* are the dummy of whether government or foreigners (foreign firms) are the controlling shareholder correspondingly. *herfindahl* measures the ownership concentration and is computed as the ratio of total number of shares held by the largest shareholders (from 2nd to 10th) over the total number shares outstanding. *float2total* is the ratio of tradeable shares to total outstanding shares. *gender_bc, age_bc, gender_sbc,* and *age_sbc* represent the gender and age of the chairman of board and the chairman of the supervisory board respectively. *indcd* is the 13 industry dummies, and *year_t* is the 6 year dummies. Heteroskedasticity robust t-statistics are reported in the column to the right of the coefficient column. *, **, *** denote significance at the 10%, 5%, and 1% level respectively.

Variables	Pooled		bdmf_dev>0		bdmf_dev<=0		sbmf_dev>0		sbmf_dev<=0	
	Estimate	t-Statistic	Estimate	t-Statistic	Estimate	t-Statistic	Estimate	t-Statistic	Estimate	t-Statistic
bdmfdev_fit2	0.156***	14.52	0.142***	9.07	0.177***	12.55	0.232***	9.47	0.352***	16.66
sbmfdev_fit2	-0.071***	-6.42	-0.065***	-3.90	-0.128***	-7.31	-0.043***	-2.85	-0.086***	-5.84
σL	0.379***	15.64	0.343***	8.70	0.394***	13.36	0.335***	9.14	0.269***	8.18
βL	-0.052	-1.46	-0.095*	-1.73	-0.002	-0.06	-0.002	-0.03	0.090*	1.84
CapDivL	-0.029	-1.41	-0.002	-0.06	-0.042*	-1.91	-0.008	-0.22	-0.025	-0.98
TobinQL	-0.024	-1.49	-0.018	-0.79	-0.037***	-2.96	-0.014	-1.03	-0.019	-0.62
roaL	-0.116	-1.26	-0.171	-1.15	-0.042	-0.34	-0.147	-1.53	-0.126	-0.92
ltaL	-0.017	-0.64	0.009	0.17	-0.010	-0.38	-0.039	-1.03	-0.058	-1.29
lnta	-0.111***	-9.27	-0.104***	-6.54	-0.127***	-9.19	-0.117***	-8.28	-0.165***	-8.67
bdsize	0.015***	3.83	0.014**	2.17	0.013***	2.59	0.020***	3.01	0.027***	5.48
ibsize	-0.031***	-2.91	-0.026	-1.44	-0.023*	-1.78	-0.026	-1.58	-0.053***	-3.91
gender_bc	-0.010	-0.33	-0.093*	-1.79	0.042	1.10	-0.026	-0.57	-0.106***	-2.83
age_bc	0.002*	1.88	0.002	1.33	0.002*	1.92	0.003*	1.81	0.006***	5.23
paid_bc	-0.016	-1.17	-0.007	-0.31	-0.019	-1.08	0.011	0.53	-0.018	-1.03
pctshare_bc	-0.001	-0.54	0.002	0.36	-0.003	-0.84	0.009*	1.91	-0.003	-1.12
gender_sbc	0.007	0.47	0.047*	1.95	-0.015	-0.73	0.004	0.18	-0.008	-0.41
age_sbc	0.001	0.78	0.002	1.61	0.000	-0.37	0.001	0.61	0.001	1.41
paid_sbc	-0.024*	-1.87	-0.031	-1.53	-0.014	-0.84	-0.038*	-1.97	-0.029*	-1.73
pctshare_sbc	0.003	0.12	0.000	0.00	0.003	0.09	0.023	0.33	0.012	0.67
foreigncontrl	-0.081	-1.44	-0.004	-0.06	-0.180**	-2.01	-0.200**	-2.45	-0.184**	-2.57
soe3contl	0.090***	6.50	0.092***	4.08	0.097***	5.39	0.100***	4.50	0.159***	8.62
turn_ceo	-0.100***	-5.65	-0.085***	-3.15	-0.121***	-5.39	-0.176***	-5.66	-0.260***	-10.34
herfindahl	0.000***	2.89	0.000	0.44	0.000***	2.84	0.000	0.53	0.000**	2.41
bcceodual	-0.037*	-1.89	-0.028	-0.87	-0.045*	-1.82	-0.072**	-2.54	-0.029	-1.09
float2total	-0.171***	-3.34	-0.057	-0.72	-0.282***	-4.20	-0.204***	-2.72	-0.330***	-4.74
sbsize	0.020***	3.88	0.019**	2.34	0.025***	3.83	0.033***	4.06	0.041***	6.51
exesize	-0.005*	-1.81	-0.005	-1.34	-0.006*	-1.69	-0.005	-1.00	-0.017***	-6.00
indcd	Mixed		Mixed				Mixed			
year_t	Mixed		Mixed				Mixed			
constant	3.766	12.53	4.233	10.91	4.622	14.34	3.580	10.9	5.011	10.16
N	4688		1993		2693		2141		2547	
Robust F-statistic	124.52		55.85		74.89		64.15		82.64	
F-statistic p-value	0		0		0		0		0	
Adj. R-squared	0.566		0.562		0.583		0.602		0.606	

Table 7 Panel B

Variables	Pooled		bdmf_dev>0		bdmf_dev<=0		sbmf_dev>0		sbmf_dev<=0	
	Estimate	t-Statistic	Estimate	t-Statistic	Estimate	t-Statistic	Estimate	t-Statistic	Estimate	t-Statistic
bdmfdev_fit2	0.030***	5.12	0.029***	3.53	0.034***	4.35	0.048***	4.61	0.072***	5.96
sbmfdev_fit2	-0.013*	-1.94	-0.013	-1.17	-0.025**	-2.29	-0.006	-0.60	-0.017*	-1.68
σL	0.134***	8.05	0.131***	4.84	0.135***	6.55	0.118***	4.75	0.118***	4.91
βL	0.163***	5.30	0.161***	3.45	0.154***	4.87	0.158***	4.19	0.199***	4.37
CapDivL	-0.061**	-2.50	-0.021	-0.55	-0.088***	-4.14	-0.045	-0.90	-0.073***	-2.77
TobinQL	-0.034	-1.49	-0.025	-0.77	-0.058***	-7.07	-0.048***	-4.25	-0.026	-0.71
roaL	-0.051	-1.02	-0.117	-1.59	0.005	0.14	-0.020	-0.23	-0.063	-0.77
ltaL	-0.011	-0.31	-0.033	-0.58	0.024	1.07	-0.009	-0.23	-0.023	-0.43
lnta	-0.039***	-2.90	-0.031*	-1.72	-0.058***	-7.30	-0.050***	-5.02	-0.046**	-2.27
bdsize	0.003	0.91	0.002	0.51	0.001	0.30	0.005	1.15	0.004	1.07
ibsize	-0.012	-1.49	-0.008	-0.66	-0.007	-0.78	-0.011	-0.95	-0.016	-1.52
gender_bc	0.009	0.48	0.010	0.29	0.013	0.51	0.012	0.40	-0.019	-0.70
age_bc	0.001	1.06	0.000	-0.39	0.001**	2.02	0.001	0.92	0.001**	1.84
paid_bc	0.009	0.91	0.012	0.83	0.006	0.49	0.014	0.96	0.009	0.74
pctshare_bc	0.001	0.44	0.001	0.16	0.000	0.16	0.004	1.16	0.000	0.09
gender_sbc	-0.004	-0.40	0.017	1.03	-0.018	-1.31	0.001	0.05	-0.011	-0.78
age_sbc	0.000	0.66	0.001	0.88	0.000	0.00	0.001	0.81	0.000	0.28
paid_sbc	-0.019**	-2.10	-0.023	-1.57	-0.018	-1.62	-0.027**	-2.01	-0.018	-1.48
pctshare_sbc	0.006	0.44	0.014	1.20	-0.007	-0.25	0.032	0.84	0.002	0.11
foreigncontrl	-0.014	-0.41	0.060	1.38	-0.101**	-1.96	-0.061	-1.25	-0.015	-0.30
soe3contl	0.026***	2.73	0.038**	2.42	0.016	1.34	0.024*	1.65	0.043***	3.38
turn_ceo	-0.024**	-2.11	-0.024	-1.38	-0.030***	-2.05	-0.041**	-2.40	-0.059***	-3.42
herfindahl	0.000	1.20	0.000	-0.03	0.000	1.18	0.000	0.44	0.000	0.70
bcceodual	-0.028**	-2.04	-0.037	-1.63	-0.022	-1.27	-0.032	-1.61	-0.030	-1.55
float2total	-0.019	-0.50	0.027	0.47	-0.075*	-1.76	-0.001	-0.02	-0.090	-1.62
sbsize	0.006**	2.01	0.010**	1.99	0.005	1.26	0.009*	1.95	0.011**	2.39
exesize	-0.001	-0.65	-0.003	-1.42	0.001	0.41	0.003	0.95	-0.007***	-3.01
indcd	Mixed				Mixed				Mixed	
year_t	Mixed				Mixed				Mixed	
constant	1.498	4.15	1.142	2.58	1.761	9.02	1.645	6.43	1.718	3.12
N	4688		1993		2693		2141		2547	
Robust F-statistic	24.72		9.69		18.9		13.74		14.91	
F-statistic p-value	0		0		0		0		0	
Adj. R-squared	0.230		0.209		0.273		0.234		0.248	

Table 8   Firm risk and meeting frequency sensitivity

This table reports the results of the sensitivity analysis between firm risk (total risk σ and market risk β) and board/supervisory board meeting frequency. We perform 4th stage regression using three different approaches. The first approach focuses on the two monitoring induced meeting frequency variables, *bdmf_fit2 and sbmf_fit2, which are the fitted values of meeting frequencies from third stage regressions*. The second approach focuses on the changes of two meeting frequency variables, *dbdmeet and dsbmeet*. The third approach focuses on the sub-sample of government controling firms. The letter "d" is attached as the prefix to the original varialbe name to denote the first difference. The capital letter "L" is attached to the original variable name to denote the lagged value of variables. The firm's total risk (σ) is computed as the standard deviation of the stock's daily return in percentage terms within a fiscal year including the capital gain and dividends. The firm's market risk (β) is estimated as the stock's daily market beta within a fiscal year. The stock's market performance (CapDiv) is computed as the sum of capital gain and dividends within a year. Return on assets (roa) is calculated as net income divided by total assets. Tobin's Q (TobinQ) is calculated as the sum of book value of liabilities and market value of equity divided by the book value of total assets. Financial leverage (lta) is measured by the ratio of total liabilities over total assets. The change in firm size (diff_ta) is measured as change in total assets. Board size (bdsize) and supervisory board size (sbsize) are the total number of board members and supervisory board members respectively. *ibsize* and *exesize* measure the number of independent board members and the number of people in the top management team respectively. *bcceodual* is the dummy of whether CEO holds the position of board chair. *turn_ceo* is the dummy of whether there is a CEO turnover. *paid_bc* and *paid_sbc* are the dummies of whether the chairman of board or the chairman of supervisory board get paid. Managerial ownership (pctshare_bc) and (pctshare_sbc) are calculated as the ratio (in percentage terms) of total number of shares held by the chairman of board or the chairman of supervisory board over the total number of outstanding shares. *soe3contl* and *foreigncontrl* are the dummy of whether government or foreigners (foreign firms) are the controlling shareholder correspondingly. *herfindahl* measures the ownership concentration and is computed as the ratio of total number of shares held by the largest shareholders (from 2nd to 10th) over the total number shares outstanding. *float2total* is the ratio of tradeable shares to total outstanding shares. *gender_bc, age_bc, gender_sbc,* and *age_sbc* represent the gender and age of the chairman of board and the chairman of the supervisory board respectively. *indcd* is the 13 industry dummies, and *year_t* is the 6 year dummies. Heteroskedasticity robust t-statistics are reported in the column to the right of the coefficient column. *, **, *** denote significance at the 10%, 5%, and 1% level respectively.

Variables	Dependent variable: dσ						Dependent variable: dβ					
	Monitoring MF		MF Difference		Gov Contl firms		Monitoring MF		MF Difference		Gov Contl firms	
	Estimate	t-Statistic	Estimate	t-Statistic	Estimate	t-Statistic	Estimate	t-Statistic	Estimate	t-Statistic	Estimate	t-Statistic
bdmf_fit2	0.133***	10.85					0.033***	4.83				
sbmf_fit2	-0.071***	-5.24					-0.023*	-2.60				
dbdmeet			0.004	1.39	0.004	1.00			0.002	0.78	0.003	1.05
dsbmeet			-0.006	-1.34	-0.005	-0.94			-0.002	-0.55	-0.001	-0.35
dσL	-0.362***	-14.07	-0.317***	-12.12	-0.305***	-9.41	0.079***	4.19	0.086***	4.65	0.084***	3.35
dβL	-0.120***	-3.75	-0.153***	-4.74	-0.203***	-4.80	-0.528***	-21.21	-0.536***	-21.63	-0.572***	-17.56
dCapDivL	-0.028	-1.39	-0.035*	-1.71	0.013	0.38	-0.034**	-2.09	-0.036**	-2.35	-0.029	-1.24
dTobinQL	-0.041**	-2.08	-0.036*	-1.77	-0.053	-1.57	-0.078***	-5.35	-0.077***	-5.33	-0.083***	-3.90
droaL	-0.120**	-2.44	-0.113**	-1.98	-0.217	-0.72	-0.082***	-2.86	-0.085***	-2.97	-0.131**	-2.43
ltaL	-0.038	-1.62	-0.029	-1.20	0.041	0.93	0.003	0.15	0.005	0.23	0.015	0.29
diff_ta	0.000	0.61	0.000	1.04	0.000	0.92	0.000	1.12	0.000	1.58	0.000	1.31
dbdsize	-0.003	-0.52	-0.003	-0.47	-0.006	-0.70	-0.001	-0.23	0.000	-0.09	0.002	0.43
dibsize	0.012	0.94	0.011	0.87	0.008	0.54	0.004	0.43	0.002	0.20	0.001	0.10
gender_bc	0.016	0.39	0.054	1.22	0.002	0.03	0.048*	1.75	0.048*	1.74	0.073**	1.98
age_bc	0.001	1.03	-0.001	-0.97	0.000	0.11	0.001*	1.93	0.001	1.45	0.001	1.23
paid_bc	0.000	-0.01	-0.008	-0.45	-0.008	-0.33	0.003	0.27	0.005	0.41	-0.010	-0.64
pctshare_bc	-0.016***	-3.07	-0.018***	-3.55	0.533***	2.72	-0.009	-1.19	-0.009	-1.19	0.277**	2.20
gender_sbc	0.001	0.07	0.001	0.06	-0.015	-0.54	-0.002	-0.16	0.005	0.38	-0.005	-0.28
age_sbc	0.001	0.61	0.001	0.50	0.000	-0.07	0.000	0.53	0.001	1.30	0.000	0.35
paid_sbc	-0.024	-1.45	-0.022	-1.32	-0.026	-1.21	-0.018	-1.53	-0.015	-1.29	-0.014	-0.96
pctshare_sbc	0.019	0.68	0.002	0.06	-0.746***	-3.17	0.044	1.64	0.043	1.59	-0.271*	-1.76
foreigncontrl	-0.037	-0.46	0.109	1.34			0.023	0.45	0.040	0.85		
soe3contl	0.046***	2.60	0.000	0.01			0.005	0.39	-0.001	-0.09		
turn_ceo	-0.086***	-3.75	0.038*	1.93	0.004	0.15	-0.025*	-1.73	0.005	0.38	0.010	0.60
herfindahl	0.000	1.04	0.000	0.57	0.000	0.64	0.000	-0.12	0.000	-0.83	0.000	0.05
bcceodual	-0.056**	-2.25	-0.052**	-2.09	-0.033	-0.97	-0.056***	-3.26	-0.050***	-2.92	-0.020	-0.92
float2total	-0.155**	-2.40	-0.061	-0.93	-0.123	-1.48	0.023	0.54	0.055	1.32	-0.002	-0.05
dsbsize	0.013	0.88	0.001	0.10	0.022	1.21	0.007	0.71	0.001	0.12	0.009	0.78
exesize	-0.005	-1.40	0.003	0.78	0.002	0.43	-0.002	-0.57	0.002	0.58	-0.001	-0.44
indcd			Mixed						Mixed			
year_t			Mixed						Mixed			
constant	-0.490	-3.71	0.504	4.41	-0.330	-2.07	-0.269	-3.17	-0.226	-3.00	-0.132	-1.35
N	3497		3503		2119		3497		3703		2230	
Adj. R-squared	0.418		0.386		0.417		0.247		0.239		0.261	