

Does Corporate Governance Enhance Firm Performance and Reduce Firm Risk? Evidence from Taiwanese Listed Companies

Jo-Yu Wang*

Department of Finance, National Formosa University, Taiwan

Juo-Lien Wang

*Department of Accounting, Chaoyang University of Technology,
Taiwan*

Hui-Yu Liao

Nexia International Sun Rise CPAs and Company, Taiwan

Corporate governance practices are perceived as ways to improve firm performance. This paper examines whether better corporate governance does indeed enhance firm performance in addition to reducing their risks. Based on Taiwanese listed firms from 2002 to 2016, Tobin's Q, ROE, and EPS were used to measure company performance, and Value at risk (VaR) was the proxy for firm risk. The empirical results show that blockholders, managerial ownership, board ownership, and independent directors have a significant impact on company performance, but also that more shares held by institutional investors and the presence of CEO duality aggravate firm risk. This implies that better corporate governance can simultaneously improve firm performance and reduce firm risk, especially in a crisis period. However, the contribution of corporate governance in risk reduction is not as significant as it is during a crisis.

Keywords: corporate governance, firm performance, firm risk

JEL classification: G30, G39

* Correspondence to: Professor Wang is an assistant professor in the Department of Finance, National Formosa University, Taiwan. Any suggestions regarding this paper can be sent to jywang@nfu.edu.tw.

1 Introduction

As companies based in the West have continuously expanded, the management and ownership functions have separated, leading to problems of corporate governance. In the past thirty years, several corporate scandals have occurred in large enterprises, such as Enron in 2001 and WorldCom in 2003¹, and corporate governance has gradually begun to receive more attention. This impacts not only the rights of the majority shareholders in these corporations, but also those of minority holders. As in many other emerging markets, the major challenge with corporate governance in Asian markets is the lack of protection of minority rights (Claessens and Fan 2002). During the financial crisis of 2008 and 2009, many companies went bankrupt or merged with others due to failures of corporate governance. Therefore, the presence of good corporate governance practices implies not only the reduction of firm risk, but also the potential to achieve better performance.

In the past two decades, some measures have been proposed to examine the quality of corporate governance. For example, information transparency helps investors better understand the company, increases their confidence, and also enables the company to operate effectively. Corporate governance ratings can improve information transparency and help reduce investment risks. There are many well-known professional institutes for corporate governance evaluation that provide measurement standards, such as Standard & Poor's, Credit Lyonnais Securities Asia (CLSA), Investor Responsibility Research Center (IRRC), and Institutional Shareholder Services (ISS). In the past, many studies have explored the relationship between corporate governance and corporate performance based on these governance standards (Love and Klapper 2002, Gompers *et al.* 2003, Brown and Caylor 2004). The results show that good corporate governance has a positive impact on firm valuation and firm performance. It is also confirmed that agency problems can be ameliorated via good corporate governance.

Poor corporate governance could be interpreted as a warning of bankruptcy (Darrat *et al.* 2016), implying that corporate risk is accounted for when the decision

¹ Notable corporate scandals include: Waste Management in 1998, Tyco in 2002, HealthSouth in 2003, American International Group in 2005, Bernie Madoff in 2008, Satyam in 2009, and Volkswagen's emissions scandal in recent years.

is made. In other words, corporate governance not only affects the firm's performance but also corporate risk. Apart from the influence of the external environment, internal conditions are also critical factors of corporate risk. Nguyen (2011) argues that firms with concentrated ownership would have a greater advantage and increased ability of risk-taking. One of the internal considerations in corporate governance is the relationship between corporate governance and corporate risk. For example, Wright *et al.* (1996) confirm that institutional investors have a positive influence on firms' risk-taking. Switzer *et al.* (2018) find that the corporate governance variables of Asian companies have a greater impact on default risk than those of European companies; for instance, insider ownership and chief executive officer (CEO) duality have a positive effect on default risk.

Most of the past literature focused on corporate governance and firm valuation or performance (Love and Klapper 2004, Brown and Caylor 2009). Moreover, the relationship between corporate governance and corporate risk has also been discussed (Andres 2008, Kim and Lu 2011, Wang *et al.* 2015). Generally speaking, good corporate governance can improve performance and also reduce corporate risk. Therefore, the biggest contribution of this paper is to examine the associations between the practices of corporate governance and firm performance and corporate risk. In this paper, 854 Taiwanese listed firms from 2002 to 2016 are considered. We aim to discuss what kind of corporate governance practices might have a linkage with firm performance and corporate risk.

Our results show that six corporate governance variables are significantly associated with firm performance (Tobin's Q, ROE, and EPS) and corporate risk (VaR) at the same time. This paper makes three contributions to the literature. First, we present which corporate governance variables would influence firm performance (e.g., managerial ownership, board ownership, institutional ownership, and the proportion of independent directors on the board) and corporate risk (e.g., CEO duality) in Taiwanese listed companies. Second, we use the strength of corporate governance to further examine the relationship between corporate governance, firm performance, and firm risk. The results show that excellent corporate governance was significantly linked to firm risk; however, they were not significantly linked to firm performance. Third, using different sample periods, we find that during the financial crisis, corporate governance was more effective in reducing risks, but it did

not improve companies' performance. However, in the period after the financial crisis, the results prove that better corporate governance can improve corporate performance while reducing firm risk.

The remainder of the paper is organized as follows. Section 2 reviews the prior research related to corporate governance, firm performance, and firm risk. Section 3 describes the data and methodology. Section 4 presents the empirical results, and Section 5 concludes the study.

2 Literature Review

Many works of research give a clear definition of corporate governance. Shleifer and Vishny (1997) suggest that corporate governance is a means to ensure that providers of corporate financing receive a return on their investments. Corporate governance is also associated with preventing agency problems and maximizing shareholders' profits. Jensen and Meckling (1976) argue that agency problems are the result of the separation of ownership and control rights, and that shareholders and managers may have different interests and preferences. Claessens and Yurtoglu (2013) state that corporate governance is a set of mechanisms to reach the firm's operating targets when the firm's ownership and management are separated. Ammann *et al.* (2011) evidence that a better corporate governance mechanism would allow investors to obtain higher cash flows and reduce the firm's capital costs.

Agency problems are increasingly prevalent, as more multinational corporations emerge. Learning from earlier major financial scandals and the global financial crisis of 2007-2008, firms with poor corporate governance have more severe operational performance. This implies that improving the quality of governance could protect shareholders' profits properly.

2.1 Corporate Governance, Firm Valuation, and Performance

Corporate governance not only plays a supervisory function to protect the interests of shareholders, but also affects the value of the company. In the past, many studies have discussed the relationship between corporate governance and firm value or performance (Bebchuk and Cohen 2005, Brown and Caylor 2004, Gompers *et al.* 2003, Love and Klapper 2004). Tsao (2015) investigates the association between the

characteristics of the top management team and firm performance after enterprise resource planning system adoption, implying that a positive relationship exists between the characteristics of management team and firm performance. However, there is no agreement on how to measure corporate governance and which proxy is highly associated with firm valuation and performance. Hence, it is critical to identify the measures of corporate governance.

Many institutes offer standards to evaluate the strength of firms' corporate governance. Standard & Poor's uses four dimensions to measure corporate governance: (1) ownership structure and external influences; (2) shareholder rights and stakeholder relations; (3) transparency, disclosure and audit; and (4) board structure and effectiveness. Institutional Shareholder Services (ISS) also proposes a corporate governance rating system, called the Corporate Governance Quotient (CGQ), using 61 topics to evaluate U.S. companies and 55 topics to evaluate international companies based on the following eight categories: (1) board of directors, (2) audit, (3) charter and bylaw provision, (4) anti-takeover provision, (5) executive and director compensation, (6) progressive practices, (7) ownership, and (8) director education. The IRRC uses 24 provisions as a standard of corporate governance. In 2010, CLSA rated companies in 12 Asian countries using the following five major frameworks as the standard for measurement: (1) discipline, (2) transparency, (3) independence, (4) responsibility, and (5) fairness. These ratings can provide clear information to investors and also help strengthen firms' corporate governance mechanisms.

Prior research has used Tobin's Q as a proxy for firm valuation in order to examine the relevance between corporate governance and firm valuation. Using IRRC data, Gompers *et al.* (2003) categorize the 24 governance rules into five groups, create a G-index, and analyze the relationship between the G-index and corporate performance. The results show that firms can increase their firm value, gain higher performance, and reduce capital expenditures when shareholders have significant authority. Bebchuk and Cohen (2005) construct the entrenchment index referring to the G-index, and suggest that six entrenching provisions, such as staggered boards and poison pills, are negatively related to firm value as measured by Tobin's Q. Nevertheless, to measure corporate governance effectively, Cremers and Nair (2005) argue that both internal and external governance mechanisms are

required. As mentioned above, those researchers use the index of corporate governance proposed by IRRC to examine external governance. Furthermore, some researchers use the governance index proposed by ISS to study corporate (internal) governance. Brown and Caylor (2004) use ISS variables to measure the correlation between firm value and performance. They find that firms with stronger corporate governance could prove more profitable, and also confirm that under the ISS classification, board ownership is a more important factor than takeover defenses. Brown and Caylor (2006) refer to prior research and create the Gov-score, a measure with 51 firm-specific ISS provisions folded into eight dimensions². The results show that the Gov-score is positive and significantly associated with Tobin's Q. Simultaneously, it also verifies that effective corporate governance is affected by both internal and external measures through the findings of Cremers and Nair (2005).

Love and Klapper (2004) analyze the corporate governance practices of 495 companies from 25 emerging markets based on the method detailed in the CLSA report. They report that better corporate governance is highly correlated to operating performance and better market valuation. Garay and González's (2008) survey of 46 Venezuelan listed firms in 2004 shows that capital costs can be reduced as a firm's corporate governance becomes stronger, as investors have more confidence and are more willing to provide capital to the firm. Renders *et al.* (2010) study the corporate governance of EU companies, exploring the relationship between corporate governance ratings and company performance measured by Tobin's Q, market value of equity at the end of every year over book value of equity, market value of equity at the end of every year over total sales, return on equity (ROE), and return on assets (ROA) as the proxy variables for company performance. The empirical results show that corporate governance ratings (especially strong shareholder-protection laws and regulations) were positively related to company performance, whether market- or accounts-based. However, while there are many factors that affect firm performance, not all corporate governance conditions can improve firm performance effectively.

² Brown and Caylor (2006) adopt 51 corporate governance standards based on ISS. These 51 provisions are divided into eight dimensions: (1) Audit; (2) Board of directors; (3) Charter/bylaws; (4) Director education; (5) Executive and director compensation; (6) Ownership; (7) Progressive practices; (8) State of incorporation. They identify six governance provisions linking with firm value. The board of directors has three provisions. Executive and director compensation has two provisions.

Brown and Caylor (2009) use 51 ISS provisions as corporate governance variables to evaluate the firms listed on the three major US stock exchanges. Their purpose is to examine whether corporate governance links to operating performance. The findings show that only six provisions are significantly positively related to firm operating performance. However, none of the six is included in the nine mandatory provisions of the three major US stock exchanges.

Corporate governance mechanisms could also effectively reduce conflicts of interest between managers and investors through supervision (Bhojraj and Sengupta 2003). Brickley *et al.* (1988) find that the blockholders with higher holdings would positively influence firm performance because they have a stronger incentive to monitor firm operations. Fuerst and Kang (2004) find that CEO duality (CEOD) has a negative impact on firm valuation. It indicates that a general manager also serving as chairman has greater power and, therefore, may cause damage to the firm's performance or shareholders' wealth. McConnell and Servaes (1990) find that institutional investors' holdings are significantly and positively associated with Tobin's Q (firm performance). Baysinger and Butler (1985) report that the board of directors has a positive relationship with firm performance, and Huson *et al.* (2001) evidence that the higher proportion of outside directors a firm has, the higher the expectations for firm performance.

2.2 Corporate Governance and Corporate Risk

Many previous studies discuss the relationship between corporate governance and performance (Brickley *et al.* 1988, McConnell and Servaes 1990, Huson *et al.* 2001). As mentioned in Section 2.1, good corporate governance mechanisms generate a positive impact on corporate performance (Love and Klapper 2004, Brown and Caylor 2006). In order to meet their commitments of corporate performance, corporates would need to pay attention to risk management as well. Shareholders cannot have complete wealth protection since losses can be uncertain and unpredictable due to the presence of risk. Brown and Caylor (2004) observe that firms with weaker corporate governance are riskier compared with firms with stronger corporate governance. Firms with stronger corporate governance would lead management to reduce firm-level risk, for example, by rejecting riskier projects. Consequently, the firms would incur a lower cost of capital (Sherman 2004). Thus,

risk management is critical in considerations of corporate governance.

Wang *et al.* (2015) investigate the relationship between corporate governance and firm risk (downside risk) by using Taiwanese listed companies from 2002-2012. They adopt value-at-risk (VaR) and expected shortfall (ES) to measure downside risk. The empirical results show that good corporate governance can reduce downside risk and increase firm value at the same time, especially in two practices: having higher managerial ownership and maintaining a higher share of independent board directors. Decision makers within management may directly affect themselves and the shareholders, as they will be able to control and reduce risk. Independent directors also help in monitoring the mechanisms and can voice concerns about reducing corporate risk. Nevertheless, Wang *et al.* (2015) also find that ownership by blockholders and institutional investors is not significantly correlated to downside risk. Hence, they suggest that blockholders and institutional investors have less potential to increase firm's revenue than monitoring.

3 Methodology

3.1 Research Method

In this study, a simple regression model is used to examine if corporate governance has influence on firm performance and risk. Based on the analysis in Section 2, six governance variables, including internal and external governance proxies³ (BH, IH, MH, BOH, IND, and CEOD), are aggregated into a Gov-score (hereafter Gov6⁴), and all the governance variables are regressed to Tobin's Q, ROE, and EPS.

Blockholders (BH) play an important role in the management of companies because they could exert a better monitoring effect (McConnell and Servaes 1995). Blockholders invest more capital than other shareholders, and thus, have stronger incentives to protect their own interests, for example, by reducing agency problems. They also exhibit greater concern about operations and performance (Andres 2008). However, Shleifer and Vishny (1986) argue that firm value can be maximized by increasing corporate risk. From this viewpoint, blockholders would support the firm

³ The details of the six corporate governance variables are defined in Appendix A.

⁴ Gov6 is an integrated governance score created by simply adding the values of BH, IH, MH, BOH, IND, and CEOD.

in taking more risk, and the stock price would increase accordingly. Similarly, literature also considers the number of independent directors on the board (IND) a governance measure. Dahya and McConnell (2005) point out that boards with more independent directors may make different, or better, decisions for the company, because independent directors can objectively consider managers' decisions. Daily and Dalton (1994) study the association between corporate governance and bankruptcy, and find that a higher percentage of independent directors on a board could lead to a lower probability of corporate bankruptcy. It also shows that the effective supervision of independent directors reduces firm risk (Eisenberg 1975, Goyal and Park 2002).

We also include some internal corporate governance variables in our model. Some shares might be held by management (MH) who have different viewpoints on governance and operational behavior. Fama and Jensen (1983) mention that shares held by managers may influence their decisions. If managers were not the major residual claimants, they would not have to bear the major risk of decision making, implying that managers with less shares would be more likely to take unnecessary risks. However, managers with higher shareholdings have higher wealth-performance sensitivity, and therefore, they may avoid risk (Kim and Lu 2011). By contrast, Kini and Williams (2012) find that firms offer incentives that stimulate managers willing to take risks to achieve better performance. In sum, managerial ownership may affect a firm's risk and performance.

Furthermore, directors and supervisors are another key governance proxy in the company, since they are the most familiar with the firm's operations and potential. The board of directors is accountable to shareholders, and directors serve as internal monitors to protect shareholders' wealth (Minnick and Noga 2010). Dechow *et al.* (1996) state that an excellent internal governance structure enhances a firm's financial performance. However, when company directors' and supervisors' ownership is high and lacks sufficient checks and balances, the effectiveness of the company's internal supervision is reduced (Fernández and Arrondo 2005). Switzer *et al.* (2018) report that insider ownership is positively related to default probabilities. An increase in insiders' ownership will bring their interests closer to that of shareholders. Thus, board ownership (BOH) might have a certain impact on corporate governance. In addition, institutional investors (IH) play a critical role in

monitoring firms' operations and whether they are efficiently managed. Erkens *et al.* (2012) indicate that firms with higher institutional ownership would take more risk, which leads to higher losses for shareholders during the financial crisis. Bhojraj and Sengupta (2003) use all U.S. industrial bonds from 1991–1996 to explore the relationship between corporate governance, bond yields, and ratings. They find that if a company has more institutional ownership, it will have a better rating and a lower bond yield. Through institutional investors' effective external monitoring, the company's cost of debt capital can be reduced, as well as the default risk. Rubin and Smith (2009) report that as the level of institutional ownership decreases, the attendant volatility increases.

The last internal governance variable is called CEO duality (CEOD), indicating that the CEO and the chairman are the same person. Considering agency problems, the two positions should be separate and independent. Goyal and Park (2002) point out that a manager would be less sensitive to firm performance when concurrently serving as chairman. Adams *et al.* (2005) find that a powerful CEO has more power to influence decisions and firm performance, and therefore, a firm has higher stock variability if the CEO and the chairman are the same person.

In sum, six variables (two dimensions) are included in our model. They are (1) blockholders' ownership, (2) independent directors on the board, (3) managerial ownership, (4) board ownership, (5) institutional investors, and (6) CEO duality. Reflecting the analysis above, the model is shown in Eq. (1):

$$\begin{aligned} Performance_i = & \beta_0 + \beta_1 BH_i + \beta_2 MH_i + \beta_3 BOH_i + \beta_4 IH_i + \beta_5 IND_i \\ & + \beta_6 CEOD_i + \beta_7 \ln(Assets_i) + \beta_8 \ln(Age_i) + \varepsilon_i \end{aligned} \quad (1)$$

where *Performance* denotes three different performance measures: Tobin's Q, ROE, and EPS. Blockholders' ownership (BH) is the share (in percentage) owned by the top ten shareholders or the shares (in percentage) owned by those holding over 5% of the outstanding shares. Managerial ownership (MH) is the shares owned by the management. Board ownership (BOH) and institutional ownership (IH) are the percentage of shares owned by directors / supervisors and institutional investors, respectively. IND is the proportion of independent directors on the board. CEO duality (CEOD) indicates if the chairman concurrently serves as the CEO. If true, then CEOD equals 1; if not, CEOD equals 0. Ln (Assets) and Ln (Age) are the

natural logarithm of the firm's assets and age.

From the perspective of risk, we further test if corporate governance can reduce firm risk. Here, VaR with a 99% confidence level is applied to measure corporate risk, representing the estimated loss over a specific period with a certain level of confidence. The model can be formulated as following:

$$\begin{aligned} Risk_{i,t} = & \beta_0 + \alpha Risk_{i,t-1} + \beta_1 BH_{i,t-1} + \beta_2 MH_{i,t-1} + \beta_3 BOH_{i,t-1} + \beta_4 IH_{i,t-1} \\ & \beta_5 IND_{i,t-1} + \beta_6 CEOD_{i,t-1} + \beta_7 \ln(Size_{i,t-1}) + \beta_8 LEV_{i,t-1} + \beta_9 CapEX_{i,t-1} \\ & \beta_{10} \ln(Age_{i,t-1}) + \varepsilon_{i,t} \end{aligned} \quad (2)$$

$$VaR_{x,t} = \bar{r}_{x,t} \pm t_{0.99} \sigma_{x,t} \quad (3)$$

where $Risk_{i,t}$ represents firm risk measured by $VaR_{x,t}$, and $VaR_{x,t}$ ⁵ is estimated by using the daily returns of firm x for one specific year t . The main advantage of VaR is that VaR summarizes the maximum potential loss of a portfolio into a single number, with a given probability over a certain horizon (Jorion 2007). In a simple word, VaR indicates how much a firm or a financial institution would lose with a given probability in the next trading day. Furthermore, it offers useful information and is easy to understand and implement. Many international financial institutions have applied internal models to measure market risk based on the VaR approach (Wong and Ting 2016). The control variables are $\ln Size$, LEV , $CapEX$, and $\ln AGE$. $\ln Size$ is the natural logarithm of firms' market value, and LEV is the debt ratio. $CapEX$ represents capital expenditure, and $\ln Age$ is the natural logarithm of the years the firm has been in existence.

3.2 Data

The sample includes 854 firms listed on the Taiwan Stock Exchange for 2002–2016, and the financial statements of the sample are collected from the Taiwan Economic

⁵ Value at risk (VaR) is a risk measure proposed by J.P. Morgan (1996), an investment bank in the U. S. In the literature, several risk measures have been provided, such as volatility of return on assets, systemic risk, and value at risk (VaR). Volatility of return measures total risk of a stock by presenting the deviations of the return from its mean, and systemic risk (β in CAPM model) presents the expected percentage change in the return of the stock for a 1% change in market portfolio return. However, neither is a dollar-based risk measure, meaning that investors cannot understand how much money they might lose from their portfolio.

Journal (TEJ). All the firms from the financial and utilities sectors are excluded. Daily stock prices are also collected from the TEJ for the calculation of risk based on the Value at risk (VaR) method.

Table 1 provides descriptive statistics of the variables used. Panel A includes the description of firms' performance, showing that the total held by the top ten shareholders or those holding over 5% of shares is 20.26%, on average. By contrast, managerial ownership was low in Taiwanese firms, only 1.07% on average. The average level of board ownership was 22.62%, and institutional ownership was 12.48%. The proportion of independent directors on the board was 14.53%, on average. The average CEO duality was about 0.28%. The averages of Tobin's Q, ROE, and EPS for measuring performance were 1.27, 6.42, and 1.99, respectively. Panel B reports the descriptive statistics of risk. The VaR ranges from 0.009 to 0.66, and the mean value at the 99% confidence levels is 0.05. In addition, based on the scale of the industry, we report average corporate governance variables for each industry in panel C.

Table 2 reports the correlation coefficient for firm performance, risk, and governance variables. In panel A, almost all corporate governance variables (BH, MH, BOH, IH, IND) have a positive relationship with Tobin's Q, ROE, and EPS, while supporting the previous assumptions from the literature that good corporate governance would lead to good firm performance. Panel B shows that most of the governance variables (BH, BOH, IH) have a negative relationship with risk. This means that companies with good governance conditions can reduce risk, in line with our expectations. It can be seen from Table 2 that the correlation coefficients between the variables are lower than 0.6, indicating that the correlations between the variables are not high, and the collinearity problem does not exist.

We also provide evidence in Panel C of Table 1 to show the quality of governance practices across industries, and the discrepancies between industries do not lead to a significant difference in corporate governance. In other words, our results are not affected by an industry factor. In Panel C, the results of BH, MH, BOH, and CEOD in every industry are similar, although the results of the automobile industry are very interesting. On average, the management levels (MH) in automobile companies hold fewer shares (0.2263), and the firms have the highest board ownership (BOH, 40.1441). Moreover, the chairmen in this industry do not

tend to take CEO positions (CEOD, 0.0875). By contrast, firms in the electronics industry seem to prefer more independent directors on the board (IND, 20.3700) and less shares held by blockholders (BH, 17.5823). In the cement industry, more chairmen take the CEO position at the same time (CEOD, 0.5714). Overall, the sample used in this paper is well-dispersed.

Table 1. Descriptive Statistics

In Panel A, we present the statistics of performance, corporate governance variables, and control variables, using yearly data from 2002 to 2016 of 854 firms namely, 10,648 samples. Panel B presents the statistics of risk, only using yearly data from 2003 to 2015 of 854 firms, namely, 9,158 samples. CapEx (capital expenditure) is defined as the change in a firm's book value of fixed assets scaled by total assets. Therefore, our sample period is two years less than that in panel A. Tobin's Q is defined as the sum of market value of equity and debt amount (the book value of the firm's short-term liabilities + the book value of the firm's long-term debt) over the firm's total assets. In Panel C, we present the statistics of corporate governance variables based on individual industries.

Panel A: Performance

	Mean	Median	Max.	Min.	Std. dev.	Skewness	Kurtosis
BH (%)	20.2684	18.2951	94.2681	0	12.1553	1.1474	5.1577
MH (%)	1.0713	0.2607	44.4910	0	2.3417	5.8160	64.8520
BOH (%)	22.6274	19.2124	98.0705	0	14.3305	1.3236	5.2015
IH (%)	12.4810	6.3951	99.2100	0	15.7895	1.9937	7.1448
IND (%)	14.5300	0	75.0000	0	16.8716	0.5643	1.8412
CEOD	0.2867	0	1.0000	0	0.4522	0.9432	1.8896
Ln(Assets)	6.9024	6.8238	9.4136	4.3793	0.5973	0.7517	3.8070
Ln(Age)	1.5225	1.5563	1.8512	0	0.1955	-1.2171	5.5582
Tobin's Q	1.2713	1.0638	15.0668	0.0451	0.7474	3.8930	32.2409
(%)							
ROE (%)	6.4248	7.7722	244.4203	-2118.2608	29.2393	-40.0886	2730.035
EPS (%)	1.9936	1.3218	180.0811	-57.8612	4.6605	14.0927	466.4619

Panel B: Risk

	Mean	Median	Max.	Min.	Std. dev.	Skewness	Kurtosis
VaR	0.0547	0.0533	0.6664	0.0095	0.0220	6.1610	136.8246
BH (%)	20.1992	18.2302	84.1200	0	11.9138	1.1470	5.1455
MH (%)	1.0816	0.2800	44.4901	0	2.3073	5.7173	62.9514
BOH (%)	22.4679	19.0041	98.0703	0	14.1876	1.3679	5.3991
IH (%)	12.2872	6.3920	99.2100	0	15.3265	1.9549	6.9564
IND (%)	13.7514	0	75.0000	0	16.6465	0.6455	1.9398
CEOD	0.2835	0	1.0000	0	0.4507	0.9603	1.9222
Ln(Size)	3.7300	3.6780	6.5691	1.6020	0.6244	0.6544	4.0315
LEV (%)	42.9916	43.545	99.1307	1.1400	17.6373	0.1038	2.6641
CapEX (%)	0.6400	0.0172	82.1968	-171.0420	7.8882	-3.1730	66.8484
Ln(Age)	1.5280	1.5563	1.8512	0.6020	0.1855	-1.0038	4.5492

Panel C: Industry

	BH (%)	MH (%)	BOH (%)	IH (%)	IND (%)	CEOD
Cement	22.5086	2.1646	24.6823	10.5194	3.7865	0.5714
Food	22.0929	0.7908	24.6513	9.2582	4.2610	0.1661
Steel	19.0958	1.0402	22.6569	7.7702	5.8469	0.2615
Automobile	18.2711	0.2263	40.1441	24.8908	9.8706	0.0875
Electronics	17.5823	1.0834	20.5756	13.9802	20.3700	0.3360
Construction	26.4794	1.0581	22.8302	7.3550	8.8117	0.3119
Chemical	20.6020	1.5598	24.8569	9.7571	15.5051	0.3466
Glass	22.7092	2.2970	21.0496	6.3343	6.8303	0.2031
Others	22.6543	0.9537	24.4239	12.8431	9.5023	0.2185

Table 2. Correlation Coefficient

Panel A. Performance		TQ	ROE	EPS	BH	MH	BOH	IH	IND	CEOD	Ln(Asset)	
ROE		0.1363										
EPS		0.4251	0.4202									
BH		0.0592	0.0022	0.0384								
MH		0.0496	0.0393	0.0296	-0.0044							
BOH		0.0827	0.0349	0.0321	-0.2056	-0.0192						
IH		0.2782	0.1343	0.3411	0.1338	-0.0603	-0.0627					
IND		0.2077	0.0673	0.1314	0.0723	0.0881	-0.0065	0.1828				
CEOD		-0.0300	-0.0238	-0.0458	-0.0025	0.0942	-0.0846	-0.0281	-0.0026			
Ln(Asset)		-0.0931	0.1178	0.1738	-0.0447	-0.1484	-0.0983	0.4334	-0.0141	-0.1184		
Ln(Age)		-0.2657	-0.0354	-0.1379	-0.0232	-0.0599	-0.0789	-0.2598	-0.4851	-0.0325	0.0939	
Panel B. Risk		Var _t	Var _{t-1}	BH _{t-1}	MH _{t-1}	BOH _{t-1}	IH _{t-1}	IND _{t-1}	CEOD _{t-1}	Ln(Size) _{t-1}	LEV _{t-1}	CapEX _{t-1}
Var _{t-1}		0.5756										
BH _{t-1}		-0.0802	-0.0591									
MH _{t-1}		-0.0160	0.0107	-0.0095								
BOH _{t-1}		-0.0693	-0.0452	-0.1936	-0.0196							
IH _{t-1}		-0.0444	-0.0352	0.1056	-0.0715	-0.0683						
IND _{t-1}		0.0001	0.0332	0.0281	0.0831	-0.0057	0.1570					
CEOD _{t-1}		0.0669	0.0437	0.0026	0.0984	-0.0896	-0.0347	-0.0174				
Ln(Size) _{t-1}		-0.1962	-0.1616	-0.0255	-0.1253	-0.0407	0.5788	0.0802	-0.1290			
LEV _{t-1}		0.1364	0.0893	0.0245	-0.0225	-0.0535	-0.0128	-0.0679	-0.0162	-0.0008		
CapEX _{t-1}		-0.0555	-0.0626	-0.0260	0.0120	0.0182	0.0924	0.0561	-0.0316	0.1390	0.0127	
Ln(age) _{t-1}		-0.1415	-0.1570	0.0200	-0.0603	-0.0692	-0.2005	-0.4950	-0.0249	-0.0318	0.1043	-0.0404

4 Empirical Results

4.1 Regression Analysis

The relationship between corporate governance (Gov6) and performance is shown in Table 3, considering three performance measures (Tobin's Q, ROE, and EPS). Generally, the results show that the aggregated corporate governance variable, Gov6, has significant effects on Tobin's Q, ROE, and EPS, indicating that good corporate governance can improve firm performance. The governance effect in the paper is clearer with respect to ROE (0.0004). The results are generally consistent with the findings of Black *et al.* (2006) for the Korean stock market. However, our results are not as significant as Black *et al.* (2006), which indicates that a worst-to-best change in corporate governance index predicts a 0.47 increase in firms' performance (i.e. Tobin's Q). In addition, we also explore the effects of individual governance variables on corporate performance. The results in the last three columns of Table 3 indicate that managerial ownership (MH), board ownership (BOH), institutional ownership (IH), and the proportion of independent directors on the board (IND) have positive and significant relationships with performance. The parameters of the individual governance variables mean that firms with larger corporate governance variables would have better performance. For example, if the management teams hold more shares, they would be incentivized to contribute more since the benefits of firm performance will accrue to them. In addition, institutional investors could provide professional knowledge, and independent directors can perform monitoring functions. In Taiwan, although the managers' average shareholding is exceedingly low (about 1.07%), their holdings also have an impact on firm performance. The government stipulates that listed companies must establish independent directors to protect the shareholders through supervision. Nevertheless, the chairman serving as general manager does not show a significantly positive relationship to enhanced performance. From the negative parameters of CEO, CEO duality causes damage to firm valuation because the CEO/chairman's own interest may adversely affect the performance of the company, which is consistent with the findings from Fuerst and Kang (2004). Compared with Benson and Davidson III (2009), the inverted U-shaped relationship between managerial ownership (MH) and firm performance

of U.S. listed firms is not found in Taiwanese firms.

Regarding control variables, firm assets have a positive and significant effect on ROE and EPS. If the company's assets increase, the company has more available resources for use in driving performance and value creation.

Table 3. Regression Analysis for Performance

	Tobin's Q	ROE	EPS	Tobin's Q	ROE	EPS
Gov6	0.0000 *** (0.0000)	0.0004 *** (0.0002)	0.0000 *** (0.0002)			
BH				0.0006 (0.2260)	0.0033 (0.8902)	0.0027 (0.4497)
MH				0.0091 *** (0.0014)	0.7068 *** (0.0000)	0.1066 *** (0.0000)
BOH				0.0037 *** (0.0000)	0.1006 *** (0.0000)	0.0174 *** (0.0000)
IH				0.0157 *** (0.0000)	0.1720 *** (0.0000)	0.0892 *** (0.0000)
IND				0.0038 *** (0.0000)	0.0931 *** (0.0000)	0.0158 *** (0.0000)
CEOD				-0.0768 *** (0.0000)	-0.7103 (0.2574)	-0.3292 *** (0.0005)
Ln(Assets)	-0.0858 *** (0.0000)	6.0328 *** (0.0000)	1.4731 *** (0.0000)	-0.2741 *** (0.0000)	4.4081 *** (0.0000)	0.4427 *** (0.0000)
Ln(Age)	-0.9466 *** (0.0000)	-5.5814 *** (0.0002)	-3.4830 *** (0.0000)	-0.4215 *** (0.0000)	1.9467 (0.2564)	-0.7227 *** (0.0053)
Adj-R ²	0.0769	0.0173	0.0552	0.1692	0.0295	0.1290
Obs.	10648	10648	10648	10648	10648	10648

***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively. The numbers in the parentheses are p-values.

The positive association between firm performance and the quality of corporate governance has been evidenced above. However, we unexpectedly find different results when we use the level of governance variables for further performance testing. We divide the corporate governance scores (Gov6) into five corporate governance groups based on strength. The results in Table 4 indicate that only companies with poor (first-Gov6) and good (fourth-Gov6) corporate governance have a positive and significant effect on performance. Firms with excellent governance (fifth-Gov6) experience no significant effect on company performance. One possible explanation for this result is that, for the companies with excellent governance, the quality of corporate governance may not be the main factor for firm performance.

Table 4. The Difference between Poor-excellent Gov6 (Performance)

This table presents the regression analysis of different groups of corporate governance variables based on their degree. We separate all the samples into five groups based on their governance scores. The first-Gov6 group has poor quality and the lowest governance scores. The Fifth-Gov6 groups have excellent governance quality.

	Tobin's Q	ROE	EPS
First-Gov6(poor)	0.0002 *** (0.0000)	0.0065 *** (0.0000)	0.0009 *** (0.0000)
Ln(Assets)	-0.2778 *** (0.0000)	4.4204 ** (0.0134)	0.0050 (0.5968)
Ln(Age)	-0.8872 *** (0.0000)	-0.8016 (0.8889)	-1.5922 *** (0.0000)
Second-Gov6(fair)	-0.0001 *** (0.0000)	-0.0005 (0.3843)	-0.0004 * (0.0812)
Ln(Assets)	-0.0914 *** (0.0001)	3.8974 *** (0.0000)	1.6449 *** (0.0000)
Ln(Age)	-0.9844 *** (0.0000)	-3.1890 (0.1175)	-3.2430 *** (0.0000)
Third-Gov6(average)	-0.0001 *** (0.0000)	-0.0043 *** (0.0000)	-0.0005 *** (0.0008)
Ln(Assets)	-0.1560 *** (0.0000)	4.3279 *** (0.0000)	1.3233 *** (0.0000)
Ln(Age)	-0.7435 *** (0.0000)	-6.2456 ** (0.0104)	-3.2995 *** (0.0000)
Fourth-Gov6(good)	0.0001 *** (0.0000)	0.0029 *** (0.0000)	0.0006 *** (0.0000)
Ln(Assets)	-0.2261 *** (0.0000)	5.3175 *** (0.0000)	1.3404 *** (0.0000)
Ln(Age)	-0.9046 *** (0.0000)	-2.8078 (0.1830)	-2.9634 *** (0.0000)
Fifth-Gov6(excellent)	0.0001 (0.1538)	0.0027 (0.1766)	0.0004 (0.2282)
Ln(Assets)	-0.1529 *** (0.0095)	4.1640 *** (0.0017)	0.8939 *** (0.0001)
Ln(Age)	-0.7009 *** (0.0002)	-3.7293 (0.3728)	-3.0652 *** (0.0000)

***, **, and * indicate significance at the 1%, 5% and 10%, levels respectively. The numbers in the parentheses are p-values.

We further examine if corporate governance is associated with firm risk. The results are shown in Table 5. Overall, based on the parameters of Gov6, high quality of corporate governance helps the firms reduce their risks. The parameters of BH, MH, BOH, and IND are negative and significant. Specifically, firms with higher blockholders ownership, managerial ownership, board ownership, and more independent board directors can reduce the firm risk. Surprisingly, IH (0.0060 and 0.0009) does not play a material role in reducing firm risk in Taiwanese listed firms. Although average institutional ownership is concentrated (about 12.28%) in Taiwan, institutional ownership does not have a significantly negative relationship with firm risk. Perhaps, IH in the Taiwanese stock market is held by a kind of qualified foreign

institutional investor (QFII) who does not prefer to interfere in the firms' operations. Furthermore, Wang *et al.* (2015) documented that institutional investors focus on boosting revenues rather than monitoring. The firm would be likely to accept more risk when institutional investors hold higher shares (Erkens *et al.*, 2012).

However, our results related to blockholders are different from those in previous literature. Switzer *et al.* (2018) find that blockholders ownership does not have a significant relationship with downside risk. Some previous research suggests that blockholders pay more attention to firm performance in order to protect their interests (Andres 2008, Switzer *et al.*, 2018). Hence, blockholders would push companies to take more risk to maximize the firm's value (Shleifer and Vishny, 1986). We speculate that blockholders will prioritize their own interests, but their interests may be affected when they agree with the manager on high-risk decisions. Thus, they strengthen the supervision of the manager's decision-making to reduce firm risk. Managers tend to consider risk when they have a higher shareholding, since their benefits could be harmed if they take more risks (Fama and Jensen, 1983), and these managers also have higher wealth-performance sensitivity, so they prefer to commit to low-risk strategies and avoid high-risk decisions (Kim and Lu, 2011). For board ownership, our results suggest that if Taiwanese firm directors' and supervisors' ownership (BOH) increases, as well as that of independent directors (IND), the firm risk would decrease. It seems that board ownership (internal) and the proportion of independent directors on the board (external) are the factors that help to oversee the firms' operations and protect shareholders' benefits.

CEO duality has a positive and significant relationship to firm risk. It is indicated that a chairman serving as CEO does not help the firm to diminish corporate risk. However, CEO duality would lower the level of wealth sensitivity and increase the willingness to take risk (Goyal and Park, 2002). A CEO has more power to influence the company's decision making, and this could lead to an increase in firm risk (Adams *et al.*, 2005). Regarding control variables, we found that firm size and firm age could impact firm risk. The results indicate that companies at a more mature stage of development were more capable of taking risk.

In addition, we further test the relationship between corporate governance and risk through the strength of corporate governance. The results are presented in Table 6. We find that firms with poor, fair, and excellent governance quality have a

negative relationship with firm risks (-0.0020, -0.0215, and -0.0441 with 10^{-4}), and firms with excellent governance quality have more significant effects on reducing risk than firms with poor and fair governance quality. For these companies, corporate governance could effectively help them reduce risk. This is quite different from the results in Table 4, which shows that high quality of corporate governance does not guarantee enhanced firm performance.

Table 5. Regression Analysis for Risk

	VaR _t	VaR _t	VaR _t	VaR _t
VaR _{t-1}	0.4536 *** (0.0000)	0.4427 *** (0.0000)		
Gov6	-0.0006·10 ⁻⁴ (0.3258)		-0.0007·10 ⁻⁴ (0.3194)	
BH _{t-1}		-0.0109·10 ^{-2***} (0.0000)		-0.0178·10 ^{-2***} (0.0000)
MH _{t-1}		-0.0322·10 ^{-2***} (0.0000)		-0.0398·10 ^{-2***} (0.0000)
BOH _{t-1}		-0.0080·10 ^{-2***} (0.0000)		-0.0130·10 ^{-2***} (0.0000)
IH _{t-1}		0.0060·10 ^{-2***} (0.0000)		0.0009·10 ^{-2***} (0.0000)
IND _{t-1}		-0.0052·10 ^{-2***} (0.0000)		-0.0075·10 ^{-2***} (0.0000)
CEOD _{t-1}		0.0983·10 ^{-2***} (0.0050)		0.1210·10 ^{-2***} (0.0035)
Ln(Size) _{t-1}	-0.3295·10 ^{-2***} (0.0000)	-0.4306·10 ^{-2***} (0.0000)	-0.5877·10 ^{-2***} (0.0000)	-0.7373·10 ^{-2***} (0.0000)
LEV _{t-1}	0.0102·10 ^{-2***} (0.0000)	0.0099·10 ^{-2***} (0.0000)	0.0164·10 ^{-2***} (0.0000)	0.0159·10 ^{-2***} (0.0000)
CapEX _{t-1}	-0.0025·10 ^{-2***} (0.2071)	-0.0021·10 ^{-2***} (0.2876)	-0.0008·10 ^{-2***} (0.0003)	-0.0079·10 ^{-2***} (0.0007)
Ln(age) _{t-1}	-0.6917·10 ^{-2***} (0.0000)	-0.0092·10 ^{-2***} (0.0000)	-0.0163 *** (0.0000)	-0.0192 *** (0.0000)
Adj-R ²	0.3549	0.3659	0.0852	0.1122
Obs.	9157	9157	9158	9158

***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively. The numbers in the parentheses are p-values.

Table 6. The Difference between Poor-excellent on Gov6 (Risk)

In this table, listed firms are separated into five groups according to their governance scores, and the relationship between firm risk and corporate governance is shown. The First-Gov6 group has poor quality and the lowest governance scores, and the Fifth-Gov6 group has good and excellent governance quality.

	First-Gov6 (poor)	Second-Gov6 (fair)	Third-Gov6 (average)	Fourth-Gov6 (good)	Fifth-Gov6 (excellent)
	-0.0020·10 ⁻⁴ (0.7273)	-0.0215·10 ⁻⁴ *** (0.0001)	0.0046·10 ⁻⁴ (0.4429)	0.0010·10 ⁻⁴ (0.8589)	-0.0441·10 ⁻⁴ *** (0.0284)
VaR _{t-1}	0.6599 *** (0.0000)	0.5184 *** (0.0000)	0.2878 *** (0.0000)	0.6456 *** (0.0000)	0.1755 *** (0.0000)
Ln(Size) _{t-1}	-0.0029 *** (0.0000)	-0.0027 *** (0.0000)	-0.0038 *** (0.0000)	-0.0007 (0.2567)	-0.0051 *** (0.0001)
LEV _{t-1}	0.0000 *** (0.0000)	0.0000 *** (0.0021)	0.0000 *** (0.0000)	0.0000 *** (0.0000)	0.0001 *** (0.0017)
CapEX _{t-1}	0.0000 (0.2618)	-0.0000 (0.6556)	-0.0000 (0.6572)	-0.0000 (0.2701)	-0.0002 *** (0.0141)
Ln(Age) _{t-1}	-0.0054 *** (0.0060)	-0.0105 *** (0.0000)	-0.0060 *** (0.0004)	-0.0069 *** (0.0004)	-0.0158 *** (0.0010)
Obs.	2855	2384	1929	1594	394

***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively. The numbers in the parentheses are p-values.

4.2 Financial Crisis

The financial crisis that occurred from 2007 to 2009 had a serious impact on global financial markets and revealed that the corporate governance of many firms was not as strong as we would have expected. Therefore, we examine the function of corporate governance in diversified periods: before the financial crisis (2002-2006), during the financial crisis (2007-2010), and after the financial crisis (2011-2016). The purpose of this section is to explore whether these governance variables could have enhanced firm performance and risk management in the most severe period.

The relationship between the aggregated corporate governance variables and firm performance shown in Panel A of Table 7 illustrates that before the financial crisis, corporate governance (Gov6) is significantly and positively related to firm performance on Tobin's Q, ROE, and EPS (0.0001, 0.0006, and 0.0001) even though they are not economically significant. During the financial crisis, the evidence shows that ROE and EPS are not as significant as in the pre-crisis period (0.0003 and 0.0000). We speculate that the contribution of corporate governance to firm performance is unsound during the period of financial crisis. Obviously, firm performance affected by a market-wide recession, such as the period between 2007 and 2010, would not be improved by corporate governance practices. After the

financial crisis (2011 to 2016), corporate governance has less impact on firm performance (ROE).

Panel B presents the relationship between firm performance and individual governance practices. Before the financial crisis, BOH, IH, and IND have a significant and positive impact on Tobin's Q, ROE, and EPS, which is consistent with the results in Table 3, except for BH. Unexpectedly, CEOD is negative and significant to all the performance measures, implying that it is harmful to performance if the firm nominates the chairman as the CEO. Contrary to the period before the crisis, we also find that most of the governance variables are not significant during the financial crisis. Only IND is consistently significant to Tobin's Q, ROE, and EPS. It indicates that when the company encounters the financial crisis, its performance cannot be maintained.

Obviously, the influence of BH increases by period. Especially, in the period after the financial crisis, the parameters are the largest in the third period when even the parameters of ROE (0.0190) and EPS (0.0039) are not statistically significant. In the last three columns, the results show that MH, BOH, and IH have significant effects on Tobin's Q, ROE, and EPS in the period after the financial crisis. As for the issue of CEO duality, CEOD seems to lose its influence on firm performance in the period after the financial crisis. Consistent with the results in section 4.1, CEO duality does not enhance company performance in any period. The CEO has decision-making dominance, and if he or she is engaged in high-risk activities and cannot obtain a positive return, the company will face losses. That is to say, the CEO's pursuit of personal interest is greater than the pursuit of firm performance.

Similar to Table 7, Table 8 presents the association between corporate governance practices and firm risk in the different periods. With respect to the aggregated governance variable (Gov6), corporate governance is significantly positively associated with risk during and after financial crisis. This result is unexpected and inconsistent with the results in Table 5, which indicates that Gov6 is negatively associated with firm risk (VaR_t).

However, the same method is used to examine the association of individual governance variables to firm risk. Most of the governance variables, including blockholders' ownership (BH), managerial ownership (MH), and board ownership (BOH) are negatively correlated to firm risk in each period. Obviously, the

parameters in the crisis period are more economically significant (BH is -0.0001, MH is -0.0005, and BOH is -0.0001). The results imply that higher levels of ownership by blockholders, managers, and the board can help firms reduce risk in Taiwan in a crisis period. In addition, both institutional ownership and CEO duality are positively related to risk. Especially in the crisis period, the CEOD has the strongest effect on firm risk. A reasonable interpretation regarding the negative parameters of IH and MH is that institutional investors and the general manager focus on revenue rather than supervision of the business. Thus, the two governance variables could not reduce firm risk. Furthermore, during a financial crisis, most of the governance variables have a more significant effect on risk than in other periods, which could not be observed through the aggregated governance proxy (Gov6). In other words, in a market recession period, the firms would be likely to try all kinds of corporate practices to maintain stable development and minimize potential losses. Therefore, corporate governance is extremely important during this period.

Table 7. Periodical Regression Analysis of Corporate Governance on Firm Performance

	2002-2006			2007-2010			2011-2016		
	Tobin's Q	ROE	EPS	Tobin's Q	ROE	EPS	Tobin's Q	ROE	EPS
Panel A									
Gov6	0.0001*** (0.0000)	0.0006*** (0.0000)	0.0001*** (0.0000)	0.0000*** (0.0050)	0.0003* (0.0727)	0.0000*** (0.0068)	0.0000 (0.3786)	0.0004** (0.0470)	0.0000 (0.5234)
Ln(Assets)	0.0221 (0.2863)	4.7478*** (0.0000)	1.0191*** (0.0000)	-0.0749*** (0.0014)	6.4727*** (0.0000)	1.4285*** (0.0000)	-0.1167*** (0.0000)	7.2562*** (0.0000)	1.7811*** (0.0000)
Ln(Age)	-1.8516*** (0.0000)	-16.3931*** (0.0000)	-4.6698*** (0.0000)	-1.5223*** (0.0000)	-8.4624*** (0.0059)	-4.4142*** (0.0000)	-0.6412*** (0.0000)	-4.1668*** (0.0681)	-3.0392*** (0.0000)
Adj-R ²	0.1698	0.0333	0.0805	0.1195	0.0242	0.0954	0.0518	0.0164	0.0439
Panel B									
BH	0.0007 (0.4272)	0.0054** (0.0862)	-0.0006 (0.8900)	0.0024** (0.0411)	0.0577 (0.1938)	0.0104* (0.0587)	0.0038*** (0.0000)	0.0190 (0.6485)	0.0039 (0.5549)
MH	-0.0005 (0.9100)	0.5507*** (0.0010)	0.0699*** (0.0042)	-0.0007** (0.9078)	0.8809*** (0.0002)	0.0981*** (0.0007)	0.0162*** (0.0000)	0.7137*** (0.0003)	0.1187*** (0.0002)
BOH	0.0016** (0.0374)	0.1730*** (0.0000)	0.0233*** (0.0000)	0.0013 (0.1446)	0.0450 (0.1909)	0.0098** (0.0216)	0.0065*** (0.0000)	0.0801** (0.0259)	0.0185*** (0.0012)
IH	0.0213*** (0.0000)	0.3266*** (0.0000)	0.0738*** (0.0000)	0.0201*** (0.0000)	-0.0005 (0.9881)	0.0821*** (0.0000)	0.0133*** (0.0000)	0.1728*** (0.0000)	0.1026*** (0.0000)
IND	0.0061*** (0.0000)	0.2816*** (0.0000)	0.0400*** (0.0000)	0.0052*** (0.0000)	0.1278*** (0.0003)	0.0272*** (0.0000)	0.0039*** (0.0000)	0.0232 (0.4787)	-0.0008 (0.8720)
CEOD	-0.0495** (0.0357)	-0.2776*** (0.0033)	-0.3044*** (0.0069)	-0.0844*** (0.0042)	-0.7491 (0.4983)	-0.4145*** (0.0026)	-0.07517*** (0.0009)	-0.3622 (0.7468)	-0.2781 (0.1197)
Ln(Assets)	-0.1901*** (0.0000)	2.5832*** (0.0033)	0.4007*** (0.0001)	-0.3228*** (0.0000)	7.1409*** (0.0000)	0.4843*** (0.0001)	-0.2772*** (0.0000)	5.6229*** (0.0000)	0.5478*** (0.0004)
Ln(Age)	-1.4378*** (0.0000)	-3.3126 (0.2064)	-2.4364*** (0.0000)	-1.1414*** (0.0000)	-3.1028 (0.3724)	-2.5026*** (0.0000)	-0.0423 (0.4409)	1.5414 (0.5729)	0.1748 (0.6879)
Adj-R ²	0.3167	0.1255	0.2074	0.2363	0.0329	0.1993	0.1464	0.0232	0.1107
Obs.	3080	3080	3080	2757	2757	2757	4808	4808	4808

***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively. The numbers in the parentheses are p-values.

Table 8. Periodical Regression Analysis of Corporate Governance on Firm Risk

	2003-2006	2007-2010	2011-2015	2003-2006	2007-2010	2011-2015
VaR _{t-1}	0.5400 *** (0.0000)	0.2089 *** (0.0000)	0.5783 *** (0.0000)	0.5119 *** (0.0000)	0.2060 *** (0.0000)	0.5718 *** (0.0000)
Gov6	0.0000 (0.1885)	0.0000 ** (0.0339)	0.0000 *** (0.0083)			
BH _{t-1}				-0.0000 (0.3495)	-0.0001 *** (0.0000)	-0.0000 (0.2193)
MH _{t-1}				-0.0002 ** (0.0196)	-0.0005 *** (0.0001)	-0.0001 * (0.0654)
BOH _{t-1}				-0.0001 *** (0.0000)	-0.0001 *** (0.0000)	-0.0000 * (0.0674)
IH _{t-1}				0.0000 * (0.0845)	0.0000 *** (0.0043)	0.0000 *** (0.0000)
IND _{t-1}				-0.0000 * (0.0548)	-0.0000 (0.2171)	0.0000 * (0.0508)
CEOD _{t-1}				0.0009 (0.1046)	0.0019 *** (0.0066)	0.0008 * (0.0674)
Ln(Size) _{t-1}	-0.0033 *** (0.0000)	-0.0026 *** (0.0000)	-0.0030 *** (0.0000)	-0.0041 *** (0.0000)	-0.0040 *** (0.0000)	-0.0041 *** (0.0000)
LEV _{t-1}	0.0000 *** (0.0000)	0.0001 *** (0.0000)	0.0000 *** (0.0000)	0.0000 *** (0.0000)	0.0001 *** (0.0000)	0.0000 *** (0.0000)
CapEX _{t-1}	-0.0000 *** (0.0073)	0.0000 (0.3680)	-0.0000 *** (0.0002)	-0.0000 ** (0.0101)	0.0000 (0.1739)	-0.0000 *** (0.0002)
Ln(Age) _{t-1}	-0.0106 *** (0.0000)	-0.0097 *** (0.0000)	-0.0096 *** (0.0000)	-0.0137 *** (0.0000)	-0.0120 *** (0.0000)	-0.0082 *** (0.0000)
Adj-R ²	0.4165	0.1633	0.4616	0.4274	0.1801	0.4646
Obs.	2492	2748	3916	2492	2748	3916

***, **, and * mean the numbers are significant at 1%, 5% and 10%, respectively. The numbers in the parentheses are p-value.

5 Conclusion

Corporate governance has been a critical influence on firm performance and risk management given the several crises that have agitated international financial markets in the last twenty years. Most of the previous research focuses on the contribution of corporate governance to firm performance. This paper contributes to the current literature by testing the association of corporate governance with firm risk, measured by Value at risk, based on Taiwanese listed firms from 2002 to 2016. Our main findings are as follows. First, we use the six corporate governance variables (BH, IH, MH, BOH, IND, and CEOD) to examine the relationship between corporate governance and corporate performance. Generally speaking, the aggregated corporate governance variable (Gov6) improves firm performance, particularly with respect to managerial ownership (MH), board ownership (BOH), institutional ownership (IH), and the proportion of independent directors on the board (IND). The results also show that a chairman also appointed as the CEO harms shareholder interests. Moreover, when the relationship is tested according to the quality of corporate governance, we find that in the firms with the best quality of corporate governance, governance practices could not further improve performance.

Second, the relationship between corporate governance and firm risk is investigated, which has less focus in the current literature. Facing the volatility of the current market, market participants would like to know whether firm risk could be reduced through a higher quality of corporate governance. Our findings show that high quality of corporate governance helps firms reduce their risks, especially in the cases of having blockholders, managerial ownership, board ownership, and more independent directors on the board. However, institutional ownership and having a chairman serving as a general manager do not help the firm diminish corporate risk. We also test the relationship between corporate governance and risk based on the strength of a firm's corporate governance. However, only the firms with best quality of corporate governance can reduce their risk.

Third, we separate the sample into three time periods based on the financial crisis, to examine the contributions of corporate governance in improving firm performance and reducing firm risks. Our results generally point to the effects of corporate governance on enhancing firm performance and reducing risks vary by

market conditions. Before the financial crisis, corporate governance practices positively contribute to firm performance, but their effects become more obscure during and after the crisis period. Even considering individual governance practices, only managerial ownership improves firm performance both during and after the crisis. In contrast, corporate governance practices have positive effects on reducing firm risk during a financial crisis, especially blockholders ownership, managerial ownership, and board ownership. However, after the crisis, the effects are weaker.

Some potential issues could not be carried out in this study, because of data availability limitations. For example, the personality of the CEO or the directors would influence the firm's decisions, and CEOs and directors with different personalities would adopt different governance practices. This idea could be extended to the characteristics of the firms.

Appendix A. Definition of Variables

Variable	Definition	Data source
Blockholders (BH)	BH is the percentage of the shares owned by the top ten shareholders or owned by the ones held over 5%	TEJ database.
Institutional investor (IH)	IH is the percentage of the shares owned by institutional investors.	TEJ database.
Managerial ownership (MH)	MH is the percentage of the shares owned by the management.	TEJ database.
Board ownership (BOH)	BOH is the percentage of the shares owned by directors and supervisors.	TEJ database.
Number of independent directors on the board (IND)	IND is the proportion of independent directors on the board.	TEJ database.
CEO duality (CEOD)	CEOD is the chairman concurrently serves as the chief executive officer (CEO). If it is then CEOD equals to 1,	TEJ database.
Gov6	Gov6 is an integrated governance score by simple adding the values of BH, IH, MH, BOH, IND, and CEOD.	Calculated by the authors.
Tobin's Q	Tobin's Q is defined that the sum of market value of equity and debt amount (the book value of the firm's short-term	The components of calculating Tobin's Q
ROE	Return on Equity	TEJ database
EPS	Earnings per share	TEJ database
VaR	Value at risk	All the stock returns are obtained from
Ln (Size)	Ln Size is the natural logarithm of firms' market value.	Market values of the firms are obtained from
Ln (Assets)	It is defined as the natural logarithm of firm's assets.	Firms Assets are obtained from TEJ
LEV	LEV is the debt ratio of the firm.	TEJ database
Capital expenditure (CapEX)	Capital expenditure is defined as the change in a firm's book value of fixed assets scaled by total assets.	The components CapEX are obtained
Ln (Age)	Ln Age is natural logarithm of the years that the firm has been founded	TEJ database.

Reference

- Adams, R. B., Alemida, H. and D. Ferreira, (2005), "Powerful CEOs and their impact on corporate performance," *The Review of Financial Studies*, 18, 1403-1432.
- Ammann, M., Oesch, D. and M. M. Schmid, (2011), "Corporate governance and firm value: International evidence," *Journal of Empirical Finance*, 18, 36-55.
- Andres, C., (2008), "Large shareholders and firm performance—An empirical examination of founding-family ownership," *Journal of corporate finance*, 14, 431-445.
- Baysinger, B. D. and H. N. Butler, (1985), "Corporate governance and the board of directors: Performance effects of changes in board composition," *Journal of Law, Economics, and Organization*, 1, 101-124.
- Bebchuk, L. A. and A. Cohen, (2005), "The costs of entrenched boards," *Journal of financial economics*, 78, 409-433.
- Benson, B.W. and W. N. Davidson III, (2009), "Reexamining the managerial ownership effect on firm value," *Journal of Corporate Finance*, 15, 573-586.
- Bhojraj, S. and P. Sengupta, (2003), "Effect of corporate governance on bond ratings and yields: The role of institutional investors and outside directors," *Journal of Business*, 76, 455-475.
- Black, B. S., Jang, H. and W. Kim, (2006), "Does corporate governance predict firms' market values? Evidence from Korea," *The Journal of Law, Economics, and Organization*, 22, 366-413.
- Brickley, J. A., Lease, R. C. and C. W. Smith Jr., (1988), "Ownership structure and voting on antitakeover amendments," *Journal of financial economics*, 20, 267-291.
- Brown, L. D. and M. L. Caylor, (2004), "Corporate governance study: the correlation between corporate governance and company performance," *Corporate Governance Study, Institutional Shareholder Services (ISS)*.
- Brown, L. D. and M. L. Caylor, (2006). "Corporate governance and firm valuation," *Journal of accounting and public policy*, 25, 409-434.
- Brown, L. D. and M. L. Caylor, (2009), "Corporate governance and firm operating performance," *Review of quantitative finance and accounting*, 32, 129-144.

- Claessens, S. and J. P. Fan, (2002), "Corporate governance in Asia: A survey," *International Review of finance*, 3, 71-103.
- Claessens, S. and B. B. Yurtoglu, (2013). "Corporate governance in emerging markets: A survey," *Emerging markets review*, 15, 1-33.
- Cremers, K. M. and V. B. Nair, (2005), "Governance mechanisms and equity prices," *The Journal of Finance*, 60, 2859-2894.
- Dahya, J. and J. J. McConnell, (2005), "Outside directors and corporate board decisions," *Journal of corporate finance*, 11, 37-60.
- Daily, C. M. and D. R. Dalton, (1994), "Bankruptcy and corporate governance: The impact of board composition and structure," *Academy of Management Journal*, 37, 1603-1617.
- Darrat, A. F., Gray, S., Park, J. C. and Y. Wu, (2016), "Corporate governance and bankruptcy risk," *Journal of Accounting, Auditing and Finance*, 31, 163-202.
- Dechow, P. M., Sloan, R. G. and A. P. Sweeney, (1996), "Causes and consequences of earnings manipulation: An analysis of firms subject to enforcement actions by the SEC," *Contemporary accounting research*, 13, 1-36.
- Eisenberg, M. A. (1975), "Legal models of management structure in the modern corporation: Officers, directors, and accountants," *California Law Review*, 63, 375-439.
- Erkens, D. H., Hung, M. and P. Matos, (2012), "Corporate governance in the 2007–2008 financial crisis: Evidence from financial institutions worldwide," *Journal of corporate finance*, 18, 389-411.
- Fama, E. F. and M. C. Jensen, (1983), "Separation of ownership and control," *The journal of law and Economics*, 26, 301-325.
- Fernández, C. and R. Arrondo, (2005), "Alternative internal controls as substitutes of the board of directors," *Corporate Governance: An International Review*, 13, 856-866.
- Fuerst, O. and S.-H. Kang, (2004), "Corporate governance, expected operating performance, and pricing," *Corporate Ownership and Control*, 1, 13-30.
- Garay, U. and M. González, (2008), "Corporate governance and firm value: The case of Venezuela," *Corporate Governance: An International Review*, 16, 194-209.
- Gompers, P., Ishii, J. and A. Metrick, (2003), "Corporate governance and equity

- prices," *The quarterly journal of economics*, 118, 107-156.
- Goyal, V. K. and C. W. Park, (2002), "Board leadership structure and CEO turnover," *Journal of corporate finance*, 8, 49-66.
- Huson, M. R., Parrino, R., and L. T. Starks, (2001), "Internal monitoring mechanisms and CEO turnover: A long-term perspective," *The Journal of Finance*, 56, 2265-2297.
- Jensen, M. C. and W. H. Meckling, (1976), "Theory of the firm: Managerial behavior, agency costs and ownership structure," *Journal of financial economics*, 3, 305-360.
- Jorion, P., (2007), "Value at risk: the new benchmark for managing financial risk. London," McGraw-Hill.
- Morgan, J. P., (1996), "RiskMetrics technical document," 4th Ed. New York, JP Morgan.
- Kim, E. H. and Y. Lu, (2011), "CEO ownership, external governance, and risk-taking," *Journal of financial economics*, 102, 272-292.
- Kini, O. and R. Williams, (2012), "Tournament incentives, firm risk, and corporate policies," *Journal of financial economics*, 103, 350-376.
- Love, I. and L. F. Klapper, (2002), "Corporate governance, investor protection, and performance in emerging markets," The World Bank.
- Love, I. and L. F. Klapper, (2004), "Corporate governance, investor protection, and performance in emerging markets," *Journal of corporate finance*, 10, 703-728.
- McConnell, J. J. and H. Servaes, (1990), "Additional evidence on equity ownership and corporate value," *Journal of financial economics*, 27, 595-612.
- McConnell, J. J. and H. Servaes, (1995), "Equity ownership and the two faces of debt," *Journal of financial economics*, 39, 131-157.
- Minnick, K. and T. Noga, (2010), "Do corporate governance characteristics influence tax management?" *Journal of corporate finance*, 16, 703-718.
- Nguyen, P., (2011), "Corporate governance and risk-taking: Evidence from Japanese firms," *Pacific-Basin Finance Journal*, 19, 278-297.
- Renders, A., Garermyck, A. and P. Sercu, (2010), "Corporate-governance ratings and company performance: a cross-European study," *Corporate Governance: An International Review*, 18, 87-106.
- Rubin, A. and D. R. Smith, (2009), "Institutional ownership, volatility and

dividends," *Journal of Banking and Finance*, 33, 627-639.

Sherman, H., (2004), "Corporate governance assessments." *Corporate governance: An International Review*, 12, 5-7.

Shleifer, A. and R. W. Vishny, (1986), "Large shareholders and corporate control," *Journal of political economy*, 94, 461-488.

Shleifer, A. and R. W. Vishny, (1997), "A survey of corporate governance," *The Journal of Finance*, 52, 737-783.

Switzer, L. N., Tu, Q. and J. Wang, (2018), "Corporate governance and default risk in financial firms over the post-financial crisis period: International evidence," *Journal of International Financial Markets, Institutions and Money*, 52, 196-210.

Tsao, H.-H., (2015), "The Relationship between Top Management Team Characteristics and Firm Performance after ERP System Adoption," *Journal of Economics and Management*, 11,199-231.

Wang, L. H., Lin, C. H., Fung, H. G. and H. M. Chen, (2015), "Governance mechanisms and downside risk," *Pacific-Basin Finance Journal*, 35, 485-498.

Wong, C. M. and L. L. O. Ting, (2016), "A Quantile Regression Approach to the Multiple Period Value at Risk Estimation," *Journal of Economics and Management*, 12, 1-35.

Wright, P., Ferris, S. P., Sarin, A. and V. Awasthi, (1996), "Impact of corporate insider, blockholder, and institutional equity ownership on firm risk taking," *Academy of Management Journal*, 39, 441-458.