CORPORATE GOVERNANCE AND THE SYSTEMIC RISK
OF FINANCIAL INSTITUTIONS IN THAILAND

BY

MISS MINLING WANG

**AN INDEPENDENT STUDY SUBMITTED IN PARTIAL
FULFILLMENT OF THE REQUIREMENTS FOR
THE DEGREE OF MASTER OF SCIENCE
PROGRAM IN FINANCE (INTERNATIONAL PROGRAM)
FACULTY OF COMMERCE AND ACCOUNTANCY
THAMMASAT UNIVERSITY
ACADEMIC YEAR 2016
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ENTITLED

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was approved as partial fulfillment of the requirements for

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ABSTRACT

This paper studies the relationship between corporate governance and the systemic risk of financial institutions in Thailand. I use a sample of forty-two financial institutions in Thailand. It is involved with banks, financial services and insurances from 2006 to 2015. I employ the SRISK and LRMES as the measure of systemic risk. My empirical findings indicate that financial institutions with stronger corporate governance trend to have higher level of systemic risk. Therefore, I suggest regulators and banking supervisors should take more seriously in the firms that have good corporate governance.

Keywords: Systemic risk, SRISK, LRMES, corporate governance

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Miss Minling Wang

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CHAPTER 1
INTRODUCTION

The financial sector is one of the most important sectors for the economy to be functional, as the speech of Federal Reserve Governor Daniel Tarullo[1] *"Financial institutions are systemically important if the failure of the firm to meet its obligations to creditors and customers would have significant adverse consequences for the financial system and the broader economy."* The biggest financial crisis in history is the subprime mortgage crisis, one of a global financial crisis that several major financial institutions collapsed in 2008. It almost brought down the entire financial system and caused the disruption in the flow of the economy leading the global into recession. For Asia, it is a Tom Yum Goong crisis in 1997. How could one firm do such a thing? This is about systemic risk.

"The systemic risk is the disruption of the flow of financial services that is caused by an impairment of all or parts of the financial system and has the potential to have serious negative consequence for the real economy" (IMF, BIS and FSB, 2009).

How important of systemic risk? Laeven et al. (2016) and Sum (2016) show us that just using individual bank risk measurements such as the stock return and volatility, would significantly underestimate the real risk.

In this paper, we aim to examine the relationship between corporate governance and the systemic risk of financial institution in Thailand by looking how corporate governance level of a firm affect the systemic risk. The CG index is different from author to author, country to country and region to region based on CG structure. For Thailand, I choose to collect data of CG rating from the Thai Institute of Directors Association (IOD). It is the only one institution in Thailand that has released the corporate governance report since 2001 with an international standard of OECD and it is accepted by Thailand stock market. While the systemic risk measurement, we choose to follow the Acharya et al. (2012) that systemic risk measures by (i) long run marginal expected shortfall (LRMES) and (ii) systemic risk (SRISK) that are collected by hand. The study period will be from 2006 to 2015 that

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[1] Regulatory restructuring, Testimony before the Committee on Banking, Housing, and Urban Affairs, U.S. Senate, Washington, D.C., on July 23, 2009.

will cover the financial crisis period and the recession period. And it involves with 42 financial institutions in Thailand.

This study will contribute the insight into the role of corporate governance in systemic risk of financial institutions in Thailand.

CHAPTER 2
REVIEW OF LITERATURE

This paper contents are related to two things. There are about systemic risk of financial institutions and the role of the corporate governance.

2.1 Systemic Risk

There is still not clear that what factors cause the systemic risk and which model should be the best to capture the real risk that firm faces. Sum (2016) reviews individual and systemic risk measurements and presents the revolution and critique of those risk measurements. The most common risk measurement is the Value at Risk (VaR). It is the maximum loss on a portfolio over a specific time horizon with an assumed probability of the loss. But VaR has many drawbacks such as there is no solution over the confidence or threshold level. Therefore, individual risk measurement does not consider the linkages within the system that one failure can cause other firms to fail too, this calls systemic risk, so individual risk measurement underestimates the real risk.

The main cause of the financial crisis in 2008 is the systemic risk. However, systemic risk is still not more widely used than the individual risk in regulatory practices. Patro et al. (2013) examines the systemic risk by analyzing trends and volatility of stock return correlations among large financial institutions in US from 1988 to 2008. The result shows that there exits systemic risk among financial institutions.

Several studies show us the factors that may affect the level of systemic risk. Those are size, leverage ratio, performance, growth, asset and income structure of the financial institutions (Laeven, Ratnovski, & Tong, 2016; Adrian and Brunnermeier, 2012).

Then, how do we know the level of systemic risk? Brownlees and Engle (2012) and Acharya et al. (2012) develop the measurement of systemic risk. In this study, systemic risk is the amount of capital needed if another financial crisis happens, the researcher calls it capital shortfall, calculated via Long Run Marginal

Expected Shortfall (LRMES) and SRISK. Another well-known method for measuring systemic risk is the Conditional Value at Risk (CoVaR) proposed by Adrian & Brunnermeier (2016). They use ΔCoVaR, defied as the change in Value at Risk of financial system conditional on an institution being under distress relative to its median state.

2.2 Corporate Governance

Apart from systemic risk, this paper is related to corporate governance. Most of the researches are about the role of corporate governance in firm performance. Kouwenberg et al. (2013) investigates the return governance-based trading strategies in Asia. The researchers Use governance rating of Credit Lyonnais Securities Asia (CLSA) to construct the portfolios and then measure abnormal return and market beta via Fama-French three-factor model. They find that a portfolio with poor corporate governance firms has a higher market beta, higher expected return, higher realized return and no abnormal returns after adjusting for risk and country effects. It means corporate governance has a negative relationship with firm performance and market risk. Another study is from Zagorchev and Gao (2015), they examine how corporate governance affects performance of financial institutions in the U.S. between 2002 and 2009. They find that better governance is negatively related to excessive risk-taking and positively related to the performance of financial institutions.

2.3 Corporate Governance and Systemic Risk

There are just a few papers toward corporate governance and systemic risk together. Iqbal et al. (2015) studies the relationship between corporate governance mechanisms and the systemic risk of 71 US financial institutions from 2005 to 2010. They find that financial institutions with good corporate governance structures and more shareholder-friendly are associated with higher levels of systemic risk. It shows that corporate governance has a positive relationship with systemic risk. Explaining that good corporate firms may encourage rather than constrain the excessive risk-taking. So, having a good corporate governance in financial institutions does not help prevent financial crisis. However, the researchers say their paper still has several limitations such as small sample size and short sample period. Andrieş and Nistor

(2016) study the impact of governance and regulation on systemic risk of banks across emerging countries (Bulgaria, Croatia, Czech Republic, Hungary, Lithuania, Poland, Romania, Serbia, Slovakia, and Ukraine) from 2005Q1 to 2012Q4. They hand-collect annul information on corporate governance from the bank's annual reports, financial statement and websites. And the systemic risk, they use the Conditional Value at Risk (CoVaR). They find that tight corporate governance mechanisms and shareholder-friendly supervisory boards are positively associated with higher contribution to systemic risk. However, they find that banks with tight risk management structure are less risky but larger contribution to systemic risk.
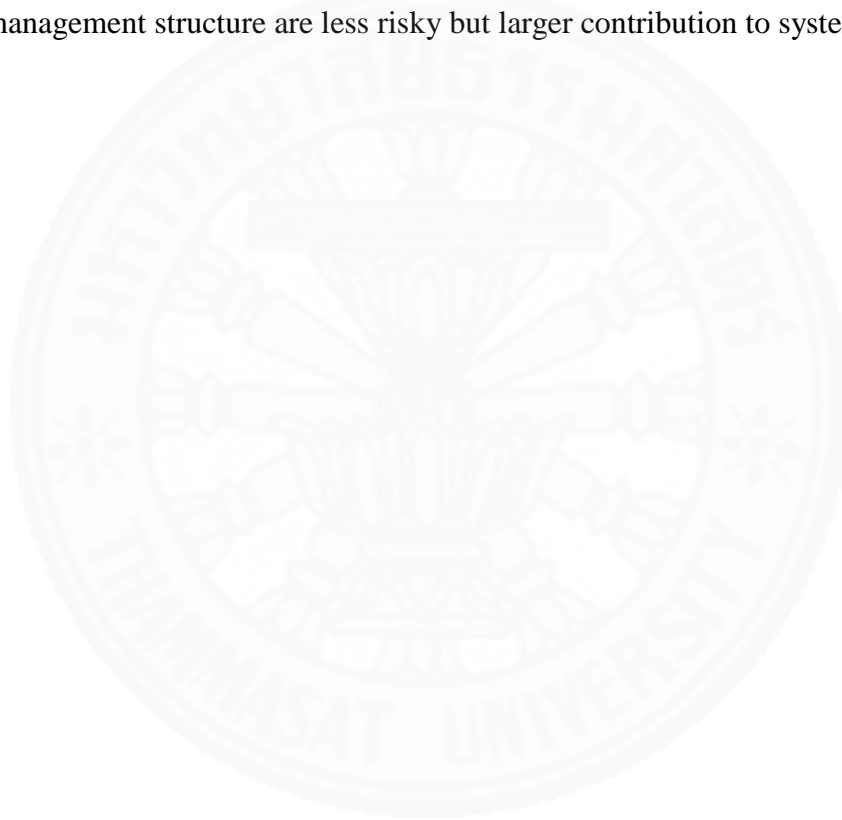
CHAPTER 3
THEORETICAL FRAMEWORK

3.1 Systemic Risk

Systemic is generally used in reference to an event that can trigger a collapse of the entire economy, while systematic risk is referred to market risk.

"The systemic risk is the disruption of the flow of financial services that is caused by an impairment of all or parts of the financial system and has the potential to have serious negative consequence for the real economy" (IMF, BIS and FSB, 2009). From this point of view, systemic risk has 2 dimensions, cross-sectional dimension and time dimension.

Cross-sectional dimension relates to the risk that is distributed within the financial system at a given point of time. While time dimension relates to how risk build-up over time.

For cross-sectional measures (Bisias, Flood, Lo, & Valavanis, 2012), they look for the co-dependence of institutions on each other's health. The examples are conditional value-at-risk (CoVaR) proposed by Adrian and Brunnermeier (2016), Co-Risk measure proposed by the International Monetary Fund (2009) and Systemic Risk (SRISK) proposed by Acharya et al. (2012). CoVaR and Co-Risk are very similar, they capture the relationship between VaRs in the tails of joint distribution over time, except Co-Risk examines the CDS spread.

In this paper, I use the method to calculate Systemic Risk (SRISK) from V-Lab website[2]. As many studies refer to this one such as Iqbal et al. (2015) and Brownlees and Engle (2012).

SRISK is computed based on the Long Run Marginal Expected Shortfall (LRMES). SRISK is the expected capital shortfall of a firm if there is another crisis. It takes 2 steps of calculation:

Firstly, estimate Long Run Marginal Expected Shortfall (LRMES). It is the expected fractional loss of a firm in a crisis when the equity market index drops significantly in a six-month period.

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[2] http://vlab.stern.nyu.edu/doc/16?topic=mdls

$$LRMES_{i,t} = 1 - e^{\beta_{i,t}log(1-d)}$$

Where d is the six-month crisis threshold for the market index decline, the default value is 40%. Acharya, V., Engle, R., & Richardson, M. (2012) used simulation to simulate the losses for 6 months that an equity holder would face if there is a future crisis. The most pessimistic scenarios for the market return are treated as crisis scenarios, and it turned out to be falls by 40%.

And $\beta_{i,t}$ is the beta of a firm over the last 2-year period. Which is calculated as the covariance between the daily return of the stock and the daily return of the market index divided by the variance of the return of the market index.

$$\beta_{i,t} = \frac{Cov(r_{i,t}, r_{m,t})}{Var(r_{m,t})}$$

And Secondly, estimate systemic risk (SRISK) the amount of capital needed when a firm is in financial crisis.

$$
\begin{aligned}
SRISK_{i,t} &= E_{i,t}(Capital\ Shortfall_i|Crisis) \\
&= E_{i,t}\big(k\big(Debtt_{i,t} + Equity_{i,t}\big) - Equity_{i,t}|Crisis\big) \\
&= \underbrace{k\big(Debtt_{i,t} + (1 - LRMES)Equity_{i,t}\big)}_{Required\ Capital} - \underbrace{(1 - LRMES)Equity_{i,t}}_{Available\ Capital} \\
&= k(Debt_{i,t}) - (1 - k)(1 - LRMES_{i,t})Equity_{i,t}
\end{aligned}
$$

Where k is the prudential capital requirement. It is set to be 8% for Asia. Debt is outstanding debt of the firm. And Equity is equity market value.

3.2 Corporate Governance

The Thai Institute of Directors Association (IOD) was founded in 1999 to promoting good governance practices in Thai companies. It cooperated with McKinsey & Company to develop the assessment criteria with financial support from the World Bank. It releases the Corporate Governance Report of Thai Listed Companies (CGR) almost every year. There has been a total of 13 reports from 2001 to 2015. During the first 2 years in 2001 and 2002, It examined only the top 100 and

200 companies, respectively, in term of their market capitalizations. Since 2003, It has examined all listed companies in the Stock Exchange of Thailand (SET) and Market for Alternative Investment (MAI).

Table 3.1: The number of companies in the CGR assessment from 2001 to 2015[3]

Year	2001	2002	2003	2005	2006	2008	2009	2010	2011	2012	2013	2014	2015
No. of companies	133	234	337	371	402	448	290	480	497	513	526	550	588

Thai IOD use only publicly available corporate information of listed companies from the Stock Exchange of Thailand and Security (SET) and Exchange Commission (SEC) from January of the previous year to the announcement of the assessment date.

The assessment criteria were based on the OECD Principles of Corporate Governance that is an international standard. There are 5 categories

1. Rights of Shareholders
2. Equitable Treatment of shareholders
3. Roles of Stakeholders
4. Disclosure and Transparency
5. Board Responsibilities

For each category, there are a number of questions that relevant to those criteria by focusing on quantitative measurements and avoiding emotional judgment.

Table 3.2: The numbers of assessment questions and category weights

Categories	Questions		Weight (%)	
	2015	**2016**	**2015**	**2016**
Rights of Shareholders	32	32	15	15
Equitable Treatment of shareholders	19	19	10	10
Roles of Stakeholders	28	29	20	20
Disclosure and Transparency	50	53	20	20
Board Responsibilities	106	108	35	35
Total	**235**	**241**	**100**	**100**

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[3] No assessment in 2004 and 2007 for reviewing and revising of the criteria. For 2009, there was a consideration for major criteria revision so only certain companies were assessed.

Thai IOD converts 0 – 100 scores into 6 levels of corporate governance recognition.

Table 3.3: CG level of recognition

Score Range	Number of Logos	Description
90 – 100		Excellent
80 – 89		Very Good
70 – 79		Good
60 – 69		Satisfactory
50 – 59		Pass
Less than 50	No logo given	-

However, Thai IOD publishes only the first 3 level from the top score. For companies with 0 to 69 scores, they do not show logos. So, my study categorizes CG into group 1, 2, 3, and 4. Group 1 means the company does not show logos (0 to 2 logos), group 2 means the company gets 3 logos, group 3 means the company gets 4 logos and group 4 means the company gets 5 logos.

3.3 Control Variables

In order to examine the relationship between corporate governance and the systemic risk we need to control other factors that may affect the level of systemic risk. I control size, leverage ratio, performance, growth, asset and income structure of the financial institutions

The most important control variable is size. If the size of the firm is large, it has more effect to the system when it fails. So, the larger the size, the higher the systemic risk (Laeven, Ratnovski, & Tong, 2016; Pais and Stork, 2013). I measure Size by the logarithm of total assets.

The second important one is leverage ratio or capital ratio. Capital is the main variable that banking supervisor looks at. It refers to the health of the institution. The systemic risk is higher in low-capitalized firms (Laeven, Ratnovski, & Tong, 2016) or

high leveraged firms. It is obvious that firm with more debt to equity has higher risk. I measure Leverage by the debt to equity.

Apart from size and leverage ratio, prior studies find performance of the firm are also important factors that might contribute systemic risk. There are the return on assets (Measures from net income to total assets), loans to assets (Measures from net loans to total assets), loan growth (Measures from the percentage change in the amount of total loans) and non-interest income to total income.

CHAPTER 4
DATA

I examine the relationship between corporate governance and the systemic risk of financial institutions in Thailand. The sample of this paper is composed of 42 financial institutions (9 banks, 20 financial services and 13 insurance firms) that exist in the financial market during the study period. The names of the financial institutions are given by Table 4.1. And the study period is from 2006 to 2015. This period covers the financial crisis of $2007 - 2009$ and the sovereign debt crisis of $2010 - 2013$. Although the data does not cover the financial crisis in Asia in 1997 but it still involves the period of recession during subprime crisis (Rodpol, 2011).

In order to calculate the systemic risk, I obtain the data of financial statements and the stock prices of each firm from Bloomberg. For the corporate governance rating, I collect from Thai IOD, Corporate Governance Report of Thai Listed Companies (CGR). And the control variables, that are in the balance sheet and income statements, are all collected from Bloomberg and SETSMART in yearly data and computed into the form of what to use in regression model. The sample period is from 2006 to 2015.

In order to get the long run marginal expected shortfall (LRMES), I use this formula:

$$LRMES_{i,t} = 1 - e^{\beta_{i,t} log(1-d)}$$

The d is the six-month crisis threshold for the market index decline. Here, I use d = 40% as Acharya, V., Engle, R., & Richardson, M. (2012) used.

For computing $\beta_{i,t}$:

$$\beta_{i,t} = \frac{Cov(r_{i,t}, r_{m,t})}{Var(r_{m,t})}$$

Therefore, I collect the price of each stock and SET index to compute the return of each stock ($r_{i,t}$) and the return of market ($r_{m,t}$). Then I can compute $\beta_{i,t}$ by the above formula.

For the corporate governance score, I use from Thai IOD. The public information does not show the score from 0 to 100, but it shows the rating for each firm by logos (no logos, 3 logos, 4 logos and 5 logos), so I categorize them into 4 groups: no logos as 1, 3 logos as 2, 4 logos as 3 and 5 logos as 4.

For control variables, I compute into the form needed as chapter 3 said.

Table 4.1: List of financial institutions

No.	Stocks	Company	Subsector
1	BAY	BANK OF AYUDHYA	Banking
2	BBL	BANGKOK BANK	Banking
3	CIMBT	CIMB THAI BANK	Banking
4	KBANK	KASIKORNBANK	Banking
5	KKP	KIATNAKIN BANK	Banking
6	KTB	KRUNG THAI BANK	Banking
7	SCB	THE SIAM COMMERCIAL BANK	Banking
8	TCAP	THANACHART CAPITAL	Banking
9	TMB	TMB BANK	Banking
10	AEC	AEC SECURITIES	Finance & Securities
11	AEONTS	AEON THANA SINSAP (THAILAND)	Finance & Securities
12	ASP	ASIA PLUS GROUP HOLDINGS	Finance & Securities
13	BFIT	BANGKOK FIRST INVESTMENT & TRUST	Finance & Securities
14	CNS	CAPITAL NOMURA SECURITIES	Finance & Securities
15	ECL	EASTERN COMMERCIAL LEASING	Finance & Securities
16	FNS	FINANSA	Finance & Securities
17	FSS	FINANSIA SYRUS SECURITIES	Finance & Securities
18	GBX	GLOBLEX HOLDING MANAGEMENT	Finance & Securities
19	GL	GROUP LEASE	Finance & Securities
20	KGI	KGI SECURITIES (THAILAND)	Finance & Securities
21	KTC	KRUNGTHAI CARD	Finance & Securities
22	MBKET	MAYBANK KIM ENG SECURITIES (THAILAND)	Finance & Securities
23	MFC	MFC ASSET MANAGEMENT	Finance & Securities
24	ML	MIDA LEASING	Finance & Securities
25	PL	PHATRA LEASING	Finance & Securities
26	THANI	RATCHTHANI LEASING	Finance & Securities
27	TK	THITIKORN	Finance & Securities

No.	Stocks	Company	Subsector
28	TNITY	TRINITY WATTHANA	Finance & Securities
29	ZMICO	SEAMICO SECURITIES	Finance & Securities
30	AYUD	SRI AYUDHYA CAPITAL	Insurance
31	BKI	BANGKOK INSURANCE	Insurance
32	BUI	BANGKOK UNION INSURANCE	Insurance
33	CHARAN	CHARAN INSURANCE	Insurance
34	INSURE	INDARA INSURANCE	Insurance
35	NKI	THE NAVAKIJ	Insurance
36	NSI	NAM SENG INSURANCE	Insurance
37	SMK	SYN MUN KONG INSURANCE	Insurance
38	THRE	THAI REINSURANCE	Insurance
39	TIC	THE THAI INSURANCE	Insurance
40	TIP	DHIPAYA INSURANCE	Insurance
41	TSI	THE THAI SETAKIJ INSURANCE	Insurance
42	TVI	THAIVIVAT INSURANCE	Insurance

CHAPTER 5

METHODOLOGY

I examine the relationship between corporate governance and the systemic risk of financial institutions in Thailand by the bivariate test and the panel regression.

5.1 Descriptive statistics and correlations

Before we conduct the test for looking at the relationship between corporate governance and systemic risk, let us look at the descriptive statistics for all variables that used in the analysis (Presented in Table 5.1).

My study involves with 42 firms from financials sector that listed in Stock Exchange of Thailand (SET) and there are 3 subsectors: (i) banking and (ii) finance & Securities (iii) insurances, and the time period of 10 years, so the sample size is 420 observations (After remove the outliers, the sample size is 414 observations). The corporate governance (CG) of the firms ranges form group 1 to group 4 that means my study consists of firms with very strong corporate governance and very weak corporate governance (Table 5.2). Apart from corporate governance measurement, there are long run marginal expected shortfall (LRMES) and Systemic Risk (SRISK) that represent for the systemic risk of financial institutions. The more the number is, the more risk the financial institution has. LRMES varies from -30.52% to 67.01% and SRISK varies from -141.71 billion baht to 80.91 billion baht.

For all the control variables, the size for each firm does not vary much but for others are very heterogeneous.

Table 5.1: Descriptive Statistics

VARIABLES	N	Mean	S.D.	Min	P25	Median	P75	Max
LRMES (%)	414	29.45	18.21	-30.52	14.84	30.38	43.96	67.01
SRISK (bt billions)	414	-0.80	18.72	-141.71	-2.67	-0.63	-0.18	80.91
Size	414	9.56	2.41	6.12	7.72	8.80	10.84	14.86
Leverage (Times)	414	4.53	6.45	0.04	0.78	1.89	6.84	58.49
ROA (%)	414	2.53	4.25	-21.66	0.85	2.05	4.30	20.80
Loan to assets (%)	414	40.68	36.61	0.00	0.19	42.53	71.15	111.18
Loan growth (%)	414	5.79	27.23	-99.55	0.00	0.00	10.33	122.22
Non-interest income[4] (%)	414	28.95	33.11	0.00	0.00	17.47	49.19	99.86

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[4] This is the non-interest income to total income

Table 5.2: The Group of Corporate Governance[5]

VARIABLES	N	% of the total
Group 1	105	25.3%
Group 2	96	23.2%
Group 3	129	31.2%
Group 4	84	20.3%
Total	414	100.0%

Table 5.3: Correlations[6]

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) LRMES	1.000							
(2) SRISK	0.066	1.000						
(3) Size	0.448	0.059	1.000					
(4) Leverage	0.143	0.184	0.554	1.000				
(5) ROA	-0.003	-0.086	-0.138	-0.312	1.000			
(6) Loan to assets	0.434	0.042	0.437	0.150	0.021	1.000		
(7) Loan growth	0.124	0.004	0.127	0.038	0.175	0.324	1.000	
(8) Non-interest income	0.462	-0.030	-0.077	-0.229	0.174	0.174	0.053	1.000

Table 5.3 shows us the pairwise correlations for all dependent variables and independent variables (including control variables). It shows that LRMES is positively correlated with corporate governance (CG), but SRISK is a little bit negatively correlated with corporate governance. For the control variables, size, loan to assets and non-interest income to total income are strongly positively correlated with the systemic risk (LRMES, but not so strong for SRISK). However, other control variables are not so obvious about the relationship with the systemic risk.

[5] As describe in page 9, group 1 means firm with no logos, group 2 means firm with 3 logos, group 3 means firm with 4 logos, and group 4 means firms with 5 logos.
[6] From Table 5.2, the correlations among each variable is not so high but I also perform VIF test for checking the multicollinearity and find that there is no multicollinearity.

5.2 The bivariate test

I divide my sample into 2 subsamples based on corporate governance rating: the weak CG group consists of the firms that have CG rating in group 1 (weak CG) and the strong CG group consists of the firms that have CG rating in group 4 (strong CG).

First, testing for the different in mean and median of systemic risk (For both LRMES and SRISK) between 2 groups. And then I perform two-tailed t-test and Wilcoxon/Mann-Whitney median test under null hypothesis that there are no differences in mean and median between financial institutions in these 2 groups.

The results of the bivariate tests are presented in Table 5.4. The difference between Strong CG group and the weak CG group in mean and median for LRMES are both positive and statistically significant. However, SRISK does not get the significant difference of the 2 groups. Therefore, I cannot conclude that the firm with strong corporate governance has more systemic risk than the weak one.

Table 5.4: Bivariate tests

VARIABLES	Strong CG			Weak CG			Difference in means[7]	Difference in median[8]
	N	Mean	Median	N	Mean	Median		
LRMES	84	37.03	43.11	105	22.08	20.77	14.95**	22.34**
SRISK	84	-1.84	-1.32	105	-0.73	-0.34	-1.11	-0.98

** Significant level at 5%

5.3 The panel regression

This is the main analysis of my study. I conduct the panel regression of the following form:

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[7] $H_0: \mu_{Strong\ CG} = \mu_{Weak\ CG}$ (There are no differences in mean) and $H_1: \mu_{Strong\ CG} \neq \mu_{Weak\ CG}$

[8] $H_0: Median_{Strong\ CG} = Median_{Weak\ CG}$ (There are no differences in median) and $H_1: \mu_{Strong\ CG} \neq \mu_{Weak\ CG}$

$$RISK_{i,t} = \alpha + \beta_1 CG3_{i,t-1} + \beta_2 CG4_{i,t-1} + \beta_3 CG5_{i,t-1} + \beta_4 CG3 \cdot Year^{2008}{}_{i,t-1}$$
$$+ \beta_5 CG4 \cdot Year^{2008}{}_{i,t-1} + \beta_6 CG5 \cdot Year^{2008}{}_{i,t-1} + \beta_7 Size_{i,t-1}$$
$$+ \beta_8 Leverage\ Ratio_{i,t-1} + \beta_9 \text{Return on Assets}_{i,t-1}$$
$$+ \beta_{10} \text{Loans to Assets}_{i,t-1} + \beta_{11} \text{Loan Growth}_{i,t-1}$$
$$+ \beta_{12} Non - interest\ Income_{i,t-1} + \varepsilon_{i,t}$$

Where; $RISK_{i,t}$	=	the two alternatives systemic risk measures (LRMES, SRISK) for firm i at time t
$CG3_{i,t-1}$	=	the dummy variable that '1' for the firm with CG score of 3 logos and '0' for otherwise
$CG4_{i,t-1}$	=	the dummy variable that '1' for the firm with CG score of 4 logos and '0' for otherwise
$CG5_{i,t-1}$	=	the dummy variable that '1' for the firm with CG score of 5 logos and '0' for otherwise
$Year^{2008}$	=	the dummy variable that '1' for the year in 2008 and '0' for otherwise
$Size_{i,t-1}$	=	the logarithm of total assets for firm i at time t-1
$leverage\ Ratio_{i,t-1}$	=	total debt to equity for firm i at time t-1
$Return\ on\ Assets_{i,t-1}$	=	net income to total assets for firm i at time t-1
$Loans\ to\ Assets_{i,t-1}$	=	net loans to total assets for firm i at time t-1
$Loan\ Growth_{i,t-1}$	=	total loans growth from
$Non - interest\ Income_{i,t-1}$	=	non-interest income to total income for firm i at time t-1
$\varepsilon_{i,t}$	=	The error term

Table 5.5 and 5.6 reports the model of panel regression. There are 3 versions in each table with different control variables and these 3 models have the p-value that are statistically significant at the level of 5%. Table 5.5 presents the model with LRMES as the dependence variable, while table 5.6 presents the model with SRISK as the dependence variable.

I. The first model is

$$LRMES_{i,t}$$
$$= \alpha + \beta_1 CG3_{i,t-1} + \beta_2 CG4_{i,t-1} + \beta_3 CG5_{i,t-1} + \beta_4 Size_{i,t-1}$$
$$+ \beta_5 Leverage\ Ratio_{i,t-1} + \beta_6 \text{Return on Assets}_{i,t-1} + \varepsilon_{i,t}$$

The dependent variable is long run marginal expected shortfall (LRMES) and the independent variables are corporate governance, size, leverage ratio and return on assets. This model is the fixed-effects panel regression. It shows that corporate governance (CG3 and CG4) is positively and statistically significant in the model (1) with R^2 of 25.4%.

II. The second model is

$$LRMES_{i,t} = \alpha + \beta_1 CG3_{i,t-1} + \beta_2 CG4_{i,t-1} + \beta_3 CG5_{i,t-1} + \beta_4 Size_{i,t-1}$$
$$+ \beta_5 Leverage\ Ratio_{i,t-1} + \beta_6 \text{Return on Assets}_{i,t-1}$$
$$+ \beta_7 \text{Loans to Assets}_{i,t-1} + \beta_8 \text{Loan Growth}_{i,t-1}$$
$$+ \beta_9 Non - interest\ Income_{i,t-1} + \varepsilon_{i,t}$$

The dependent variable is LRMES and the independent variable I added more control variable from model (1). I added loans to assets, loan growth and non-interest income to total income variable. This model is the random-effects panel regression, it has R^2 of 55.1%, and it shows statistically significant of corporate governance (CG3 and CG4), size, loans to assets and non-interest income to total income.

III. The third model is the full model:

$$LRMES_{i,t}$$

$$= \alpha + \beta_1 CG3_{i,t-1} + \beta_2 CG4_{i,t-1} + \beta_3 CG5_{i,t-1}$$

$$+ \beta_4 CG3 \cdot Year^{2008}{}_{i,t-1} + \beta_5 CG4 \cdot Year^{2008}{}_{i,t-1}$$

$$+ \beta_6 CG5 \cdot Year^{2008}{}_{i,t-1} + \beta_7 Size_{i,t-1}$$

$$+ \beta_8 Leverage\ Ratio_{i,t-1} + \beta_9 Return\ on\ Assets_{i,t-1}$$

$$+ \beta_{10} Loans\ to\ Assets_{i,t-1} + \beta_{11} Loan\ Growth_{i,t-1}$$

$$+ \beta_{12} Non - interest\ Income_{i,t-1} + \varepsilon_{i,t}$$

I added financial crisis interaction variable, the dummy variables of all CG multiply the dummy variable of Year 2008, into the model (2). This model has R^2 of 30.8% and it is a fixed-effects model. It shows no sign of the crisis interaction. However, it shows statistically significant size, loans to assets, and non-interest income to total income.

Table 5.5: Panel Regression as LRMES is a dependence variable

VARIABLES	(1) Fixed Effects	(2) Random Effects	(3) Fixed Effects
CG3	3.585*	3.338*	4.081*
	(2.151)	(1.937)	(2.202)
CG4	4.585*	4.725**	4.113
	(2.580)	(2.097)	(2.569)
CG5	3.096	3.028	2.765
	(3.484)	(2.785)	(3.443)
CG3xYear^{2008}			-3.696
			(4.916)
CG4xYear^{2008}			6.046
			(4.846)
CG5xYear^{2008}			4.763
			(6.205)
Size	3.404	2.787***	4.352*
	(2.123)	(0.575)	(2.247)
Leverage	0.143	0.170	0.119
	(0.166)	(0.140)	(0.166)

VARIABLES	(1) Fixed Effects	(2) Random Effects	(3) Fixed Effects
ROA	0.199	0.0305	0.228
	(0.200)	(0.176)	(0.199)
Loans to assets		0.0589*	-0.247***
		(0.0301)	(0.0720)
Loan growth		-0.0154	0.0226
		(0.0245)	(0.0264)
Non-interest income		0.224***	0.291***
		(0.0296)	(0.0885)
Year 2008			-4.660*
			(2.379)
Constant	-6.284	-8.721*	-12.95
	(19.26)	(4.958)	(19.60)
Observations	367	367	367
Number of id	42	42	42
Year FE	Yes	Yes	Yes
R-squared	0.254	0.551	0.308
Wald-chi2	-	249.76**	-
F-Stat.	7.57**		6.77**

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

IV. The fourth model is

$$SRISK_{i,t} = \alpha + \beta_1 CG3_{i,t-1} + \beta_2 CG4_{i,t-1} + \beta_3 CG5_{i,t-1} + \beta_4 Size_{i,t-1}$$
$$+ \beta_5 Leverage\ Ratio_{i,t-1} + \beta_6 \text{Return on Assets}_{i,t-1} + \varepsilon_{i,t}$$

The dependent variable is SRISK and the independent variables are corporate governance, size, leverage ratio and return on assets. This model is the random-effects panel regression controlled of year fixed-effects. It shows that corporate governance (CG4) is positively and statistically significant in the model (4) with R^2 of 6.3%.

V. The fifth model is

$$SRISK_{i,t} = \alpha + \beta_1 CG3_{i,t-1} + \beta_2 CG4_{i,t-1} + \beta_3 CG5_{i,t-1} + \beta_4 Size_{i,t-1}$$
$$+ \beta_5 Leverage\ Ratio_{i,t-1} + \beta_6 \text{Return on Assets}_{i,t-1}$$
$$+ \beta_7 \text{Loans to Assets}_{i,t-1} + \beta_8 \text{Loan Growth}_{i,t-1}$$
$$+ \beta_9 Non - interest\ Income_{i,t-1} + \varepsilon_{i,t}$$

The dependent variable is SRISK and the independent variable I added more control variable from model (4). I added loans to assets, loan growth and non-interest income to total income variable. This model is the random-effects panel regression, it has R^2 of 5.6%, and it shows statistically significant of corporate governance (CG4).

VI. The sixth model is the full model:

$$SRISK_{i,t} = \alpha + \beta_1 CG3_{i,t-1} + \beta_2 CG4_{i,t-1} + \beta_3 CG5_{i,t-1} + \beta_4 CG3 \cdot Year^{2008}{}_{i,t-1}$$
$$+ \beta_5 CG4 \cdot Year^{2008}{}_{i,t-1} + \beta_6 CG5 \cdot Year^{2008}{}_{i,t-1} + \beta_7 Size_{i,t-1}$$
$$+ \beta_8 Leverage\ Ratio_{i,t-1} + \beta_9 \text{Return on Assets}_{i,t-1}$$
$$+ \beta_{10} \text{Loans to Assets}_{i,t-1} + \beta_{11} \text{Loan Growth}_{i,t-1}$$
$$+ \beta_{12} Non - interest\ Income_{i,t-1} + \varepsilon_{i,t}$$

I added financial crisis interaction variable, the dummy variables of all CG multiply the dummy variable of Year 2008, into the model (5). This model has R^2 of 5.4% and it is a fixed-effects. It shows statistically significant of corporate governance (CG4).

Overall, the regression results from those 6 models (Presented in Table 5.5 and 5.6) suggest that stronger corporate governance financial institutions have higher systemic risk, as the coefficients of some dummy variables of corporate governance ($\beta_1, \beta_2\ and\ \beta_3$) are positively and statistically significant. However, the R-squared is quite low for most of the models, and the dummy variables of the CG score are not all significant. It means the models are not really fit with the data.

Table 5.6: Panel Regression as SRISK is a dependence variable

VARIABLES	(4) Random Effects	(5) Random Effects	(6) Fixed Effects
CG3	2.411	2.644	2.449
	(2.559)	(2.565)	(2.695)
CG4	6.666**	6.824**	7.129**
	(2.974)	(2.985)	(3.069)
CG5	4.209	4.567	4.463
	(3.999)	(4.010)	(4.090)
CG3xYear^{2008}			0.887
			(6.177)
CG4xYear^{2008}			-3.312
			(6.078)
CG5xYear^{2008}			0.952
			(7.780)
Size	-0.526	-0.902	-0.906
	(1.078)	(1.208)	(1.243)
Leverage	0.276	0.276	0.269
	(0.183)	(0.185)	(0.186)
ROA	-0.116	-0.0957	-0.105
	(0.233)	(0.235)	(0.236)
Loans to assets		0.0615	0.0642
		(0.0619)	(0.0633)
Loan growth		-0.0219	-0.0246
		(0.0313)	(0.0316)
Non-interest income		-0.0842	-0.0898
		(0.0640)	(0.0658)
Year 2008			7.352**
			(2.988)
Constant	0.988	4.131	4.264
	(9.928)	(10.63)	(10.96)
Observations	367	367	367
Number of id	42	42	42
Year FE	Yes	Yes	Yes
R-squared	0.063	0.056	0.054
Wald-chi2	39.24**	41.98**	42.67**
F-Stat.	-	-	-

CHAPTER 6

ROBUSTNESS TESTING

I aware of the value of the long run marginal expected shortfall (LRMES) and the systemic risk (SRISK) as they are computed from d=40%. So, I compute the historical return of the SET index over 6-month period to see the lowest loss. I found that the lowest loss from 1995 - 2015 is -53% in October 27th, 2008 (Figure 6.1). Therefore, I do the robustness test by using the d=50%.

Figure 6.1: SET Index 6-month return
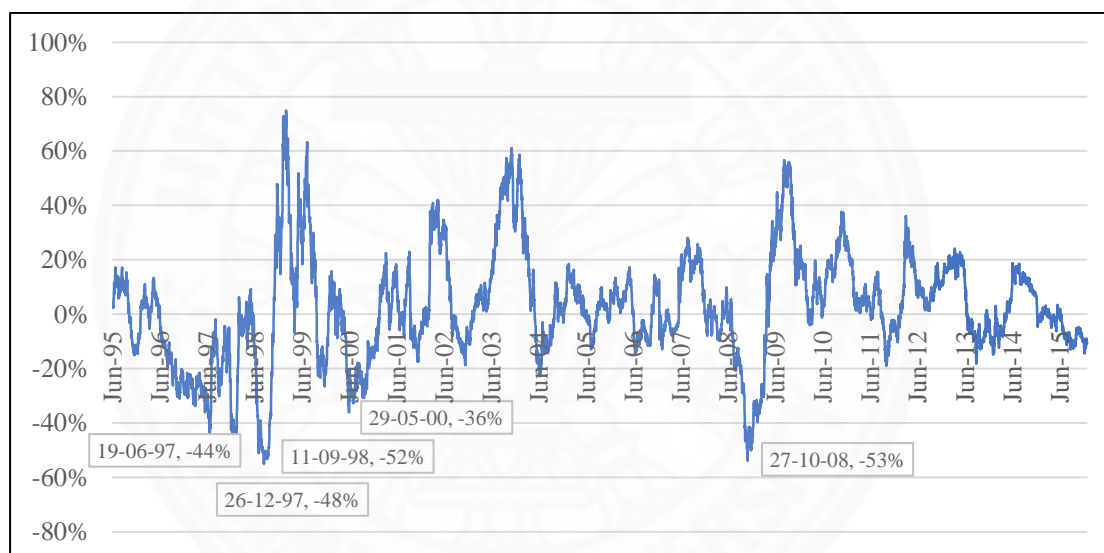
6.1 Descriptive statistics and correlations

Table 6.1: Descriptive Statistics

VARIABLES	N	Mean	S.D.	Min	P25	Median	P75	Max
LRMES (%)	414	36.71	21.95	-43.54	19.58	38.82	54.42	77.79
SRISK (bt billions)	414	2.73	17.76	-81.27	-1.64	-0.45	-0.10	102.94
Size	414	9.56	2.41	6.12	7.72	8.80	10.84	14.86
Leverage (Times)	414	4.53	6.45	0.04	0.78	1.89	6.84	58.49
ROA (%)	414	2.53	4.25	-21.66	0.85	2.05	4.30	20.80
Loan to assets (%)	414	40.68	36.61	0.00	0.19	42.53	71.15	111.18
Loan growth (%)	414	5.79	27.23	-99.55	0.00	0.00	10.33	122.22
Non-interest income[9] (%)	414	28.95	33.11	0.00	0.00	17.47	49.19	99.86

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[9] This is the non-interest income to total income

The descriptive statistics in Table 6.1 is quite similar to Table 5.1 except for LRMES and SRISK as they are computed from the formula of d=50%. The range of the LRMES seems to be wider from -43.54% to 77.79%. And the SRISK seems to be higher than Table 5.1 ranges from -81.27 billion baht to 102.94 billion baht.

Table 6.2: Correlations[10]

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) LRMES	1.000							
(2) SRISK	0.237	1.000						
(3) Size	0.453	0.432	1.000					
(4) Leverage	0.147	0.335	0.554	1.000				
(5) ROA	-0.008	-0.139	-0.138	-0.312	1.000			
(6) Loan to assets	0.438	0.177	0.437	0.150	0.021	1.000		
(7) Loan growth	0.126	0.036	0.127	0.038	0.175	0.324	1.000	
(8) Non-interest income	0.457	-0.036	-0.077	-0.229	0.174	0.174	0.053	1.000

The main difference of the correlations between variables of Table 6.2 and Table 5.2 is the correlation between SRISK and CG. Table 6.2 shows that SRISK is positively correlated with CG, while Table 5.2 shows the negative correlation.

6.2 The bivariate test

Table 6.3: Bivariate tests

	Strong CG			Weak CG			Difference in means[11]	Difference in median[12]
VARIABLES	N	Mean	Median	N	Mean	Median		
LRMES	84	45.87	53.49	105	27.77	27.09	18.10**	26.40**
SRISK	84	11.41	0.40	105	-0.46	-0.30	11.87**	0.70**

** Significant level at 5%

Table A.3 shows the results of the bivariate tests. The difference between Strong CG group and the weak CG group in mean and median for LRMES and

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[10] From Table A.2, the correlations among each variable is not so high but I also perform VIF test for checking the multicollinearity and find that there is no multicollinearity.

[11] $H_0: \mu_{Strong\ CG} = \mu_{Weak\ CG}$ (There are no differences in mean) and $H_1: \mu_{Strong\ CG} \neq \mu_{Weak\ CG}$

[12] $H_0: Median_{Strong\ CG} = Median_{Weak\ CG}$ (There are no differences in median) and $H_1: \mu_{Strong\ CG} \neq \mu_{Weak\ CG}$

SRISK are both positive and statistically significant. So, I can conclude that the firm with strong corporate governance has more systemic risk than the weak one.

6.3 The panel regression

I use the model as the same as in chapter 5. The results are shown in Table 6.4 and Table 6.5.

From the results, I can conclude that stronger corporate governance financial institutions have higher systemic risk because the coefficients of some dummy variables of corporate governance $(\beta_1, \beta_2 \ and \ \beta_3)$ in all models are positively and statistically significant. However, the R-squared is quite low for most of the models,

And the dummy variables of the CG score are not all significant. It means the models are not really fit with the data.
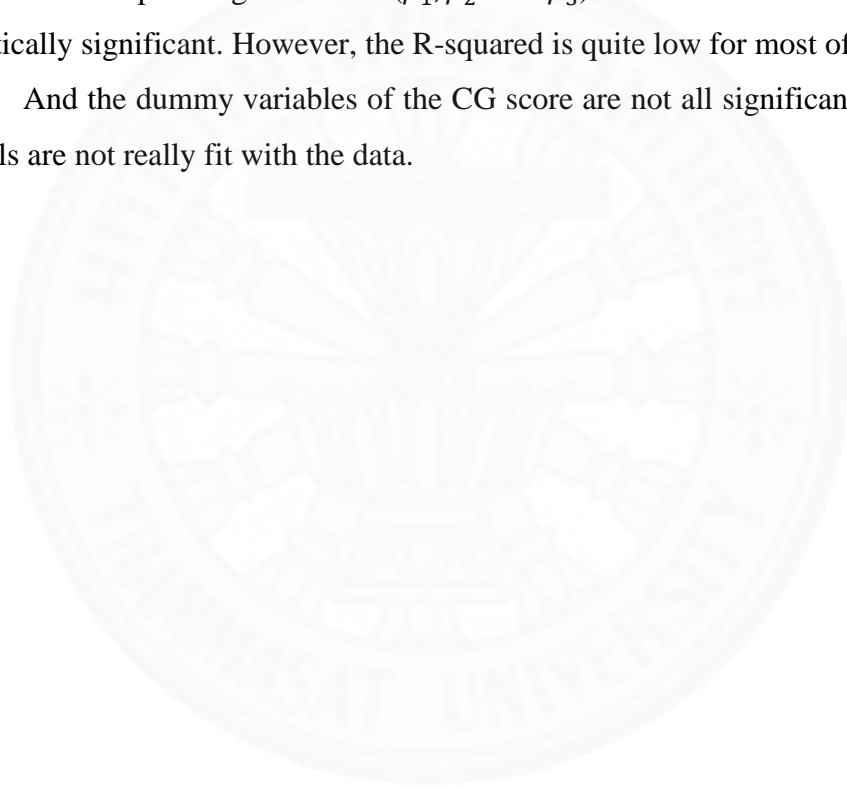
Table 6.4: Panel Regression as LRMES is a dependence variable

VARIABLES	(1) Random Effects	(2) Random Effects	(3) Fixed Effects
CG3	4.688*	3.973*	4.729*
	(2.497)	(2.351)	(2.688)
CG4	6.037**	5.729**	4.867
	(2.860)	(2.532)	(3.136)
CG5	3.350	3.606	3.172
	(3.838)	(3.361)	(4.203)
CG3xYear^{2008}			-4.557
			(6.000)
CG4xYear^{2008}			7.206
			(5.915)
CG5xYear^{2008}			5.890
			(7.575)
Size	3.881***	3.351***	5.088*
	(0.914)	(0.685)	(2.744)
Leverage	0.106	0.205	0.154
	(0.178)	(0.170)	(0.203)
ROA	0.230	0.0215	0.268
	(0.227)	(0.214)	(0.243)
Loans to assets		0.0755**	-0.293***
		(0.0358)	(0.0878)
Loan growth		-0.0189	0.0274
		(0.0299)	(0.0323)
Non-interest income		0.267***	0.356***
		(0.0351)	(0.108)
Year 2008			-5.152*
			(2.904)
Constant	-4.516	-9.682	-13.62
	(8.374)	(5.913)	(23.93)
Observations	367	367	367
Number of id	42	42	42
Year FE	Yes	Yes	Yes
R-squared	130.87	0.549	0.302
Wald-chi2	0.338**	253.27**	-
F-Stat.	-	-	6.60**

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 6.5: Panel Regression as SRISK is a dependence variable

VARIABLES	(4) Random Effects	(5) Random Effects	(6) Random Effects
CG3	1.190	1.394	1.123
	(2.144)	(2.152)	(2.258)
CG4	4.511*	4.561*	4.841*
	(2.502)	(2.512)	(2.579)
CG5	2.950	3.109	3.268
	(3.366)	(3.376)	(3.439)
CG3xYear^{2008}			1.397
			(5.162)
CG4xYear^{2008}			-2.628
			(5.080)
CG5xYear^{2008}			-3.884
			(6.502)
Size	2.393**	2.307**	2.255**
	(0.949)	(1.055)	(1.085)
Leverage	0.0607	0.0545	0.0468
	(0.154)	(0.156)	(0.156)
ROA	-0.0705	-0.0423	-0.0418
	(0.195)	(0.198)	(0.198)
Loans to assets		0.0228	0.0262
		(0.0535)	(0.0546)
Loan growth		-0.0204	-0.0225
		(0.0263)	(0.0265)
Non-interest income		-0.0589	-0.0655
		(0.0557)	(0.0572)
Year 2008			5.879**
			(2.497)
Constant	-21.86**	-20.47**	-19.93**
	(8.760)	(9.312)	(9.588)
Observations	367	367	367
Number of id	42	42	42
Year FE	Yes	Yes	Yes
R-squared	0.201	0.192	0.188
Wald-chi2	40.07**	41.04**	41.39**
F-Stat.	-	-	-

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

CHAPTER 7
CONCLUSION

Financial crisis reveals severe failure of corporate governance especially among Tom Yum Goong crisis in 1997. Many companies fail to make their obligations. Therefore, I examine the relationship between corporate governance and the systemic risk of financial institution in Thailand by looking how corporate governance level of a firm affects the systemic risk. During crisis, the failure of one financial institution can easily affect others or the potential to have serious negative consequence for the real economy.
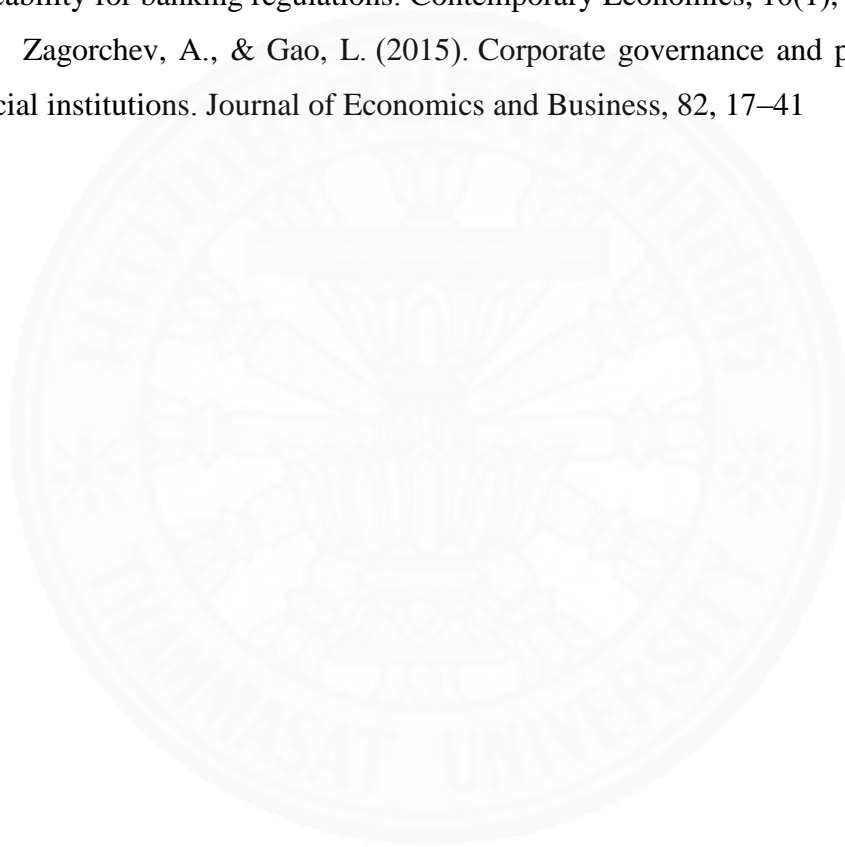
My empirical findings show that the financial institutions with stronger corporate governance have higher systemic risk that is consistent with prior literatures (Iqbal, J., Strobl, S., & Vähämaa, S. (2015); Mehran, H., Morrison, A. and Shapiro, J. (2011)). The prior findings gave the reason that firms with strong corporate governance may motivate excessive risk-taking in order to increase shareholders' wealth. However, the R-squared is pretty low for most of the models, and the dummy variables of the CG score are not all significant. It means the models are not really fit with the data.

From our findings, therefore, I suggest regulators and banking supervisors should take more seriously in the firms that have good corporate governance. However, my study has several limitations. First, my sample is quite small and limited to 42 financial institutions and a ten-year period, so the sample is only 420 observations. And second, the corporate governance scores I collected are too broad. It can only categorize into 4 groups. Therefore, it would be great if the future study can expand the sample size and cover for more countries. Moreover, if the corporate governance scores are more frequency like score 0 – 100, it would be better.

REFERENCES

1.   Acharya, V., Engle, R., & Richardson, M. (2012). Capital shortfall: A new approach to ranking and regulating systemic risks. American Economic Review, 102(3), 59–64.

2.   Adrian, T., & Brunnermeier, M. K. (2016). CoVaR. American Economic Review, 106(7), 1705–1741.

3.   Andrieş, A. M., & Nistor, S. (2016). Systemic risk, corporate governance and regulation of banks across emerging countries. Economics Letters, 144, 59–63.

4.   Bisias, D., Flood, M., Lo, A. W., & Valavanis, S. (2012). A survey of systemic risk Analytics. Annual Review of Financial Economics, 4(1), 255–296.

5.   Brownlees, C. T., & Engle, R. F. (2012). Volatility, correlation and tails for systemic risk measurement. Mimeo, Pompeu Fabra

6.   Brunnermeier, M. K., Dong, G. (n., & Palia, D. (2012). Banks' non-interest income and systemic risk. SSRN Electronic Journal

7.   Engle, R., Jondeau, E., & Rockinger, M. (2014). Systemic risk in Europe. Review of Finance, 19(1), 145–190.

8.   IMF, BIS and FSB (2009), "Guidance to assess the systemic importance of financial institutions,markets and instruments: initial considerations", Report to the G-20 Finance Ministers and Central Bank Governors.

9.   Iqbal, J., Strobl, S., & Vähämaa, S. (2015). Corporate governance and the systemic risk of financial institutions. Journal of Economics and Business, 82, 42–61.

10.   Klapper, L. F., & Love, I. (2004). Corporate governance, investor protection, and performance in emerging markets. Journal of Corporate Finance, 10(5), 703–728.

11.   Kouwenberg, R., Salomons, R., & Thontirawong, P. (2013). Corporate governance and stock returns in Asia. Quantitative Finance, 14(6), 965–976.

12.   Laeven, L., Ratnovski, L., & Tong, H. (2016). Bank size, capital, and systemic risk: Some international evidence. Journal of Banking & Finance, 69, S25–S34.

13.   Mehran, H., Morrison, A. and Shapiro, J. (2011). Corporate Governance and Banks: What Have We Learned from the Financial Crisis?. Federal Reserve Bank of New York.

14.   Pais, A. and Stork, P. (2013). Bank Size and Systemic Risk. European Financial Management, 19(3), pp.429-451.

15.   Patro, D. K., Qi, M., & Sun, X. (2013). A simple indicator of systemic risk. Journal of Financial Stability, 9(1), 105–116.

16.   Rodpol, J. (2011). Quantifying systemic risk : the case of Thai banking sector. Bangkok, Thailand : Faculty of Commerce and Accountancy, Thammasat University.

17.   Sum, K. (2016). A review of individual and systemic risk measures in terms of applicability for banking regulations. Contemporary Economics, 10(1), 71–82.

18.   Zagorchev, A., & Gao, L. (2015). Corporate governance and performance of financial institutions. Journal of Economics and Business, 82, 17–41

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