

CORPORATE RISK AND CORPORATE GOVERNANCE

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THESIS ABSTRACT
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This thesis investigates the effect of Gompers, et al.'s governance index (gindex) and other possible factors on corporate risk. I find that corporate risk is significantly inversely-related with the gindex, which essentially gauges how extensively anti-takeover provisions are adopted by a firm, in both univariate and multivariate models. Firm size is the other variable significant in both univariate and multivariate models. Leverage and percentage of outsiders on the board are significantly related to firm riskiness when not controlling for other factors. Board percentage of voting power does not affect firm riskiness statistically. In summary, an inverse association between corporate risk and corporate governance using a proxy of anti-takeover provisions is confirmed in this thesis.

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CHAPTER I: INTRODUCTION

Corporate governance originally came into existence in the background of the agency theory and is based on the premise of shareholder value maximization. Jensen and Meckling (1976) define an agency relationship as a contract under which one or more persons (the principal(s)) engage another person (the agent) to perform some service on their behalf which involves delegating some decision making authority to the agent. If both parties to the relationship are utility maximizers, there is a good reason to believe that the agent will not always act in the best interest of the principal. In the case of a corporation, the shareholders are the principals contracting with management, who are the agents. Since the goal of the company is shareholder value maximization, agency conflicts may arise. Corporate governance is the collection of mechanism to reduce agency conflicts and ensure shareholder wealth is maximized.

The effect of corporate governance on equity prices and the distribution of returns is an important issue in corporate finance. There are several factors widely known to influence the quality of corporate governance, including board structure, ownership structure, executive compensation, and anti-takeover provisions.

Byrd and Hickman (1992) find that bidding firms with a majority of independent outside directors earn higher announcement abnormal returns than do firms without a majority of independent directors. Morck, Shleifer and Vishny (1988)

investigate the relationship between management ownership and market value of the firm, and they find that market valuation of the firm (as measured by Tobin's Q) first increases, then declines, and finally rises slightly as ownership by the board of directors rises. Gompers, Ishii and Metrick (2003) construct a "Governance Index" to proxy for the level of shareholder rights at about 1500 large firms during the 1990s, and an investment strategy that buys firms in the lowest decile of the index (strong rights) and sells firms in the highest decile of the index (weakest rights) earns abnormal returns of 8.5 percent per year during the sample period. All the aforementioned prominent research findings show that corporate governance, to some extent, determines the quality of corporate performance. Because poor corporate governance may result in more agency conflicts and high agency costs, the hypothesis that corporate governance influences corporate risk should not be groundless.

Despite the research that has been done on the relationship among corporate value, corporate governance and corporate risk, no analysis has been done specifically attempting to investigate the relationship between corporate risk and corporate governance, the latter which is measured by the most widely acknowledged governance index constructed by Gompers, et al. The purpose of my thesis is to explore the specific nexus between corporate risk and corporate governance.

My study proceeds as follows. The second chapter consists of a literature review of the commonly accepted factors of corporate governance, the widely cited Gompers, et al.'s corporate governance index, as well as the relationship between firm value and corporate governance. In the third chapter, I formulate my conceptual and estimated models, define the variables and develop hypotheses to be tested. Chapter four

presents the data description and summary statistics. Chapter five contains my results and discussion. At the end, in chapter six, conclusions are made and suggestions for future research are presented.

CHAPTER II: LITERATURE REVIEW

1. Measures of Risk

Risk is a concept that denotes the precise probability of specific eventualities. In finance, risk is the probability that an investment's actual return will be different than expected. However, in most cases, investors are more concerned about the probability of downside risk in their investment. Corporate risk is commonly measured using historic equity price volatility, that is, the standard deviation of the stock price of a publicly-listed company.

An alternative risk measure for equity is implied volatility of stock price, which traditionally can be calculated using either the Black-Scholes formula (Black and Scholes, 1973) or the Cox-Ross-Rubinstein binomial model (Cox, Ross and Rubinstein, 1979), and can be interpreted as the market's assessment of the average volatility over the remaining life of the stock option. Mayhew (1995) systematically summarizes the literature about implied volatility.

One problem with historic volatility is that it is backward-looking, and people using historic volatility assume that stock prices in the future will follow the same distribution as the past, an assumption that is often violated in the real market. Compared with historic volatility, implied volatility is a forward-looking measure and this is the main reason that it is preferred to historic volatility as a proxy measuring future corporate

risk. Latané and Rendelman (1976), Schmalensee and Trippi (1978), Chiras and Manaster (1978), and Beckers (1981) all find that implied volatility is better than historical standard deviation at forecasting future realized volatility.

In 1993, the first VIX (volatility index), a weighted measure of the implied volatility of eight S&P100 at-the-money put and call options, was introduced by the Chicago Board Options Exchange (CBOE). Now, it has expanded to use options based on a broader index, the S&P500, which allows for a more accurate view of investors' expectations on future market volatility. This index is commonly used as a proxy for market risk.

By the same token, implied volatility for a specific firm can be calculated from at-the-money options if the firm has options outstanding. I use a ready source of implied volatility for firms from OptionMetrics¹, a provider of historical volatility and implied volatility. Since prior work (Donders and Vorst [1996], Donders, et. al. [2000], Isakov and Perignon [2001]) finds that implied volatility changes around earnings announcements, my estimate of implied volatility is measured thirty days following the earnings announcement to remove transient changes in volatility surrounding the announcement, and is defined as the implied volatility for the closest to at-the-money option. In the case where a firm has multiple options trading that are equally close to at the money, implied volatility is defined as the average implied volatility of all closest to at-the-money options.

¹ Data of implied volatility for firms from OptionMetrics are provided with assistance of Peter J. DaDalt and Bing-Xuan Lin, both of whom are from The University of Rhode Island, College of Business Administration.

2. Measures of Corporate Governance and Related Indices

Board structure, ownership structure, executive compensation, and anti-takeover provisions are acknowledged as main drivers influencing the quality of corporate governance.

A. Board Structure

Regarding board structure, we are mainly interested in two major issues. One is whether the firm has a staggered board, (i.e., classified board), and the other is the percentage of outsiders sitting on the board.

A staggered board of directors is a board that is made up of different classes of directors. Usually, there are three classes. Elections for the directors of staggered boards usually happen on an annual basis, and each board member is serving for a three-year term. At each election, shareholders are asked to vote to fill whatever positions of the board are vacant, or up for re-election.

Generally, proponents of staggered boards cite two main advantages over traditionally elected boards: board continuity and takeover protections -- hostile acquirers have a difficult time gaining control of companies with staggered boards. Opponents of staggered boards, however, argue that directors are less accountable to shareholders than annually elected boards and that staggering board terms tend to breed a fraternal atmosphere inside the boardroom that serves to protect the interests of management above those of shareholders.

Outside board members are often considered to be better than insiders as monitors because they are not subordinated to the management and inclined to be fair in

judging the performance of the management with the only principle of shareholder wealth maximization. Rosenstein and Wyatt (1990) report that the market reacts positively to the announcement of outside director appointments. Byrd and Hickman (1992) find that bidding firms with a majority of independent outside directors earn higher announcement abnormal returns than do firms without a majority of independent directors. Brickley, Coles, and Terry (1994) suggest that the proportion of outside board members relates positively to the abnormal returns at the announcement of poison pill adoptions, and they also find that the average stock-price reaction to poison pill adoptions is significantly positive when the board is controlled by the outside directors and significantly negative when it is not. In the same vein, Cotter, Shivdasani and Zenner (1997) argue that independent outside directors play an important role during tender offers and that they enhance shareholder wealth during tender offers. They also suggest that bid premium revisions and target shareholder gains are higher in resisted offers when the target's board is independent than when it is not. Weisbach (1998) reports that boards dominated by outsiders are more likely to force the resignation of poorly performing CEOs.

Bebchuk, Coates and Subramanian (2003) cite that in the nine months after a hostile takeover bid is announced, shares in companies with staggered boards increase only 31.8%, compared to the average of 43.4% return to stockholders of companies with non-staggered boards, which means staggered board may deter hostile takeovers that otherwise maximize shareholder wealth, although they are fairly rare occurrences. Collectively, the evidence illustrates the importance of outside directors during specific corporate events.

B. Ownership Structure

Ownership structure refers to the breakdown of ownership claims held by insiders (management) and outsiders (investors with no direct role in the management of the firm) (Jensen and Meckling, 1976). The reason that ownership structure is deemed as a proxy to measure corporate governance is a basic recognition argued by Adam Smith in his book “The Wealth of Nations” that directors of a firm cannot be expected to watch over the wealth with the same anxious vigilance with which the partners in a private copartnership frequently watch over their own. Smith’s viewpoint is basically a reflection of agency theory. A low percentage of director’s ownership may not be a sufficient incentive for them to monitor the performance of the management on behalf of shareholders. However, excessive ownership by directors may inevitably entrench them to maximize their own interests within the firm at the expense of shareholder’s wealth. Manjón (2003) also develops a model and finds the predictions of the model agree with the extant empirical evidence that changes in the characteristics of governance, in the information available to the investor and in the size of the firm affect ownership concentration. Therefore, the level of ownership of different stakeholders linked to firms matters.

Morck, Shleifer and Vishny (1988) investigate the relationship between management ownership and market value of the firm, and they find that market valuation of the firm (as measured by Tobin’s Q) first increases, then declines, and finally rises slightly as ownership by the board of directors rises. This indicates that the aforementioned relationship is nonlinear.

McConnell and Servaes (1990) find a significant curvilinear relation between Tobin’s Q and the fraction of common stock owned by corporate insiders. The curve

slopes upward until insider ownership reaches approximately 40% to 50% and then slopes slightly downward. The results are consistent with the hypothesis that corporate value is a function of the structure of equity ownership. Holderness, Kroszner and Sheehan (1999) give a new reference for ownership structure, which is not treated as an exogenous factor, but as the outcome of an optimization process that determines the most effective use of control devices to maximize firm value.

Moreover, due to the fact that shares are dispersely held by outsiders, common shareholders do not, or strictly are not able to, oversee the performance of the management with due diligence. Beyond monitoring by the board, the task of oversight is more likely undertaken by blockholders, commonly institutional investors such as mutual funds, pension funds, endowments, and etc.

Blockholders are shareholders with an ownership greater than 5% of the firm's outstanding shares. They are hypothesized to be more active in monitoring the performance of the management due to their large investment in certain stocks. Institutional trading is an important channel through which information is incorporated into stock prices. Hartzell and Starks (2003) find that institutional investors contribute to private information collection and trading. Piotrosk and Roulstone (2004) also find that institutional trading is positively associated with idiosyncratic volatility. Large institutional investors thus serve as effective monitors of corporate behavior.

C. Executive Compensation

The effectiveness of incentive pay in resolving the agency problem and providing the desirable business and societal outcomes is being frequently questioned by

a number of economists and business academics. Bebchuk and Fried (2003) argue that, while executive compensation is typically viewed as a potential solution to the agency problem, it is in fact likely to be part of the agency problem. In this sense, excessive pay for executives may actually cause, rather than solve, managerial problems. Hal Varian (2002) recognizes that, given the powerful incentive provided by stock options, “the temptation to inflate stock prices artificially will also be strong,” leading to the executive’s moral risk. Nobel Laureate Joseph Stiglitz argues that high-powered incentives and stock options give executives “more incentive to misreport (corporate) incomes” (Meyers, 2003). In support of these ideas, researchers have empirically examined the link between high levels of CEO incentive compensation and the likelihood of financial misrepresentation, finding that such malfeasance is increasingly likely as the level of incentive compensation rises (e.g., Harris and Bromiley, 2005). Graham, Li and Qiu (2008) find that firms with over-paid managers use less debt, consistent with theoretical prediction that managers tend to choose suboptimal capital structure in order to secure their compensation by shirking good projects and evading taking necessary risk to maximize shareholder value. Again, this is further evidence of agency problems that can arise.

D. Anti-takeover Provisions

There are some special provisions in by-laws or charters of companies to impact the soundness of corporate governance. Among those provisions, poison pills and greenmail are the most typical. There are a number of anti-takeovers. In general, proponents argue that such measures allow managers to focus on long run decisions.

Opponents contend that such provisions simply provide job protection for managers. The later view is known as the management entrenchment hypothesis.

a) Poison Pills

In finance, a poison pill is a term referring to one type of strategy that the target company used to defend itself against unwanted takeover bids. Commonly, companies employ stock issues, special distributions, spin-offs and golden parachutes (management payouts). It is especially interesting that poison pills have the potential to either benefit or harm shareholders, but are adopted by the board of directors without a shareholder vote. Malatesta and Walkling (1989) indicate that poison pill defenses reduce stockholder wealth by a statistically significant amount, and the firms that adopt poison pill defenses are significantly less profitable than the average firm in their industries during the year prior to adoption. In addition, they find that the managers of these firms hold statistically significantly smaller fractions of their own firms' stock than the average fraction held by managers of other firms in the same industries. The evidence provided by Malatesta and Walkling (1989) suggests that a poison pill is a tactic that management use to protect their own interest in firm by hurting shareholders rather than protecting the company from the danger engendered by a hostile takeover.

In poison pill provisions, golden parachutes are commonly used. They are severance agreements that provide cash and non-cash compensation to senior executives upon an event such as termination, demotion, or resignation following a change in control. While such payments would appear to deter takeovers by increasing their costs, one could argue that these parachutes also ease the passage of mergers through contractual

compensation to the manager of the target company (Lambert and Larcker, 1985).

Although the net impact on managerial entrenchment and shareholder wealth is ambiguous, the more important effect is the clear decrease in shareholder rights. Silver parachutes are similar to golden parachutes in that they provide severance payments upon a change in corporate control, but differ in that a large number of a firm's employees are eligible for these benefits. Other poison pills make additional share available to current shareholders at a favorable price.

b) Greenmail

Greenmail refers to a transaction between a large shareholder and a company in which the shareholder agrees to sell his stock back to the company, usually at a premium, in exchange for the promise not to seek control of the company for a specified period of time. Antigreenmail provisions prevent such arrangements unless the same repurchase offer is made to all shareholders or approved by a shareholder vote. Such provisions are thought to discourage accumulation of large stocks because one source of exit for the stake is closed. Gompers, et al. (2003) argue that antigreenmail is like a defense and code it as a decrease in shareholder rights.

E. Corporate Governance Index

There are a variety of measures which either integrally or separately address the quality of corporate governance for a firm. One highly cited is Gompers, et al.'s G index. A number of researchers have used this index as a proxy for corporate governance.

Gompers, et al.'s G index uses data from RiskMetrics, which publishes detailed

listings of corporate governance provisions for individual firms (Rosenbaum 1990, 1993, 1995 and 1998). RiskMetrics tracks 22 charter provisions, bylaw provisions, and other firm-level rules plus coverage under six state takeover laws; duplication between firm-level provisions and state laws yields 24 unique provisions, which are divided into five groups by Gompers and his colleagues, such as tactics for delaying hostile bidders (Delay), voting rights (Voting), director/officer protection (Protection), other takeover defenses (Other) and state laws (State). The index construction is straightforward: for every firm, they add one point for every provision that restricts shareholder rights (increases managerial power), and the bigger the index, the poorer the corporate governance of the firm.

Gompers, et al. (2003) analyze the empirical relationship between the index and corporate performance, and find that corporate governance is strongly correlated with stock returns during the 1990s. An investment strategy that purchased shares of firms in the lowest decile (“Democracy” firms with strong shareholder rights), and sold shares of firms in the highest decile (“Dictatorship” firms with weak shareholder rights) during that period earned abnormal returns of 8.5 percent per year.

3. Relationship Among Equity Price, Corporate Risk and Corporate Governance

The scarcity of firm resources encourages many people from both academia and industry to strive for various methods to diminish the conflict among different interest groups within firms, mitigate corporate risk, and then eventually maximize the firm value on behalf of shareholders. Many researchers have attempted to empirically determine the relationship between corporate risk and corporate governance.

Evidence suggests that governance practitioners can directly influence equity prices (Gompers, et al. (2003) and Cremers and Nair (2005)). Constraints and incentives for managers are generally posited as the mechanism by which corporate governance influences prices. Gompers, et al. (2003) argue that early 1990s investors might not have fully appreciated the agency costs engendered by weak governance. Their paper extends the current understanding by showing how governance provisions and informed trading interact to influence the incorporation of information into stock prices.

Cremers and Nair (2005) find external (market for corporate control) and internal (shareholder activism) governance mechanisms are strong complements in being associated with both long term abnormal returns and accounting measures of profitability. The importance of internal governance depends on the extent of external governance and vice versa. The proxies for external governance used are the index developed by Gompers, et al. and an alternative takeover index (ATI) proposed by Cremers and Nair. The proxies for internal governance used are the percentage of share ownership by public pension funds and the percentage of share ownership by the largest blockholder.

Ferreira and Laux (2005) find that idiosyncratic risk is decreasing in firms' degree of insulation from takeovers. Within the interpretation of idiosyncratic risk as an index of information flow, their finding implies a tight link between openness to the market for corporate control and openness of private information flows to the market. However, openness to the market for control is linked to information flow in a way not captured by the openness of a firm's financial reporting. They also show that an institutional trading link is one mechanism for the relationship from governance to idiosyncratic risk. That is, the governance-risk relationship is more pronounced for firms

subject to intense trading by institutional investors, and particularly those that have recently been involved in risk arbitrage around mergers.

Litov, John and Yeung (2006) assert that better investor protection reduces private benefits and may therefore induce riskier but value enhancing investment policy. Managers in countries with poor investor protection are often dominant insiders having much of their wealth invested in the firms they control, and they invest more conservatively as compared to what outsider shareholders desire and thus forgo positive net present value investments. Managers/insiders may also skip risky but value-enhancing projects to protect their expected private benefits, leading to underinvestment of capital. They also present that non-equity stakeholders, such as banks, labor unions and the government, may constrain value-enhancing corporate risk-taking to protect their claims.

CHAPTER III: CONCEPTUAL AND ESTIMATED MODEL

From the literature review, it can be concluded that corporate performance and corporate risk are impacted by various factors of corporate governance, such as board structure, ownership structure and anti-takeover provisions. As firm risk may be influenced by firm size and its leverage, they must be controlled for in the regression model.

Based on these factors, a conceptual model is formulated as follows:

IMPLIED VOLATILITY = f(GOVERNANCE INDEX, FIRM SIZE, LEVERAGE, BOARD STRUCTURE, OWNERSHIP STRUCTURE, ANTI-TAKEOVER PROVISIONS)

My estimated model is formulated as follows:

$$\text{impl_vol} = \beta_0 + \beta_1 \text{g_index} + \beta_2 \text{g_m} + \beta_3 \text{g_h} + \beta_4 \text{g_l} + \beta_5 \text{ta_ln} + \beta_6 \text{dr} + \beta_7 \text{pct_ctrl} + \beta_8 \text{pct_affile} + \varepsilon$$

Where my variables are defined as follows (the cross-sectional regression analysis is executed for the following five years respectively: 1998, 2000, 2002, 2004 and 2006).

Dependent Variable:

impl_vol – annualized implied volatility for a specific company (percent), which is defined as the average implied volatility for the closest to outstanding at-the-money options measured thirty days following the earnings announcement. The reason to measure implied volatility this way is only to remove transient changes in volatility surrounding the announcement. The data for implied volatility is obtained from OptionMetrics.

Independent Variables:

g_index – governance index constructed by Gompers, et al. (2003). The index has a possible range from 1 to 24. The higher the index, the more anti-takeover provisions a firm employs. The relationship can be interpreted as the higher the index, the worse the quality of governance, and the less the shareholders' rights are protected. The data for the governance index are obtained from RiskMetrics.

g_m – dummy variable built upon the governance index. When the governance index is equal to or more than 9, the value for *g_m* is equal to one. Otherwise, *g_m* is equal to zero. 9 is the median of the *g_index* used in regressions for the five sample years, so it is chosen as the cutoff point for building this dummy variable. This variable is built to check whether the firms with better governance than median firms in term of Gomer's *gindex*, are different from the rest firms in corporate risk. It is expected that the sign of the coefficient for this variable is same as that of the coefficient for the *g_index*.

g_h – dummy variable built upon the governance index. When the governance index is equal to or more than 14, the value for *g_h* is equal to one. Otherwise, *g_h* equal

to zero. 14 is the critical point chosen by Gompers, et al. (2003) to divide the dictatorship portfolio firms from the rest and 14 is the upper decile of the *g_index*. The dictatorship portfolio firms are characterized as ones with poor shareholder rights protection. The reason to build this variable is to explore whether the firms with superior governance, in terms of Gomper's *gindex*, are different from the rest firms in corporate risk. It is expected that the sign of the coefficient for this variable is same as that of the coefficient for the *g_index*.

g_l – dummy variable built upon governance index. When the governance index is equal to or less than 5, the value for the *g_l* is equal to one. Otherwise, *g_l* is equal to zero. 5 is the critical point chosen by Gompers, et al. to divide the democracy portfolio firms from the rest and 5 is the lower decile of the *g_index*. The democracy portfolio firms are characterized as ones with good shareholder rights protection. The reason to create this variable is to investigate whether the firms with inferior governance, in terms of Gomper's *gindex*, are different than the rest firms in corporate risk. The sign of the coefficient for this variable is expected to be opposite to that of the coefficient for the *g_index*.

ta_ln – natural logarithm of total assets. Taking the natural logarithm of total assets serves to reduce the magnitude of total assets while keeping the original major relationship between firm risk and total assets. The transformation does not change the significance of total assets or the sign of the coefficient for total assets in the model. The data of total assets is provided by COMPUSTAT North America.

dr – debt ratio. This is calculated as total long-term debt divided by total assets (book value). The higher the debt ratio is, the more leverage the firm has, and the firm is

viewed as more risky in terms of financial risk. The data for long-term debt is from COMPUSTAT North America.

pcnt_ctrl – percentage control of voting power for board members. This variable shows the extent to which the interest of board members is associated with the performance of firm. The higher the percentage control of voting power the board members have, the more due diligence will be executed by board members, and the higher the probability that a firm has a better governance. The data of this variable is accessed from the Directors Dataset in RiskMetrics.

pcnt_affili – percentage of outsiders on board. This variable is calculated as the number of independent directors sitting on the board divided by the total number of directors on the board. The higher the percentage of outsiders, the stronger the supervision the board executes on the management, and the more likely governance will be sound and robust. The data for the number of the outside directors and the total number of the board member is from the Directors Dataset in RiskMetrics.

The main hypothesis I test is whether Gompers, et al.'s governance index affects corporate risk and whether other potential factors such as firm size, leverage, level of board control, and outsiders on the board matter in affecting a firm's riskiness.

Therefore, I have the following hypotheses:

Hypothesis I:

H₀: Gompers, et al.'s governance index does not affect corporate risk

H_a: Gompers, et al.'s governance index affects corporate risk

Hypothesis II:

H₀: firm size, leverage, level of board control and outsiders on the board do not affect corporate risk

H_a: firm size, leverage, level of board control and outsiders on the board affect corporate risk.

CHAPTER IV: DATA DESCRIPTION AND SUMMARY STATISTICS

My purpose in this thesis is to determine how corporate risk is related to corporate governance and other possible factors. The sources of data for my study include OptionMetrics, RiskMetrics, and the COMPUSTAT North America database. Some variables are annual, while others are only provided once every two years. Since data come from different sources, a specific firm may have some missing values for corresponding variables. Due to the potential problem of autocorrelation of the data for the same firms across different years, I execute cross-sectional regression analysis separately for each year, which includes 1998, 2000, 2002, 2004, and 2006. Due to the issue of missing values for various variables, different years and models may have different numbers of observations. Figure 1 shows the implied volatility is positively skewed for each sample year in this study, and therefore the medians for implied volatility are better than means for each year to determine the true center of the distribution.

Descriptive statistics are presented in table 1. The means of *g_index*, *g_m*, *ta_ln* and *pcnt_affili* all have an increasing trend from 1998 to 2006, while the mean of *g_l* is decreasing during the same period. Although the medians of *g_index* and related dummy variables remain constant over the sample period, the medians of *ta_ln* and *pcnt_affili* are decreasing. There are no other obvious change patterns in means of other

variables. Table 2 encompasses the distribution of data by industry and year. The dataset is not dominated by any industry. However, it is worth mentioning that there exist more than 20 percent of firms from utilities and financial industries, and my further analysis will examine the impact of these firms.

Figure 1: Distribution of Implied Volatility for Each Sample Year

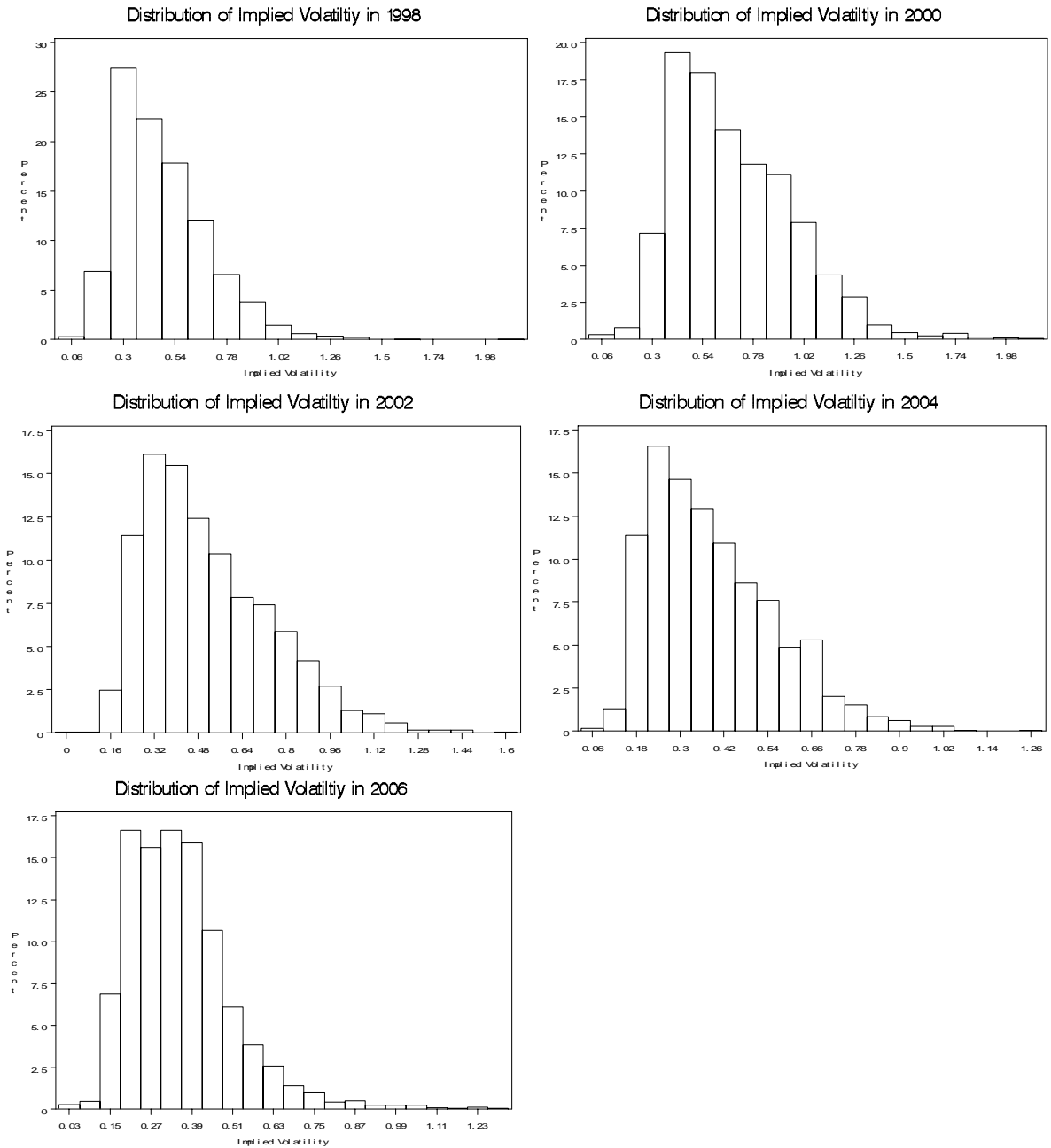


Table 1: Descriptive Statistics

The data on implied volatility come from OptionMetrics. Governance index, percentage control of voting power, and percentage of outsiders come from RiskMetrics. Medians are presented below means in parentheses, and the numbers of observations are presented below medians in brackets.

	1998	2000	2002	2004	2006
Implied Volatility (impl_vol)	0.4824 (0.4355) [1763]	0.6880 (0.6316) [1780]	0.5168 (0.4708) [1699]	0.3906 (0.3540) [1775]	0.3585 (0.3374) [2117]
Governance Index (g_index)	8.7833 (9) [1938]	8.9828 (9) [1921]	9.0329 (9) [1916]	9.0593 (9) [1989]	9.0173 (9) [1907]
Governance Index (g_h)	0.0454 (0) [1938]	0.0458 (0) [1921]	0.0491 (0) [1916]	0.0427 (0) [1989]	0.0388 (0) [1907]
Governance Index (g_l)	0.1398 (0) [1938]	0.0973 (0) [1921]	0.0872 (0) [1916]	0.0830 (0) [1989]	0.0745 (0) [1907]
Governance Index (g_m)	0.5258 (1) [1938]	0.5617 (1) [1921]	0.5637 (1) [1916]	0.5767 (1) [1989]	0.5752 (1) [1907]
Logarithm of Total Asset (ta_ln)	4.8128 (4.8057) [11483]	4.9381 (5.0700) [11181]	4.9199 (5.1599) [10179]	5.1621 (5.3911) [9738]	5.4540 (5.614) [9115]
Debt Ratio (dr)	0.2764 (0.0996) [11451]	0.3901 (0.0858) [11165]	0.3877 (0.0906) [10160]	0.3502 (0.0800) [9719]	0.2146 (0.0761) [9097]
Percentage Control of Voting Power (pcnt_ctrl)	12.3290 (2.85) [1794]	13.7518 (3.5) [1789]	9.7728 (2.7) [1457]	10.7647 (3.9) [1136]	17.8597 (4) [1082]
Percentage of outsiders (pcnt_affili)	0.5938 (0.625) [1794]	0.6080 (0.6364) [1789]	0.6593 (0.6667) [1457]	0.7026 (0.7143) [1484]	0.7198 (0.75) [1425]

Table 2: Distribution of Data by Industry and Year

The data are broken down into eight industry groups based on the one digit SIC code. Percentages of the industry groups per year are presented below the numbers of firms from the corresponding industries in parentheses. SIC codes are below the industry description in brackets.

Industry	1998	2000	2002	2004	2006
Agriculture, Forestry, and Fishery [SIC=0]	42 (0.32%)	36 (0.28%)	38 (0.32%)	32 (0.28%)	27 (0.25%)
Mining and Construction [SIC=1]	855 (6.54%)	901 (7.00%)	893 (7.56%)	1023 (9.11%)	968 (9.12%)
Manufacturing [SIC=2]	4403 (33.69%)	4197 (32.60%)	3905 (33.07%)	3595 (32.01%)	3140 (29.58%)
Transportation, Communication, Electric, Gas, and Sanitary Services [SIC=3,4]	1213 (9.28%)	1173 (9.11%)	1107 (9.38%)	1022 (9.10%)	892 (8.40%)
Wholesale and Retail [SIC=5]	1081 (8.27%)	978 (7.60%)	850 (7.20%)	736 (6.55%)	630 (5.93%)
Finance, Insurance, and Real Estate [SIC=6,7]	2585 (19.78%)	2655 (20.62%)	2685 (22.74%)	2734 (24.34%)	2867 (27.01%)
Services [SIC=8]	2436 (18.64%)	2296 (17.83%)	1942 (16.45%)	1640 (14.60%)	1348 (12.70%)
Public Administration [SIC=9]	152 (1.16%)	175 (1.36%)	157 (1.33%)	142 (1.26%)	148 (1.39%)
Not listed	303 (2.32%)	464 (3.60%)	230 (1.95%)	308 (2.74%)	595 (5.61%)
Total	13070 (100%)	12875 (100%)	11807 (100%)	11232 (100%)	10615 (100%)

CHAPTER V: RESULTS AND DISCUSSION

The results of the ordinary least square (OLS) regressions are shown in table 3. Table 3 presents the estimating results for several specifications for the main model for each sample year. Model 2.2 is tested for the presence of multicollinearity using variance inflation factors (VIF). No serious problem of multicollinearity exists for model 2.2 (See Appendix II).

I run one univariate model with implied volatility against each independent variable of interest and one full model for each year. According to the classification of the governance index constructed by Gompers, et al. (2003), I am interested in investigating the specific relationship between corporate risk and corporate governance for all the firms, and exploring whether dictatorship portfolio firms or democracy portfolio firms are different from the rest.

Model 1.1, model 1.3, model 1.4, model 1.5, model 1.6, and model 1.7 are univariate regression models. Model 1.1 examines the relationship of the governance index for each sample year with implied volatility. Model 1.3 addresses the effect of dummy variable of governance index, *g_index*, for each sample year. Model 1.4, model 1.5 and model 1.6 deal with the effects of firm size, leverage, board percentage of voting power and percentage of outsiders, respectively, on implied volatility.

Model 1.2 and model 2.1 are multivariate regression models. Model 1.2 is designed to compare the difference of implied volatility between democracy portfolio firms, dictatorship portfolio firms and the rest. Model 2.1 is a full model that includes the g_index and all the other relevant factors in this research.

Table 3: OLS Estimation: Analysis of Implied Volatility

T-statistics are in parentheses below the estimated coefficients. * indicates significance at the ten percent level, ** indicates significance at the five percent level, and *** indicates significance at the one percent level.

	model 1.1				
	1998	2000	2002	2004	2006
Intercept	0.5178*** (33.10)	0.7561*** (32.46)	0.6914*** (31.41)	0.4649*** (32.45)	0.3705*** (32.10)
Governance Index (g_index)	-0.0124*** (-7.32)	-0.0192*** (-7.76)	-0.0243*** (-10.41)	-0.0133*** (-8.80)	-0.0071*** (-5.86)
Number of Observations	1122	1062	1232	1342	1418

	model 1.2				
	1998	2000	2002	2004	2006
Intercept	0.4033*** (75.38)	0.5808*** (81.17)	0.4686*** (69.90)	0.3431*** (83.88)	0.3069*** (97.52)
Governance Index (g_h)	-0.0530*** (-2.18)	-0.0879*** (-2.59)	-0.0999*** (-3.40)	-0.0553*** (-2.84)	-0.0358** (-2.45)
Governance Index (g_l)	0.0564*** (3.99)	0.0617*** (2.63)	0.0941*** (4.04)	0.0323** (2.20)	0.0261** (2.08)
Number of Observations	1122	1062	1232	1342	1418

	model 1.3				
	1998	2000	2002	2004	2006
Intercept	0.4428*** (63.42)	0.6378*** (64.46)	0.5301*** (56.38)	0.3783*** (63.76)	0.3237*** (67.81)
Governance Index (g_m)	-0.0644*** (-6.7)	-0.0981*** (-7.43)	-0.1034*** (-8.30)	-0.0589*** (-7.65)	-0.0313*** (-5.03)
Number of Observations	1122	1062	1232	1342	1418

	model 1.4				
	1998	2000	2002	2004	2006
Intercept	0.9928*** (63.34)	1.2911*** (55.29)	1.0228*** (55.11)	0.8547*** (68.99)	0.7747*** (70.50)
Logarithm of Total Assets (ta_ln)	-0.0729*** (-33.37)	-0.0836*** (-26.85)	-0.0703*** (-28.33)	-0.0621*** (-38.64)	-0.0556*** (-38.84)
Number of Observations	1581	1555	1614	1676	1958

	model 1.5				
	1998	2000	2002	2004	2006
Intercept	0.5107*** (70.58)	0.7030*** (74.97)	0.5440*** (69.80)	0.4048*** (71.73)	0.3713*** (76.77)
Debt Ratio (dr)	-0.1157*** (-4.77)	-0.0975*** (-3.06)	-0.1686*** (-5.74)	-0.0764*** (-3.67)	-0.0590*** (-3.38)
Number of Observations	1573	1549	1608	1672	1947

	Model 1.6				
	1998	2000	2002	2004	2006
Intercept	0.4087*** (75.56)	0.5948*** (79.05)	0.4320*** (66.25)	0.3419*** (69.00)	0.308*** (94.14)
Percentage Control of Voting Power (pcnt_ctrl)	0.0004** (1.80)	0.0001*** (3.60)	0.0007** (1.89)	0.0001 (0.5)	0.0000 (0.76)
Number of Observations	1072	1107	1035	804	845

	model 1.7				
	1998	2000	2002	2004	2006
Intercept	0.4835*** (30.15)	0.7335*** (34.23)	0.5290*** (22.88)	0.3821*** (20.79)	0.3383*** (22.49)
Percentage of Outsiders (pcnt_affili)	-0.1188*** (-4.65)	-0.2090*** (-6.24)	-0.1386*** (-4.08)	-0.0819*** (-3.22)	-0.0582*** (-2.86)
Number of Observations	1072	1107	1035	1078	1145

	model 2.1				
	1998	2000	2002	2004	2006
Intercept	0.8646*** (33.08)	1.1573*** (28.27)	0.9244*** (26.22)	0.7214*** (25.69)	0.5562*** (27.20)
Governance Index (g_index)	-0.0064*** (-3.81)	-0.0119*** (-4.65)	-0.0130*** (-6.02)	-0.0089*** (-6.00)	-0.0034*** (-3.06)
Logarithm of Total Assets (ta_ln)	-0.0489*** (-17.16)	-0.0502*** (-12.6)	-0.0420*** (-13.14)	-0.0394*** (-16.94)	-0.0297*** (-16.46)
Debt Ratio (dr)	-0.0618** (-2.49)	0.0076 (0.21)	-0.0391 (-1.18)	0.0476** (2.17)	-0.0270 (-1.48)
Percentage Control of Voting Power (pcnt_ctrl)	-0.001 (-0.70)	-0.0003 (-0.91)	-0.0005 (-1.58)	-0.0003 (-1.50)	0 (1.00)
Percentage of Outsider (pcnt_affili)	-0.0204 (-0.80)	-0.1074*** (-2.98)	-0.0376 (-1.09)	0.0042 (0.15)	0.0254 (1.26)
Number of Observations	984	922	965	762	773

My primary focus lies on the coefficient for g_index and the other relevant factors. From model 1.1 and model 2.1, it is obvious that corporate governance affects the implied volatility because the coefficients for g_index are significant not only in both the univariate model and multivariate model, but also across years. Therefore, I can reject the null hypothesis and conclude that Gompers, et al.'s governance index is related to corporate risk. The negative sign for the coefficient of the g_index means that implied volatility is inversely associated to the value of the g_index. Essentially, the g_index is an anti-takeover provisions index, which captures the acquisition potential for firms. Hence, I can make an argument that the greater barriers a firm has to be acquired, the less implied volatility that firm has. The argument may seem contrary to expectations because

more anti-takeover provisions are hypothesized to imply weak governance, and weak governance is hypothesized to be associated with higher volatility. However, in fact, more anti-takeover provisions may make the firm less attractive on the open market and drive away potential investors, resulting in less takeover activity and lower implied volatility of the firm. Therefore, implied volatility decreases with the introduction of anti-takeover provisions. Since implied volatility is calculated using short-term outstanding options, the potential risk of a firm in a long run cannot be captured by it.

Gompers proposed an investment strategy that purchases shares of democracy portfolio firms and short sells shares of dictatorship portfolio firms. The strategy would have earned an abnormal return of 8.5 percent per year in the 1990s. Model 1.2 examines the relationship of these firms with implied volatility. On average (simple average across samples years), firms have implied volatility of 0.4205 percent during the sample years, while dictatorship portfolios firms have an implied volatility of 0.3542 percent, and democracy portfolio firms have an implied volatility of 0.4747 percent.

Model 1.4 and model 1.5 find that firm size and leverage level are significantly related to the riskiness of a firm. In model 1.6, board percentage of voting power is insignificant in explaining the variability of implied volatility. In model 1.7, the coefficient for percentage of outsiders on the board is significant across sample years, and outsiders sitting on the board do affect firm riskiness as expected. In model 2.1, the significance of the firm's leverage and outsiders on the board become inconsistent across sample years while the *g_index* and firm size remain significant.

The result of the regression analysis in this thesis indicates an inverse relationship between implied volatility and corporate governance using the proxy of

g_index. The inverse relationship seems contrary to expectations at first sight. However, the result is consistent with Ferreira and Laux (2005). They find that idiosyncratic risk is decreasing in a firms' degree of insulation from takeovers, although idiosyncratic risk is just a part of total implied volatility, which I use in my analysis.

One explanation for the inverse relationship is that the higher degree of insulation from takeovers and fewer potential takeover activities may decrease the expected volatility of a firm's stock price, thereby reducing corporate risk. As corporate governance improves with the decrease in anti-takeover provisions, the uncertainty of being acquired increases correspondingly, leading to a higher level of stock volatility and corporate risk.

An alternative explanation for the inverse relationship is that poorer corporate governance due to more anti-takeover provisions or less shareholder rights protection may create an agency conflict where managers are too conservative and avoid taking some beneficial risk, thus the firm operates at a suboptimal risk level. As corporate governance improves, the risk increases up to the optimal level. This explanation coincides with what Litov, John and Yeung (2006) document. They suggest that better investor protection reduces private benefits and may therefore induce riskier but value enhancing investment.

However, even though the inverse relationship between corporate risk and the g_index is significant and robust, different factors in corporate governance are not mutually independent and the further associations among corporate risk and various factors influencing corporate governance must be examined.

As in the case of leverage and percentage of outsiders on the board, each of

them is found to be significantly related to implied volatility in the univariate models but the relationships do not hold in the full model. This evidence suggests that there may exist interactions among various components within corporate governance, and one should not examine each component in isolation. Agca and Mansi (2008) find that firms with large managerial ownership operate at high debt levels unless they have a large number of takeover defenses, which basically tells that an interaction between anti-takeover defenses and managerial ownership determines the level of debt. Consistent with this, it is likely that the mutual effect between leverage and the *g_index* in my analysis drives leverage to be insignificant in the full model. Therefore, the relationship between corporate risk and corporate governance, as an integrated concept, should be interpreted very carefully.

Another potential concern is that my dataset includes firms from all industries. Because firms in the utilities and financial sectors are special due to government regulation and distinct characteristics of their balance sheets, respectively for those two industries, it is common in finance research to remove these firms from one's analysis. To test the robustness of my result, I remove from the dataset firms from the utilities (SIC code in the range between 4900 and 4999) and financial (SIC code in the range between 6000 and 6999) sectors and run the same set of regressions again. The results using non-utility and non-finance firms are qualitatively the same as the models using the whole dataset. In particular, the *g_index* and its three derived variables, *g_h*, *g_l* and *g_m*, are all statistically significant and of same sign in both sets of regression models. Therefore, my result that the Gomper's *gindex* is informative in explaining the variability in implied volatility is robust to the inclusion or exclusion of utilities and financial firms.

In summary, my analysis suggests a consistent and statistically significant inverse relationship between implied volatility and the g_index. While counter to initial expectations, these results suggest, at the very least, a firm with good governance may not necessarily have low implied volatility in its stock price.

CHAPTER VI: CONCLUSION AND SUGGESTIONS FOR FUTURE RESEARCH

It is safe to conclude that Gompers, et al.'s governance index is a significant factor in explaining the implied volatility of certain firms. Gompers, et al.'s governance index is robust to various measures including the g_index itself as well as the dummy variables g_m , g_h and g_l , and with and without the inclusion of control variables. In addition, dictatorship firms are less risky than non-dictatorship firms by 0.0664 percent annually and democracy firms are riskier than non-democracy firms by 0.0541 percent annually during the sample years. More strictly speaking, anti-takeover provisions employed by the firm are associated with a reduction in risk, particularly short-term risk measured by implied volatility. However, anti-takeover provisions can only partly measure the soundness of corporate governance.

Moreover, firm size is a vital component in the riskiness of a firm, and both the univariate model and multivariate model find that firm size is inversely related to firm risk. Larger firms may be better able to diversify themselves and thus decrease certain elements of their risk. Certainly more information about larger firms is available due to more press coverage and more analysts following them, resulting in decreased uncertainty. Hence, keeping firm size in a model to explain volatility is meaningful.

Firm leverage is also a significant factor determining the firm risk, though the sign of the coefficient for this factor is contrary to conventional wisdom that leverage brings more volatility to the entity.

As to board percentage of voting power, it turns out to be insignificant when controlling for the *g_index*, total assets, debt ratio and percentage of outsiders on the board. This outcome signifies that board percentage of voting power is not truly important in influencing the firm risk when controlling for other measures of corporate governance.

The percentage of outsiders sitting on the board is related to corporate risk as expected. The more outsiders on the board, which captures board independence, the better governance a firm has and the less risk a firm is expected to incur.

Due to data limitations, this research only focuses on how implied volatility is related to factors in corporate governance. However, the corporate risk can be decomposed into systematic risk and firm-specific risk. And corporate governance, which differs from firm to firm, is actually part of the source of firm-specific risk, and can at most partially explain corporate risk for a certain firm. Therefore, a model employing a variable that explains the market risk with other corporate governance factors will be better to analyze the relationship I am interested in in this thesis.

In addition, previous literature finds that institutional holdings and block holders have an impact on corporate performance and might also affect the corporate risk. However, due to the difficulty in collecting data on block holders and the scarcity of information of institutional holdings, these two important variables are not introduced into the models.

Future research needs to examine why higher takeover defenses lead to lower implied volatility. This includes exploring whether the lower level of expected volatility is due to lower levels of takeover activity or whether firms with poor governance assume a suboptimal amount of risk. Moreover, the causality between takeover defenses and the riskiness of corporations needs to be explored.

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APPENDIX I

OLS Estimation: Analysis of Implied Volatility for Stock Price of Non-utility and Non-financial firms

T-statistics are in parentheses below the estimated coefficients. * indicates significance at the ten percent level, ** indicates significance at the five percent level, and *** indicates significance at the one percent level.

	model 1.1				
	1998	2000	2002	2004	2006
Intercept	0.5328*** (32.11)	0.7952*** (30.90)	0.7269*** (30.86)	0.5008*** (32.07)	0.3891*** (30.23)
Governance Index (g_index)	-0.0126*** (-7.00)	-0.0214*** (-7.77)	-0.0252*** (-9.97)	-0.0148*** (-8.92)	-0.0071*** (-5.26)
Number of Observations	972	883	1022	1101	1159

	model 1.2				
	1998	2000	2002	2004	2006
Intercept	0.4169*** (72.84)	0.6003*** (76.66)	0.4977*** (68.95)	0.3659*** (82.29)	0.3228*** (90.41)
Governance Index (g_h)	-0.0588** (-2.27)	-0.1003** (-2.51)	-0.0997*** (-2.99)	-0.0608*** (-2.74)	-0.0298* (-1.66)
Governance Index (g_l)	0.0558*** (3.72)	0.0720*** (2.76)	0.0944*** (3.83)	0.0355** (2.22)	0.0328** (2.35)
Number of Observations	972	883	1022	1101	1159

	model 1.3				
	1998	2000	2002	2004	2006
Intercept	0.4548*** (61.52)	0.6619*** (61.61)	0.5558*** (56.19)	0.4018*** (63.25)	0.3397*** (65.34)
Governance Index (g_m)	-0.0629*** (-6.13)	-0.1062*** (-7.36)	-0.0998*** (-7.47)	-0.0611*** (-7.33)	-0.0277*** (-4.05)
Number of Observations	972	883	1022	1101	1159

	model 1.4				
	1998	2000	2002	2004	2006
Intercept	1.0329*** (58.27)	1.3332*** (49.08)	1.0580*** (49.18)	0.8963*** (61.82)	0.8141*** (62.50)
Logarithm of Total Assets (ta_ln)	-0.0792*** (-30.59)	-0.0888*** (-23.30)	-0.0744*** (-24.40)	-0.0676*** (-33.92)	-0.0605*** (-33.87)
Number of Observations	1386	1321	1367	1401	1626

	model 1.5				
	1998	2000	2002	2004	2006
Intercept	0.5322*** (70.06)	0.7395*** (74.03)	0.5778*** (71.39)	0.4265*** (71.86)	0.3890*** (74.76)
Debt Ratio (dr)	-0.1237*** (-4.95)	-0.0109*** (-3.27)	-0.1717*** (-5.66)	-0.0505** (-2.26)	-0.0262 (-1.37)
Number of Observations	1378	1315	1361	1397	1615

	model 1.6				
	1998	2000	2002	2004	2006
Intercept	0.4253*** (73.45)	0.6211*** (74.21)	0.4639*** (65.70)	0.3612*** (68.82)	0.3234*** (92.32)
Percentage Control of Voting Power (pcnt_ctrl)	0.0002 (0.69)	0.0007** (2.50)	0.0004 (0.15)	-0.0001 (-0.25)	0.0000 (0.53)
Number of Observations	924	915	841	678	701

	model 1.7				
	1998	2000	2002	2004	2006
Intercept	0.4726*** (28.07)	0.7374*** (32.00)	0.5472*** (22.01)	0.4022*** (20.55)	0.3523*** (21.88)
Percentage of Outsiders (pcnt_affili)	-0.0778*** (-2.86)	-0.1785*** (-4.91)	-0.1275*** (-3.48)	-0.0818*** (-3.01)	-0.0525** (-2.40)
Number of Observations	924	915	841	873	922

	model 2.1				
	1998	2000	2002	2004	2006
Intercept	0.8817*** (29.86)	1.2224*** (25.91)	0.9727*** (24.84)	0.7556*** (24.13)	0.5721*** (23.45)
Governance Index (g_index)	-0.0065*** (-3.49)	-0.0143*** (-4.92)	-0.0140*** (-5.94)	-0.0090*** (-5.49)	-0.0034*** (-2.65)
Logarithm of Total Assets (ta_ln)	-0.0540*** (-14.93)	-0.0569*** (-11.18)	-0.0434*** (-10.76)	-0.0416*** (-14.25)	-0.0316*** (-12.91)
Debt Ratio (dr)	-0.0345 (-1.28)	0.0193 (0.49)	-0.0313 (-0.87)	0.0682*** (2.84)	-0.0081*** (0.37)
Percentage Control of Voting Power (pct_ctrl)	-0.0002 (-0.79)	-0.0003 (-1.02)	-0.0011** (-3.19)	-0.0005** (-2.03)	0.0000 (0.99)
Percentage of Outsider (pct_affili)	0.0075 (0.27)	-0.0919** (-2.33)	-0.0609 (-1.64)	-0.0172 (-0.59)	0.0232 (1.03)
Number of Observations	840	748	775	638	636

APPENDIX II

Test for Multicollinearity Using Variance Inflation Factors (VIF)

Model 2.1

variable	VIF				
	1998	2000	2002	2004	2006
gindex	1.1338	1.1384	1.1225	1.0874	1.0305
ta_ln	1.0875	1.0434	1.0948	1.0665	1.0546
dr	1.0074	1.0214	1.0586	1.047	1.0419
pcnt_ctrl	1.33	1.2191	1.2237	1.2566	1.0019
pcnt_affili	1.1792	1.2457	1.2501	1.2444	1.0221
Mean VIF	1.1476	1.1336	1.1499	1.1404	1.0302