

CORPORATE GOVERNANCE, CREDIT RATING AND BUSINESS CYCLES

by

Chunbo Fan

A dissertation submitted to the Faculty of the University of Delaware in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Economics

Summer 2014

© 2014 Chunbo Fan
All Rights Reserved

UMI Number: 3642306

All rights reserved

INFORMATION TO ALL USERS

The quality of this reproduction is dependent upon the quality of the copy submitted.

In the unlikely event that the author did not send a complete manuscript and there are missing pages, these will be noted. Also, if material had to be removed, a note will indicate the deletion.



UMI 3642306

Published by ProQuest LLC (2014). Copyright in the Dissertation held by the Author.

Microform Edition © ProQuest LLC.

All rights reserved. This work is protected against unauthorized copying under Title 17, United States Code



ProQuest LLC.
789 East Eisenhower Parkway
P.O. Box 1346
Ann Arbor, MI 48106 - 1346

CORPORATE GOVERNANCE, CREDIT RATING AND BUSINESS CYCLES

by

Chunbo Fan

Approved:

James L. Butkiewicz, Ph.D.
Chair of the Department of Economics

Approved:

Bruce W. Weber, Ph.D.
Dean of the Alfred Lerner College of Business and Economics

Approved:

James G. Richards, Ph.D.
Vice Provost for Graduate and Professional Education

I certify that I have read this dissertation and that in my opinion it meets the academic and professional standard required by the University as a dissertation for the degree of Doctor of Philosophy.

Signed:

James L. Butkiewicz, Ph.D.
Professor in charge of dissertation

I certify that I have read this dissertation and that in my opinion it meets the academic and professional standard required by the University as a dissertation for the degree of Doctor of Philosophy.

Signed:

Terry L. Campbell, Ph.D.
Member of dissertation committee

I certify that I have read this dissertation and that in my opinion it meets the academic and professional standard required by the University as a dissertation for the degree of Doctor of Philosophy.

Signed:

William R. Latham III, Ph.D.
Member of dissertation committee

I certify that I have read this dissertation and that in my opinion it meets the academic and professional standard required by the University as a dissertation for the degree of Doctor of Philosophy.

Signed:

Kenneth A. Lewis, Ph.D.
Member of dissertation committee

ACKNOWLEDGMENTS

Many thanks to my late professor Robert L. Schweitzer, whose warm encouragement was always there along my course of pursuing this degree.

Special thanks to my parents who have passed the best of their qualities and characters to me.

No written words can adequately express my appreciation for the love, joy and support of my husband, Luqiang Wang, and my beloved boys, James and Michael. In particular, James' birth marked the beginning of my pursuit, and his 10th birthday will be celebrated together with my triumphant completion of my degree.

TABLE OF CONTENTS

LIST OF TABLES	vii
LIST OF FIGURES	viii
ABSTRACT	ix
Chapter	
1 INTRODUCTION	1
2 LITERATURE REVIEW	4
2.1 The Role of Corporate Governance.....	4
2.2 Corporate Governance and Bondholders.....	7
2.3 Credit Rating, Corporate Governance, and Business Cycle.....	9
3 DATA SAMPLE AND VARIABLE SELECTION.....	11
3.1 Credit Rating	11
3.2 Principal Component Analysis and Factor Analysis	13
3.3 Corporate Governance Data	14
3.4 Data on Firm Characteristics	34
3.5 Understanding and Indexing Business Cycles	36
3.6 Summary of Data Sample and Variables.....	37
4 METHODS AND RESULTS.....	39
4.1 Regression Model	39
4.2 Model Specification and Results	45
4.3 Assessment of Meaningful Marginal Changes.....	55
4.4 Summary of Modeling Results	61
5 DISCUSSION.....	62
5.1 Is Corporate Governance Still Important to Bondholders?	63
5.2 Corporate Governance Promoting Decision Efficiency	64
5.3 Dealing with Correlated and Autocorrelated Data	65
5.4 Recommended Future Studies	65
REFERENCES	67

Appendix	
A	2002 NAICS INDUSTRY CODES AND NAMES.....71

LIST OF TABLES

Table 1	Grouping of S&P Credit Ratings for Analysis	12
Table 2	Variable Definitions	17
Table 3	Descriptive Statistics of Variables.....	19
Table 4	Correlation of Firm Characteristics	20
Table 5	Correlation of Corporate Governance Variables.....	21
Table 6	Governance Provisions Captured by Different Indexes	22
Table 7	COMPUST Variable Name & Meaning.....	36
Table 8	Indexing Business Cycles 1996-2011	37
Table 9	Data Sample Size by Year.....	38
Table 10	Specifications of Ordered Logistic Models.....	45
Table 11	Usable Firm Count by Year.....	46
Table 12	Ordered Logistic Regression Results (Dependent Variable= <i>SPRating</i>) .	47
Table 13	Baseline Predicted <i>SPRating</i> and Probability of Up(Down) Grading.....	57
Table 14	Marginal Impact of Corporate Governance on Upgrading.....	58
Table 15	Marginal Impact of Corporate Governance on Downgrading.....	59
Table 16	All Corporate Governance Change in order to Push for Credit Rating Change.....	60

LIST OF FIGURES

Figure 1	Firm Institutional Holding and Block Holding Trend (1996-2011).....	28
----------	---	----

ABSTRACT

Corporate governance has the function of mitigating agency cost, through which it has impacts on shareholders and bondholders. Using a data sample of S&P 1500 companies over the period of 1996-2011, I study the relationship between corporate governance and credit ratings controlling for the state of the business cycle. I find that in addition to mitigating agency cost, corporate governance also has a second function to promote decision efficiency and bondholders' demand for this function varies along the states of business cycles. More specifically, when the economy is in a recession where risk levels are relatively higher, bondholders demand more from corporate governance to mitigate agency cost, while in booms, the demand is higher for decision efficiency.

Chapter 1

INTRODUCTION

Corporations are a very effective form of business and are commonplace in today's world. The key feature of the corporate form is the separation of ownership and control, where one party provides the capital to fund the business while the other decides how to use that capital. If there is no effective corporate governance, the investors would be very vulnerable in this arrangement. It is commonly recognized that protection of investor's interest is essential to maintain healthy financing channels for corporations.

In the literature, corporate governance is thought of as being the set of rules and arrangements designed to protect investors by mitigating agency cost. Such monitoring is primarily initiated by the board and acted upon executives, especially the CEO. The majority of studies also focus on shareholder interests, since under the shareholder theory, the corporation's paramount task is to maximize shareholder value. However, with the development of stakeholder theories, researchers have begun to think of corporations more holistically, and the managers not only need to consider shareholders, but also other parties, such as bondholder, suppliers, and even the general community.

Taking the perspective of bondholders, this dissertation examines a key question of corporate governance: what are the key functions of corporate governance. It would be desperate to rely solely on the rules and arrangements to protect investor's interest. Executive managers, especially those who are hired to take care of big

corporations like S&P 1500, are the top talents at any given time. These smart people would always be able to game the rules and arrangements if they choose to. However, that type of breach is not what the majority have chosen to do. Obviously, executives have a desire to behave properly and know that doing so is also good for their own long term benefits.

This dissertation contributes by addressing this underlying trust and explores the role of corporate governance in promoting decision efficiency. By using credit ratings as a proxy for bondholder's evaluation of corporations and incorporating business cycles as a measure of the risk environment, I will show that bondholders value corporate governance in its ability to promote decision efficiency, besides its role of mitigating agency costs. Promoting decision efficiency involves empowering the CEO and allowing for CEO influence over the board, which to some degree contradicts the role of mitigating agency costs. I will also show that during economic recessions, investors (bondholders and shareholders) want corporate governance to focus on their primary role of mitigating agency costs, while when the economy is in a boom, bondholders want governance to promote decision efficiency.

This dissertation also contributes by addressing the importance of proper handling of correlated and autocorrelated data, which is quite common in economic studies. If not taken care of, multicollinearity and autocorrelation may not be a severe problem if the sole purpose of a model is to predict credit rating. However, if one tries to infer the impact of each corporate governance attribute on the credit rating, it may produce misleading results. For example, some prior studies found independence of the board to have a positive impact on credit ratings, while in my more robust estimation analysis this is found to be false.

This dissertation makes policy recommendations that will help to improve corporate governance. They are: i) to attract more capable expert directors to the board and retain them for longer tenure, ii) to limit executive share holdings, and if possible, also limit block holdings and institutional holdings, and iii) to enable close cooperation between the CEO and the board. Typical corporate governance was for the board to act upon executives especially the CEO, but my study shows that the board needs to improve as well. As to who should initiate such efforts, I will not be able to analyze in this study. However, I will show that it is hugely rewarding if a corporation can do at least one thing a year continuously. For an average corporation with a non-investment grade rating of B- to BB+, if it keeps improving corporate governance continuously, the probability of being upgraded to investment grade can be greater than 0.8 in as few as three years.

Chapter 2

LITERATURE REVIEW

Well-functioning corporate governance is essential to the success of corporations. It promotes good financial performance and helps to maintain healthy channels of capital from shareholders and debtholders. Credit ratings reflect the overall evaluation of the corporation's financial position for the investor community. Therefore, it is important to understand how corporate governance can impact credit ratings, and how the impact varies in different states of the business cycles.

2.1 The Role of Corporate Governance

Corporate governance can be traced back at least 200 years to the very first known corporation, the East India Company (which was funded by the British crown but operated in the far east), even though the term "corporate governance" was not used until the 1980's. Corporations as a new form of conducting business brought with it the need to control how its business was run, which is the essence of corporate governance. Therefore, understanding the role of corporate governance has big implications for corporate laws (external) and corporate policies (internal). For example, there used to be no requirement of placing an independent financial expert on the auditing committee until the Sarbanes Oxley Act of 2002. Prior to that, it was

assumed the corporate governance should be able to take care of "ethical and trustworthy" financial reporting.

There has not been a widely agreed upon definition of corporate governance. The literature has two main schools of thought. One is based on the shareholder theory and the agency framework, and the other is based on stakeholder theory. In order to better understand corporate governance and these views, I need to take a historical view to understand the evolution of corporate governance. In the beginning years of corporations, investors existed first, and the process of organizing a corporation is as the textbooks prescribe: they form a fund pool, and then select a board of directors, and then the board would appoint managers to run the companies. Back then, the direction of corporate governance was much clearer, namely governed by investors on the board and managers. This is well represented by the first school of thought on corporate governance, which is "the way suppliers of finance get managers to return some of the profits to them" (Shleifer and Vishney, 1996). This description aligns closely with the agency theory framework, where fund holders are principals hiring managers to run the business on their behalf. The shareholders and bondholders (fund suppliers) are considered to initiate the action of corporate governance, and the main tools available are corporate laws, regulations, processes and responsibility contracts. All these are applied to the corporate managers. In this framework, managers should take care of investors' interests. Furthermore, in 1970, Milton Friedman in his milestone article further narrowed it down to shareholders. He argued that the fundamental obligation of managers is to return profits to shareholders, but not to invest corporate funds in endeavors that they find socially beneficial but that reduce shareholders' returns. In 1976, Michael Jensen and William Meckling explored the

notion of principal-agent conflicts, arguing that shareholders need to invest their time and money to monitor agency cost, otherwise executives would fail to maximize profits. These theories and their following studies have heightened shareholder awareness in corporate governance.

However, this shareholder view of corporations was challenged by many law researchers who question whether shareholders own the corporations as residual claimants. They argue that from the legal perspective, shareholders do not own the corporations; corporations own themselves as a legal entity. Therefore, the shareholders, as owners of shares of the corporations, do not have legal ownership of all the companies' profits (for example, Stout, 2007). Meanwhile, the shareholder theory was also challenged by Freeman (1984) and subsequent researchers (Alkhafaji, 1989; Anderson, 1989; Brummer, 1991; and Brenner & Cochran, 1991) in their work on stakeholder theory. They believe that corporations owe a responsibility to a wider group of stakeholders, other than just shareholders. They claim that not only investors, but also other stakeholders, such as such suppliers, employees and even customers who have an intrinsic interest in the corporation should all be considered when the board and management make corporate decisions. They argue that this socially responsible role of corporations makes sustainable business growth possible. In this context, corporate governance is no longer just "the way suppliers of finance get managers to return some of the profits to them", but is the organizing and managing of the relationship between outside investors and the managers and employees who actually run the firm. As a result, bondholders who used to be overlooked step to the spotlight of corporate governance as the other prominent participant from the investor camp. Unlike shareholders who were viewed as residual

claimants of the corporation's total income, bondholders get a fixed income based on their loan contract with the companies. On the surface, it seems that they should be satisfied as long as the corporations continue to exist, so long as they will get their fixed income payments. However, this is not true. Bondholders also pay attention to corporate governance.

2.2 Corporate Governance and Bondholders

Bondholders have intrinsically more interest in the long term financial performance of the corporations than shareholders, since most bonds have less liquidity than stocks. Under Jensen and Meckling's agency framework (1976), there are conflicts of interests between managers and the camp of investors. It is summarized as the "separation problem", where fund owners do not control the way funds are used, while managers of funds do not own the funds (at least not in its entirety). This separation was the result of market forces pursuing higher efficiency in resource allocation and business operations. However capital owners and professional managers are all human beings, whose interests are not always aligned, thus creating this agency conflict and the need for monitoring from investors. Most studies of corporate governance and investors explain the impact of corporate governance by its function of mitigating agency costs, addressing the separation problem.

There has been a few studies focusing on the relationship between corporate governance and bondholders (Skaif *et al.*, 2006, Chen 2011) and they identified a second agency conflict as the reason for bondholders to pay attention to corporate governance. They argue that there is a potential problem of wealth transfer from

bondholders to shareholders if shareholders push the managers to invest in higher risk projects. Since bondholders earn a fixed income, they may potentially suffer the extra risk of potential loss while gaining no extra income from it. However, I question the severity of the potential wealth transfer problem between shareholders and bondholders. Firstly, bondholders only face a potential loss of future payback when managers invest in risky projects, not realistic losses on their current investment as long as the firms still exist, even when the bonds are rated below investment grade. Secondly, the worries over "investing in risky projects" are not well grounded. Many studies have found that managers do not prefer riskier projects as the wealth transfer hypothesis stated (Amihud and Lev, 1981; Holmstrom and Costa, 1986; Adams et al., 2005). Instead, most managers and directors prefer more conservative investment options. In my opinion, using agency conflicts and agency costs helps us to understand corporate governance but it has limited success when trying to explain why corporate governance should address bondholder needs as stakeholder theory describes, or why bondholders should care about corporate governance as much as shareholders, if not more.

Instead, I believe that corporate governance has two main functions which are: 1) mitigating agency costs, and 2) promoting decision efficiency. I define decision efficiency as the management's capability to make correct business decisions in a timely fashion. Note it is not just quick decisions. Corporate governance's function of promoting decision efficiency is vastly different from its other function of mitigating agency cost in that the former is more actively involving and helping the management, whereas the latter is more passive and more controlling. Good corporate

governance that promotes decision efficiency while mitigating agency cost makes the corporations more appealing to bondholders as a source of future income.

2.3 Credit Rating, Corporate Governance, and Business Cycle

I choose to use credit ratings as a proxy for bondholders' assessment of corporations, because credit ratings measure the corporations' credit worthiness and are readily available from well accredited rating agencies in the US. I measure corporate governance using the structure that S&P uses and extend on this basis. S&P had been considering corporate governance in light of credit ratings from the following 4 factors: ownership structure and influence, financial stakeholder rights and relations, financial transparency, and board structure and processes. Considering the essential role of the CEO in corporate governance, I decide to include CEO pay and turnover as well.

From history we understand that decision efficiency is constantly at war with decision democracy. Similarly, the function of promoting decision efficiency is also at war with that of mitigating agency cost. In order to promote decision efficiency, the corporate board would need to empower the executives and select managers and directors with expertise and entrepreneurship. On the other hand, mitigating agency cost is most commonly practiced by limiting executive power and implementing tighter control over the executives and board directors. How each corporate governance attribute is valued by debtholders ultimately is the result of the comparative demand of these two functions. Debt holders value decision efficiency because it helps to improve financial performance of the corporation. During economic recessions, since such improvement opportunity is small for all companies,

debtholders would naturally shift their focus to mitigating agency cost. When the economy is in a boom where such opportunities are rich, they would again turn their eyes to corporations with better decision efficiency. In summary, I have three hypotheses, which will be tested in Chapter 4:

- H1: Corporate governance has a statistically significant and economically important influence on a corporation's credit rating.
- H2: Corporate governance functions to mitigate agency cost and promote decision efficiency, but debtholders' preference for these two functions vary during economic booms and recessions.
- H3: In recessions, the function of mitigating agency cost dominates that of promoting decision efficiency, while the opposite is true during economic booms.

Chapter 3

DATA SAMPLE AND VARIABLE SELECTION

There are three types of data used in this study: 1) financial data, which includes credit rating from S&P, stock returns data from CRSP, and firm balance sheet accounting data from WRDS/CompuStat, 2) data that measures corporate governance from the RiskMetrics Corporate Governance Database, and 3) data that measure the business cycles from NBER. Among these different data pieces, credit rating is the most straightforward, while measuring corporate governance and business cycle involves more effort. Once data is cleaned, ordinal logistic models are fitted to evaluate the impact of corporate governance on credit rating, controlling for the states of the business cycles.

3.1 Credit Rating

I use credit ratings published by S&P, which are letter ratings, and thus need to be coded numerically for modeling purposes. There are 22 letter ratings and I grouped them into 7 groups as illustrated in Table 1. S&P offers three types of credit ratings: both long-term and short term rating of the firm's bonds, and ratings of particular issues. For our purposes, I choose to use the long-term issuer credit rating. S&P had been rating over 100,000 firms during 1999 to 2011, with peak years of

rating over 130,000 firms. However, the number dropped down to 79,000 firms in 2012. This study selected only those by firm and year records on which Metric Risk also collected governance information, which includes most S&P 1500 companies. For our sample, the average rating is 4.05, with a standard deviation of 1.05. Every year, over 60% of the firms receive above investment grade ratings.

Table 1 Grouping of S&P Credit Ratings for Analysis

S&P Credit Rating	Grade	Grouping in Analysis
AAA	Investment	7
AA+	Investment	6
AA	Investment	6
AA-	Investment	6
A+	Investment	5
A	Investment	5
A-	Investment	5
BBB+	Investment	4
BBB	Investment	4
BBB-	Investment	4
BB+	Speculative	3
BB	Speculative	3
BB-	Speculative	3
B+	Speculative	2
B	Speculative	2
B-	Speculative	2
CCC+	Speculative	1
CCC or CC	Speculative	1
C	Speculative	1
D or SD	Speculative	1

3.2 Principal Component Analysis and Factor Analysis

In social science studies, many similar variables are used to describe related traits of the subject, and by nature tend to correlate with each other. If we include all these variables in the models, the result can be misleading, and the real impact of the observed explanatory variables on the dependent variable can be diluted by the high correlation in data. One common approach to handle this situation is to use principal component analysis (PCA) and factor analysis to derive underlying factors for the observed variables, and then construct an index or factor scores for the next step in modeling.

For illustration purposes, suppose there are k variables that we need to explore, and the variance-covariance matrix of the k variables is a $k \times k$ matrix. We do not need to assume which variables are explanatory or dependent in PCA or factor analysis. PCA focuses on the variances and transforms the whole $k \times k$ matrix to derive k principal component vectors, each orthogonal to the others. Every one of the principal components is a weighted average of all of the k variables. In the transformation process, PCA finds the first principal component by choosing weights that can represent the maximum possible proportion of the total variation in the variable set. The second principal component in turn will be determined to represent the next biggest proportion of the total variance in the variable set. For the $k \times k$ matrix, PCA produces k principal components. Some researchers use principal component scores as is in the subsequent modeling process. I will only use PCA results to select

and group key variables for later modeling analysis, instead of direct use of PCA results.

The intent of factor analysis is to represent the k variables in terms of fewer hypothetical constructs, namely, factors. It assumes that the underlying factor influences more than one observed variable in the explanatory variable set, thus some of the observed k variables are correlated. Factor analysis attempts to discover these factors. It assumes an underlying linear model in which the observed variable is a linear combination of the underlying factors and focuses on the covariance and correlation of the variable set. Factor analysis finds coefficients for each factor on the observed variables and calls them "factor loadings". I can analyze the pattern in the factor loading to select and group the explanatory variables.

PCA does not involve covariance or correlation and is more appropriate for variables with fewer category values, for which linear correlation estimates can be inaccurate. We use principal component analysis to explore the corporate governance database, and use factor analysis to validate our selection of financial variables to describe firm characteristics.

3.3 Corporate Governance Data

RiskMetrics has a wealth of data measuring corporate governance. Many prior studies of corporate governance have focused on a single corporate governance attribute, such as independence of the board or block holders. The risk of doing so is that the analysis results may not be robust since many governance attributes may be

complimentary to each other, and some others substitutional. As a result, the findings based on one single attribute may not stand if another attribute is included. S&P in 2002 introduced a more comprehensive framework to view governance, which includes 4 aspects: ownership structure and influence, financial stakeholder rights and relations, financial transparency, and board structure and processes. This structure is consistent with the results of our PCA analysis.

The studies of Skaif *et al.* (2006) and Chen *et al.* (2008) incorporate this comprehensive view of measuring corporate governance, but did so by modeling all the variables from each attribute directly into the models. The variables within each corporate governance attribute have underlying multicollinearity issues and potential interaction problems. These issues undermine the validity of their findings. After all, a model can only be as good as the data used for analysis.

I start with a very thorough PCA analysis of corporate governance and focus on five attributes, including the four laid out in the S&P framework, plus CEO pay and turnover. I use board director entrenchment score, *EBINDEX*, and regulation opt-out score, *FINDEX*, to describe financial stakeholder rights and relationships. Four composite variables, independence of the board committees, *indep_cmt* and director capability, *dir_capability*, tenure of board directors, *dir_tenure*, and CEO's influence over the board, *CEO_bd_influence*, are selected to describe board structure and process. Three variables, number of block holders, percent of shares held by institutional holders, and percent of shares held by executive directors (denoted as

num_blk_holder, *per_inst* and *per_execdir_share*), represent ownership and structure. Two decile variables, decile of financial transparency, *wcaq_decile* and decile of reporting timeliness, *timeliness_decile*, describe financial transparency and timeliness. Two variables, CEO's base salary, *CEO_base* and CEO's tenure, *CEO_tenure*, capture CEO incentives to perform. Table 2 lists the definition of these variables, together with firm characteristic variables and Table 3 shows the descriptive statistics of these variables. Tables 4 and 5 list the correlation among firm's characteristics and governance variables.

Table 2 Variable Definitions

Variables	Definitions	Predicted Sign	Data Source
Financial Stakeholder Rights & Relations:			
EBINDEX	Board index -- Expanded board director entrenchment score	–	RiskMetrics
FINDEX	Regulation Opt-out Index -- one point for each decision to opt-out of the following laws: Recapture of Profits law, control share acquisition law, directors duties law, control share cashout law, Fair Price law, and BusComb/Freezeout law.	?	RiskMetrics
Board Structure and Processes:			
indep_cmt	Independence of board committees -- average % of independent directors on the board, on the nomination committee and compensation committee, scaled by existence of corporate governance committee (scalar is 1.5 if exists; 1 otherwise)	+	RiskMetrics
dir_capability	Director capability -- composite score representing whether a director is an expert director by serving on more than 4 public boards, and whether the director is a CEO of another firm. Score is 2 if both criteria met; 1 if only one met, and 0 if neither.	+	RiskMetrics
dir_tenure	Director tenure -- Number of years of director service until the year of observation	?	RiskMetrics
CEO_bd_influence	CEO's influence over the board -- mean score of CEO power and % of insiders on the finance auditing committee, where CEO power get 1 point for each board the CEO sits on and whether he is the chair of the board	–	RiskMetrics
Ownership Structure and Influence:			
num_block_inst	Number of block holders -- where block is defined at the 5% ownership level	?	RiskMetrics
per_inst	Institutional shares -- % of shares held by institutional investors	?	RiskMetrics & Reuters

per_execdir_share	Executive director shares -- % of shares held by executive also serving on the board	-	RiskMetrics
Financial Transparency & Information Disclosure:			
wcaq_decile	Financial transparency score -- decile score of standard deviation of estimation errors from the equation $WCA_t = \beta_0 + \beta_1 NCF_{t-1} + \beta_2 NCF_t + \beta_3 NCF_{t+1} + \varepsilon_t$ estimated by general linear model by three, two, or one-digit SIC code groups with at least 10 firms in the group. WCA=working capital accruals $(-(RECCH+INVCH+APALCH+TXACH+AOLOCH)*AT)$, and NCF=net cash flow from operations $(OANCF * AT)$	+	CompuStat
timeliness_decile	Reporting timeliness score -- decile score of residuals of from the regression $RET = \beta_0 + \beta_1 IB + \beta_2 LOSS + \beta_3 IB * LOSS + \beta_4 \Delta IB + \varepsilon$, estimated with the general linear model by three, two, or one-digit SIC code conditional on having at least 10 firms in each SIC group.	+	CompuStat
CEO Pay and Turnover			
CEO_base	CEO base salary -- Base salary of CEO	?	RiskMetrics
CEO_tenure	CEO tenure -- years of CEO service till year of observation	-	RiskMetrics
Firm Characteristics:			
size	Firm size -- Natural logarithm of total assets	+	CompuStat
Leverage	Debt leverage -- total debt (DLTT + DLC) divided by total assets (AT)	-	CompuStat
ROA	Return of assets -- net income before extra ordinary items (IB) divided by total assets	+	CompuStat
LOSS	Financial year loss -- one if the net income before extra ordinary items is negative in the current fiscal year, zero otherwise	-	CompuStat
INT_cov	Interest coverage -- operating income before depreciation (OIBDP) divided by interest expense (XINT)	+	CompuStat
Cap_intensity	Capital intensity -- gross PPE (PPEGT) divided by total assets	+	CompuStat
subordinate	Subordinate debt -- one if the firm has subordinated debt, zero otherwise	-	CompuStat
Utility	Indicator of utility firms -- one if firm is a utility firm(two-digit SIC code 49), zero otherwise	+	CompuStat

Table 3 Descriptive Statistics of Variables

	Mean	Std Dev	Median	25%	75%
<i>Financial Stakeholder Rights and Relations:</i>					
EBindex	4.39	2.08	4.00	3.00	6.00
findex	0.12	0.46	0.00	0.00	0.00
<i>Board Structure and Process:</i>					
indep_cmt	0.44	0.15	0.47	0.33	0.55
dir_capability	0.15	0.16	0.11	0.00	0.23
dir_tenure	8.35	3.56	8.00	5.91	10.30
CEO_bd_influence	0.02	0.11	0.00	0.00	0.00
<i>Ownership Structure and Influence:</i>					
num_block_inst	2.17	1.38	2.00	1.00	3.00
per_inst	0.69	0.18	0.72	0.59	0.82
per_execdir_share	0.02	0.05	0.00	0.00	0.01
<i>Financial Transparency:</i>					
wcaq_decile	5.45	2.62	5.00	4.00	8.00
timeliness_decile	5.62	2.97	6.00	3.00	8.00
<i>CEO Pay and Turnover:</i>					
ceo_base	868.37	390.26	845.48	630.00	1000.04
ceo_tenure	6.65	6.62	5.00	2.00	9.00
<i>Firm Characteristics:</i>					
size	8.72	1.47	8.56	7.67	9.62
leverage	0.29	0.17	0.27	0.17	0.38
ROA	0.04	0.12	0.04	0.01	0.07
loss	0.10	0.30	0.00	0.00	0.00
INT_cov	27.09	560.77	7.39	4.17	13.86
cap_intensity	0.58	0.41	0.53	0.26	0.88
subordinate	0.14	0.35	0.00	0.00	0.00
utility	0.03	0.04	0.02	0.00	0.04
<i>Credit Rating:</i>					
SPRating	4.05	1.05	4.00	3.00	5.00

Table 4 Correlation of Firm Characteristics

	size	leverage	ROA	loss	INT_cov	cap_ intensity	subordinate	utility	<i>SPRating</i>
size		-0.10	-0.06	-0.06	0.07	-0.04	-0.02	0.05	0.38
leverage	-0.10		-0.17	0.11	-0.49	0.18	0.09	0.20	-0.19
ROA	-0.06	-0.17		-0.40	0.53	-0.01	-0.14	-0.09	0.20
loss	-0.06	0.11	-0.40		-0.29	0.04	0.08	-0.05	-0.23
INT_cov	0.07	-0.49	0.53	-0.29		-0.08	-0.20	-0.22	0.32
cap_intensity	-0.04	0.18	-0.01	0.04	-0.08		-0.10	0.28	-0.01
subordinate	-0.02	0.09	-0.14	0.08	-0.20	-0.10		-0.12	-0.17
utility	0.05	0.20	-0.09	-0.05	-0.22	0.28	-0.12		0.06
<i>SPRating</i>	0.38	-0.19	0.20	-0.23	0.32	-0.01	-0.17	0.06	

Notes:

Correlation values are Kendall's rank order correlation scores.

Bold text indicates high correlation and significance at the 0.05 level.

Table 5 Correlation of Corporate Governance Variables

Variable	A	B	C	D	E	F	G	H	I	J	K	L	M	N
EIndex	A	0.02	0.17	0.05	0.00	-0.05	0.04	0.08	-0.06	0.01	0	0.04	-0.04	0.04
Findex	B	0.02	0.01	0.01	0.02	0.02	0.02	0.00	-0.02	-0.05	-0.02	0	0.01	0.01
indep_cmt	C	0.17	0.01	0.10	-0.07	-0.09	0.10	0.20	-0.01	0.02	-0.01	0.13	0	-0.03
dir_capability	D	0.05	0.01	0.10	-0.11	0.08	-0.07	-0.05	-0.17	0.00	0.01	0.07	-0.08	0
dir_tenure	E	0.00	0.02	-0.07	-0.11	0.00	-0.03	-0.05	0.16	0.01	0.00	-0.01	0.17	0.08
CEO_bd_influence	F	-0.05	0.02	-0.09	0.08	0.00	-0.03	-0.09	-0.02	-0.01	0.01	-0.06	0.00	0.00
num_block_inst	G	0.04	0.02	0.10	-0.07	-0.03	-0.03	0.48	0.10	0.08	-0.01	-0.08	0.03	-0.33
per_inst	H	0.08	0.00	0.20	-0.05	-0.05	-0.09	0.48	0.08	0.08	0.00	0.07	0.03	-0.21
per_execdir_share	I	-0.06	-0.02	-0.01	-0.17	0.16	-0.02	0.10	0.08	0.09	-0.01	-0.08	0.24	-0.23
wcaq_decile	J	0.01	-0.05	0.02	0.00	0.01	-0.01	0.08	0.08	0.09	0.03	-0.05	0.03	-0.12
timeliness_decile	K	0	-0.02	-0.01	0.01	0.00	0.01	-0.01	0.00	-0.01	0.03	0.02	-0.01	0.00
ceo_base	L	0.04	0	0.13	0.07	-0.01	-0.06	-0.08	0.07	-0.08	-0.05	0.02	0.06	0.21
ceo_tenure	M	-0.04	0.01	0	-0.08	0.17	0.00	0.03	0.03	0.24	0.03	-0.01	0.06	-0.05
<i>SPRating</i>	N	0.04	0.01	-0.03	0	0.08	0.00	-0.33	-0.21	-0.23	-0.12	0.00	0.21	-0.05

Notes:

Correlation values are Kendall's rank order correlation scores.

Bold text indicates high correlation and significance at the 0.05 level.

3.3.1 Financial Stakeholder Rights and Relations

One early measurement of financial stakeholder rights and relations is the G-Index, developed by Gompers, Ishi and Metrick (2003). A firm gets one point for each of the 24 provisions in place as listed in Table 6.

Table 6 Governance Provisions Captured by Different Indexes

	G-Index	B-Index	Expanded B-Index	FIndex
Blank Checks	√		√	
Classified Board	√	√	√	
Golden Parachutes	√	√	√	
Poison Pill	√	√	√	
Limit to Special Meetings	√		√	
Limit to Amend Bylaws	√	√	√	
Limit to Act on Written Consent	√		√	
Supermajority Required on Merger	√	√	√	
Limit to Amend Charter	√	√	√	
Fair Price Required for Bidder	√		√	
Opt out of Recapture of Profits Law	√			√
Opt out of Control Share Acquisition Law	√			√
Opt out of Directors Duties Law	√			√
Opt out of Control Share Cashout Law	√			√
Opt out of Fair Price Law	√			√
Opt out of BusComb/Freezeout law	√			√
Opt out of Poison Pill	√			√
Cumulative Voting	√			
Unequal Votes	√			
Confidential Votes	√			
Anti-green Mail	√			
Compensation Plans	√			
Director Indemnification	√			

Subsequently, Bebchuk, Cohen and Ferrell (2005) fine-tuned the G-Index and proposed a subset of metrics to describe a firm's director entrenchment, which is referred to as the E-Index. This subset included 6 metrics, namely golden parachutes, limits to amend bylaws, limits to amend charter, poison pills, staggered board, and supermajority required on merger decisions. They argue that this subset E-index can represent stakeholder rights efficiently. With the evolving business environment and development of regulations on board structure and responsibilities, some metrics are not longer as impactful.

I test the G-Index and E-Index with recent data, and find that there is a need to expand the E-Index to include these four additional provisions: 1) limit ability to call special meetings, 2) limit ability to act on written consent, 3) blank checks for preferred stock proposals, and 4) fair price required from bidder. I call this expanded metric the *EBIndex*. PCA over the most recent 16 years (1996 to 2011) also suggests a potential metric that gives some flexibility to management when they make decisions. This involves a set of provisions "opting out" of certain laws and regulations. More specifically, the ability to

- 1) opt out of Recapture of Profits law,
- 2) opt out of control share acquisition law (CSA),
- 3) opt out of directors duties law,
- 4) opt out of control share cashout law (PA),
- 5) opt out of Fair Price law, and
- 6) opt out of BusComb/Freezeout law.

When a firm opts out of these laws, it is not protected by them if there are conflicts, but on the other hand, the firm's management earns back some flexibility which may enhance their decision efficiency. Since this potential component is around the flexibility of management, I call it *Findex* in our analysis. Due to the binary nature of these provisional variables, this study will continue to use the sum of existence to calculate the *EBindex* and *Findex* and will incorporate them in model estimation. For our sample of firms with a board size of at least 4, the mean *EBIndex* is 4.39 with a standard deviation of 2.08. Election of opting out of laws appears to be rare, since the mean for is only *Findex* 0.12, and its Q1 to Q3 are all 0.

3.3.2 Board of Directors

The RiskMetric data only captures director information after 1996. In the modeling step, I only include data from the period 1996-2011. For directors, prior literature has focused on their independence, and I enhance the study of directors by addressing how they can help promoting decision efficiency. I quantify the board of directors with four variables: *indep_cmt*, *dir_capability*, *dir_tenure*, and *CEO_bd_influence*.

Independent directors are defined as those who are personally not affiliated with the firm or firm executives, and whose business has no major business relationship with the firm. The most straight forward measure in the literature has been to use the percent of the committee members that are independent. Taking it one

step further, we understand that directors sit on different committees, through which these directors exercise their influences on the corporate decision making process. These committees include the nomination committee that focuses on finding the best executives, the compensation committee that decides how these executives should be paid, and the financial committee that makes sure the firm is making sound financial investments and that the auditing results are trustworthy. It is helpful to measure the independence of the committees (for example, Skaif *et al.*, 2006). PCA results suggest that it is not the overall level of board independence, but rather the independence of nomination committee and compensation committee that matter most to financial stakeholders. As a result, I define independence of board committees, *indep_cmt*, as the average of percent of independent directors on nomination committee, the percent of independent directors on compensation committee, and the percent of board directors on the board, to describe the firm's committee independence. Interestingly enough, I observe that *%_fincmt_ind* is not included in this variable group. On the contrary, the opposite of measurement of financial committee independence, which is the percent of insiders on finance committee, was grouped together with CEO power. I hypothesize that this happens because the level of trust of public auditing firms is still pretty high and the need to have independent directors to reinforce auditing is low. For our sample of firms with at least 4 directors reported on the board, the independence level is pretty high across firms, with a mean value of *indep_cmt* of 0.44 and a standard deviation of 0.15.

This "averaging" approach is different from what one will do should I strictly follow the principal component analysis, where all metrics in the full explanatory variable matrix will need to be weighted in the latent variable. That approach is mathematically cleaner, while our approach is practically more understandable and can help to interpret modeling results more intuitively. I will use the averaging approach for most of our composite variables.

I use director capability, *dir_capability*, to describe how capable these directors are at promoting decision efficiency. It is the sum of the indicator variable, *expert_dir_4boards* that represents whether a director sits on no less than four other boards, and *other_firm_ceo*, that represents whether the director is a CEO of another firm. If a director is both an expert director and a CEO for another firm, he is considered to be more immersed with directing management. On the individual level, *dir_capability* takes values of 2, 1, and 0. On the firm level, *dir_capability* is the average score of all directors' individual scores. For our sample data limited to firms with at least four directors reported, the mean of *dir_capability* is 0.15, with a standard deviation of 0.16. This means that most directors are neither expert directors nor other firm CEOs, which can be improved.

The third aspect of the board is the tenure of directors. I hypothesize that the longer tenure will add to the directors' experience with the corporations and enable them to promote decision efficiency. I define *dir_tenure* as the number of years a

director has served on the board until the year of observation. For our data sample, on average directors serve 8.35 years, and the standard deviation is 3.56.

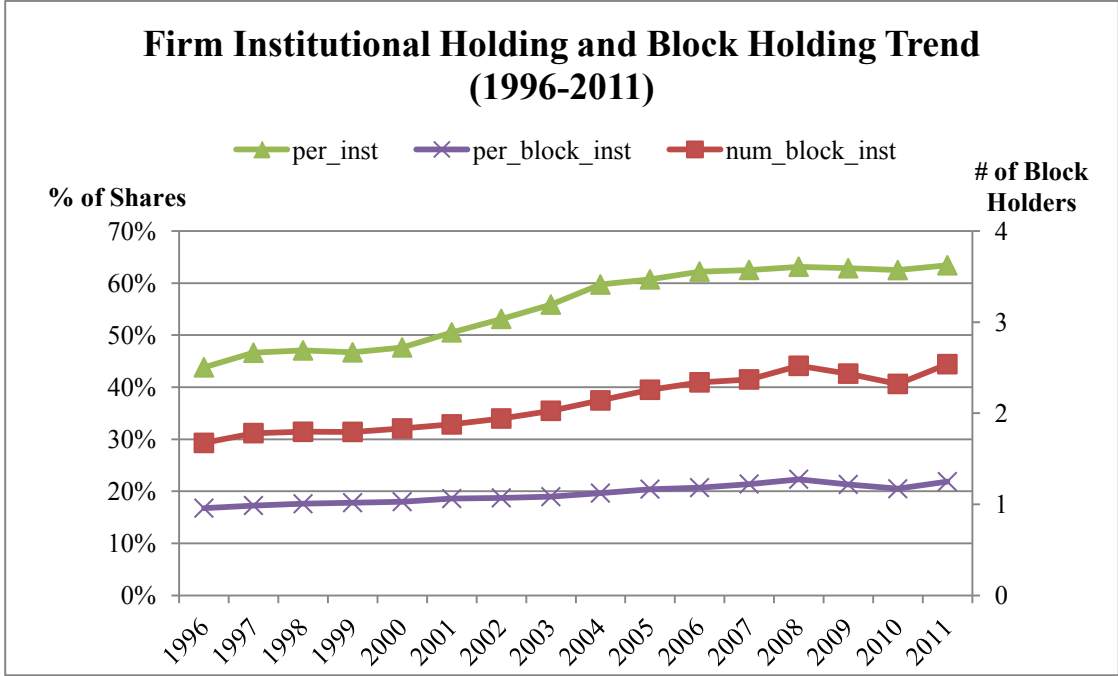
The fourth aspect of the board captured in this study is CEO power and CEO's influence on the board, denoted as *CEO_bd_influence*, and I hypothesize that higher CEO influence on the board promotes decision efficiency. The variable *CEO_bd_influence* is the mean of *CEO_power* and *%_fincmt_inside*, where *CEO_power* is a composite score which gets 1 point if the CEO is the chairperson of the board, and 1 point for each committee that he or she sits on; and *%_fincmt_ind* represents the percent of independent directors on the finance committee. For our data sample, CEO's influence over the board is rather low, with a mean of 0.02, and a standard deviation of 0.11. For more than 75% of the by firm by year observations, the *CEO_bd_influence* is 0.

3.3.3 Ownership Structure and Influence

As mentioned in the literature review, block holdings and institutional holdings have been shown to have a negative impact on credit rating. Based on the information collected by the RiskMetric Corporate Governance database and principal component analysis, I select three variables for this attribute: 1) *num_block_inst* that represents the number of institutional block holders; 2) *per_inst* that represents the percent of outstanding shares owned by institutions, and 3) *per_execdir_share* that represents the percent of shares owned by executive directors of the firm. From 1996

to 2011, the level of institutional holding and block holding has been on the rise, as shown below in chart 3.1.

Figure 1 Firm Institutional Holding and Block Holding Trend (1996-2011)



I choose to use the number of block holders to describe block holding since it contains more information than the number of shares held by block holders. They are well correlated, but the change in the number of block holders can cause direct changes in shares held by blockholders, while the opposite is not necessarily true. The change in blockholding shares can be a result of existing block holders obtaining more shares, without changing the number of block holders. Why is the number of block holders important? Because they are a very special type of shareholders and can exert

influence on management. The majority of the share holders, institutional or individual, are not block holders. Most of them will not have the incentive to monitor the firm or the board. However, block holders do since they have big enough blocks of shares. For our data sample, on average, firms have 2.17 block holders, which is rather small. The standard deviation is 1.38.

While most institutional holders are not block holders, their collective holding of the firm is still large enough for the management to care. On average, the institutional holding has been more than 50% starting in the 21st century. Institutional investors differ from individual investors in that they have better tools and can afford their own analysts to monitor the firm's performance, even though they may not engage in the firm's decision making. They can act faster when buying or selling. This indirect impact is an increasingly important factor for the management to consider when they make business decisions. I use *per_inst* to capture this collective institutional holding. For our data sample, the average *per_inst* is 0.69, with a standard deviation of 0.18.

Institutional holders, whether holding a block or smaller amount, are external holders. I need to capture a third aspect of shareholders that describes internal holding. I choose the variable *per_execdir_share* which is the percent of shares held by executives who also serve on the board. PCA and factor analysis confirm that *per_execdir_share* represents a different latent factor from blockholding. Since higher values of this variable may suggest higher management influence over

the board, I also test how correlated it is with *CEO_bd_influence*. I find that the correlation is rather low, thus it is not a big problem when I include them together in the model. For our sample data, *per_execdir_share* has a mean of 2% with a standard deviation of 6%.

3.3.4 Financial Transparency

Normally investors prefer higher financial transparency, since transparency reduces agent cost and enhances investor's confidence in a firm. I use working capital accrual quality (WCAQ) and how timely the stock return reflects the changes in net income before extraordinary items (timeliness) to proxy the financial transparency. Decow and Dichev (2001) suggest that estimation errors of accruals can serve as a good estimate of the quality of working capital. The equation they proposed to use is as follows:

$$WCA_t = \beta_0 + \beta_1 NCF_{t-1} + \beta_2 NCF_t + \beta_3 NCF_{t+1} + \varepsilon_t, \quad (3.1)$$

where

WCA=working capital accruals (-(*RECCH*+*INVCH*+*APALCH*+*TXACH*+*AOLOCH*)**AT*), and

NCF=net cash flow from operations (*OANCF* **AT*).

The variables naming convention is consistent with COMPUSTAT database, and specifically:

RECCH = Accounts Receivable/Decrease (Increase),

INVCH= Inventory /Decrease (Increase),

APALCH=Accounts Payable and Accrued Liabilities/Increase/(Decrease),

TXACH=Income Taxes/Accrued/Increase/(Decrease),
AOLOCH=Assets and Liabilities/Other/Net Change,
OANCF=Operating Activities/Net Cash Flow, and
AT=total assets.

Then I look at how closely distributed the residuals of this equation are for a firm over time. If the dispersion is small, it implies that the quality of working capital is high. The subscript t of ε_t suggests that the error term is not independent over time and we need to take care of the autocorrelation problem when handling this time series panel data. The errors may also vary across different industry sectors. For example, the need for working capital for the banking industry may be very different from that of a utility company. I use industry grouping, *SIC_group*, to account for industry differences. *SIC_group* is based on the 3, 2, or 1 digit SIC code provided that there are at least 10 firms in each group. For example, if a 3 digit SIC group has only 5 firms in it, I will use their 2 digit SIC code to group them with other firms. If by going up to 2 digits SIC code, there are still fewer than 10 firms, then I will use the 1 digit SIC code to create a large enough group. I use a general linear model to estimate the error terms of equation 3.1 by *SIC_group*. My next step improves upon previous studies which used the standard deviation of the by-firm and year level estimated residuals. For our purposes of finding the relationship between financial transparency and credit rating, I do not calculate the standard deviations of the estimated errors, but instead group the estimated errors into 10 decile groups. I question whether it is important to maintain the fine differences of these estimated standard deviations. Is a

standard deviation of 1200 much different from 1250? The answer is "maybe not" and these artificial large differences may reduce the power of the model tests. To that end, I grouped these firms into ten deciles by year, based on the standard deviation of the residual estimates, and denote this variable as *WCAQ_decile*.

I also followed the work of Gu (2002) to estimate timely reporting by estimating the errors from equation 3.2 below:

$$RET_{it} = \beta_0 + \beta_1 IB_{it} + \beta_2 LOSS_{it} + \beta_3 IB_{it} * LOSS_{it} + \beta_4 \Delta IB_{it} + \varepsilon_{it}$$

(equation 3.2)

Where

RET_{it} = the market adjusted return for firm i over fiscal year t from CRSP,

IB_{it} = IB * CSHO * PRCC_C,

$LOSS_{it}$ = one if NIBE is negative, zero otherwise,

ΔIB_{it} = (change in IB) * CSHO * PRCC_C, and

$NIBE_{it} * LOSS_{it}$ = interaction term that allows for a differential market reaction for loss versus profit.

The variable naming convention is consistent with CompuStat and CRSP, and IB=Income before Extraordinary Items, CSHO=Common Shares Outstanding, and PRCC_C=Price Closing-Annual.

Here also I include the industry grouping variable, *SIC_group*. Gu argued that the squared residuals of this equation can be interpreted as the degree of price movement that cannot be explained by the contemporaneous accounting earnings, thus higher squared residuals imply lower relevance of the variables. Again, instead of squaring the residuals, I grouped the firms into ten deciles based on their estimated

residuals, and denote this variable as *timeliness_decile*. For our purposes, I do not need to square the residuals before deciling, because squaring is a monotone aggregation and thus will not change the decile group membership for a firm. For our sample, the average of *WCAQ_decile* is 5.45 with a standard deviation of 2.62. The average of *timeliness_decile* is 5.62 with a standard deviation of 2.97.

3.3.5 CEO Pay and Turnover

The literature has shown that CEO base salary is only one part of total CEO compensation, and sometimes a smaller part. However, the bonus or incentive of the CEO has not been strongly related to better performance (e.g., Murphy 1998). The data from RiskMetrics Corporate Governance seems to confirm this view. PCA suggests that CEO base salary is not grouped together with bonus. From the set of variables describing CEO compensation package, base salary stands out to be more strongly correlated with credit rating. For our data sample, the mean base salary of CEO pay is \$868k, with a standard deviation of \$390k.

CEO tenure, *Ceo_tenure*, helps to describe CEO turnover. Interestingly, I find very little correlation between *CEO_tenure* and *CEO_power*. I decide to use *CEO_base* and *CEO_tenure* to represent the attribute on CEO pay and turnover. For our data sample, CEO tenure varies drastically, that its mean is 6.65, and standard deviation is 6.62.

3.4 Data on Firm Characteristics

Even though our focus is on the impact of corporate governance on credit rating, we have to remember that credit rating is a flag on the firm's financial strength, which is very strongly determined by the firm's fundamental financial performance. I use the CompuStat database to derive accounting based ratios of debt-to-assets (*leverage*), return-on-assets (*ROA*), and interest coverage (*INT_cov*, the ratio of operating income to interest and related expenses) to proxy for firms' default risk. If a firm has higher leverage and a lower return on assets, it would have a harder time to come up with cashflow to cover the interest on their debt. Another indicator of the firm's financial performance, *LOSS*, is defined as 1 if income before extraordinary items is negative for the year, since when the firm encounters a business loss, the default risk is much higher than those that earn a positive earning. For our sample data, the average *ROA* is 0.04, mean *leverage* is 29%, and 10% of the by firm by year data points show a loss. *INT_cov* varies drastically, with a mean of 27.08, and a standard deviation of 560.

Typically we also believe that the default risk is smaller for larger firms, smaller for utility firms since they are highly regulated and well monitored, and smaller for firms with higher capital investment intensity since this type of investment is less liquid. On the other hand, if the firm has subordinated debt, it is a sign of higher risk of default due to the differential claims to assets by lenders. Being in the utility industry can also make a difference, since these firms are highly regulated.

I capture firm size, *SIZE*, as the logarithm of assets to smooth over the vastly different asset size over our sample. *Cap_intensity* is the ratio of capital spend on property, plants, and equipments to total assets. *UTILITY* is coded as 1 for firms in the utility industry (two digit SIC code is 49), 0 otherwise. The financial industry is also highly regulated, but due to the recent occurrences of bail-out and near bankruptcy of big financial firms, we can no longer say that higher regulation correlates with lower default risk. *Subordinate* is coded as 1 if a firm has subordinated debt, 0 otherwise. The definitions of these variables are summarized in Table 3.2a, and descriptive statistics are shown in table 3.2b. For our sample, the mean *Cap_intensity* is 0.58, 14% of firm-year records have subordinate debt, and 10% of the by firm by year records are from utility firms. Correlation of these firm character variables is documented in Table 3.2c. Correlation of the corporate governance attributes is documented in Table 3.2d. For reference, I document the variable naming convention of COMPUSTAT used in our analysis in Table 7.

Table 7 COMPUST Variable Name & Meaning

Variable Name	legacy Item #	Meaning of Variable
AOLOCH	307	Assets and Liabilities/Other/Net Change
APALCH	304	Accounts Payable and Accrued Liabilities/Increase/(Decrease)
AT	6	Assets - Total
DLC	34	Debt in Current Liabilities - Total
DLTT	9	Long-Term Debt - Total
DS	80	Debt-Subordinated
IB	18	Income Before Extraordinary Items
INVCH	303	Inventory /Decrease (Increase)
OANCF	308	Operating Activities/Net Cash Flow
OIBDP	13	Operating Income Before Depreciation
PPEGT	7	"Property, Plant and Equipment - Total (Gross)"
RDIP	388	In Process R&D Expense
RECCH	302	Accounts Receivable/Decrease (Increase)
SPLTICRM	280	S&P Domestic Long Term Issuer Credit Rating
TXACH	305	Income Taxes/Accrued/Increase/(Decrease)
XINT	15	Interest and Related Expense - Total
XRD	46	Research and Development Expense

3.5 Understanding and Indexing Business Cycles

Business Cycle data is published by the US National Bureau of Economic Research (NBER), and the latest release was on September 20th, 2010. In this release, NBER announced that latest trough occurred in Jun, 2009 in the US. The NBER has identified three recessions in the period of our sample data, and I will use this definition in our analysis as shown in Table 8 below. For our sample data, the three recessions last for six years all together.

Table 8 Indexing Business Cycles 1996-2011

Period	Business Cycle Index
1992 - 2000	boom
2001	recession
2002-2007	boom
2008-2009	recession
2010-2011	boom

3.6 Summary of Data Sample and Variables

Our sample covers S&P 1500 firms from 1996 to 2010 wherever data is available, and I will limit data to those firm-year observations where at least 4 directors were reported on the board, otherwise it most likely has incomplete data. Also, I excluded firm-year observations where reported institutional holdings are more than 100%, since it is obviously a data error.

I use principal component analysis heavily to understand and describe corporate governance. As a result, I will use five corporate governance attributes: financial stakeholder rights and relations, board structure and process, ownership structure and influence, financial transparency, and CEO pay and turnover. The two metrics measuring financial transparency also involved decile grouping of the firms' scores for more meaningful inferences. Then I merged this data with COMPUSTAT data for firm financial information that are control variables. The last piece, indexing business cycles that have occurred during our data period, was done based on the official pronouncements of the NBER. Our data covers a total of 2108 firms over a 16 year period.

Table 9 Data Sample Size by Year

Year	Total Firms	# of Firms with at least 4 Directors on Board
1996	1,755	753
1997	1,860	859
1998	1,972	992
1999	2,041	1,082
2000	2,095	1,138
2001	2,137	1,249
2002	2,163	1,056
2003	2,186	1,113
2004	2,189	1,134
2005	2,157	1,125
2006	2,104	1,093
2007	1,978	1,061
2008	1,947	1,143
2009	2,115	1,287
2010	2,170	1,367
2011	2,108	1,356

Chapter 4

METHODS AND RESULTS

Regression methods are determined by the statistical characteristics of the data, especially the distribution of the dependent variable. In my study, the ordered nature of credit ratings lend themselves very well to ordered logistic regression. Furthermore, due to the time series nature of credit ratings and corporate financial data, I use the generalized estimating equations (GEE) methods to estimate the coefficients of the ordered logistic model.

4.1 Regression Model

The ordered logistic regression has a link function of logit and can be viewed as an expansion to the more widely known binary logistic regression methods. The logit in this case is defined as the $\log(\pi/(1-\pi))$, where π is the cumulative probability of a particular firm getting a rating as the number smaller or equal to r . Here lies the key difference of ordered logistic model from binary logistic model, that the latter has a probability of the binary event happening.

Another important feature of my data besides the ordered dependent variable is the within subject correlation caused by repeated measurements of the same firm over the years. Prior studies, such as Skaif (2006) and Chen (2008, 2011), pooled observations over the years together and simply used 'year' as dummy variables to

handle the time series problem. That is not sufficient, because even with year dummies, the model still assumes temporal independence of the observations, and the standard errors calculated this way are not trustworthy and can lead to misleading statistical test results. I use longitudinal estimation methods to handle the temporal dependence while using logit as the link function.

In a simple form, the model specification for logistic models is a linear form of the explanatory variables. However, with the autocorrelation that existed in the credit rating and firm characteristic variables, I need to use multilevel models, which handles the between- and within- firm correlation properly. Other names for this type of models are mixed-effects regression models, random-effects models, variance component models, hierarchical linear models, two-stage models, empirical Bayes models, and random regression models, all of which have the basic characteristic of including the random subject effects into regression models in order to account for the influence of subjects on their repeated observations. In my data sample, the firm is observed year after year on its credit ratings and financial performance, and as a result, the observations of the firms by year have a within firm correlation. Specifically, my models are specified as the equation below:

$$\text{logit}(\text{credit Rating } r)_{ij} = \alpha + \beta * X_{ij} + \alpha_i + \varepsilon_{ij}.$$

In the equation, α is the overall population intercept, β is the slope coefficient vector for the firm characteristics and corporate governance attributes, α_i is the firm specific intercept for firm i , and ε_{ij} is the error term. Note the double subscript

of i and j for the error term- it indicates that the error terms are specific to firm i at year j , and it is defined to be independent conditional on the random firm-specific effects α_i . Specifically, the error terms of observations in year j are independent of each other; but within the same firm i , the error terms are not independent unless the random intercept has been taken out. If parametric assumptions are made regarding the within- and between- subject components of variation then maximum likelihood methods can be used to estimate the regression parameters. Since my data is far from being normally distributed, it would be wise not to make such assumptions.

Therefore, I use a second regression approach which is called the generalized estimating equations, or GEE (Liang and Zeger 1986). In GEE, two steps are taken, that first a regression model for the mean response is estimated, and then a regression model for the within-subject correlation is estimated. The mean model is where we specify the logistic regression model with the link function of a logit. The correlation model serves two purposes: it is used to obtain weights that are applied to obtain regression coefficient estimates; and to provide model-based standard errors for the estimated coefficients.

In SAS, this can be accomplished with the GENMOD procedure. The REPEATED statement is used to indicate that data is longitudinal by year by firm, which is denoted by its ticker symbol, *ticker*. With the two step estimation, GEE takes care of logistic models and autocorrelation at the same time.

Since GEE does not assume the joint distribution of explanatory variables, there is no likelihood function. We cannot use the typical log-likelihood statistics to assess model fit, or evaluate model efficiency. In general, there is no closed form solution for GEE and coefficient estimates are obtained through a quasi-likelihood estimator iteration process. GEE is a very powerful tool and the estimates are valid even when the covariance and correlation structure are mis-specified. However, when covariance or correlation is mis-specified, the standard errors derived from the model are not good, and some adjustments are needed. GEE applies an "empirical adjustment" from the data to help obtain more appropriate standard errors. In fact, Agresti (2002) argues that a chosen model in practice is never exactly correct, but carefully choosing a working correlation (covariance structure) can help with efficiency of the estimates. SAS coefficient estimates are tested using the empirically adjusted standard errors by default.

Even though we cannot use log-likelihood related statistics to evaluate the model fit, we can compare other fit statistics such as quasi-likelihood information criterion (QIC and QICu, proposed by Pan 2001) for model comparison. QIC is analogous to the AIC statistic for general linear models. Recall that $AIC = -2\ln(L) + 2k$, where k is the number of parameters and L is the likelihood of the MLE at convergence. Similarly, the first term of QIC is the quasi-likelihood (Q) computed using a specified working correlation which is analogous to the likelihood estimation counterpart of the AIC. Similarly, the second term is the penalty term which has a

similar effect to the AIC second term as well (Hardin and Hilbe, 2003), but instead of the number of parameters, QIC uses the trace of working covariance matrix (T). Simply put, $QIC = -2Q + 2T$. When comparing models, a smaller QIC is preferred.

Besides model fitting statistics, I also care about the model's predictive power, since I will use the estimated equations to assess marginal changes on *SPRating* when any corporate governance variable changes. To that end, I also compute two more statistics for the models' predictive power. One statistic is the percent of correctly predicted *SPRating* of the data sample. This involves some heavy post modeling processing, since the linear form of equation 4.1 is estimating the odds ratio of cumulative probabilities, and needs to be converted in two steps to find the predicted *SPRating*. This statistic is commonly adopted. Another statistic that I use seems overly simple, but can be very helpful and reliable. Since our goal is to see how powerful the models are at predicting the dependent variable, I can simply compute a correlation analysis of the observed *SPRating* and the predicted *SPRating_pred*. I say it is simple because it does not depend on the model specification, or the regression methods, but rather goes directly to the end results. I believe it can be a better statistic than the percent of correct predictions, since it can also assess how closely the unmatched predictions are to *SPRating*. After all, I need to evaluate the non-matched cases differently, and closer predictions are always preferred over distant guesses. Due to the non-normal distribution nature of *SPRating*, I select a nonparametric statistic, Kendall's τ instead of Pearson correlation, to evaluate the level of

association. Actually, the Kendall's τ thus obtained is very similar to the concept behind the various forms of pseudo R^2 , therefore, for convenience I will call it pseudo $R^2(K,\tau)$ in this paper.

After obtaining the model estimation results, I take a step further to assess whether the impact of corporate governance is large enough to change a firm's credit rating. Prior practice is to compare a model's predicted rating and probability at grand mean level of the independent variable matrix X, with predictions at first (Q1) and third quartile(Q3) levels, as was done in Skaif (2006) and Chen (2011). However, this approach can be improved since a move from Q1 to Q3 may not be sensitive enough since corporate governance data are usually highly skewed. For example, for *per_execdir_share*, from Q1 to Q3, there is almost no change—both values very close to 0. Instead, I create a dataset with meaningful marginal changes of key corporate governance variables. For example, if a board of 5 now swaps an insider for an independent director, there will be a 20% increase in the percent of independent directors and the change in *indep_cmt* is about 10%, depending on which committees the new director sits on. This 10% marginal change is more meaningful than the changes from Q1 to Q3. After obtaining group level means of the explanatory variables based on *SPRating*, and then for each of these observations, marginal changes are created for these corporate governance attributes.

4.2 Model Specification and Results

I first set up a base model with *SPRating* as the dependent variable, and firm characteristics as independent variables. The results can serve as a benchmark for the following models with corporate governance attributes. Then in Model 2 I introduce the business cycle variable, *cyclevalue*, to the base model. I add one corporate governance attribute at a time for models 3 through 7, whereas Model 8 is the comprehensive model with all the corporate governance attributes included.

Table 10 Specifications of Ordered Logistic Models

Model ID	Model Explanatory Variables
Model 1	Firm Characteristics, year
Model 2	Firm Characteristics, Business Cycle
Model 3	Firm Characteristics, Business Cycle, EBIndex/Findex, interaction term $cyclevalue * Eindex$
Model 4	Firm Characteristics, Business Cycle, Board Characteristics, interaction term $cyclevalue * indep_cmt$
Model 5	Firm Characteristics except <i>utility</i> , Business Cycle, ownership
Model 6	Firm Characteristics except <i>utility</i> , Business Cycle, Financial Transparency
Model 7	Firm Characteristics except <i>utility</i> , Business Cycle, CEO Pay/Tenure
Model 8	Firm Characteristics except <i>utility</i> , Business Cycle, all significant Corporate Governance Attributes

As discussed in Chapter 2, the booms and recessions present different risk environments to corporations and we can test how bondholders value corporate governance for its ability to mitigate agency costs and promote decision efficiency.

After extensive model selection, I decide to keep only three interaction terms:

*cyclevalue*Ebindex*, *cyclevalue*indep_cmt*, and *cyclevalue*per_inst*.

I limit the data to include firms with four or more directors reported in RiskMetric's corporate governance . The number of usable firms range from 426 to 746 as shown in Table 11, with more firms in recent years. The base model results are reported as Model 1 of Table 12. All coefficient estimates have the predicted signs. Variables *size*, *ROA* and *utility* are positively related to credit rating, while *leverage*, *loss* and *subordinate* are negatively related. The model's QIC is 24,594 and correctly predict 46% of the *SPRating* observations. The pseudo $R^2(K,\tau)$ is 0.51.

Table 11 Usable Firm Count by Year

year	# of Usable Firm Observations
1996	426
1997	460
1998	535
1999	587
2000	641
2001	686
2002	605
2003	652
2004	664
2005	640
2006	634
2007	627
2008	652
2009	716
2010	745
2011	746
total Firms	1252
Average # of Firms	626

Table 12 Ordered Logistic Regression Results (Dependent Variable=*SPRating*)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Firm Characteristics:								
size	0.77****	0.77****	0.77****	0.81****	0.71****	0.68****	0.79****	0.74****
leverage	-1.8****	-1.8****	-1.79****	-1.79****	-1.86****	-1.78****	-1.75****	-1.82****
roa	5.96****	5.92****	5.95****	5.92****	6.61****	3.03**	6.89****	7.37****
loss	-0.84****	-0.82****	-0.82****	-0.85****	-0.78****	-1.19****	-0.75****	-0.69****
subordinate	-0.91****	-0.92****	-0.91****	-0.91****	-0.84****	-1.11****	-0.99****	-0.81****
utility	0.38**	0.38**	0.38**	0.5**				
Business Cycle								
cyclevalue		0.06**	-0.05	0.1	0.23**	0.06**	0.05**	0.26**
Financial Stakeholder Rights & Relations:								
EBindex			0					
findex			0.07					
cyclevalue*EBindex			0.02**					
Board Structure and Processes:								
indep_cmt				-0.61**				0.1
dir_capability				2.37****				1.96****
dir_tenure				0.08****				0.08****
CEO_bd_influence				0.87**				0.53

cyclevalue*indep_cmt -0.28** -0.43**

Ownership Structure and Influence:

num_block_inst -0.2**** -0.18****
 per_inst -2.17**** -2.37****
 per_execdir_share -2.82**** -2.82***
 cyclevalue*per_inst -0.31** -0.15

Financial Transparency & Information Disclosure:

wcaq_decile -0.02
 timeliness_decile 0.01

CEO Pay and Turnover

ceo_base 0
 ceo_tenure -0.01* -0.02**

Sample Size	10,012	10,012	10,012	9,129	9,938	4,754	9,151	8,358
QIC	24,594	24,589	24,600	21,550	23,497	11,808	22,306	18,924
% Correct Prediction	46%	46%	46%	48%	47%	45%	47%	49%
pseudo $R^2(K, \tau)$	0.51	0.51	0.51	0.54	0.54	0.47	0.50	0.57

Notes: Table values are coefficient estimates from the ordered logistic models.

**** significant at 0.001 level

*** significant at 0.01 level

** significant at 0.05 level

* significant at 0.1 level

Model 2 in Table 12 documents the results when *cyclevalue* is introduced into the base model. For firm characteristics, coefficient estimates and p-values are very stable as compared to the base model, and *cyclevalue* is positively related to credit rating, suggesting that for the same firm it is easier to get a better rating in a boom as opposed to a recession. For Model 2, the QIC is 24,589 and is slightly smaller than the QIC of Model 1 with the same number of observations used, thus Model 2 is an improvement. The percent of correct prediction remains at 46%, and pseudo $R^2(K,\tau)$ remains at 0.51. In Model 2, I do not treat *cyclevalue* as a categorical variable, since we believe it is numeric in nature. If categorical, a *cyclevalue* of 1 is just another different category from -1, no better and no worse. However, in reality, a *cyclevalue* of 1 represents an economic boom, which is better than a *cyclevalue* of -1 of an economic recession. By using *cyclevalue*, we can assess the impact of the business cycle on credit rating. Our hypothesis is that *cyclevalue* should have a positive impact on *SPRating*.

Model 3 through Model 7 explore corporate governance dimensions one at a time. Comparing the results of these models with Model 2, we find that estimation results are very stable. All the firm characteristic variables have the predicted signs, and all remain significant except *Utility* in Models 5 through 8. To understand why this happens, we run descriptive statistics of these variables by *utility*, and find that non-utility companies tend to have more block institutional holders by as much as 50%, and have more shares held by institutional holders by as much as 30%. This means there is latent correlation between the dummy variable *utility* and

ownership structure variables, and including both in the same model makes the estimate unstable. Therefore, for Model 5, we exclude utility from the firm character control variables. Similarly, *utility* is not significant for models 6, 7 and 8, and is excluded from these models. For all these models, *cyclevalue* is positively impactful to *SPRating* and significant at the 0.001 level for most models.

Model 3 tests the impact of financial stakeholder rights and relations, which we describe with two index variables: *EBIndex* and *Findex*. For these, lower scores are linked with stronger shareholder rights and their influence on firm management. Regression results, shown in Model 3 of Table 12, suggest that the impact of *Ebindex* depends on the states of business cycle. On the main effect level, neither *Ebinex* nor *findex* are significant, but *Ebindex* is impactful on *SPRating* through the interaction with *cyclevalue*. The interaction has a positive sign, therefore during economic booms (*cyclevalue*=1) weaker shareholder control enhances the probability of a better credit rating, but during economic recession (*cyclevalue*=-1) it decreases the probability of better credit rating. It suggests that bondholders prefer less shareholder control over the firm's management during good times, where they are willing to promote decision efficiency by allowing more flexibility to management. However, during bad economic times, they would rather team up with shareholders to push for more stakeholder control, where the top concern is mitigating agency cost, rather than promoting decision efficiency. This is clearly consistent with my hypothesis H3 that in a recession the bondholders value mitigating agency cost over promoting decision efficiency.

Model 4 explores the impact of board of directors on *SPRating* and its estimation results show that *dir_capability*, *dir_tenure*, *CEO_bd_influence* are all positively linked with *SPRating*, while the impact of board independence varies in booms from recessions. As we document in the literature review, prior studies linked independence of the board positively to firm value and credit rating. However, my estimated model does not confirm previous works, but I find that the independence of the board directors and board committees have negative impact on *SPRating*, while such negative impact is smaller during a recession than in a boom. This confirms my hypothesis H3, that during economic booms bondholders look to the board for decision efficiency, while during recessions their concern is more on mitigating agency costs. Also, this result is consistent with that of Model 3 on financial stakeholder rights. Naturally, it is understandable that more immersed but less independent directors may have the firm and industry specific field expertise, and thus can help to promote decision efficiency. However, on the other hand, independent directors are less influenced by the management, thus mitigating agency costs.

The other director variables, *dir_capability*, *dir_tenure*, and *CEO_BD_influence* are all positive and significant to *SPRating*. Of board characteristics, *dir_capability* is the most important, and its point estimate is 2.37, three times as large as the next biggest variable in this category, which is *CEO_BD_influence* with an estimate of 0.87. It is rational that more capable directors are preferred by bond holders, since capable directors can better navigate the business and increase the probability of good future performance of the firm.

CEO_BD_influence is an average score of *CEO_power* and *%fincom_inside* (percent of insiders on finance committee). Prior studies such as Klein (1998) find a positive impact of insiders on finance and investment committees on stock market performance measures. We believe the impact of *CEO_BD_influence* comes from the specialized institutional and industry-specific knowledge of the insiders that can help the board to select long term investment and financing strategies that enhance firm value. For *dir_tenure*, the point estimate is only 0.08, which suggests that even though it is significant, its actual impact on *SPRating* is minimal. Model 4 has a QIC of 21,550 which represents an improvement over models 2 and 3. Its percent of correct predictions increases to 48%, and pseudo $R^2(K,\tau)$ increases to 0.54, both of which are also improvements from models 2 and 3.

While my estimation results do not confirm prior studies, I have firm confidence in my study since I selected the variables by principal component analysis and handled the autocorrelation correctly through the two-step GEE estimations, where autocorrelation is estimated and applied to correct for coefficient estimates and standard errors. Composite variables based on principal component analysis minimize the level of correlated attributes, while prior studies included more individual variables which were correlated. For example, the Skaif (2006) study included both *CEO_power* and *%fincom_inside* (percent of insiders on finance committee), which correlate heavily with each other and are found to be in the same latent variable in our principal component analysis. Also, autocorrelation, if not handled properly, can

cause a well specified model to produce unreliable coefficient estimates and misleading statistical testing results.

Model 5 explores the ownership structure and reports that the number of block institutional holders and percent of shares by executive directors all have negative impacts on *SPRating* and the negative impacts are statistically significant at the 0.001 level. This is consistent with an earlier study by Bhojraj and Sengupta (2003) who also found that blockholders have an adverse impact on credit rating. The point estimates for *per_exedir_share* is -2.82, and for *num_block_inst* is -0.20. Similarly, the impact of institutional holding is negative, but the negative impact is much smaller in recessions than in booms. On the main effect level, the point estimate for *per_inst* is -2.17, and the interaction term has an estimated coefficient of -0.31. It means that the impact is -2.48 per one unit increase in *per_inst* in booms but -1.86 in recessions. This suggests that bondholders dislike the involvement of institutional holders during good times, which impairs decision efficiency; but value their role of monitoring during harder times to mitigate agency costs. This is consistent with Models 3 and 4 and all confirm my hypothesis H3, that bondholders look for decision efficiency during economic booms, but worry more about mitigating agency costs during recessions. Overall, Model 5 has a QIC of 23,497, which is better than that of Model 2. Its correct prediction rate is 47%, and its pseudo $R^2(K, \tau)$ is 0.54, which are both better than Model 2.

Model 6 tests the impact of financial transparency and finds that both earnings quality and timeliness of return reporting do not have a significant impact on

credit rating. This is not consistent with some of the prior studies by Skaif (2006) and Chen (2008), where both found a positive impact of financial transparency on credit ratings. We believe the discrepancy arise from 1) the different estimation methods and model specification, and 2) different way of deriving metrics on financial transparency. These two prior studies both included multiple variables in each corporate governance dimension that were potentially correlated, and both also used the residual based scores on the observation level. Our study grouped the residual based scores into deciles. Based on this modeling approach, I conclude that financial transparency does not impact *SPRating* for our data sample.

Model 7 tests the impact of CEO pay and tenure on credit ratings and finds that *ceo_base* is not significantly influencing, but *ceo_tenure* has a significant negative impact on credit rating. The longer a CEO serves, the harder it is to remove him or her when situations call for it. We believe for that reason, bondholders do not favor firms with longer tenured CEOs. Model 7 has a QIC of 22,306, which is a lower, thus better, than Model 2. Its correct prediction rate is 47%, and pseudo $R^2(K,\tau)$ is 0.50, which are very close to Model 2.

Model 8 tests the different corporate governance dimensions together at the same time, except *Ebindex* and *findex* and the financial transparency variables. Financial transparency attributes are excluded since they are not significant in Model 6. After exploring different attributes to include in Model 8, we decide to exclude *Ebindex* and *Findex* as well, because including them will cause the model to be very unstable. Comparing Model 8 with the Models 4, 5, and 7, we find that estimates are

stable and have the predicted signs as well. We will use the results of this model for further assessment and inferences. Model 8 has a QIC of 18,924, which is better than Model 2. Its correct prediction rate is 49%, and pseudo $R^2(K,\tau)$ is 0.57, which are both higher than Model 2.

Summarizing over the eight models, we find that size, ROA, being a utility company, director expertise and capability, tenure of board directors and CEO's influence on the board all positively impact credit ratings, while debt leverage, subordinate debt, and number of block holders and percent of shares owned by executives all impact credit ratings negatively. During a boom, *Ebindex* has positive impact on credit rating, while institutional holding and board independence have negative impacts. On the other hand, during a recession *Ebindex* has negative impact but institutional holding and board independence have positive impacts. Such differential impacts are consistent with my hypothesis that debt holders favor corporate governance with better decision efficiency during good times, but pursue better mitigation of agent costs during bad economic times.

4.3 Assessment of Meaningful Marginal Changes

Even though I find statistically significant results for the variables of interest, these results do not tell whether corporate governance is important. The sign and estimated value of the coefficients alone do not tell how much impact a particular attribute can have. In order to correctly assess the importance of corporate governance attributes, meaningful marginal changes need to be used. I first define four artificial

'mean firms' which have the average profile of firms with $SPRating=3$ or 4 under economic recession and economic boom. Then meaningful changes in each corporate governance attribute are defined and form comparisons. Then, both "mean firms" and "comparison firms" are applied to Model 8 to calculate predicted $SPRating$ and the probability of getting different ratings. In general, comparison results show that even though corporate governance does impact the probability of upgrading and downgrading, the impact is not strong enough to actually move the credit rating.

For *indep_cmt*, the marginal change we use is 0.1. Recall that I define *indep_cmt* as average percent of independent directors on the board, on the nomination committee and on the compensation committee. For a firm with a board of 10 directors, if one affiliated or inside director is replaced by an independent director, the overall percent of independent director increases by 10%. Suppose this new director also sits on one of the nomination or compensation committees and the committee size is 5, then the percent of independent directors of this committee increases by 20%. As a result, the increase in *indep_cmt* is 10%. In other cases, if he doesn't sit on either of these two committees, the increase in *indep_cmt* is 3%; however if he sits on both committees, the increase in *indep_cmt* is 17%. On average, the increase is 10%. The variable *dir_capability* is the average score of directors. For each individual director, the score is 2 if he is an expert director and also is a CEO for another firm, 1 if he either is an expert director or another firm CEO, and 0 otherwise. If any one of the 10 directors gets one more point in his score, the change in the overall board level *dir_capability* is 10%. For *CEO_tenure* and *dir_tenure*, the marginal change is 1 year.

For *CEO_bd_influence*, it is the average of *CEO_Power* and the percent of insider directors. If the CEO sits on one more committee then *CEO_Power* is up by 1, which is a 0.5 change in *CEO_bd_influence*. Marginal changes for ownership structure and influence variables are easier to define. For *num_block_inst*, the natural marginal change is 1. Since institutional holding is more than 50%, we select a marginal change of 5% for *per_inst*. Executive holding is relatively lower, at around 5% overall. It is reasonable to define 1% as the marginal change to *per_execdir_share*.

Table 13 Baseline Predicted *SPRating* and Probability of Up(Down) Grading

Mean Firm Profile	Predicted <i>SPRating</i>	Probability of Upgrade	Probability of Downgrade
Mean firm with <i>SPRating</i> =3 in recession	3	0.3022	
Mean firm with <i>SPRating</i> =3 in boom	3	0.3011	
Mean firm with <i>SPRating</i> =4 in recession	4		0.2190
Mean firm with <i>SPRating</i> =4 in boom	4		0.2215

Table 13 shows the baseline predicted *SPRating* remains at 3 for both the boom firm and the recession firm with *SPRating*=3 and 4. For both mean firms with *SPRating*=3 in boom and recession, the upgrading probability is around 0.30, and for both mean firms with *SPRating*=4, the downgrading probability is around 0.22.

Table 14 Marginal Impact of Corporate Governance on Upgrading

	Mean firm with <i>SPRating</i> =3 in recession		Mean firm with <i>SPRating</i> =3 in boom	
	Predicted <i>SPRating</i>	Δ Prob(upgrade) From Mean	Predicted <i>SPRating</i>	Δ Prob(downgrade) From Mean
Baseline at Mean	3	-	3	-
ceo_tenure +1	3	-0.0038	3	-0.0038
ceo_tenure -1	3	0.0038	3	0.0038
dir_capability +0.1	3	0.0432	3	0.0432
dir_capability -0.1	3	-0.0395	3	-0.0400
dir_tenure +1	3	0.0177	3	0.0177
dir_tenure -1	3	-0.0172	3	-0.0172
indep_cmt +0.1	3	0.0129	3	-0.0073
indep_cmt -0.1	3	-0.0126	3	0.0074
num_block_inst +1	3	-0.0376	3	-0.0375
num_block_inst -1	3	0.0404	3	0.0403
per_execdir_share +0.01	3	-0.0059	3	-0.0059
per_execdir_share -0.01	3	0.0060	3	0.0060
per_inst +0.05	3	-0.0254	3	-0.0253
per_inst -0.05	3	0.0266	3	0.0266

Table 14 lists the assessment results of mean firm with *SPRating*=3 when one corporate governance attribute changes at a time, and Table 15 lists similar one way change assessment results of 'mean' firm with *SPRating*=4. Compared with the baseline probability, we find that upgrading is more probable when there is an increase in *dir_capability* and *dir_tenure*, but less probable when institutional holding, block holding or executive holding is higher. The impact of *indep_cmt* differs that in a recession, its marginal impact on upgrading is positive, but in booms, it is negative. However, even though the corporate governance changes do impact the probability of

upgrading, the impact is not big enough to move *SPRating* up to an investment grade for any individual attributes. This is also true for the assessment of firms with *SPRating*=4 on downgrading—impact is there, but not big enough to make a difference, as shown in Table 15.

Table 15 Marginal Impact of Corporate Governance on Downgrading

	Recession		Boom	
	Predicted <i>SPRating</i>	Δ Prob(upgrade) From Mean	Predicted <i>SPRating</i>	Δ Prob(downgrade) From Mean
Baseline at Mean	4	-	4	-
ceo_tenure +1	4	0.0031	4	0.0031
ceo_tenure -1	4	-0.0030	4	-0.0031
dir_capability +0.1	4	-0.0314	4	-0.0317
dir_capability -0.1	4	0.0351	4	0.0354
dir_tenure +1	4	-0.0136	4	-0.0137
dir_tenure -1	4	0.0143	4	0.0144
indep_cmt +0.1	4	-0.0100	4	0.0060
indep_cmt -0.1	4	0.0104	4	-0.0059
num_block_inst +1	4	0.0327	4	0.0330
num_block_inst -1	4	-0.0295	4	-0.0298
per_execdir_share +0.01	4	0.0048	4	0.0048
per_execdir_share -0.01	4	-0.0047	4	-0.0048
per_inst +0.05	4	0.0215	4	0.0216
per_inst -0.05	4	-0.0200	4	-0.0202

For the group with *SPRating*=4, we find that when there is an increase in *CEO_bd_influence*, *dir_capability*, or *dir_tenure*, the risk of downgrading decreases, while when there is an increase in CEO tenure, block holding, executive holding or institutional holding, such risks increase. The impact of *indep_cmt* differs that in a recession, its marginal impact on down grading is negative, while in booms, it is

positive. Again, no one individual attribute can move the credit rating individually. Next I explore whether multiple attributes changing together can be strong enough to change credit ratings. I decide to use the two most extreme cases, where all attributes are changing in the same direction of upgrading (downgrading). Table 16 shows the results and unfortunately, even with multiple attributes changing in the same direction, corporate governance still does not shift credit rating.

Table 16 All Corporate Governance Change in order to Push for Credit Rating Change

Marginal Changes	predicted <i>SPRating</i>	Marginal Probability Change in Recession	Marginal Probability Change in Boom
For Mean Firm of <i>SPRating</i> =3: indep_cmt -0.1 dir_capability +0.1 dir_tenure +1 num_block_inst -1 per_inst -0.05 per_execdir_share -0.01 ceo_tenure -1	3	0.4384	0.4606
For Mean Firm of <i>SPRating</i> =4: indep_cmt +0.1 dir_capability -0.1 dir_tenure -1 num_block_inst +1 per_inst +0.05 per_execdir_share +0.01 ceo_tenure +1	4	0.1346	0.1255

4.4 Summary of Modeling Results

First of all, corporate characteristics significantly impact its credit rating. Specifically, its size, ROA, and being a utility company all have a positive impact on its credit ratings, while having a higher debt leverage and having subordinate debt negatively impact credit ratings. Secondly, my study also shows that corporate governance attributes are significantly impactful to credit rating. Overall, for a corporation, having stronger director expertise and capability, longer tenure of board directors and stronger CEO's influence on the board all positively impact credit ratings. On the other hand, the number of block holders and percent of shares owned by executives both impact credit ratings negatively. *Ebindex* has a positive impact on credit rating during economic booms, but a negative impact during economic recessions. Institutional holding and board independence both have negative impact on credit ratings, but much less so during economic recessions than during booms. Such differential impacts are consistent with our hypothesis that debt holders favor corporate governance with better decision efficiency during good times, but pursue better mitigation of agent costs during bad economic times. However, even though corporate governance is impactful, its impact is not pivotal enough to shift ratings.

Chapter 5

DISCUSSION

Compared to previously published studies of credit ratings and corporate governance, the biggest contribution of my study is that I show evidence that corporate governance has a secondary role of promoting decision efficiency besides its primary role of mitigating agency cost, and the comparative value of these two functional roles varies between the different states of business cycles. Furthermore, this study is i) more robust, handling correlated variables by principal component analysis and treating autocorrelation correctly, and ii) more insightful, incorporating time in the form of business cycles with implicit risk factors, other than merely a series of dummy variables.

As a result, the estimation techniques used in this study are robust enough to suggest ways to improve corporate governance and lay the step stones for further studies on the interactive relationship of board director selection and CEO selection. Ways to improve corporate governance are: 1) to select more capable and expert directors, and retain them as long as possible, which is normally initiated by the collective effort of existing board members and executives; 2) limit internal executive holding; and 3) allow CEO influence on the board, but limit the CEO's tenure, which can only be done by the board.

5.1 Is Corporate Governance Still Important to Bondholders?

Consistent with prior studies, this study also finds that corporate governance has a statistically significant impact on credit ratings. However, a further step of examining the meaningful marginal changes of corporate governance attributes shows that such impact is not pivotal enough to cause a credit rating change. This casts a question on whether corporate governance is still important to bondholders. The answer is "YES". Firstly, stronger corporate governance is associated with lower bond yield, thus can reduce a firm's debt financing costs (Bhojraj and Sengupta 2003, Klock *et al.* 2004). Secondly, if corporate governance keeps improving for a few years, the chance of upgrading is very high. Take the mean firm with $SPRating=3$ as an example, whose upgrading probability is 0.3022, while gaining a more capable director increases the probability by 0.0432. Within one time period, this may not mean much. However, if a corporation keeps improving its corporate governance continuously, its probability of upgrading becomes very high, very quickly. Suppose this company gains a more capable director in year 1, and reduces institutional holding by 5% in year 2, and reduces the number of block holders by 1 in year 3. During this interval, its upgrading probability is over 0.5 in year 2, and by year 3, it is over 0.87.

Of course, this continuous improvement of corporate governance is only hypothetical, since it may not be easy to reduce institutional holding, or the number of block holders. Also, this study only suggests such ways, but does not explore who should carry out these tasks. However, the analysis of upgrading probability still

sheds light on what bondholders could do to improve corporate governance, had they ever decided to.

5.2 Corporate Governance Promoting Decision Efficiency

With the results shown in Chapter 4, we can see that 1) bondholders value shareholder rights in economic booms, but not in recessions; 2) they do not value the independence of the board, but view independence more favorably in recessions; and 3) they do not value institutional holdings, but view institutional holdings more favorably in recessions. When the economic condition is more risky, bondholders prefer to team with shareholders, value independent board monitoring more, and value the insight and monitoring from institutional holders. However, as the economic environment becomes better, they seem to be more willing to give executives more power, more influence over the board, and more freedom in their decision making.

Such differential value of these corporate governance attributes can lead one to make an analogue to Maslow's Hierarchy of Needs. It seems as if mitigating agency cost is the most basic need when the risk environment is harsh (as in a recession), while promoting decision efficiency is a higher need, but can only be fulfilled when the environment becomes better (as in a boom). With the development of management theories, it would be interesting to see whether this comparative hierarchy of these two roles will change for corporate governance.

5.3 Dealing with Correlated and Autocorrelated Data

In this study, correlated data is addressed by PCA, while autocorrelation from the time series nature of corporate data is handled by the GEE estimation method. If these issues are not taken seriously, one might get misleading estimation results. For example, independence of board directors was largely found to have positive impacts on credit ratings in other studies such as Skaif (2006) and Chen (2011), which was proven wrong. A similar situation occurs for financial transparency and timeliness too, where prior studies found them to be significant, while this study finds them to be not significant at all. Poorly handled multicollinearity and autocorrelation can impair the model's ability to test null hypotheses.

Incorporating the interaction between corporate governance and time also proves to be important, otherwise, I will not be able to discover the differential value of shareholder rights, board independence, and institutional holdings. It is especially true in the case of examining shareholder rights, where the interaction term is bigger but opposite to its main effect. Omitting this interaction would leave the estimation of the main effect to randomness, while sometimes being positive, and other times negative.

5.4 Recommended Future Studies

While this study shows that bondholders value that corporate governance promotes decision efficiency, it would be interesting to see how it is appreciated by the shareholders. After all, shareholders have been the center of most corporate

governance studies. It would also be very helpful to see which attributes shareholders value when it comes to promoting decision efficiency.

One policy recommendation from this study is that corporations should keep improving corporate governance continuously, and by doing so, holding other things unchanged, their upgrading probability would become very high in as short as three years. However, while corporate governance keeps improving, it would be reasonable to assume that financial performance would improve concurrently. As a result, the time needed to achieve upgrading may be shorter than three years. This will require a more complicated analysis that will also involve simulation to estimate the ratings response curve over time.

This study shows the importance of improving corporate governance, but does not suggest who should carry out the tasks. Since improvement can take place by gaining more capable directors on the board, it would be interesting to see who should initiate the changes on the board, since normally it is the board's role to select and manage the CEOs.

REFERENCES

- Acharya, V. V., Myers, S. C. and Rajan, R. G., The Internal Governance of Firms (2011), *The Journal of Finance*, 66: 689–720.
- Agresti, A., *Categorical Data Analysis*, Second Edition (2002), New York: John Wiley & Sons.
- Amato, Jeffery D. and Furfine, Craig, Are Credit Ratings Procyclical? (2003). Bank for International Settlements Working Paper No. 129. Available at SSRN: <http://ssrn.com/abstract=384080> or <http://dx.doi.org/10.2139/ssrn.384080>
- Beasley, M., Carcello, J. V., Hermanson, D. R., and Lapides, P. D., Fraudulent Financial Reporting: Consideration of Industry Traits and Corporate Governance Mechanisms (2000). *Accounting Horizons*, 14: 441–52.
- Bebchuk, L., Grinstein, Y., Peyer, U., Lucky CEOs and Lucky Directors (2010), *Journal of Finance* 65, 2363-2401.
- Bebchuk, Lucian A. and Weisbach, Michael S., The State of Corporate Governance Research (2010). *Review of Financial Studies*, 23-3: 939-961. Available at SSRN: <http://ssrn.com/abstract=1508146> or <http://dx.doi.org/10.2139/ssrn.1508146>
- Bertrand, M., Mullainathan, S., Enjoying the quiet life? corporate governance and managerial preferences (2003), *Journal of Political Economy* 111, 1043-1075
- Bhojraj, S. and Sengupta, P., Effect of Corporate Governance on Bond Ratings and Yields: The Role of Institutional Investors and the Outside Directors (2003), *The Journal of Business* 76: 455-475.
- Billett, Matthew T., Flannery, Mark J. and Garfinkel, Jon A., The Effect of Lender Identity on a Borrowing Firm's Equity Return. *JOURNAL OF FINANCE*, 50 No 2, June 1995. Available at SSRN: <http://ssrn.com/abstract=6221>
- Black, Bernard S., Shareholder Activism and Corporate Governance in the United States (1998). *The New Palgrave Dictionary of Economics and the Law*, 3: 459-465. Available at SSRN: <http://ssrn.com/abstract=45100>

- Bradley, Michael and Chen, Dong, Corporate Governance and the Cost of Debt: Evidence from Director Limited Liability and Indemnification Provisions (2010). *Journal of Corporate Finance*, 2011, 17, 83-107. Available at SSRN: <http://ssrn.com/abstract=1555303>
- Chhaochharia, V., Grinstein, Y., CEO Compensation and Board Structure(2009), *Journal of Finance* 64: 231-261.
- Chung, Kee H., Zhang, Hao, Corporate Governance and Institutional Ownership, *The Journal of Financial and Quantitative Analysis* (FEBRUARY 2011), 46-1: 247-273.
- Dechow, Patricia M., and Dichev, Ilia D., The Quality of Accruals and Earnings: The Role of Accrual Estimation Errors (2002), *The Accounting Review*: 77: 35-59.
- Friedman, M., The Social Responsibility of Business Is To Increase Its Profits (1970), *New York Times Magazine*, Sept. 13, 1970, sec. 6, p. 32.
- Gillan, Stuart L. and Starks, Laura T., A Survey of Shareholder Activism: Motivation and Empirical Evidence (1998), Available at SSRN: <http://ssrn.com/abstract=663523> or <http://dx.doi.org/10.2139/ssrn.663523>
- Glascok , John L., Davidson ,Wallace N., III and Henderson Glenn V. Jr., Announcement Effects of Moody's Bond Rating Changes on Equity Returns, *Quarterly Journal of Business and Economics* (1987), 26-3: 67-78. URL: <http://www.jstor.org/stable/40472883>
- González, Fernando, Haas, François, Persson, Mattias, Toledo, Liliana, Violi, Roberto, Wieland, Martin and Zins, Carmen, Market Dynamics Associated with Credit Ratings: A Literature Review (2004). ECB Occasional Paper No. 16. Available at SSRN: <http://ssrn.com/abstract=752065>
- Gu, Z, Cross-Sample Incomparability of R2s and Additional Evidence on Value Relevance Changes Over Time (2002), Working paper, Carnegie Mellon University.
- Hardin and Hilbe, *Generalized Estimating Equations*, Second Edition (2003), Chapman & Hall/CRC.
- Harris, Milton, and Raviv, Artur, Control of Corporate Decisions: Shareholders vs. Management (2010). *The Review of Financial Studies*, 23-11: 4115-4147.
- Hermalin, B. E., and M. S. Weisbach, Endogenously Chosen Boards of Directors and Their Monitoring of Management (1998), *American Economic Review* 88: 96–118.

- Jensen, M.C., and Meckling, W.H., Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure (1976), *Journal of Financial Economics* 3: 305–360.
- John M. Bizjak and Christopher J. Marquette, Are Shareholder Proposals All Bark and No Bite? Evidence from Shareholder Resolutions to Rescind Poison Pills (1998). *Journal of Financial and Quantitative Analysis*, 33: 499-521.
- Karpoff, J., P. Malatesta, and R. Walkling, Corporate Governance and Shareholder Initiatives: Empirical Evidence (1996), *Journal of Financial Economics*, 42: 365-95.
- Kennedy, P., *A guide to Econometrics* (2003), MIT Press.
- Klein, A., Firm Performance and Board Committee Structure (1998), *Journal of Law and Economics*, 41: 275-303.
- Klock, Mark and Mansi, Sattar and Maxwell, William F., Does Corporate Governance Matter to Bondholders? (2004). Available at SSRN: <http://ssrn.com/abstract=527663>
- Murphy, Kevin J., Executive Compensation (1998). Available at SSRN: <http://ssrn.com/abstract=163914> or <http://dx.doi.org/10.2139/ssrn.163914>
- Myers, S., Determinants of corporate borrowing (1977). *Journal of Financial Economics* 5: 147-175.
- Pan, W., Akaike's information criterion in generalized estimating equations (2001), *Biometrics* 57-1: 120-125.
- Pathan, S., Strong boards, CEO power and bank risk-taking (2009), *Journal of Banking & Finance* 33, 1340-1350.
- Post, J.E., Preston, L.E. and Sachs, S., Managing the Extended Enterprise: The New Stakeholder View (2002), *California Management Review* 45-1: 5–28.
- Predescu, Mirela, Hull, John C. and White, Alan, The Relationship between Credit Default Swap Spreads, Bond Yields, and Credit Rating Announcements (2004). Rotman School of Management Working Paper No. 2173171. Available at SSRN: <http://ssrn.com/abstract=2173171>
- Romano, Roberta, Less Is More: Making Shareholder Activism A Valued Mechanism Of Corporate Governance (May, 2000). Yale Law & Economics Research Paper No. 241. Available at SSRN: <http://ssrn.com/abstract=218650>

- Shleifer, Andrei and Vishny, Robert W., A Survey of Corporate Governance (1996). NBER Working Paper No. w5554. Available at SSRN: <http://ssrn.com/abstract=10182>
- Shleifer, Andrei, and Vishny, Robert W., Large Shareholders and Corporate Control, *Journal of Political Economy* (1986), 94-3:461-488. URL: <http://www.jstor.org/stable/1833044>
- Sironi, Andrea, Altman, Edward I., Brady, Brooks and Resti, Andrea, The Link between Default and Recovery Rates: Implications for Credit Risk Models and Procyclicality (April 2002). Available at SSRN: <http://ssrn.com/abstract=314719>
- Skaife, Hollis Ashbaugh, Collins, Daniel W. and LaFond, Ryan, The Effects of Corporate Governance on Firms' Credit Ratings (2004). Available at SSRN: <http://ssrn.com/abstract=511902>
- Skaife, Hollis Ashbaugh, Collins, Daniel W. and LaFond, Ryan, The Effects of Corporate Governance on Firms' Credit Ratings (2006), *Journal of Accounting and Economics*, 42: 203-243 . Available at SSRN: <http://ssrn.com/abstract=511902>
- Smith, M., Shareholder Activism by Institutional Investors: Evidence from CalPERS (1996), *Journal of Finance*, 51: 227-252.
- Stout, Lynn A., The Mythical Benefits of Shareholder Control (2007), *Virginia Law Review*, 93-3: 789-809, Article Stable URL: <http://www.jstor.org/stable/25050361>
- Wahal, S., Pension Fund Activism and Firm Performance (1996), *Journal of Financial and Quantitative Analysis*, 31: 1-23.
- Weisbach, M. S., Outside Directors and CEO Turnover (1988), *Journal of Financial Economics*, 20: 431-60.

Appendix A

2002 NAICS INDUSTRY CODES AND NAMES

Code	Name*
1	Agriculture, Forestry, Fishing and Hunting
2	Mining, Quarrying, and Oil and Gas Extraction
2	Utilities
2	Construction
3	Manufacturing (food, beverage, tobacco, textiles, apparel, leather)
3 2	Manufacturing (wood products, paper, printing, petroleum, coal, chemicals, plastics, rubber, non-metallic mineral products)
3 3	Manufacturing (primary metals, fabricated metals, machinery, computers, electronics, electrical equipment, appliances, transportation equipment, furniture, miscellaneous manufacturing)
4	Wholesale Trade
4 4	Retail Trade (motor vehicles, furniture and home furnishings, electronics and appliances stores, building material, garden equipment and supplies, food and beverage, health and personal care, gasoline, clothing and accessories)
4 5	Retail Trade (sporting goods, hobby, book, and music stores, general merchandise, miscellaneous retailers, non-store retailers)
4 8	Transportation and Warehousing (air, rail, water, truck, transit and ground passenger, pipeline, scenic and sightseeing, support activities for transportation)
4 9	Transportation and Warehousing (postal service, couriers and messengers, warehouse and storage)
5	Information
5	Finance and Insurance
5	Real Estate and Rental and Leasing
5	Professional, Scientific, and Technical Services
5	Administrative and Support and Waste Management and Remediation Services
6	Educational Services
6	Health Care and Social Assistance
7	Arts, Entertainment, and Recreation
7	Accommodation and Food Services
8	Other Services (except Public Administration)
99**	Establishments Not Otherwise Classified

* My data does not contain any observations of code 55 – Management of Companies and Enterprises or code 92 – Public Administration

** 99 is a code supplied by Compustat, not by the U.S. Census Bureau