INFORMATION ASYMMETRY BETWEEN FIRM OWNERS AND MANAGERS: TWO ESSAYS

by

JOSEPH SCOTT RUHLAND

(Under the Direction of David W. Sommer)

ABSTRACT

This dissertation examines two distinct issues involving information asymmetry. First, I examine whether or not insurance firms, as compared to other firms, are more difficult for outside investors to value. Second, I examine the impact of corporate governance mechanisms on the ability of outsiders to value the firm. Both essays employ a market microstructure based measure of information asymmetry. In the first essay, I examine the relative level of information asymmetry in the insurance industry compared to other industries. Several influential papers in the insurance literature rely on the argument that a great degree of information asymmetry exists in the insurance industry, yet no previous empirical work has tested this conjecture. I find evidence consistent with the argument that the property-liability insurance industry exhibits higher levels of information asymmetry than non-insurance industries. In the second essay, I explore the role of corporate governance structures in influencing levels of information asymmetry in publicly traded firms. Recent regulatory changes (i.e., Sarbanes-Oxley) have called for changes to create a "stronger" corporate governance structure. If one of the goals of such regulation is to make firms more informationally transparent, it is important to know whether differences in governance structures are associated with differences in levels of information asymmetry. Using a simultaneous equations system, I find evidence consistent with institutional ownership reducing levels of information asymmetry. In addition, I find evidence complementing recent work in the board determinants literature, namely that information

asymmetry impacts board structure. Further, I find evidence suggesting that inside ownership

and board independence may act as substitutes for one another in their monitoring role.

INDEX WORDS: Information Asymmetry, Corporate Governance, Insurance

INFORMATION ASYMMETRY BETWEEN FIRM OWNERS AND MANAGERS:

TWO ESSAYS

by

JOSEPH SCOTT RUHLAND

BBA, University of Wisconsin-Madison, 1997

A Dissertation Submitted to the Graduate Faculty of The University of Georgia in Partial
Fulfillment of the Requirements for the Degree

DOCTOR OF PHILOSOPHY

ATHENS, GEORGIA

2006

INFORMATION ASYMMETRY BETWEEN FIRM OWNERS AND MANAGERS:
TWO ESSAYS

by

JOSEPH SCOTT RUHLAND

Major Professor: David W. Sommer
Committee: Martin Halek
                    Robert E. Hoyt
                    James S. Linck

Electronic Version Approved:

Maureen Grasso
Dean of the Graduate School
The University of Georgia
December 2006

DEDICATION

This dissertation is dedicated to my wife Kristen, whose support through this process will always be treasured.

ACKNOWLEDGEMENTS

I would like to thank the members of my dissertation committee, Martin Halek, Robert E. Hoyt, James S. Linck, and David W. Sommer for their time, thoughtful comments and helpful suggestions. I would additionally like to thank David Sommer for his mentorship and encouragement throughout my graduate experience.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER 1: Introduction

1.1   Introduction

This dissertation examines information asymmetry, the disparity in the ability of firm managers and firm owners to value a firm. The extant literature in the insurance discipline has long assumed the existence of a high degree of information asymmetry between owners and managers of insurers. This asymmetry forms part of the basis for such areas of interest in the literature as underwriting cycles, merger and acquisition activity and insurance crises. However, to the best of my knowledge, no empirical study has examined whether or not this high relative level of information asymmetry actually exists. The purpose of the first essay of the dissertation is to provide evidence on whether the assumption put forth in existing literature regarding the high level of information asymmetry for property-liability insurers is supported empirically.

The second essay of the dissertation explores the effect of corporate governance on information asymmetry. Recent public policy decisions such as the Sarbanes-Oxley Act of 2002 (SOX), passed in the wake of several corporate scandals, were intended, in part, to increase the amount of information disclosed to the public about activities undertaken by publicly traded companies and their management. One provision in SOX calls for the independence of firm audit committees. Similarly, the New York Stock Exchange called for the independence of all boards of directors for firms trading on its exchange in late 2003. If part of the motivation behind these governance mandates is to increase transparency, it is important to explore whether or not firms with stronger governance characteristics exhibit less information asymmetry than those with relatively weak governance structures.

1.2   **Research Questions**

This dissertation consists of two essays. The first essay of the dissertation seeks to answer the question of whether property-liability insurance companies exhibit a relatively high degree of information asymmetry between firm owners and managers. In order to do this, we look to the market microstructure literature for a measure of information asymmetry. Market microstructure examines the trading mechanism itself (in this case equity markets) and its role in how prices are formed. As discussed in detail in Chapter 2, market makers are persons or groups of persons responsible for supplying liquidity to the market when there is a disequilibrium in the market of buyers and sellers of a stock. In the course of providing this service, the market maker exposes himself to the risk of trading with market participants who hold superior information regarding the true value of the stock for which the market maker provides liquidity. Those with superior information are called informed traders. When the market maker suspects informed traders exist, he will widen the spread of prices at which he will buy stock from sellers and sell stock to buyers. Thus, the spread increases in the amount of information asymmetry the market maker perceives to exist. By looking at trading patterns and trade directions (buy vs. sell), bid-ask spread decomposition models have evolved that allow for a more precise measurement of how much information asymmetry exists in the market for a particular stock. This methodology is utilized across a broad cross-section of firms in order to measure whether or not property-liability insurance firms exhibit higher levels of information asymmetry than their non-insurance counterparts. The evidence suggests that property-liability insurers generally suffer from greater information problems than their non-insurance counterparts. Further, when tested against different specific industries, no other industries have significantly greater levels of information asymmetry than property-liability insurers.

The objective of the second essay is to provide evidence on whether corporate governance mechanisms effectively lower the level of information asymmetry for firms. One of the objectives of recent policy changes (such as the Sarbanes-Oxley Act of 2002) appears to be to lower the levels of information asymmetry between managers and investors. One of the ways in which the regulations seek to meet this objective is through mandated structures of boards of directors and their committees. Therefore, it is interesting to explore whether or not differences in corporate governance structures do yield differences in the level of information asymmetry. I use bid-ask spread decomposition models to measure information asymmetry for firms. Recognizing the endogenous nature of the governance and asymmetry variables, the study is conducted using both simultaneous equation systems and lagged endogenous variables to control for impact of endogeneity on the results and inferences. The results are mixed. Higher levels of institutional ownership are associated with lower levels of information asymmetry. In addition, some evidence exists consistent with information asymmetry influencing the choice of governance structure. Lastly, higher levels of inside ownership are associated with lower levels of board independence, evidence consistent with my hypothesis that corporate governance mechanisms may serve as substitutes for one another in their monitoring role.

CHAPTER 2: Information Asymmetry and Market Microstructure

2.1   Information Asymmetry, the Bid-Ask Spread and Publicly Traded Stock Firms

In modern stock exchanges such as the New York Stock Exchange and NASDAQ, transactions for any particular stock route through "market makers." These market makers are usually one or several individuals or firms per stock whose primary role is to keep the market liquid. In order to do this, they are obligated by the exchange to buy stock when there are no at-large buyers in the market and sell stock when there are no at-large sellers. In exchange for this responsibility, the market maker is allowed to set their own "bid" and "ask" prices at which the market maker is willing to buy and sell stock. The bid-ask spread refers to the difference between the ask and the bid price. This difference between the actual transaction price and what the market maker assesses to be the true value of the stock allows the market maker to cover his costs and make a fair profit when making the market.

Microstructure theory states the market maker must cover order processing costs, inventory holding costs, and information asymmetry (or adverse selection) costs (Demsetz (1968)). Asymmetric information costs invoke a bid-ask spread even in the absence of other frictions for the market maker (Demsetz (1968), Glosten and Milgrom (1985)). If there is a truly "informed" trader, one that knows more about the true value of the stock than the market maker, this informed trader will only buy from the market maker if the true value of the stock is higher than the ask price or sell to the market maker if the true value is lower than the bid price. Therefore, the market maker will never profit from trading with an informed trader. On the other

4

hand, uninformed traders, those that trade for liquidity, misperception of true value, or other reasons not related to profiting from the underlying true value of the stock, will systematically lose money to the market maker through the difference between the true value of the stock and the bid or ask price. The market maker may only have an idea of the probability distribution around a trader being informed or uninformed. He will not know precisely if any particular trader is informed or uninformed. His job then becomes to set the bid-ask spread wide enough so money made from uninformed traders equals or exceeds that of money lost to the informed traders. Even in the absence of order processing and inventory holding costs, as long as the probability of informed traders existing is greater than zero, a spread will evolve. This spread is a function of the level of perceived levels of information asymmetry between the informed and uninformed, as well as the probability of trading with an informed trader.

2.1.1 *Previous literature*

A number of papers have developed theory and performed empirical studies on the issue of identifying and estimating components of the bid-ask spread, including asymmetric information. Earlier theoretical papers (Copeland and Galai (1983); Glosten and Milgrom (1985)) assume that there are two groups of traders, informed and uninformed, to whom the market maker must balance losses and profits, respectively, in order to remain solvent. Kyle (1985) expands this model to account for differing trade sizes.

2.1.2 *Empirical Approaches to Decomposition*

Several contemporary papers explore the measurement of asymmetric information through decomposing the bid-ask spread around a firm's stock price (e.g. George, Kaul and Nimalendran (1991), Lin, Sanger and Booth (1995) and Hasbrouck (1991)). These papers expound upon the idea that the bid-ask spread consists of an order processing component, an

inventory holding component, and an adverse selection (information asymmetry) component and estimate parameters for one or more of the components. Methods of George, Kaul and Nimalendran (1991) and Lin, Sanger and Booth (1995), whose methodologies are used extensively in the dissertation, are discussed later in the section.

There has been some disagreement regarding the precision with which these decompositions measure information asymmetry. Work by Van Ness, Van Ness and Warr (2001) states that spread decompositions, including George, Kaul and Nimalendran (1991) and Lin, Sanger and Booth (1995) are possibly nothing more than noisy measures of spread. Further, they were found to be weakly correlated with more traditional corporate finance measures of information asymmetry, such as market-to-book and R&D expenditures. However, work by Chung and Li (2003) finds that these decompositions are strongly related to information asymmetry. They examine the correlation between bid-ask spread decomposition models' measures of information asymmetry and the composite scores of the PIN (Probability of Informed Trading) model developed in Easley, Hvidkjaer and O'Hara (2002) and find the correlation to be positive and significant. The decision to utilize the methodology of George, Kaul and Nimalendran (1991) and Lin, Sanger and Booth (1995) over that of Easley, Hvidkjaer and O'Hara (2002) is based on the use of the former models in a broader cross-section of the literature as well as its use in the work of Flannery, Kwan and Nimalendran (2004), whose empirical and theoretical approach is followed closely by the first essay.

2.1.3   Empirical Work Using Bid-Ask Spread Decomposition Models

Past empirical research has relied on decompositions of the bid-ask spread as a measure of information asymmetry. Affleck-Graves, Callahan and Chipalkatti (2002) examine the impact of earnings announcements on the information asymmetry component of the bid-ask spread. They find that firms with historically less predictable earnings exhibit higher levels of bid-ask spread-based information asymmetry in the day before and day of earnings announcements. The authors state that their findings suggest firms with less predictable earnings will incur higher costs of equity capital, *ceteris paribus.* This higher cost of capital evolving from higher bid-ask spreads (and therefore components of the spread) is documented by Amihud and Mendelson (1986).

Most research involving market microstructure measures of information asymmetry has not focused on any particular industry, but some notable exceptions exist. Flannery, Kwan and Nimalendran (2004) look to the microstructure literature and add to the corporate finance literature by looking specifically at information asymmetry in the banking industry. The authors examine the magnitude of the bid-ask spread of bank holding companies compared to the spreads of non-bank control firms matched by size and stock price to determine whether banks actually display the high level of asset opaqueness often cited as a reason for strict levels of regulatory oversight. Surprisingly, they find that BHCs do not exhibit higher levels of information asymmetry than their non-financial matching firms. In fact, smaller (NASDAQ) BHC's exhibit less opaqueness than their non-bank counterparts. Further, they regress their effective spread on variables representing the balance sheet composition of the associated BHC's and strongly reject their null hypothesis that the joint effect of the variables on effective spread is zero. Specifically,

they find that the proportion of bank holding company assets held in loan portfolio is positively related to effective spread, their proxy for information asymmetry.

2.2 Derivation of Bid-Ask Spread Decomposition Models

2.2.1 *George, Kaul and Nimalendran (1991)*

The GKN model makes the assumption that the inventory holding cost component of the spread is negligible, thus it provides estimates of the order processing cost component and the asymmetric information component. Further, they assume that the quoted spread is constant across time and the probability of any trade being a buy or sell order to be 0.5. The Neal and Wheatley (1998) model relaxes the assumption of constant spread and the fixed probability of buy and sell to yield the following estimable equation:

$$2R_t^D = \pi_0 + \pi_1\left(s_{qt}Q_t - s_{qt-1}Q_{t-1}\right) + \varepsilon_t$$

where $R_t^D = R_t^T - R_{t*}^M$,

R_t^T = percentage change in transaction prices between the last trade at t-1 and the trade at time t,

R_t^M = percentage change in the midpoint of the bid and ask prices following the last trades at time t and time t-1,

s_{qt} = quoted proportional spread at time t,

Q_t = +1/-1 buy/sell indicator variable, and

ε_t = error term

The estimate of $(1-\hat{\pi}_1)$ yields the proportion of the spread due to asymmetric information. When matching quotes with trades in the GKN model, I use the work of Lee and Ready (1991), and lag quotes by 5 seconds to capture the effects of reporting lags.

2.2.2 Lin, Sanger and Booth (1995)

As with the GKN model, LSB assume that inventory holding costs are zero. However, in contrast to GKN which calculates levels of asymmetric information based on *quoted* spread, LSB calculates levels of asymmetric information as a proportion of the *effective* spread, which accounts for trades taking place inside the spread, a common practice among institutional investors making trades in the upstairs market. The LSB estimate of λ represents asymmetric information as a fraction of the effective spread and is estimated from the following equation:

$$Q_{t+1} - Q_t = \lambda Z_t + \varepsilon_{t+1}$$

where $Z_t = P_t - Q_t$, one half the effective spread,

P_t = transaction price at time t, and

Q_t = the quote midpoint at time t

2.3   Conclusion

This chapter of the dissertation examined the role of the market maker in the process of setting the prices for which investors may buy and sell stock. Market makers exist to supply liquidity to the market. When the collection of buyers and sellers interested in trading is not sufficient to clear the list of orders, the market maker is obligated to buy stock from excess sellers or sell stock to excess buyers. Costs are incurred by the market maker to provide this service. Market makers incur inventory holding costs, the cost of risk associated with holding a non-optimally diversified portfolio of stocks. Secondly, market makers incur order processing costs, the costs associated with actually executing orders as well as the price to hold a seat on the exchange. Finally, market makers incur costs related to information asymmetry, the cost of having incomplete information about the true value of a stock. Due to the non-trivial probability

of the existence of informed traders, those that know more about the true value of the stock than the market maker, the market maker must set a bid-ask spread, a set of prices at which market makers are willing to buy stock from investors looking to sell and a higher price at which market makers are willing to sell stock to investors looking to buy. This spread is theoretically set widely enough for any losses incurred by the market maker by trading with informed traders to be at least offset by the profit made from trading with uninformed traders.

Previous papers have explored the decomposition of the bid-ask spread into its three components: order processing costs, inventory holding costs and information asymmetry costs. The work of two of these papers, George, Kaul and Nimalendran (1991) and Lin, Sanger and Booth (1995) form the basis for the information asymmetry used in the empirical analysis sections of the dissertation. Although some mixed results have been reported regarding the efficacy of these measures of information asymmetry, several empirical studies have used the decompositions as the basis for their measure of information asymmetry, therefore its use in the empirics here seems to be supported.

References:

Affleck-Graves, John, Carolyn M. Callahan, and Niranjan Chipalkatti, 2002, Earnings
        Predictability, Information Asymmetry, and Market Liquidity, *Journal of Accounting
        Research* 40, 561-83.

Amihud, Yakov, and Haim Mendelson, 1986, Asset pricing and the bid-ask spread, *Journal of
        Financial Economics* 17, 223-249.

Chung, Kee H., and Mingsheng Li, 2003, Adverse-Selection Costs and the Probability of
        Information-Based Trading, *Financial Review* 38, 257-72.

Copeland, Thomas E., and Dan Galai, 1983, Information Effects on the Bid-Ask Spread, *Journal
        of Finance* 38, 1457-1469.

Demsetz, Harold, 1968, The Cost of Transacting, *The Quarterly Journal of Economics* 82, 33-
        53.

Easley, D., S. Hvidkjaer, and M. O'Hara, 2002, Is Information Risk a Determinant of Asset
        Returns?, *Journal of Finance* 57, 2185-2221.

Flannery, Mark J., Simon H. Kwan, and M. Nimalendran, 2004, Market evidence on the
        opaqueness of banking firms' assets, *Journal of Financial Economics* 71, 419-460.

George, Thomas J., Gautam Kaul, and M. Nimalendran, 1991, Estimation of the Bid-Ask Spread
        and its Components: A New Approach, *Review of Financial Studies* 4, 623-656.

Glosten, Lawrence R., and Paul R. Milgrom, 1985, Bid, ask and transaction prices in a specialist
        market with heterogeneously informed traders, *Journal of Financial Economics* 14, 71-
        100.

Hasbrouck, Joel, 1991, Measuring the Information Content of Stock Trades, *Journal of Finance*
        46, 179-207.

Kyle, Albert S., 1985, Continuous Auctions and Insider Trading, *Econometrica: Journal of the
        Econometric Society* 53, 1315-1336.

Lee, Charles M. C., and Mark J. Ready, 1991, Inferring Trade Direction from Intraday Data,
        Journal of Finance 46, 733-46.

Lin, Ji-Chai, Gary C. Sanger, and G. Geoffrey Booth, 1995, Trade Size and Components of the
        Bid-Ask Spread, *Review of Financial Studies* 8, 1153-1183.

Neal, Robert, and Simon M. Wheatley, 1998, Adverse selection and bid-ask spreads: Evidence
        from closed-end funds, *Journal of Financial Markets* 1, 121-149.

Van Ness, B., R. Van Ness, and R. Warr, 2001, How Well do Adverse Selection Components
        Measure Adverse Selection, *Financial Management* 30, 77-98.

**CHAPTER 3: Relative Levels of Information Asymmetry
in the Property-Liability Insurance Industry**

**3.1	Introduction**

The academic literature has often argued that property-liability insurers are particularly subject to the problem of information asymmetry, defined here as a significant difference in the ability of outside investors to value components of the firm as opposed to inside investors, including top management. Arguably, the most important source of insurer information asymmetry is a firm's liability portfolio. Insurer liabilities consist primarily of reserves for future loss payments. In addition to being subject to error, loss reserves are highly discretionary and subject to potential manipulation (Petroni (1992); Angbazo and Narayanan (1996); Nelson (2000)). Akhigbe, Borde and Madura (1993) and Randall and Kopke (1992) also report that newer insurance transactions such as risk securitization and financial reinsurance further reduce the ability of investors to rely on an insurer's financial statements. On the asset side, accounting activities may mask the actual market value of real estate holdings by insurers (Akhigbe, Borde and Madura (1993)). The presumed information asymmetry problems associated with property-liability insurers have been used as a potential explanation for such varied issues as merger and acquisition activity in the industry (Chamberlain and Tennyson (1998)), the valuation effect of insurer equity offerings (Akhigbe, Borde and Madura (1997)), and the existence of periodic insurance 'crises' (Cummins and Danzon (1997)). Cummins and Doherty (2002) find information asymmetries between managers and investors to be a common link between the three primary theories of insurance cycles: the capacity constraint theory (Winter (1997); Gron (1994)), the implicit contract theory (Doherty and Posey (1997)), and the risky debt theory (Cummins and Danzon (1997)). Further, Cummins and Doherty (2002) argue that dividend

"stickiness", borne from the difficulty in raising capital in times of crisis (due to increased information asymmetry) lead, in part, to an overcapitalization of the entire industry in the 1990s. However, despite the literature's heavy reliance on the assumption of the insurance industry's high relative level of information asymmetry, no research, to the best of my knowledge, has empirically tested for a high relative level of asymmetric information.

Examining the relative level of information asymmetry between insurance and non-insurance firms is very important considering its common reference in the literature. As stated above, the literature has long simply assumed that property-liability insurers are subject to particularly high information asymmetry, and has made predictions based on this assumption. If the findings are consistent with the assumption, the results of previous literature in the field will be strengthened. If the results are at odds with the assumption, more work may be needed to add credence to the findings of previous literature.

This chapter examines the relative level of asymmetric information in the property-liability insurance industry using elements of the bid-ask spread as a proxy for information problems in order to determine the relative opacity of the property-liability insurance industry. Controlling for other factors documented to affect the spread and decompositions of the spread, the industry effect on levels of information asymmetry is explored. The empirical work reveals evidence consistent with insurance being a relatively opaque industry. When compared to the general stock market, as well as specific industries, insurance firms are more opaque.

3.2   Prior Literature

Most research involving market microstructure measures of information asymmetry has not focused on any particular industry, but some notable exceptions exist. Flannery, Kwan and

Nimalendran (2004) look to the microstructure literature and add to the corporate finance literature by looking specifically at information asymmetry in the banking industry. The authors examine the magnitude of the bid-ask spread of bank holding companies compared to the spreads of non-bank control firms matched by size and stock price to determine whether banks actually display the high level of asset opaqueness often cited as a reason for strict levels of regulatory oversight. Surprisingly, they find that BHCs do not exhibit higher levels of information asymmetry than their non-financial matching firms. In fact, smaller (NASDAQ) BHC's exhibit less opaqueness than their non-bank counterparts. Further, they regress their effective spread on variables representing the balance sheet composition of the associated BHC's and strongly reject their null hypothesis that the joint effect of the variables on effective spread is zero. Specifically, they find that the proportion of bank holding company assets held in loan portfolio is positively related to effective spread, their proxy for information asymmetry.

In the insurance literature, Zhang, Cox and Van Ness (2004), using market microstructure measures (asymmetric information component of the bid-ask spread) to proxy for relative asymmetric information costs, find that the level of asset and liability portfolio transparency, as well as the degree of analyst coverage, are significant determinants of information asymmetry for their intraindustry sample of property-liability insurers. Their findings regarding the impact of liability transparency are particularly interesting given the uncertain nature of both timing and amounts of insurer liabilities.

Work on the relative opacity of insurance firms relying on proxies outside of the microstructure literature is also not well developed. Morgan (2002) focuses on the relative opacity of banks to other industries. A split initial rating between S&P and Moody's on debt issued by the firm serves as the proxy for a firm suffering from information problems. Morgan

(2002) concludes that banks are more opaque than almost any other industry, such as mining, manufacturing, public utilities, etc. Interestingly, the one industry found to be even more opaque than banking is insurance.

Pottier and Sommer (2006) use an intra-industry sample of insurers to determine what characteristics of firms make them more likely to receive split financial strength ratings from S&P and Moody's. They find that those insurers that are smaller, organized as stock companies, have a more significant history of reserving errors, use less reinsurance, have greater investments in stocks and low grade bonds, and exhibit greater geographic diversification are more likely to receive split financial strength ratings.

Using bid-ask spread decompositions complements the work of Morgan (2002) by analyzing the broader market's perception of asymmetric information as opposed to a select group of experts, namely the bond rating agencies. In addition, it provides a stronger basis for papers such as Pottier and Sommer (2006) who examine determinants of split financial strength ratings among insurers obtaining a rating from S&P and Moody's.

3.3 Hypothesis Development – Relative Levels of Asymmetric Information

3.3.1 Introduction

As stated in the introduction, much academic insurance literature works under the assumption of high relative levels of information asymmetry in the insurance industry. The reason cited most commonly in the literature for this high level of information asymmetry is the unique structure of a property-liability insurer's liabilities. Insurer liabilities are unique because they are dominated by loss reserves, which are set with a high degree of managerial discretion. Chamberlain and Tennyson (1998) motivate their work on intra-industry insurance mergers by

making the argument that the underinvestment problem for firms exhibiting high levels of information asymmetry can be mitigated by merger. This holds if the level of information asymmetry between acquirers and those being acquired is lower than between the firm being acquired and other providers of external capital, such as the broader capital market. The authors hypothesize that firms that are thinly capitalized would be particularly prone to such asymmetries. Their findings support their hypothesis of insurance firm mergers being motivated by the mitigation of information asymmetries between buyer and seller. Akhigbe, Borde and Madura (1997) examine the impact of equity issuance of insurance companies in a matched-pair, event study context. They state that insurance firms may need to issue capital in order to maintain financial strength ratings, which will positively impact the price they can command for their insurance products (Sommer (1996)). Further, they argue that insurance firms may want to bring themselves under the scrutiny of capital markets more often in order to lower information asymmetry between the firm and the market.

Cummins and Doherty (2002) look to information asymmetry as a reason behind underwriting cycles. Looking to three major theories of underwriting cycles, the authors state, "A common feature to all three theories is the argument that external capital is costly to insurers because of information asymmetries between managers and capital markets and other imperfections. Information asymmetries are believed to be especially prevalent in the insurance industry because managers know much more about the adequacy of loss reserves and the total exposure to loss than do the securities markets." Additionally, they look at the dividend "stickiness" propagated by the difficulty incurred by insurers in raising capital after a large loss shock (due to information asymmetries) as one cause for the run-up in insurer capitalization in the 1990s.

The prevalence in the literature regarding the perceived level of information asymmetry leads us to the first hypothesis:

Hypothesis 1: Compared to firms in other industries, property-liability insurers display systematically higher levels of information asymmetry.

3.3.2 Dependent Variables

Three different dependent variables are employed in this study. Several papers exist within the finance literature offering models which decompose the bid-ask spread. Following the work of Flannery, Kwan and Nimalendran (2004) and Zhang, Cox and Van Ness (2004), I benchmark the results on the average quoted national best bid or offer bid-ask spread stated as a percentage of the stock's midpoint. I rely on the models of George, Kaul and Nimalendran (1991) (as adapted by Neal and Wheatley (1998)) and Lin, Sanger and Booth (1995) to proxy specifically for levels of asymmetric information between those with inside information and those without (including the market maker). Hereafter, George, Kaul and Nimalendran (1991) and Lin, Sanger and Booth (1995) will be referred to as GKN and LSB, respectively.

George, Kaul and Nimalendran (1991)

The GKN model makes the assumption that the inventory holding cost component of the spread is negligible, thus it provides estimates of the order processing cost component and the asymmetric information component. Further, they assume that the quoted spread is constant across time and the probability of any trade being a buy or sell order to be 0.5. The Neal and Wheatley (1998) model relaxes the assumption of constant spread and the fixed probability of buy and sell to yield the following estimable equation:

$$2R_t^D = \pi_0 + \pi_1\left(s_{qt}Q_t - s_{qt-1}Q_{t-1}\right) + \varepsilon_t$$

where $R_t^D = R_t^T - R_{t*}^M$,

R_t^T = percentage change in transaction prices between the last trade at t-1 and the trade at time t,

R_t^M = percentage change in the midpoint of the bid and ask prices following the last trades at time t and time t-1,

s_{qt} = quoted proportional spread at time t,

Q_t = +1/-1 buy/sell indicator variable, and

ε_t = error term

The estimate of $(1-\hat{\pi}_1)$ yields the proportion of the spread due to asymmetric information. When matching quotes with trades in the GKN model, I use the work of Lee and Ready (1991), and lag quotes by 5 seconds to capture the effects of reporting lags.

Lin, Sanger and Booth (1995)

As with the GKN model, LSB assume that inventory holding costs are zero. However, in contrast to GKN which calculates levels of asymmetric information based on *quoted* spread, LSB calculates levels of asymmetric information as a proportion of the *effective* spread, which accounts for trades taking place inside the spread, a common practice among institutional investors making trades in the upstairs market.

The LSB estimate of λ represents asymmetric information as a fraction of the effective spread and is estimated from the following equation:

$$Q_{t+1} - Q_t = \lambda Z_t + \varepsilon_{t+1}$$

where $Z_t = P_t - Q_t$, one half the effective spread,

P_t = transaction price and time t, and

Q_t = the quote midpoint at time t

3.3.3   Variables of Interest

The objective of this essay is to test for evidence of greater levels of information asymmetry in the insurance industry. First, I look at the relative level of information asymmetry between insurance firms and the broader equity markets by using an indicator variable set to one for insurance firms and zero for non-insurance firms. Second, I look at the relative level of asymmetric information between insurance firms and firms in other specific industries by using industry dummies, omitting the insurance industry variable in the regression.

3.3.4   Control Variables

3.3.4.1 Market Microstructure Factors

Volume

Tinic and West (1972) explain that the level of market maker intervention declines in volume, as relatively high levels of buy and sell orders will mitigate the need for the market maker to take significant, persistent long or short positions in the stock for which they make the market. Further, lack of trading activity indicates new, valuable information (Jakob and Kalay (2001)). For these reasons, both spread and asymmetric information components of the spread are predicted to decrease in volume. Volume is measured as the average daily volume of the firm over the sample period.

Price

Benston and Hagerman (1974) find evidence that the absolute amount of the spread increases at a decreasing rate in share price. This is consistent with the hypothesis that the order processing component of spread is relatively fixed on a per share basis. Based on this evidence, spread, as a percentage of stock price, is hypothesized to decline in share price. Price is measured using the average trading price of the firm over the sample period.

Volatility

Stoll (1978) explores the determinants of spread and finds that the magnitude of the bid-ask spread is positively related to the return volatility of the stock. Since market makers may be forced to hold suboptimal levels of inventory in a stock, the degree of volatility in returns increases the inventory risk. Further, volatility has been shown to increase around such informational events as earnings announcements (Kavajecz and Odders-White (2001)), seasoned equity offerings (Ho, Lee, Lin and Wang (2005)) and dividend cuts (Acker (1999)). Based on this work, I hypothesize that both the spread and the asymmetric information component of the spread will increase in volatility of the stock return. Volatility is defined consistent with Flannery et al. (2004) as the variance of the firm's quote midpoint during the sample period.

Capitalization

Chamberlain and Tennyson (1998) discuss the motivation for merger activity in the insurance industry. They state firms that are thinly capitalized are more likely to suffer from asymmetric information problems. Further, Bohn and Hall (2000) find evidence linking those firms most likely to go bankrupt as those likely to employ some sort of "go for broke" business strategy. Therefore, the capitalization measure (capital over assets) is expected to have a negative relationship with the asymmetric information component of the spread.

Exchange

There are inherent differences between the NASDAQ and the NYSE/AMEX. Kleidon and Willig (1996) state that the limited ability for any one NASDAQ market maker to see the complete order flow of a stock leaves him or her more open to exploitation by an informed trader. Further, asymmetric information is more likely to arise in less actively traded stocks (Easley, Kiefer, O'Hara and Paperman (1996)). These are the firms more likely to be traded on

the NASDAQ. Firms that primarily trade on NYSE or AMEX are coded with an indicator variable equal to one and those that primarily trade on NASDAQ are coded with a zero.

Size

Wei, Hsieh and Sirmans (1995) demonstrate through their evaluation of REIT's that larger firms tend to be closely watched firms by institutional investors and analysts, thus a smaller degree of information asymmetry is expected for larger firms. Spread and the asymmetric information component of the spread are expected to decrease in firm size.

3.3.4.2 Model

The primary model can be written as follows:

$$\text{Asymmetric Information} = \alpha_0 + \beta_1 * \text{Exchange} + \beta_2 * \text{Volume} + \beta_3 * \text{Price} + \beta_4 * \text{Volatility} + \beta_5 * \text{Capitalization} + \beta_6 * \text{Size} + \sum_{i=7}^{16} \beta_i * \text{Industry} + \varepsilon$$

3.4 Data and Methodology

This essay focuses on publicly traded companies trading in the fourth calendar quarter of 1997. Data are obtained from three sources: Center for Research in Security Prices (CRSP) monthly stock files, Compustat and the NYSE TAQ (Trade and Quote) database. I begin with 10,392 unique firms reported on the TAQ database, 9,175 from CRSP and 22,253 from Compustat. The intersection of these three databases produced a sample of 5,444 firms. Insufficient data to calculate values for some of the control variables reduced the final sample to 4,528, including 84 property-liability insurers.

Ordinary least squares was used to examine the relationship between market microstructure measures of information asymmetry and industry groupings, while controlling for exogenous firm and trading characteristics demonstrated by the extant literature to impact levels of information asymmetry. General industry classification follows the work of Morgan (2002)

21

using Standard Industry Classification (SIC) codes. The industries and their associated SIC codes are: Manufacturing (2000-3999), Mining (1000-1499), Trade (5000-5999), Services (7000-8999), Public Utilities (4900-4999), Transportation (4000-4899), Banking (6020-6025, 6035), Other Finance and Real Estate (6000-6019, 6026-6034, 6036-6299, 6500-6999), Other (forestry, fishing, agriculture and construction; 0000-0999, 1500-1799). Insurance firms were identified using publicly traded property-liability firms listed in the Best's Holding Company Guide, 1998 edition (Best (1998)). Property-liability firms were defined as those firms whose consolidated statutory shareholders' equity from property-liability operating subsidiaries is greater than or equal to 50 percent of the consolidated statutory shareholders' equity for the holding company. Using a more refined definition of property-liability insurer is important for this study. Since the main objective of the study is to determine the relative opacity of the insurance industry compared to other industries, it is crucial for all insurance firms to be included. The initial criteria for insurers to fall within SIC-prescribed codes caused the omission of clearly insurance-focused firms, such as Traveler's.

3.5 Results

3.5.1 Summary Statistics

Summary statistics are reported in Table 1. The GKN and LSB estimates suggest that about one half of one percent of the value of a firm's stock is attributable to asymmetric information. The reported mean values for the industry dummy variables are interpreted as that industry's representation as a percentage of the total sample. Insurance firms account for slightly less than two percent of the total sample of 4,528.

3.5.2 Pairwise Correlations

Correlation coefficients are reported in Table 2. The only potentially concerning correlation is between volume and market value of equity. However, this seems like a perfectly intuitive relation. Larger companies are more likely to be actively followed and traded. To the extent that I do not hinge any conclusions of the study on the coefficients of either variable in the regressions, I do not have any serious concerns about multicollinearity.

3.5.3 Univariate Analysis

As a first step, univariate tests of differences in means of the two proxies for asymmetric information between each industry and the rest of the sample are performed. These results are reported in Table 3. Firms in the manufacturing, public utility, and transportation sectors exhibit significantly lower levels of asymmetric information when measured with the GKN proxy for information asymmetry. Banking and other finance and real estate, in contrast, exhibit higher levels of asymmetric information. Using the LSB proxy, results are qualitatively unchanged with the exception of banking, which exhibits insignificant differences in asymmetric information from firms in other industries. However, results from the univariate tests must be interpreted with caution since no steps have been taken to control for the effects of other factors which may impact the degree of asymmetric information exhibited by firms.

3.5.4 Regression Analysis

As a baseline, the average quoted spread, as a percentage of the firm's stock price midpoint, is examined as a function of control variables and an insurance/non-insurance dummy variable. Standard errors reported in the first set of regressions are adjusted for heteroskedasticity, using the White (1980) method after the Lagrange multiplier test for heteroskedasticity (Breusch and Pagan (1979)) rejected the null of homoskedasticity. As show in

Table 4, findings for the control variables are generally consistent with hypotheses, but the key variable of interest is insignificant. The NYSE exchange dummy coefficient is negative and significant, consistent with NASDAQ's structure allowing for more uncertainty regarding activity of informed traders. The coefficient on volume is negative and significant, consistent with reduced needs for market makers to take significant, suboptimal short or long positions in the stocks for which they make the market. The coefficient on price is also negative and significant, consistent with the market maker's fixed cost of doing business per dollar of trading activity being dispersed. The coefficient on volatility is positive and significant, consistent with volatility increasing the likelihood of market makers needing to carry suboptimal levels of inventory. Further, since higher volatility is associated with information events, market makers may be insulating themselves against the threat of informed traders. The coefficient on market value of equity, the proxy for size, is negative and significant. This is consistent with larger firms being more commonly held by watchful institutional investors and followed by analysts. The coefficients on capitalization and insurance industry dummy are both insignificant. However, this is only the baseline measure; the spread has not been decomposed.

In the second specification, the dependent variable is the asymmetric information measure from the GKN decomposition. This measure is the product of the GKN estimator, which measures the percentage of the total spread attributable to asymmetric information, and the average spread as a percentage of stock price. The coefficient on the indicator variable representing firms in the insurance industry is positive and statistically significant. This is the first piece of evidence linking insurance firms to relatively high levels of information asymmetry and is consistent with the first hypothesis stating that insurance firms have relatively higher levels of information asymmetry than non-insurance firms. The coefficients on volume,

exchange, and price remain negative and significant consistent with expectations. The coefficient on capitalization is now negative and significant. This is consistent with thinly capitalized firms being more likely to engage in asset substitution or other agency-cost inducing behavior.

In the last specification, the asymmetric information measure from the LSB estimator is used. Like the GKN measure, the LSB measure is the product of the LSB estimator, which measures asymmetric information as a percentage of the total spread, and the spread as a percentage of the firm's stock price. Again, the indicator variable for insurance firms remains positive and significant. Results for the control variables are generally consistent with the GKN measure. The coefficient on the volatility variable is now insignificant.

The second set of regressions includes industry dummies following the model of Morgan (2002). Insurance firms, as defined earlier in the paper, were withheld from "Other Finance and Real Estate" and set to "Insurers". The insurer indicator variable was excluded from the regression, therefore coefficient estimates on industry variables represent the relative level of spread or asymmetric information as compared to the insurance industry.

Table 5 reports the baseline measurement. The dependent variable in this specification is log of average spread as a percentage of stock price. The firm-level control variables carry over from the first set of regressions. Standard errors reported in the regressions are adjusted for heteroskedasticity, using the White (1980) method after the Lagrange multiplier test for heteroskedasticity (Breusch and Pagan (1979)) rejected the null of homoskedasticity. The exchange variable shows a negative and significant coefficient, consistent with expectations of NYSE/AMEX firms being likely to carry smaller spreads. Coefficients on volume and price are also negative, consistent with expectations. Volume decreases inventory risk to the market

maker, allowing him to set a lower spread. Further, some order processing components of the spread are fixed on a per share basis. The coefficient on the volatility proxy is positive and significant, consistent with the added inventory risk to the market maker caused by stock price volatility. The coefficient on size is negative and significant, consistent with large firms being followed by more analysts and being more likely to be traded by institutional investors. The capitalization coefficient shows as negative and significant, consistent with better capitalized firms being less likely to exhibit asset substitution or other agency cost-enhancing behavior. The industry indicator variable coefficients show mixed results. Public utilities and other finance and real estate exhibit significantly lower average spreads than do insurers, while mining firms show significantly higher spreads than insurers. Other industries are insignificantly different from insurance firms. Again, caution must be used in interpreting these results with respect to relative levels of information asymmetry because the spread has not yet been decomposed into its elements.

The dependent variable in the next specification of the model is the asymmetric information percentage of the spread, as estimated by the GKN model, multiplied by the average percentage spread as the dependent variable. This allows comparisons of the percentage of the firm's spread, as a percentage of stock price, attributable to asymmetric information across firms. In this specification, the control variables maintain their sign and significance level from the first specification. Now, however, insurance firms exhibit significantly higher levels of information asymmetry than firms in the manufacturing, trade, public utility, transportation, banking, and other finance and real estate sectors. Insurance shows as insignificantly different from mining, services and other with respect to information asymmetry. No sectors report significantly higher

levels of asymmetric information than insurance. Again, this is evidence consistent with the hypothesis of insurance firms being relatively opaque.

Using the LSB estimator of asymmetric information, results are less clear. The control variables are largely unchanged. The coefficient on the exchange variable is now significant in the opposite direction, and the volatility measure coefficient is now insignificant. The industry indicator variable coefficients are now largely insignificant, with the exceptions of public utilities, banking and other finance and real estate, which remain negative and significant.

In summary, I find evidence that insurance firms are more informationally opaque than the broader market, and weaker evidence that insurance firms are more opaque than many specific industries.

3.6   Conclusion

This paper explores the relationship of information asymmetry in the insurance industry versus other industries. Given a large amount of literature working from the assumption of high levels of information asymmetry within the insurance industry, it seems important to empirically test. Measures of information asymmetry are derived from the bid-ask spread and trade data using the methodology of Lin, Sanger and Booth (1995) and George, Kaul and Nimalendran (1991). Support is found for the hypothesis that insurers are relatively prone to suffer information problems as opposed to other industries.

References:

Acker, Daniella, 1999, Stock Return Volatility and Dividend Announcements, *Review of Quantitative Finance and Accounting* 12, 221-42.

Akhigbe, Aigbe, Stephen F. Borde, and Jeff Madura, 1993, Dividend Policy and Signaling by Insurance Companies, *Journal of Risk and Insurance* 60, 413-428.

Akhigbe, Aigbe, Stephen F. Borde, and Jeff Madura, 1997, Valuation Effects of Insurers' Security Offerings, *Journal of Risk and Insurance* 64, 115-137.

Angbazo, Lazarus A., and Ranga Narayanan, 1996, Catastrophic Shocks in the Property-Liability Insurance Industry: Evidence on Regulatory and Contagion Effects, *Journal of Risk and Insurance* 63, 619-637.

Benston, George J., and Robert L. Hagerman, 1974, Determinants of bid-asked spreads in the over-the-counter market, *Journal of Financial Economics* 1, 353-364.

Best, A.M., 1998. *Best's Holding Company Guide - GAAP - United States* (A.M. Best Co., Inc., Oldwick, NJ).

Bohn, James G., and Brian J. Hall, 2000, The Moral Hazard of Insuring the Insurers, in *Financing Catastrophe Risks in Property and Casualty Insurance* (University of Chicago Press, Chicago).

Breusch, T.S., and A.R. (1979) Pagan, 1979, A Simple Test for Heteroscedasticity and Random Coefficient Variation, *Econometrica: Journal of the Econometric Society* 47, 1287-1294.

Chamberlain, Sandra L., and Sharon Tennyson, 1998, Capital Shocks and Merger Activity in the Property-Liability Insurance Industry, *Journal of Risk and Insurance* 65, 563-595.

Cummins, J. David, and Patricia M. Danzon, 1997, Price, Financial Quality, and Capital Flows in Insurance Markets, *Journal of Financial Intermediation* 6, 3-38.

Cummins, J. David, and Neil A. Doherty, 2002, Capitalization of the Property-Liability Insurance Industry: Overview, *Journal of Financial Services Research* 21, 5-14.

Doherty, Neil A., and Lisa L. Posey, 1997, Availability Crises in Insurance Markets: Optimal Contracts with Asymmetric Information and Capacity Constraints, *Journal of Risk and Uncertainty* 15, 55-80.

Flannery, Mark J., Simon H. Kwan, and M. Nimalendran, 2004, Market evidence on the opaqueness of banking firms' assets, *Journal of Financial Economics* 71, 419-460.

George, Thomas J., Gautam Kaul, and M. Nimalendran, 1991, Estimation of the Bid-Ask Spread and its Components: A New Approach, *Review of Financial Studies* 4, 623-656.

Gron, Anne, 1994, Capacity Constraints and Cycles in Property-Casualty Insurance Markets, *Rand Journal of Economics* 25, 110-127.

Ho, Chia-Cheng, Chin-Chuan Lee, Chien-Ting Lin, and C. Edward Wang, 2005, Liquidity, Volatility and Stock Price Adjustment: Evidence from Seasoned Equity Offerings in an Emerging Market, *Review of Pacific Basin Financial Markets and Policies* 8, 31-51.

Jakob, Keith, and Avner Kalay, 2001, Voluntary Lack of Trade and its Effects on Short Term Information Asymmetry, *Working Paper*.

Kavajecz, Kenneth A., and Elizabeth R. Odders-White, 2001, Volatility and market structure, *Journal of Financial Markets* 4, 359-384.

Lee, Charles M. C., and Mark J. Ready, 1991, Inferring Trade Direction from Intraday Data, *Journal of Finance* 46, 733-46.

Lin, Ji-Chai, Gary C. Sanger, and G. Geoffrey Booth, 1995, Trade Size and Components of the Bid-Ask Spread, *Review of Financial Studies* 8, 1153-1183.

Morgan, Donald P., 2002, Rating Banks: Risk and Uncertainty in an Opaque Industry, *American Economic Review* 92, 874-888.

Neal, Robert, and Simon M. Wheatley, 1998, Adverse selection and bid-ask spreads: Evidence from closed-end funds, *Journal of Financial Markets* 1, 121-149.

Nelson, Karen K., 2000, Rate Regulation, Competition, and Loss Reserve Discounting by Property-Casualty Insurers, *The Accounting Review* 75, 115-138.

Petroni, Kathy Ruby, 1992, Optimistic reporting in the property- casualty insurance industry, *Journal of Accounting and Economics* 15, 485-508.

Pottier, Steven W., and David W. Sommer, 2006, Opaqueness in the Insurance Industry: Why are some insurers harder to evaluate than others?, *Risk Management and Insurance Review 9,149-164*.

Sommer, David W., 1996, The Impact of Firm Risk on Property-Liability Insurance Prices, *Journal of Risk and Insurance* 63, 501-514.

Stoll, Hans R., 1978, The Pricing of Security Dealer Services: An Empirical Study of Nasdaq Stocks, *Journal of Finance* 33, 1153-1172.

Tinic, Seha M., and Richard R. West, 1972, Competition and the Pricing of Dealer Service in the Over-the-Counter Stock Market, *Journal of Financial and Quantitative Analysis* 7, 1707-1727.

White, Halbert, 1980, A Heteroskedacity-consistent Covariance Matrix Estimator and a Direct Test for Heteroskedacity, *Econometrica: Journal of the Econometric Society* 48, 817-838.

Winter, Ralph, 1997, The Dynamics of Competitive Insurance Markets, *Journal of Financial Intermediation* 3, 379-415.

Zhang, T., L. Cox, and R. Van Ness, 2004, Adverse selection and the opaqueness of insurers, *University of Mississippi Working paper, Oxford, MS*.

CHAPTER 4: Information Asymmetry
and Corporate Governance Mechanisms

4.1   Introduction

This chapter of the dissertation examines the effect of corporate governance mechanisms on information asymmetry between insiders of the firm and the equity market. The efficacy of corporate governance remains a very timely topic in the wake of such scandals such as Enron, Worldcom, Tyco, and Adelphia Communications. Government and market regulatory groups have responded to these developments with measures such as the Sarbanes-Oxley Act of 2002 and New York Stock Exchange actions/rules requiring structural changes to boards of directors. Institution-led efforts to improve corporate governance, such as those by the California Public Employees' Retirement System (CalPERS), have also increased. These efforts to require firms to alter their corporate governance structure make understanding the real impact of corporate governance mechanisms on information asymmetry between firms and their investors of great importance, from both an investor perspective and a public policy perspective.

Previous related work has focused primarily on the impact of corporate governance on various measures of firm value and firm performance, as well as the impact of governance on cost of capital. One means through which corporate governance mechanisms may impact value, performance and cost of capital is through their influence on levels of information asymmetry. As introduced in Chapter 2 and described more fully in the next section, information asymmetry increases the bid-ask spread of a firm's stock. Amihud and Mendelson (1986) argue that as the bid-ask spread of a stock rises, so does its cost of capital. Thus, one of the ways that effective corporate governance may increase firm value is by lowering information asymmetry, thus

reducing the firm's cost of equity capital. Papers such as Diamond and Verrecchia (1991), Botosan (1997) and Leuz and Verrecchia (2000) find higher levels of disclosure by the firm are associated with lower cost of capital. In addition, Bhojraj and Sengupta (2003), Anderson, Mansi and Reeb (2004), and Ashbaugh, Collins and LaFond (2004) examine the effect of corporate governance and its impact on cost of capital. These papers find evidence consistent with strong governance characteristics having a favorable impact on cost of capital for the firm. However, the results of these papers provide only indirect evidence of the impact of corporate governance on information asymmetry, since the governance/cost-of-capital relation could be driven by factors other than reduction of information asymmetry, and the empirical tests used do not measure information asymmetry directly.

The purpose of this paper is to directly analyze the impact of various corporate governance mechanisms on an explicit measure of information asymmetry derived from market microstructure data. While the results of previous papers have sometimes been suggestive of a link between corporate governance and information asymmetry by showing the impact of governance on factors such as firm performance, value, debt ratings and debt yields, this is the first paper to directly test for such a link. In addition, recognizing the potential for endogeneity, the empirical tests are designed to look not only at the impact of corporate governance on information asymmetry, but also at the impact of information asymmetry on corporate governance and the impact of governance mechanisms on each other. Thus, the paper also contributes to the literature on the determinants of corporate governance characteristics.

The results of this essay suggest that lower levels of institutional ownership are associated with greater levels of information asymmetry between firms and their investors, consistent with our hypotheses. Further, there is strong evidence that suggests that the

information environment impacts board structure as well as institutional and insider ownership levels. Lastly, there is evidence to suggest that certain governance mechanisms may act as substitutes for other governance mechanisms.

The remainder of chapter 4 presents the relevant literature, develops hypotheses, describes the sample, presents the methodology used, discusses results of the main analysis, and summarizes the findings.

4.2   Literature Review

4.2.1   Introduction

This section examines the literature used to form the theoretical underpinnings of the empirical analyses. First, I examine the concept of information asymmetry in the context of the paper. I continue by reviewing theoretical and empirical literature linking information asymmetry to firm value, much of which is drawn from the accounting literature. Next, I review the corporate governance literature linking governance with firm value and firm performance. Finally, I review the existing literature tying governance and information asymmetry.

4.2.2   Information Asymmetry

Information asymmetry, in the context of this essay, exists when differing levels of information exist between firm owners (shareholders) and firm management regarding the value of the firm. This information asymmetry is one of the agency costs that arise when principals (firm owners) contract with agents (firm managers) to conduct business on behalf of the principal. Jensen and Meckling (1976) explain that an agent will rationally work in his own self-interest to maximize his utility. It is very likely that a manager's utility-maximizing actions will not align with those of the firm's owners. Well diversified, risk-neutral firm owners are solely

concerned with profit maximization, while firm managers may maximize their utility through empire-building, perquisite consumption and other such activities which do not contribute to the goal of profit maximization. Such activities evolving from the separation of ownership and control are defined by Jensen and Meckling (1976) as agency costs incurred by firm owners.

4.2.2.1 Information Asymmetry and Firm Value

Easley and O'Hara (2004) form a theoretical asset pricing model in which both private and public information affect asset returns. They state that firms with higher levels of private information pose a risk to uninformed investors, because informed investors are better able to shift their portfolio weights to incorporate new information. In exchange for this risk, investors demand higher rates of return, which in turn adversely affects the firm's cost of capital. Easley and O'Hara (2004) state that one implication of their research is that firms may influence their cost of capital "by affecting the precision and quantity of information available to investors."

Amihud and Mendelson (1986) examine the effect of the bid-ask spread on asset pricing. One component of the bid-ask spread is an information asymmetry component. As market makers suspect informed traders in the marketplace who know more about the true value of the firm than the market maker, the market maker increases the spread such that losses they incur from trading with informed traders are offset by trading with uninformed or liquidity traders. They construct a theoretical model of the return spread relationship in which expected return is increasing at a decreasing rate in spread. They then examine the relationship using NYSE data and find that their theory is supported by the data. Cost of capital is increasing in the firm's bid-ask spread. Thus as spread increases, firm value decreases.

Diamond and Verrecchia (1991) demonstrate theoretically that firms, by lowering their levels of information asymmetry through voluntary disclosure of information, reduce their

expected required return (cost of capital). Bartov and Bodnar (1996) look at the issue of disclosure and cost of capital empirically. They argue that managers wishing to maximize their firm's value will work to reduce the degree of information asymmetry between firm management and investors. They test their hypothesis by looking at the information asymmetry effects of firms electing to adopt SFAS No. 52, a change in accounting standards allowing firms to choose whether to use the home currency or the dollar as the functional currency when measuring and reporting the impact of exchange rate changes on foreign operations[1]. Thus, opting to use the home currency, they hypothesize, will reduce information asymmetry (as proxied by shares traded in the year of the currency decision scaled by shares outstanding) compared with those firms who choose using the dollar in their reports of exchange rate changes. Their empirical findings are consistent with their hypothesis.

Botosan (1997) examines the impact of disclosure on cost of equity capital. To quantify disclosure, the author constructs a disclosure index based on levels of voluntary disclosure provided by a sample of manufacturing firms in their annual reports. Testing firms with heavy analyst following versus those with light following, he finds evidence consistent with high levels of informational disclosure being associated with lower costs of capital, but only for those firms without heavy analyst following.

Leuz and Verrecchia (2000) look for a more pronounced result by examining accounting changes that occur in Germany. They argue that previously weak results linking disclosure changes to lowered information asymmetry (thus lower cost of capital) may be due to the already disclosure-rich state of U.S. accounting standards. They examine the impact of firms choosing a reporting regime with higher levels of disclosure (U.S. GAAP) on information asymmetry

---

[1] The authors suggest that anecdotal and empirical evidence suggests that using home currency of the foreign operation provides a clearer picture (less information asymmetry) on firm financials.

(proxied with the bid-ask spread) versus firms who opt to stay with international accepted standards (IAS). They hypothesize that firms that commit to a reporting system with more information content should see a reduction in bid-ask spread, and thus cost of capital. Their findings are consistent with their hypothesis.

4.2.3 *Governance mechanisms and value/performance*

Clearly, if owners were omniscient or constantly present to monitor the activities of firm managers, agency costs would be greatly reduced or eliminated completely. However, owners are not all-knowing and not always physically present. Firm owners, therefore, employ methods which reduce agency problems between themselves and management. Methods used to mitigate agency costs may involve the use of a subset of monitoring and incentive-aligning techniques which fall under the category of corporate governance. Corporate governance involves the set of rules and processes by which a corporation is controlled and monitored. One commonly used corporate governance method is the issuance of equity ownership to management. As a manager's equity stake begins to grow, his incentive for value-destroying, utility enhancing activities is tempered by the effect such actions have on his own wealth, vis-à-vis his equity holdings (Jensen and Meckling (1976)). Another method of controlling agency costs exists through external monitoring. Monitoring can come from independent (non-employee) members of firms' boards of directors (Fama and Jensen (1983)) and through large institutional owners, such as pension funds, mutual funds or insurance companies (Gillian and Starks (2000)).

Inside Ownership

Much of the previous empirical work focusing on the use of corporate governance in controlling agency costs has concentrated on the relationship between specific governance

techniques (such as levels of inside ownership) and firm-level measures of value and performance.

Morck, Shleifer and Vishny (1988) examine the role of managerial (inside) ownership on market valuation of the firm, as measured by Tobin's Q. In their paper, they test two hypotheses. First, their "convergence of interests" hypothesis, aligns with the prediction of Jensen and Meckling (1976) that more managerial ownership will yield a greater convergence of interest between managers and owners. Conversely, Morck, Shleifer and Vishny (1988) state that managers with large equity stakes may have enough control to guarantee their own employment at an attractive salary. So, it could be that managers with high levels of equity ownership are effectively entrenched and can make decisions that, while having a bigger impact than if the managers had no ownership stake, are not completely borne by the managers. They refer to this as their "entrenchment hypothesis" Their empirical results are consistent with both the "convergence of interests hypothesis" and their "entrenchment hypothesis". They find Tobin's Q rises in low levels of managerial ownership (0-5%), falls at higher levels (5-25%), then rises at a lesser rate beyond 25%. The authors also use accounting profit rate as a dependent variable measuring performance. Their results were not robust to this change in specification.

McConnell and Servaes (1990) expand the set of possible owners in their empirical paper to include institutional owners and block owners. Their results are consistent with Morck, Shleifer and Vishny (1988) in that they find a curvilinear relationship between Q and inside ownership. Their results are, however, robust to the accounting profit rate specification.

Cho (1998) expounds upon the work of Demsetz and Lehn (1985), who look at Q and inside ownership in an endogenous framework using a simultaneous equation system. Estimates from the Cho system shows that Q has power in predicting inside ownership but not vice versa.

37

Holderness, Kroszner and Sheehan (1999) also find evidence showing inside holdings to be endogenous and predictable with firm size, performance volatility, volatility squared, regulation and leverage.

Demsetz and Villalonga (2001) also look at ownership structure as endogenously determined. Their findings suggest that there is no systematic change in performance given variation in ownership structure, when both are modeled simultaneously. This supports a more contemporary notion that ownership structure is driven by the environment in which the firm operates and thus any finding in a single-equation system supporting the causal relationship between ownership structure and firm performance may be biased.

4.2.3.2 Board Structure

Fama and Jensen (1983) state that a common thread among organizations of all sizes in which managers do not bear the full financial impact of their decisions is a board of directors. Boards are charged with, among other things, monitoring top management and appropriately acting on the information exposed through the monitoring process, including replacing top management. Further, boards are typically staffed with a significant proportion of "outsiders", those board members with no other affiliation with the firm aside from the board seat they hold. Outsiders work as "decision experts", those with specific product, industry or business knowledge and, as hypothesized by Fama and Jensen (1983), have the incentive to build and maintain their reputations as decision experts. They conjecture that outside board members are commonly themselves executives of other companies. Further, outside board members tend to be members of more than one board of directors.

In addition to being decision experts, outside directors have a natural advantage in monitoring top management within the firm. As opposed to inside directors, who are employees

of the company, outside directors have a primary motivation to maintain their reputation as an expert monitor and decision maker to the external market. Fama (1980) states that the chances of top management expropriating wealth from shareholders may be reduced through the use of outside directors. In addition, he argues that the inclusion of outsiders on the board increases the likelihood that the board will be looked at as a low-cost, internal method of transferring control. The board of directors as a control mechanism has been said, in a normative sense, to be successful in its charge. According to Jensen (1986): "the internal control mechanisms of corporations, which operate through the board of directors, generally work well."

Testing the efficacy of boards of directors in their role in upholding shareholder interests has taken several forms. Brickley, Coles and Terry (1994) examine stock market reactions for firms adopting "poison pills", a strategy usually involving the dilution of a firm's stock in the face of a pending acquisition. These poison pills can be used for shareholder good or shareholder harm. If they are implemented for purposes of extracting the largest amount of money from a potential acquirer, then adopting a poison pill is a strategy consistent with upholding shareholder interests. If, however, the poison pill is implemented with the notion that such a move will prevent a takeover and entrench management, such a strategy is clearly not consistent with shareholder interests. The authors find that there is a significant positive relationship between the stock price reaction to poison pill adoptions and the proportion of outside directors on the board. Outside director-dominated boards tend to have positive stock price reactions, while inside director-dominated boards tend to have negative stock price reactions. These findings are consistent with the notion that outside directors work in shareholders' interest.

McWilliams and Sen (1997) also examine the stock price reaction to antitakeover amendments based on board structure. Their findings are consistent with Brickley, Coles and Terry (1994). Additionally, they find evidence that the magnitude of negative reactions when insiders dominate the board are amplified when those insiders hold significant portions of firm equity and when the CEO chairs the board of directors.

Cotter, Shivdasani and Zenner (1997) complement the work of Brickley, Coles and Terry (1994) by examining the shareholder gains experienced in tender-offer takeovers. They conclude that independent directors do enhance shareholder value. Target firms with independent boards (greater than 50% independent directors) experience a statistically and economically significantly higher bid premium (20 basis points) than firms without an independent board. Further, they recognize that outside directors put their positions as outside directors at risk when taking steps to accept a favorable takeover, yet often accept the takeover anyway. The authors view this as further evidence that outside directors act as shareholder advocates.

Shivdasani (1993) also looks at takeovers, but focuses on hostile takeovers. Hostile takeovers are generally looked at as the corporate governance mechanism of last resort (Jensen (1986)), used when internal governance mechanisms fail. The author finds no significant relationship between the proportion of outside directors on the board and the probability of a hostile takeover, consistent with other work, such as Hermalin and Weisbach (1991). However, the author does find a significantly lower level of outsider equity ownership for firms who are involved in hostile takeovers, as compared to non-takeover firms. Further, outside board members of hostile takeover targets hold fewer other outside directorships than their non-takeover counterparts.

Byrd and Hickman (1992) examine tender offers, but from the perspective of the bidding firm. The find evidence of bidding firms with a majority of outside directors experiencing higher abnormal returns than bidders with a minority of outside directors. However, the relationship is monotonic, but non-linear, which the authors interpret as suggestive of the possibility of a firm having "too many" outside directors.

Rosenstein and Wyatt (1997) examine board effectiveness from the perspective of the inside director. Their analysis addresses the question of whether inside directors are added for efficiency purposes (the benefits of expert knowledge) or entrenchment purposes. Insiders on boards, who must answer to the CEO, will clearly be of less value to shareholders as monitors; however, Fama and Jensen (1983) state that inside directors are an important source of firm-specific information, thus their positioning on the board could yield a more effective and efficient decision making process. Therefore, the impact of inside directors on firm value is an empirical question. Looking at stock-market price reactions, they find that the announcement of a new inside director yields a negative and significant stock price reaction if the new inside director holds a relatively small percentage of equity in the firm. However, at larger levels of ownership, the stock price reacts positively and significantly. They conclude that the expected benefits of inside directors' expert knowledge only outweigh the costs of entrenchment when managerial and outside shareholder interests are aligned through insider ownership.

Further evidence suggests that debt issuers benefit from the monitoring actions of independent directors. Bhojraj and Sengupta (2003) study the impact of board independence on corporate bond yields and ratings. Bhojraj and Sengupta (2003) find evidence consistent with increasing independence of corporate boards being related to decreasing bond yields and increased bond ratings. They argue that this impact is due in part to a reduction in "agency risk",

which they define as the risk that management acting in its self-interest would take actions that deviate from firm value maximization, as well as the risk that the manager is incompetent. Further, they state that the impact could also be due to mitigation of "information risk", defined as the risk that firm managers have private information that would adversely affect the default risk of the loan.   Anderson, Mansi and Reeb (2004) also look at the impact of board independence on bond yield spreads and find results consistent with Bhojraj and Sengupta (2003). Anderson, Mansi and Reeb (2004) hypothesize that board independence reduces bond yield spreads based on the tendency of firms to delegate the control of the financial accounting process to the audit committee, thus reducing information asymmetry. The audit committee is a subgroup of the board of directors which must consist of at least three independent directors during the time period my sample covers. This argument is based on the work of Carcello and Neal (2000), who find that greater audit committee independence leads to better quality of financial reporting to the investing public. The evidence cited above suggests that board independence has a favorable impact on the level of IA between a firm and its investors.

In sum, the evidence suggests that outside members of boards of directors do serve in a monitoring role, mitigating agency costs, reducing information asymmetry between management and investors and working for the good of both shareholders and debt holders.

4.2.3.3 Institutional Ownership

Institutional owners, such as insurance companies, mutual funds and pension funds, have gained an increasingly large relative position in the equity markets. A large stream of literature examines institutional owners and discusses their theoretical role as external monitors of firm management (see Demsetz (1983), Demsetz and Lehn (1985) and Shleifer and Vishny (1986)).

A substantive empirical literature also exists which examines institutions' roles in monitoring management actions. Jarrell and Poulsen (1987) examine "shark repellants", which they define as "a popular term for amendments to corporate charters that put conditions on and restrict the transfer of managerial control." They find firms adopting anti-takeover amendments have the greatest negative stock price reaction when levels of institutional ownership of that firm are low, implying that institutions actively monitor those firms in which they invest.

Brickley, Lease and Smith (1988) study the impact of institutional owners on the voting process on anti-takeover amendments. They look to the theory put forth by Downs (1957) which states that the existence of institutional owners can increase the efficiency of the voting process. These firms, by holding larger blocks of stock than the individual shareholder, have more incentive to vote their blocks of stock in ways that are more beneficial to them as shareholders. These institutions will have less of the relative benefit go to other shareholders and are more likely to have a measurable impact with their vote, as compared to an individual shareholder. Consistent with their argument, the authors find evidence that institutions are more likely to actively vote their stock than non-institutional owners. Further, they find that institutions are less likely to vote with management on decisions that are followed by a negative excess stock return.

Akhigbe and Martin (2006) examine firm value changes for financial services companies in the wake of Sarbanes-Oxley. They hypothesize that Sarbanes-Oxley emphasized the importance of monitoring, and thus firms who have strong governance mechanisms in place to monitor managerial actions will be rewarded by the market. In contrast, those with weak governance mechanisms are hypothesized to be punished by the market, reflecting the increased expected costs of compliance. Their findings show that firms with higher levels of institutional

ownership were associated with more positive wealth effects around the time period in which Sarbanes-Oxley was enacted that those with low levels of institutional ownership.

Work by Bathala, Moon and Rao (1994) investigates the efficacy of institutional ownership as a mechanism to reduce agency costs by testing its substitutability with debt financing, another monitoring mechanism (Jensen (1986)). Using a simultaneous equations framework, the authors find a strong negative relationship between the use of debt financing in the capital structure, and the levels of institutional ownership. They conclude that this negative relationship supports the role of institutional ownership as that of monitor.

Brous and Kini (1994) investigate the direction of causality assumed by the McConnell and Servaes (1990) study on institutional ownership and Tobin's Q. McConnell and Servaes (1990) make the assertion that the positive relation between Q and institutional ownership may be due to monitoring by institutions, but acknowledge that they cannot definitively state the direction of causality. Brous and Kini (1994), in an event-study framework, measure the level of abnormal returns around announcements of seasoned equity offerings. They hypothesize that others may view institutional owners as effective monitors, and therefore the institutions' holdings signal a "stamp of approval" on the plans for the use of funds. The findings of the paper are consistent with institutional investors acting as effective monitors, thus supporting the earlier assertion of McConnell and Servaes (1990).

Hartzell and Starks (2003) examine the role of institutional owners in monitoring management through the relationship between institutional ownership and executive compensation. They find that firms with higher levels of institutional ownership exhibit higher levels of pay-to-performance sensitivity. Further, they find that after controlling for size, industry and performance, firms with higher levels of institutional ownership offered lower

levels of pay to top executives. The authors present their findings as evidence in support of the monitoring role of institutional owners, reducing agency costs between owners and managers.

4.2.4   Governance and Cost of Capital

4.2.4.1 Governance and Cost of Debt Capital

Bhojraj and Sengupta (2003) examine the link between governance and both bond ratings and bond yields. They suggest that governance mechanisms may reduce both "agency risk" and "information risk." They describe agency risk in the usual manner as management acting in their own interest at the expense of the firm's investors, and information risk as the risk of firm management holding private information that would adversely affect the default risk on a loan. They hypothesize that debt issued by firms with stronger governance mechanisms, specifically greater board independence and greater levels of institutional ownership, should exhibit higher ratings and lower yields if governance mechanisms are successful at reducing agency and/or information risk. Looking at a sample of over 1000 corporate bond issues, the authors find evidence consistent with strong governance being associated with lower bond yields and higher ratings. Specifically, they find that higher levels of institutional ownership and more independent boards experience more favorable ratings and lower yields.

Anderson, Mansi and Reeb (2004) also look at the cost of debt and its association with governance mechanisms. Focusing on the board of directors, they find evidence suggesting that strong governance is reflected in lower costs of debt capital. Specifically, they find, in their S&P 500 sample, firms with more independent boards are associated with a lower cost of capital. Further, firms with fully independent audit committees experience lower costs of capital. Lastly, cost of capital decreases in audit committee size and meeting frequency.

4.2.4.2 Governance and Cost of Equity Capital

Ashbaugh, Collins and LaFond (2004) examine governance attributes across four dimensions: financial information quality, ownership structure, shareholder rights and board structure and their relation to firms' equity cost of capital. They hypothesize that if governance mechanisms are intended to mitigate agency risks between firm owners and firm managers, strong governance should be associated with lower costs of equity capital. Consistent with their hypothesis, they find that firms with higher levels of institutional ownership and more independent boards enjoyed lower costs of capital than firms with low levels of institutional ownership and less board independence.

4.2.5   Methodological Issues

4.2.5.1 Endogeneity

The endogenous nature of governance variables both with each other and with the measures of information asymmetry poses a challenge. Hermalin and Weisbach (2003) discuss the issue at length regarding governance and value. They state, for example, that "firm performance is both a result of the actions of previous directors and itself a factor that potentially influences the choice of subsequent directors." Several papers previously cited (i.e., Morck, Shleifer and Vishny (1988)) simply ignore the issue and treat the governance variables as exogenously determined. However, more contemporary work, such as Cho (1998), reexamine the inside owner/value relationship in an endogenous framework and find evidence suggesting that causality runs the other way; that it is firm value that is a significant determinant of insider ownership, not the reverse. The author specifically states that conclusions reached by Morck, Shleifer and Vishny (1988) may be called into question. Similarly, when approaching the board independence/performance relationship, papers such as Mehran (1995) and Klein (1998) treat

board independence as endogenously determined. Other work, such as Hermalin and Weisbach (1991) and Bhagat and Black (2002) attempt to attenuate the endogeneity issue through the use of simultaneous equations methods and lagged performance variables. Hartzell and Starks (2003) recognize the potential for endogeneity when studying the relationship between institutional ownership and CEO pay-to-performance sensitivity. They use lagged variables to control for effects of endogeneity and to help establish causality.

Agrawal and Knoeber (1996) examine the impact of governance mechanisms on firm performance but also acknowledge the endogenous nature of the governance mechanisms themselves. In a methodology most like the methodology employed here, the authors examine six governance mechanisms in a simultaneous equations framework. They argue that governance mechanisms could act as substitutes (i.e. the monitoring role of inside ownership may lead a firm to require a less independent board) or as complements (i.e. takeovers could be made easier in the presence of large institutional owners since transactions costs and free-rider costs may be lower.) Therefore, if any one mechanism's impact on a factor such as performance or value is examined in isolation, unobserved factors may be at work and any findings could be misleading. In their sample of relatively large (Forbes 800) firms, they find no significant evidence of the degree of use of independent directors, institutional owners or insider owners having an impact on the use of the other governance mechanisms.

Beiner, Drobetz, Schmid and Zimmerman (2006) look at governance and value among Swiss firms using a methodology much like Agrawal and Knoeber (1996). They do find a negative relation between insider ownership and board independence, evidence consistent with the existence of substitution effects among governance mechanisms.

47

Given the more recent work attempting to deal with the endogeneity problem, the methodology employed in this essay uses a simultaneous equations model employing two stage least squares (2SLS) using first stage equations to estimate predicted values of the endogenous variables to be used as instruments in the second stage. Choosing to simply use ordinary least squares (OLS) would require the assumption that the error term is uncorrelated with each regressor. Since many of the explanatory variables are not predetermined or exogenous to the system, using OLS would lead to biased and inconsistent estimates. Using 2SLS will allow us to see how each governance variable impacts other governance variables, how information asymmetry impacts the governance variables and how the governance variables impact information asymmetry.

4.2.5.1.1 Determinants of Board Structure

Several papers have emerged recently empirically examining the determinants of board structure. Until recently, a paucity of theoretical predictions existed on why boards are structured the way they are. Linck, Netter and Yang (2006), Boone, Field, Karpoff and Raheja (2006), Lehn, Patro and Zhao (2006), and Coles, Daniel and Naveen (2006) look to the theory of Raheja (2005) and Maug (1997) to explain how boards may be constructed optimally based on the environment in which the firm operates. Linck, Netter and Yang (2006) find that firms with high levels of R&D expenditures, growth opportunities and stock return variation have smaller and less independent boards. This is consistent with the theory of Raheja (2005) and Maug (1997), who suggest that firms with higher levels of information asymmetry and high monitoring costs would structure their boards in this manner. Boone, Field, Karpoff and Raheja (2006) examine changes in board structure of IPO firms over time. They find that these firms begin with smaller and more independent boards than their more seasoned counterparts. Further, they

find board size and composition reflect the monitoring requirements of that firm, similar to Linck, Netter and Yang (2006). Lehn, Patro and Zhao (2006) argue that board structure is determined by tradeoffs involving incremental information that independent directors bring to the table versus the incremental coordination costs and free-rider costs associated with additional independent directors. Their evidence supports their hypotheses that board structure is determined endogenously in ways consistent with value maximization.

4.2.5.1.2   Determinants of Inside Ownership

Cho (1998) examines levels of inside ownership and its impact on firm value. Adding to the work of Morck, Shleifer and Vishny (1988) and McConnell and Servaes (1990), Cho (1998) also considers the impact of firm value on the inside ownership decision. Using a 2SLS simultaneous equations framework, the author models inside ownership as a function of managerial wealth constraints, managerial risk aversion, firm value, investment, liquidity and industry. He finds evidence directly contradictory to Morck, Shleifer and Vishny (1988). Firm value is highly positively correlated with inside ownership, but no relationship is found in the other direction.

4.2.5.1.3   Determinants of Institutional Ownership

Eakins, Stansell and Below (1996) examine the determinants of institutional ownership. They consider the work of Aggarwal and Rao (1990), who hypothesize that institutional ownership has a favorable impact on the number of earnings releases, the number of earnings surprises and the number of earnings forecast errors. They state that this improvement in information yields an aversion of institutions to invest in firms with high return variance, skewness, and kurtosis. Eakins, Stansell and Below (1996) consider that the individual return attributes of a potential investment may drive institutional demand, and test causation in the

opposite direction. Eakins, Stansell and Below (1996) find evidence supporting the hypothesis that institutional investors evaluated stocks individually based on higher moments of stock returns. They find institutions avoid firms with high levels of volatility, skewness and kurtosis.

4.2.6   Conclusion

The previous sections discuss the extant literature which provides a theoretical and empirical framework for the study. Section 4.2.2 discusses information asymmetry in the context of the study and continues to describe work relating the impact of information asymmetry on firm value. Next, section 4.2.3 discusses the governance mechanisms of interest in this study and their impact on firm value and performance. Section 4.2.4 continues with a discussion of studies relating the impact of governance structures on equity and debt cost of capital. The literature review concludes with a discussion of a contemporary literature discussing the determinants of governance structures as well as a discussion of endogeneity issues inherent in these types of studies.

While work does exist which examines the impact of governance on cost of capital and on firm value, no work to my knowledge directly considers the impact of governance on information asymmetry, which in turn affects cost of capital and value. The next section presents hypotheses on the relationships between information asymmetry and governance.

4.3   Hypothesis Development

4.3.1 Introduction

The hypothesis development section contains a summary of the system of equations being estimated and discussion of hypotheses relating information asymmetry and corporate governance mechanisms. Separate sections are devoted to the impact of corporate governance

mechanisms on information asymmetry, the impact of information asymmetry on corporate governance mechanisms, and the impact of corporate governance mechanisms on each other.

4.3.2   Summary of Equation System

In order to capture the effects of corporate governance mechanisms on information asymmetry (the main focus of the paper), the impact of information asymmetry on corporate governance mechanisms, as well as the impact of corporate governance mechanisms on each other, information asymmetry, board independence, inside ownership, and institutional ownership are all treated as endogenously determined, using a system of four equations to test hypotheses.   While this is a rather large system to be estimated, I feel that it is the most appropriate approach, given the natural endogeneity of the key variables.   This approach is further validated by the even larger system which Agrawal and Knoeber (1996) estimate in order to find relationships between governance mechanisms.   Proper identification of the model is clearly a concern, but one that I feel can be dealt with effectively using previous literature as a basis.   The reasoning behind the inclusion or omission of each variable is grounded in the literature and is explained in the methodology section.

The system is as follows:

Information Asymmetry =   f(Board Independence, Institutional Ownership, Inside Ownership, Control Variables)

Board Independence =   f(Information Asymmetry, Institutional Ownership, Inside Ownership, Control Variables)

Institutional Ownership =   f(Information Asymmetry, Inside Ownership, Board Independence, Control Variables)

Inside Ownership =   f(Information Asymmetry, Board Independence, Institutional Ownership, Control Variables)

4.3.3   The Impact of Corporate Governance Mechanisms on Information Asymmetry

As described by Shleifer and Vishny (1997), "Corporate governance deals with the ways in which suppliers of finance to corporations assure themselves of getting a return on their investments" (p.737). One way suppliers of finance help assure themselves of their investment returns is through information exchange with firm management. These exchanges can come, for example, via press releases, analyst calls, and financial statements. Information asymmetry in the context of this essay refers to insiders of the firm and outside investors having different levels of information regarding the value of the firm. If information asymmetry exists, investors will demand a premium in exchange for their lack of full (or at least equal) information (Easley and O'Hara (2004)). As discussed in detail earlier in the chapter, one way the existence of information asymmetry manifests itself in the market is through the bid-ask spread.   Increased information asymmetry widens the spread, which Amihud and Mendelson (1986) show has a positive impact on expected returns/cost of capital. Thus, one means of increasing firm value is to reduce the spread by reducing information asymmetry, all else constant. Thus, effective corporate governance may lead to lower levels of information asymmetry, thus increasing value.

I deliberately choose to use a microstructure-based measure of information asymmetry for this study, as opposed to more traditional measures of the presence of information asymmetry, such as the market-to-book ratio or research and development expenses. Although these latter measures are prevalent in the literature and readily available, their value may be limited in the context of this particular study. While these corporate finance variables are indeed likely to be proxies for the information environment, as demonstrated by their frequent use in the literature, they may also measure other unrelated factors that make them undesirable for use in the current study. For example, if effective corporate governance leads to reduced information

asymmetry, as I posit, then a negative relation would be expected between variables measuring good governance and the microstructure-based measure of information asymmetry, since it is designed to be a direct measure of such asymmetry. By contrast, even if the hypothesis regarding corporate governance and information asymmetry is correct, one would not necessarily expect that effective governance would be associated with lower investment in research and development or a lower market to book ratio.

To approach the issue from a slightly different angle, while these corporate finance variables (MTB, R&D) and microstructure variables both measure aspects of the state of the information environment of a firm, the corporate finance variables capture the inherent level of information asymmetry, gross of any impact of corporate governance on information asymmetry, while microstructure variables convey the realized asymmetric information level net of the impact of corporate governance (or of any other means to reduce information asymmetry). Since the objective of this essay is to examine the impact of corporate governance on the level of information asymmetry between the firm and investors, I believe that market microstructure measures, capturing both inherent information asymmetry as well as the effect of efforts to control such asymmetry, are the appropriate measures of information asymmetry for this study.

4.3.3.1 Board Independence and Information Asymmetry

The Hermalin and Weisbach (2003) survey paper finds no connection between board composition and either firm value or firm performance. However, in order for outside directors to fulfill their fiduciary obligations to shareholders, and to enhance their reputation as valuable directors (Fama and Jensen (1983)), I argue that they have incentives to reduce information asymmetries between shareholders and management. Although in sum, no direct relationship between firm value and board independence has been shown empirically, theory indicates the

monitoring role of outside directors should be associated with reduced levels of information asymmetry between the management and the investor, raising firm value. Further, the work of Bhojraj and Sengupta (2003) as well as Anderson, Mansi and Reeb (2004) suggests an increase in the concentration of independent directors leads to lower cost of debt due, in part, to the monitoring actions of independent directors. Therefore, I hypothesize that levels of information asymmetry are negatively related to the proportion of independent directors on a firm's board.

4.3.3.3 Institutional Ownership and Information Asymmetry

Institutional owners, such as pension plans and insurance companies, have moved from the fringe to the forefront over time. In the period between 1980 and 1996, institutional holdings doubled (Gompers and Metrick (2001)). Shleifer and Vishny (1986) argue that institutions holding large positions in a firm's stock have incentives to actively monitor a firm's actions. As long term investors[2], large institutions have used their sheer size to become a much more actively involved shareholder advocacy group than in the past. Institutional owners advocate for shareholders, in part, through their demand for more and better information. Bushee and Noe (2000) as well as Healy, Hutton and Palepu (1999), find evidence that institutions are more interested in purchasing equity in firms with sustained disclosure requirements. It would seem plausible that these institutions would work to maintain or improve the disclosure requirements of firms whose shares they own. Ajinkya, Bhojraj and Sengupta (2005) suggest that brokerage firms cater to institutional owners by hosting investor conferences where firms reveal information to institutional owners regarding the prospects of their company. Further, Ajinkya, Bhojraj and Sengupta (2005) find empirical evidence that firms with greater institutional ownership are more likely to issue earnings forecasts. They also find that firms issuing earnings

---

[2] The California Public Employees' Retirement System (CalPERS) is reported to have an average holding period of 6 to 10 years. (http://www.corpgov.net/forums/commentary/ending.html)

forecasts are more likely to revise them more frequently as institutional ownership rises. Lastly, Bhojraj and Sengupta (2003) find corporate bond yields decrease in institutional ownership while bond ratings rise. This is consistent with institutional ownership working as a corporate governance mechanism to reduce information asymmetry. Together, findings of prior work are consistent with the hypothesis of institutional investors' interest in reducing information asymmetry between investors and the firm.

4.3.3.4 Inside Ownership and Information Asymmetry

Jensen and Meckling (1976) offer managerial equity ownership as a partial solution for the agency issue between managers and shareholders by aligning the interests of both parties. As discussed in section 4.2.3.1, McConnell and Servaes (1990) find a non-monotonic relationship between ownership and firm performance, as measured by Tobin's Q. Increased ownership by insiders at levels up to between 40 and 50% resulted in a rise in Q, while Q fell at higher levels. Consistent with McConnell and Servaes (1990), it is hypothesized that insiders will seek to mitigate information asymmetries as their ownership stake rises, further enhancing value, with decreasing marginal effects.

4.3.4   The Impact of Information Asymmetry on Corporate Governance Mechanisms

The structure of our equation system assumes endogeneity among governance variables and information asymmetry. This essay's analysis of the impact of corporate governance mechanisms on direct measures of information asymmetry is a new contribution to the literature. Some previous work already exists investigating the impact of information asymmetry on corporate governance mechanisms, although it has used traditional corporate finance proxies for information asymmetry rather than direct microstructure-based measures of such asymmetry.

The theory and expected impact of information asymmetry on corporate governance mechanisms is discussed below.

4.3.4.1 Information Asymmetry and Board Independence

As discussed above, Hermalin and Weisbach (2003) survey the literature on the impact of boards on firm value and find little conclusive evidence of the independence of boards impacting firm value. However, theory and empirical evidence shows that perhaps a single "appropriate" board structure may not exist. Different firms have different needs most appropriately addressed by different board structures. Theoretical models proposed by Maug (1997) and Raheja (2005) show that information asymmetry impacts the effectiveness of independent directors in their monitoring role. Specifically, they note that the marginal cost of gaining information is the key component in the decision process by which independent directors choose whether or not to become fully informed, and thus, more effective monitors. This indicates that firms with a high degree of inherent information asymmetry, whose independent directors incur high costs to gain information about the firm, may prefer a more efficient method of monitoring management actions than the use of independent directors. In contrast, monitoring by independent directors would be less costly and more effective in firms with low levels of inherent information asymmetry. Linck, Netter and Yang (2006) empirically examine this issue. They proxy for information asymmetry using market-to-book ratio, R&D spending and standard deviation of stock return. Their findings are consistent with information asymmetry leading to a smaller proportion of independent directors. I expect that the market microstructure measure of information asymmetry will also be negatively related to the degree of board independence.

4.3.4.3 Information Asymmetry and Inside Ownership

There is no theory, to the best of my knowledge, from which to develop a hypothesis regarding the impact of information asymmetry on the level of inside ownership. For completeness, the variable is included in this equation of the system.

4.3.4.4 Information Asymmetry and Institutional Ownership

Bushee and Noe (2000) state that "one commonly cited benefit of disclosure is that, by mitigating information asymmetry, it reduces the magnitude of periodic surprises about a firm's performance and makes its stock price less volatile" (p.177). Standard portfolio theory would state that institutional owners, like all owners, would base their decision to purchase a firm's equity based on the risk/return profile of the stock. However, work by Eakins, Stansell and Below (1996) finds that institutions are interested in pursuing stocks with lower standard deviation, skewness and kurtosis of returns. Given the use of standard deviation of return as a proxy for information asymmetry in the board determinants literature, one interpretation of their findings may be that institutions are interested in firms with lower degrees of information asymmetry. Bushee and Noe (2000) find that firms with higher disclosure rankings (as ranked by the Association for Investment and Management Research (AIMR)) have higher levels of institutional ownership. Further, they find that positive changes in AIMR disclosure rankings are associated with increased holdings by some subsets of institutional owners. Based on previous empirical work linking disclosure, volatility and institutional ownership, I hypothesize that information asymmetry will have a negative relationship with institutional ownership levels.

4.3.4.5 Governance Mechanisms' Effects on Each Other

In addition to examining the impacts of governance mechanisms on information asymmetry and the impacts of information asymmetry on governance mechanisms, it is

important to examine the impact of the use of each governance mechanism on the use of other governance mechanisms.

When seeking to mitigate agency conflicts, Jensen and Meckling (1976) argue that managerial ownership will more closely align the interests of shareholders and managers. Managers, in effect, will become their own monitors when making decisions affecting shareholder wealth because they themselves are shareholders. Theoretically, desired behavior by shareholders and actual behavior by managers should converge as managerial ownership increases. Likewise, as mentioned above, one of the roles of the independent director is the monitoring of management. Since both of these functions work to achieve the same ends, it is plausible that they are substitutes for each other. Work by Booth, Cornett and Tehranian (2002) finds evidence that inside ownership and board independence are substitute monitoring mechanisms.

As discussed in the literature review, Agrawal and Knoeber (1996) examine corporate governance mechanisms. They hypothesize that different governance mechanisms may be substitutes for each other or complements to each other. While Agrawal and Knoeber (1996) found no significant relations among the governance variables examined here, Beiner, Drobetz, Schmid and Zimmerman (2006) do find a negative relationship between insider ownership and board independence, indicative of a possible substitution relationship.

Institutional ownership differs from inside ownership and board independence in that it is not determined internally. Therefore, it is reasonable to assume that institutions construct their portfolios in such a way to maximize the value of the institution, not necessarily in such a way to maximize the value of the individual firms in which they hold shares. Because of this distinction from inside ownership and board independence, we cannot assume that institutions will structure

their own ownership share optimally with other, firm-chosen, governance structures. For this reason, it is potentially interesting to explore this data but not appropriate to formulate hypotheses.

4.3.5 Other Control Variables

In addition to the variables of interest discussed in the previous sections outlining the primary hypotheses of the essay, control variables are used in each equation of the system based on prior literature.

4.3.5.1 Controls - Information Asymmetry Equation

Beyond the variables of interest that enter into equation one, there are several control variables included based on theory and prior work.

Volume

Tinic and West (1972) explain that the level of market maker intervention declines in volume, as relatively high levels of buy and sell orders will mitigate the need for the market maker to take significant, persistent long or short positions in the stock for which they make the market. Higher volume implies large numbers of buyers and sellers in the market, with each side having less reason to believe they should restrict trading based on information they believe others to have. Further, lack of trading activity indicates new information (Jakob and Kalay (2001)). For these reasons, information asymmetry is predicted to decrease in volume.

Price

Benston and Hagerman (1974) find evidence that the absolute amount of the spread increases at a decreasing rate in share price. This is consistent with the hypothesis that the order processing component of spread is relatively fixed on a per share basis. Based on this evidence, spread, as a percentage of stock price, and information asymmetry, a component of the spread is

hypothesized to decline in share price. Price is measured using the average trading price of the firm over the sample period.

Volatility

Stoll (1978) explores the determinants of spread and finds that the magnitude of the bid-ask spread is positively related to the return volatility of the stock. Since market makers may be forced to hold suboptimal levels of inventory in a stock, the degree of volatility in returns increases the inventory risk. Further, volatility has been shown to increase around such informational events as earnings announcements (Kavajecz and Odders-White (2001)), seasoned equity offerings (Ho, Lee, Lin and Wang (2005)) and dividend cuts (Acker (1999)). Based on this work, information asymmetry is predicted to increase in volatility of the stock return.

Size

Wei, Hsieh and Sirmans (1995) demonstrate through their evaluation of REIT's that larger firms tend to be closely watched by institutional investors and analysts, leading to a smaller degree of information asymmetry for larger firms. Information asymmetry is predicted to decrease in firm size.

Exchange

There are inherent differences between the NASDAQ, NYSE and AMEX. Kleidon and Willig (1996) state that the limited ability for any one NASDAQ market maker to see the complete order flow of a stock leaves him or her more open to exploitation by an informed trader. Further, asymmetric information is more likely to arise in less actively traded stocks (Easley, Kiefer, O'Hara and Paperman (1996)). The less actively traded firms tend to be smaller. These are the firms more likely to be traded on the NASDAQ and AMEX. Therefore,

information asymmetry levels are expected to be lower for firms traded on the NYSE, compared to those firms traded on NASDAQ or AMEX.

Year Dummies

Year dummies are included to control for any latent environmental changes occurring through time that are not captured through other control variables. No predictions of sign are offered on these variables.

SIC Dummies

Two-digit SIC code dummy variables are included to control for industry-specific effects. No predictions of signs are offered on these variables.

4.3.5.2 Control Variables – Board Independence Equation

Monitoring and Advising Benefits

Independent directors on a firm's board serve the functions of expert advisor and monitor (Fama and Jensen (1983)). Firms whose operations are more complex, such as those which are geographically diverse across different lines of business may optimally employ more directors, particularly independent directors. Linck, Netter and Yang (2006) refer to this as their *scope of operations hypothesis.* Further, firms whose structure allows for greater extraction of private benefits for managers are more likely to benefit from the monitoring role of independent directors. Thus, more complex firms and those likely to be conducive to managerial rent extraction will more likely have more directors, with both groups also being more likely to have a greater proportion of independent directors. Complexity is proxied by firm size and the proportion of debt in the firm's capital structure. The opportunity to extract rents is proxied by free cash flow per Jensen (1986).

Growth Opportunities

Growth firms benefit from nimbleness in decision-making. Firms may realize greater costs than benefits from taking the time to fully inform outside directors of decisions and the rationale behind them (Linck, Netter and Yang (2006)). Growth opportunities are proxied for with the market-to-book ratio. Board independence is expected to decrease in market-to-book.

Bargaining Power

Linck, Netter and Yang (2006) also look to the work of Hermalin and Weisbach (1998) which states that board independence is a product of a bargaining process between the CEO and the board. Hermalin and Weisbach (1998) predict an increase in board independence following a period of poor performance. Since poor performance may reflect badly on the CEO, the CEO may be given less discretion by the board to appoint inside directors, those most likely to be loyal to the CEO. In other words, board composition following poor performance is predicted to be attenuated. Linck, Netter and Yang (2006) use average industry-adjusted return on assets over the previous two years as a proxy for past performance. Board independence is expected to decrease in past performance.

4.3.5.3 Control Variables – Institutional Ownership

Aggarwal and Rao (1990) hypothesize that firms held by institutions have more informational releases, fewer errors and fewer surprises. They test the hypothesis by examining higher moments of stock returns (variance, skewness, and kurtosis) and find an inverse relationship between higher moments and institutional ownership. Eakins, Stansell and Below (1996) add to the work of Aggarwal and Rao (1990) and find a positive relationship between institutional ownership and lagged beta and a negative relationship between institutional ownership and lagged return standard deviation, skewness and kurtosis when controlling for size

and primary exchange. Thus, size, exchange, lagged beta and lagged higher moments are used as independent variables to model institutional ownership in the empirical analysis.

4.3.5.4 Control Variables – Inside Ownership

Cho (1998) forms the basis of the choice of inside ownership control variables. Cho (1998) hypothesizes that managerial wealth constraints and risk aversion may limit how large of a proportion of stock a manager will be able to hold as well as whether or not the manager would want to hold it. This implies a low level of ownership in large firms, proxied with market value of equity. Next, Tobin's Q and free cash flow are used to measure corporate value and investment opportunities. Cho (1998) argues that managers of firms with favorable prospects may require a greater percentage of equity compensation with the expectation that the value of the firm will continue to rise in the wake of positive firm performance. Therefore, inside ownership is expected to increase in Tobin's Q. Lastly, volatility of stock returns is measured. Volatility may contribute to managerial risk aversion, making inside ownership less attractive.

4.4   Description of the Sample

The baseline sample of firms begins with all firms contained in the "directors" file of the Investor Responsibility Research Center, Inc. (IRRC) database in the year 2000. Director data from the same firms are pulled for years 1998 and 1996, resulting in a three period panel. Institutional and insider ownership data are pulled from Thomson Financial Ownership database for the same years. Information asymmetry measures are derived from data drawn from the NYSE Trade and Quote (TAQ) database. Control and instrumental variables are pulled from Center for Research in Security Prices (CRSP), CRSP/Compustat merged database, and TAQ.

In order to remain in the sample, the initial set of 1,446 firms must have remained in the dataset for the three years of the panel. Additionally, data for control and instrumental variables need to be available for all years. This results in a final sample of 2,486 firm-years for the three year panel. The necessity of data from many sources combined with starting with IRRC data leads to a bias towards large firms. The mean market value of equity of sample firms is $7.7 billion while the mean MVE for all Compustat covered firms during the three period sample is $1.8 billion. This bias makes it necessary to interpret the results with caution and avoid generalization of results to firms of all sizes.

4.5   Methodology

The primary econometric approach used in this essay is the estimation of a system of simultaneous equations using two stage least squares (2SLS) regression. Much of the extant work relating corporate governance "choices" such as board size and board independence to factors such as firm performance may mention endogeneity as an acknowledged problem but do little to deal with the problem. Endogeneity in this context refers to the joint determination of governance characteristics and the information environment. If it is true that exogenous factors, such as regulation, the state of product markets, etc. determine optimal governance structures, any relation between individual governance characteristics and value, or in the case of the dissertation, information asymmetry, may be spurious (Coles, Lemmon and Meschke (2003)). In this case, one method to deal with the endogeneity is through a simultaneous equations framework using two stage least squares regression. Here, we model the governance characteristics we suspect of being endogenously determined with instruments correlated with the governance characteristic but uncorrelated with the error term. Those estimated values are

then used as instruments in the structural equations relating information asymmetry and governance characteristics.

This two stage least squares methodology yields the following system of equations estimated in this chapter:

$$IA_i = \alpha_0 + \beta_1*\text{Board Independence}_i + \beta_2*\text{Institutional Ownership}_i + \beta_3*\text{Insider Ownership}_i + \beta_4*\text{Insider Ownership}^2_i + \beta_5*MVE_i + \beta_6*\text{Volume}_i + \beta_7*\text{Price}_i + \beta_8*\text{Midpoint Variance}_i + \beta_9*\text{Year1998}_i + \beta_{10}*\text{Year2000}_i + \beta_{11}*NYSE_i + \beta_{12}*NASDAQ_i + \varepsilon_i$$
Eq. (1)

$$\text{Board Independence}_i = \lambda_0 + \zeta_1*IA_i + \zeta_2*\text{Insider Ownership}_i + \zeta_3*\text{Institutional Ownership}_i + \zeta_4*\text{Leverage}_i + \zeta_5*MVE_i + \zeta_6*MTB_i + \zeta_7*\text{Free Cash Flow}_i + \zeta_8*\text{Performance}_i + \zeta_9*\text{Year1998}_i + \zeta_{10}*\text{Year2000}_i + \zeta_{11}*AMEX_i + \zeta_{12}*NYSE_i + \varepsilon_i$$
Eq. (2)

$$\text{Institutional Ownership}_i = \delta_0 + \theta_1*IA_i + \theta_2*\text{Insider Ownership}_i + \theta_3*\text{Board Independence}_i + \theta_4*MVE_i + \theta_5*LSTDDEV_i + \theta_6*LSkewness_i + \theta_7*LKurtosis_i + \theta_8*LReturns_i + \theta_9*LBeta_i + \theta_{10}*\text{Year1998}_i + \theta_{11}*\text{Year2000}_i + \theta_{12}*NYSE_i + \theta_{13}*AMEX_i + \varepsilon_i$$
Eq. (3)

$$\text{Inside Ownership}_i = \gamma_0 + \xi_1*IA_i + \xi_2*\text{Board Independence}_i + \xi_3*\text{Institutional Ownership}_i + \xi_4*MVE_i + \xi_5*\text{Free Cash Flow}_i + \xi_6*STDDEV_i + \xi_7*\text{Tobin's Q}_i + \xi_8*MTB_i + \xi_9*\text{Year1998}_i + \xi_{10}*\text{Year2000}_i + \xi_{11}*NYSE_i + \xi_{12}*AMEX_i + \varepsilon_i$$
Eq. (4)

Where,

IA_i = GKN Measure of Information Asymmetry

Board Independence_i = Proportion of board seats held by independent directors

Insider Ownership_i = Proportion of shares outstanding held by officers and directors of the firm

Institutional Ownership_i = Proportion of shares outstanding held by 13f institutions

MVE_i = natural log of market value of equity

Volume$_i$ = natural log of average daily trading volume of firm common stock

Price$_i$ = natural log of average trading price per share of firm common stock

Midpoint Variance$_i$ = natural log of variance of firm common stock share price midpoint

MTB$_i$ = market to book ratio

LSTDDEV$_i$ = one year lagged standard deviation of daily returns

LSkewness$_i$ = one year lagged skewness of daily returns

LKurtosis$_i$ = one year lagged kurtosis of daily returns

Performance$_i$ = average industry adjusted return on equity over the previous three years

LReturns$_i$ = one year lagged average daily returns

LBeta$_i$ = one year lagged CAPM Beta

STDDEV$_i$ = standard deviation of monthly returns

In addition to a simultaneous equation system, the information asymmetry equation will be run in isolation using lagged values of the governance variables as instruments for governance variables. The use of lags as an approach to handling endogeneity has been used in other governance work, such as Hermalin and Weisbach (1998) and Bhagat and Black (2002).

4.6   Results

4.6.1   Summary Statistics and Correlation Coefficients

4.6.1.1   Summary Statistics

Table 6 displays summary statistics from variables used in the second stage equation in the two stage least squares (2SLS) framework.

4.6.1.2   Correlation Coefficients

Pearson correlation coefficients for selected variables are presented in Table 7. Market value of equity has strong positive correlations with trading volume and share price. Intuitively, we would expect larger companies to trade more often and perhaps to carry a higher per-share price. Overall, there is little worry about multicollinearlity adversely affecting the primary results.

4.6.2   Regression Analysis – Simultaneous Equation System

Regression analysis is used to test the hypotheses described in the section 4.4. A simultaneous equations framework using two stage least squares (2SLS) estimation is the primary methodology used in order to address endogeneity of the primary variables of interest. First stage equations model corporate governance mechanisms based on determinants exogenous to the system. Predicted values are then used as instruments for the corporate governance variables in the second stage equation modeling information asymmetry. The use of a 2SLS estimation methodology to simultaneously model the effects of governance mechanisms on each other has been used in Agrawal and Knoeber (1996), and Beiner, Drobetz, Schmid and Zimmerman (2006). Further, Agrawal and Knoeber (1996) include an equation in their system to model the effects of governance mechanisms on firm performance.

The GKN measure is used to measure the amount of information asymmetry present.[3,4] Table 8 is used to report the results of the system estimation.

---

[3] Coefficients were also estimated using the Lin, Sanger and Booth (1995) (LSB) method. Results from the system estimated using the LSB measurement of information asymmetry yielded strange results, contrary both to expectations and to the results yielded with GKN both in this chapter and in Chapter 3. After attempting to find an explanation to this through censoring, windsorizing, and individual outlier analysis, a plausible explanation for the results could not be found. Based on the consistency found between the GKN measures in Chapters 3 and 4 and given the unexplained inconsistency between the LSB measures, only GKN seems appropriate to report here.
[4] Estimates from the first stage equations are available upon request from the author.

4.6.2.1   Results – Information Asymmetry Equation

Positive values for coefficient estimates in column one of table 8 indicate a positive association between that variable and the firm exhibiting a higher level of realized information asymmetry as measured with the GKN specification.

4.6.2.1.1   Governance Variables

The positive coefficient on board independence indicates that the addition of independent board members is associated with an increase in information asymmetry. This is inconsistent with our hypothesis suggesting that independent board members are associated with increased monitoring of management and reducing the amount of "information risk" suggested by Bhojraj and Sengupta (2003). It is possible that the favorable impact that Bhojraj and Sengupta (2003) find independent directors have on the cost of debt may come predominantly from a reduction in "agency risk." The negative coefficient on institutional ownership is consistent with large shareholders having incentives to actively monitor firm actions and promote corporate disclosure (Shleifer and Vishny (1986); Ajinkya, Bhojraj and Sengupta (2005)). Therefore, the result is consistent with the hypothesis that institutional owners have incentives to reduce levels of information asymmetry. The coefficient on insider ownership is insignificant, while the coefficient on insider ownership squared is positive and significant. While McConnell and Servaes (1990) and Morck, Shleifer and Vishny (1988) show a non-linear relationship between insider ownership and value, our results of the impact of insider ownership on information asymmetry do not follow. Additional specifications (not reported) involving piecewise regression (Morck, Shleifer and Vishny (1988)) as well as a simple linear relationship between insider ownership and information asymmetry did not yield significant results.

4.6.2.1.2   Control Variables – Information Asymmetry Equation

As predicted, the coefficient on price is significant and negatively related to information asymmetry, consistent with evidence suggesting spread (and its components) decline in price. The coefficient on the variance of stock price midpoint variable is positive and significant, consistent with the finding of Stoll (1978), stating the magnitude of the spread increases in the volatility of stock returns and with the empirical findings of Flannery, Kwan and Nimalendran (2004), who find that the information asymmetry component of spread is increasing in volatility in their sample. The coefficients on the year 1998 and year 2000 dummies are negative and significant (Year 1996 omitted), suggesting that overall levels of information asymmetry have decreased over time. This could be suggestive of increasing disclosure requirements as well as increasing voluntary disclosure taking place over the sample period. Both the NYSE and AMEX variables show coefficients that are negative and significant. The NYSE result is consistent with these firms being more actively traded, yielding a greater flow of information (Easley, Kiefer, O'Hara and Paperman (1996)). Coefficients on trading volume and firm size are insignificant.

4.6.2.2   Results – Board Independence Equation

Positive values for coefficient estimates in the board independence equation (Table 8, Column 2) indicate a positive relationship between that variable and the proportion of the board seats held by independent directors.

4.6.2.2.1   Variables of Interest

The coefficient on the information asymmetry variable is negative and significant. This result is consistent with the results of Linck, Netter and Yang (2006), who rely on the theory of Maug (1997) and Raheja (2005), stating that firms with high levels of information asymmetry

are likely to incur high costs of monitoring. This inherent asymmetry may make it relatively inefficient to employ independent directors, who will incur high marginal costs of gaining information to properly monitor the firm. The coefficient on insider ownership is negative and significant, consistent with the hypothesis of substitutability among governance mechanisms. This is inconsistent with Agrawal and Knoeber (1996), who find no relation between governance mechanisms, but consistent with Beiner, Drobetz, Schmid and Zimmerman (2006), who find a negative relationship between board independence and insider ownership, which they deem as evidence of substitution effects among governance mechanisms. Institutional ownership is negative and marginally insignificant, with a p-value of 0.1044. Though not significant, the negative sign is consistent with the notion of the substitutability among governance mechanisms.

4.6.2.2.2   Control Variables

All other control variables have statistically insignificant coefficients with the exception of size, which is negative and significant. The negative sign is in conflict with our hypothesis and with the results of Linck, Netter and Yang (2006). However, when the parameters were estimated using OLS for the board independence equation only, the coefficient on firm size was negative and significant, consistent with Linck, Netter and Yang (2006).

4.6.2.3   Results – Institutional Ownership Equation

Positive values for coefficient estimates in Table 8, Column 3 indicate a positive association between that variable and the proportion of shares outstanding held be 13f institutions.

4.6.2.3.1   Variables of Interest

The coefficient on information asymmetry is negative and significant. This may be interpreted as firms exhibiting low levels of information asymmetry being attractive to

institutional owners.   This is consistent with the work of Bushee and Noe (2000) and Healy, Hutton and Palepu (1999), who find evidence suggesting institutions are more interested in investing in firms with sustained disclosure requirements.

4.6.2.3.2   Other Variables – Institutional Ownership

As discussed in the hypothesis development section, institutional ownership is an externally determined governance mechanism.   The primary objective of the institution is to maximize the value of the institution, not to maximize the value of the individual firms in which they invest.   Therefore, no expectation exists that institutional ownership will be structured optimally with board independence or insider ownership.   Both inside ownership and board independence are negatively related to institutional ownership.   Firm size is negatively related to the proportion of shares held by institutions.   This is inconsistent with expectations. All other control variables were found to be statistically insignificant.

4.6.2.4   Results – Inside Ownership Equation

Positive values for coefficient estimates in Table 8, Column 4 indicate a positive association between that variable and the proportion of shares outstanding held by officers and directors of the firm.

4.6.2.4.1   Variables of Interest – Inside Ownership Equation

The coefficient on board independence is negative and significant.   As in the board independence equation, this result is consistent with the substitutability of governance mechanisms (Beiner, Drobetz, Schmid and Zimmerman (2006)).   The coefficient on institutional ownership is insignificant, which is consistent with Agrawal and Knoeber (1996), who find no relation between governance mechanisms, but inconsistent with Beiner, Drobetz, Schmid and Zimmerman (2006), who find a negative relation between inside ownership and board

independence, evidence consistent with the existence of substitution effects among governance mechanisms.

4.6.2.4.2   Other Variables – Inside Ownership Equation

All control variables in the inside ownership equation are insignificant, with the exception of free cash flow, which is positive and significant, consistent with the hypothesis put forth by Cho (1998), stating that inside ownership is increasing in investment opportunities.

4.6.2.5   Regression Analysis – Lagged Endogenous Variables

In addition to the simultaneous equation system, the information asymmetry equation is estimated using lagged values of governance variables as instruments for the contemporaneous values of the governance variables. This approach follows previous empirical work (Bhagat and Black (2002), Hermalin and Weisbach (1998)) and increases the probability that the governance variables are predetermined, thus exogenous to the system.

4.6.2.5.1   Variables of interest

Results from the regression equation are reported in Table 9. The coefficient on institutional ownership is negative and significant, again consistent with large shareholders having incentives to actively monitor firm actions and promote corporate disclosure (Shleifer and Vishny (1986); Ajinkya, Bhojraj and Sengupta (2005)). Therefore, it the result is consistent with the hypothesis that institutional owners having incentives to reduce levels of information asymmetry. Coefficients on inside ownership and board independence are insignificant.

4.6.2.5.2   Control Variables

The coefficient on volume is negative and significant, consistent with higher volume being associated with a greater flow of information. Price shows a negative coefficient, consistent with Benston and Hagerman (1974). The coefficient on the volatility measure is

positive and significant, consistent with Flannery, Kwan and Nimalendran (2004) and Stoll (1978). Coefficients on both NYSE and AMEX are negative and significant (NASDAQ is the excluded variable), consistent with firms traded on NYSE and AMEX tending to be more actively traded firms with greater information flow. Finally, the coefficient on the size variable is positive and significant, contrary to the hypothesis.

4.6.3   *Conclusion*

In summary, the primary focus of the econometric analysis was to uncover the impact of corporate governance mechanisms on information asymmetry in a simultaneous equations framework. In addition, the study looks at the impact of information asymmetry on corporate governance structures as well as the impact of corporate governance structures on each other. The results support some of the hypotheses. Evidence suggests that higher levels of institutional ownership are associated with lower levels of information asymmetry. Further, information asymmetry levels appear to have decreased over time, and consistent with expectations, the degree of information asymmetry of firms traded on the New York Stock Exchange is lower than that of firms traded on NASDAQ. Information asymmetry also has an impact on firms' governance structures. Consistent with expectations, greater information asymmetry appears to contribute to decreased board independence and lower levels of institutional holdings. Finally, firms' choices in one dimension of governance structure seem to have impacts on other dimensions. Namely, board independence decreases in the face of increased insider ownership. The reverse also holds, consistent with the argument of substitutability of governance mechanisms. Lastly, using lagged endogenous variables to serve as instruments for the governance variables resulted in qualitatively similar results when estimating information asymmetry equation.

4.7   Conclusion

This chapter of the dissertation examines the relationships that exist between corporate governance structures and information asymmetry. First, the extant literature is discussed. Next, using a three-period sample of firms found in the Investor Responsibility Research Center, Inc. database, a system of simultaneous equations is developed and tested to determine the impact of governance mechanisms on information asymmetry, the impact of information asymmetry on governance mechanisms and the impact of governance mechanisms on other governance mechanisms. This section reviews the study's contribution to the literature, the key findings of the study, and suggests limitations and future directions of the research.

4.7.1   Contribution to the Literature

This paper is the first to my knowledge to directly test the impact of corporate governance mechanisms on an explicit measure of information asymmetry. Previous work has suggested that the link between governance and performance, value, debt ratings, and debt yields may be due to the ability of governance mechanisms to reduce the level of information asymmetry between managers and investors. However, previous work has tested for the impact of information asymmetry indirectly, at best. Further, the structure of the tests in an endogenous framework (2SLS) allows for the testing of the impact of information asymmetry on corporate governance structure. Through these tests, the study contributes to the emerging governance determinants literature.

4.7.2   Key Findings

The findings suggest that higher levels of institutional ownership are associated with lower levels of information asymmetry. Further, information asymmetry levels appear to have

decreased over time, and consistent with expectations, the degree of information asymmetry of firms traded on the New York Stock Exchange is lower than that of firms traded on NASDAQ. Information asymmetry also has an impact on firms' governance structures. Consistent with expectations, greater information asymmetry appears to contribute to reduced board independence, and lower levels of institutional holdings. Firm choices for one governance mechanism can have impacts on the choice of other mechanisms. Specifically, board independence decreases in the face of increased insider ownership, while a decrease in insider ownership is associated with an increase in board independence. This is consistent with the hypothesis that governance mechanisms can act as substitutes for each other.

4.7.3   *Limitations of the Study and Opportunities for Future Research*

The current study looks at firms drawn from the IRRC database. As mentioned earlier, these firms tend to be significantly larger than the median firm. This does not allow for the generalization of findings across firms in general. Further, the problem of endogeneity is not resolved with the use of a simultaneous equation system and lags. The tactics used are simply methods with which to try to address endogeneity.

One possibility for an extension of this study involves the exploration of the impact of Sarbanes-Oxley. It would be potentially interesting to explore the absolute levels of information asymmetry, as well as the relative importance of governance structures in lowering information asymmetry, in a pre-SOX and post-SOX world.

References:

Acker, Daniella, 1999, Stock Return Volatility and Dividend Announcements, *Review of Quantitative Finance and Accounting* 12, 221-42.

Affleck-Graves, John, Carolyn M. Callahan, and Niranjan Chipalkatti, 2002, Earnings Predictability, Information Asymmetry, and Market Liquidity, *Journal of Accounting Research* 40, 561-83.

Aggarwal, R., and R.P. Rao, 1990, Institutional Ownership and Distribution of Equity Returns, *The Financial Review* 25, 211-229.

Agrawal, Anup, and Charles Knoeber, R, 1996, Firm Performance and Mechanisms to Control Agency Problems between Managers and Shareholders, *Journal of Financial and Quantitative Analysis* 32, 377-397.

Agrawal, Anup, and Charles R. Knoeber, 1996, Firm Performance and Mechanisms to Control Agency Problems between Managers and Shareholders, *Journal of Finance and Quantitative Analysis* 32, 377-397.

Ajinkya, Bipin, Sanjeev Bhojraj, and Partha Sengupta, 2005, The Association between Outside Directors, Institutional Investors and the Properties of Management Earnings Forecasts, *Journal of Accounting Research* 43, 343-76.

Akhigbe, Aigbe, Stephen F. Borde, and Jeff Madura, 1993, Dividend Policy and Signaling by Insurance Companies, *Journal of Risk and Insurance* 60, 413-428.

Akhigbe, Aigbe, Stephen F. Borde, and Jeff Madura, 1997, Valuation Effects of Insurers' Security Offerings, *Journal of Risk and Insurance* 64, 115-137.

Akhigbe, Aigbe, and Anna D. Martin, 2006, Valuation Impact of Sarbanes-Oxley: Evidence from Disclosure and Governance within the Financial Services Industry, *Journal of Banking and Finance* 30, 989-1006.

Amihud, Yakov, and Haim Mendelson, 1986, Asset pricing and the bid-ask spread, *Journal of Financial Economics* 17, 223-249.

Anderson, Ronald C., Sattar A. Mansi, and David M. Reeb, 2004, Board characteristics, accounting report integrity, and the cost of debt, *Journal of Accounting and Economics* 37, 315-342.

Ashbaugh, Hollis, Daniel W. Collins, and Ryan LaFond, 2004, Corporate Governance and the Cost of Equity Capital, *Working Paper*.

Bartov, Eli, and Gordon M. Bodnar, 1996, Alternative Accounting Methods, Information Asymmetry and Liquidity: Theory and Evidence, *Accounting Review* 71, 397-418.

Bathala, Chenchuramaiah T., Kenneth P. Moon, and Ramesh P. Rao, 1994, Managerial Ownership, Debt Policy, and the Impact of Institutional Holdings: An Agency Perspective, *Financial Management v23*.

Beiner, Stefan, Wolfgang Drobetz, Markus M. Schmid, and Heinz Zimmerman, 2006, An Integrated Framework of Corporate Governance and Firm Valuation, *European Financial Management* 12, 249-283.

Benston, George J., and Robert L. Hagerman, 1974, Determinants of bid-asked spreads in the over-the-counter market, *Journal of Financial Economics* 1, 353-364.

Best, A.M., 1998. *Best's Holding Company Guide - GAAP - United States* (A.M. Best Co., Inc., Oldwick, NJ).

Bhagat, Sanjai, and Bernard Black, 2002, The Non-Correlation Between Board Independence and Long-Term Firm Performance, *Journal of Corporation Law* 27, 231-273.

Bhojraj, Sanjeev, and Partha Sengupta, 2003, Effect of Corporate Governance on Bond Ratings and Yields: The Role of Institutional Investors and Outside Directors, *Journal of Business* 76, 455-75.

Bhojraj, Sanjeev, and Partha Sengupta, 2003, Effect of Corporate Governance on Bond Ratings and Yields: The Role of Institutional Investors and Outside Directors, *Journal of Business* 76, 455-475.

Boone, Audra Leigh, Laura Casares Field, Jonathan M. Karpoff, and Charu G. Raheja, 2006, The Determinants of Corporate Board Size and Composition: An Empirical Analysis, *Working Paper*.

Booth, James R., Marcia Millon Cornett, and Hassan Tehranian, 2002, Boards of directors, ownership, and regulation, *Journal of Banking & Finance* 26, 1973-1996.

Botosan, Christine A., 1997, Disclosure Level and the Cost of Equity Capital, *Accounting Review* 72, 323-349.

Brickley, James A., Jeffrey L. Coles, and Rory L. Terry, 1994, Outside directors and the adoption of poison pills, *Journal of Financial Economics* 35, 371-390.

Brickley, James A., Ronald C. Lease, and Jr. Smith, Clifford W., 1988, Ownership structure and voting on antitakeover amendments, *Journal of Financial Economics* 20, 267-291.

Brous, Peter A., and Omesh Kini, 1994, The Valuation Effects of Equity Issues and the Level of Institutional Ownership: Evidence from Analysts' Earnings Forecasts, *Financial Management* 23, 33-46.

Bushee, Brian J., and Christopher F. Noe, 2000, Corporate Disclosure Practices, Institutional Investors, and Stock Return Volatility, *Journal of Accounting Research* 38, 171-202.

Byrd, John W., and Kent A. Hickman, 1992, Do outside directors monitor managers? : Evidence from tender offer bids, *Journal of Financial Economics* 32, 195-221.

Carcello, J., and T. Neal, 2000, Audit Committee Composition and Auditor Reporting, *Accounting Review* 75, 453-467.

Cho, Myeong-Hyeon, 1998, Ownership structure, investment and the corporate value: an empirical analysis, *Journal of Financial Economics* 47, 103-121.

Chung, Kee H., and Mingsheng Li, 2003, Adverse-Selection Costs and the Probability of Information-Based Trading, *Financial Review* 38, 257-72.

Coles, J. L., Michael L. Lemmon, and J. Felix Meschke, 2006, Structural Models and Endogeneity in Corporate Finance: The Link Between Managerial Ownership and Corporate Performance, *Working Paper*.

Copeland, Thomas E., and Dan Galai, 1983, Information Effects on the Bid-Ask Spread, *Journal of Finance* 38, 1457-1469.

Cotter, James F., Anil Shivdasani, and Marc Zenner, 1997, Do independent directors enhance target shareholder wealth during tender offers?, *Journal of Financial Economics* 43, 195-218.

Demsetz, H., 1983, The Structure of Ownership and the Theory of the Firm, *Journal of Law and Economics* 26, 375-390.

Demsetz, H., and Kenneth Lehn, 1985, The Structure of Corporate Ownership: Causes and Consequences, *Journal of Political Economy* 93, 1155-1177.

Demsetz, H., and B. Villalonga, 2001, Ownership Structure and Corporate Performance, *Journal of Corporate Finance* 7, 209-233.

Demsetz, Harold, 1968), The Cost of Transacting, *The Quarterly Journal of Economics* 82, 33-53.

Diamond, Douglas W., and Robert E. Verrecchia, 1991, Disclosure, Liquidity, and the Cost of Capital, *Journal of Finance* 46, 1325-1359.

Downs, Anthony, 1957. *An Economic Theory of Democracy* (Harper & Row, New York).

Eakins, Stanley G., Stanley R. Stansell, and Scott D. Below, 1996, The determinants of institutional demand for common stock: Tests of the capm vs. individual stock attributes, *International Review of Financial Analysis* 5, 237-257.

Easley, D., S. Hvidkjaer, and M. O'Hara, 2002, Is Information Risk a Determinant of Asset Returns?, *Journal of Finance* 57, 2185-2221.

Easley, David, Nicholas M. Kiefer, Maureen O'Hara, and Joseph B. Paperman, 1996, Liquidity, Information and Infrequently Traded Stocks, *Journal of Finance* 51, 1405-1436.

Easley, David, and Maureen O'Hara, 2004, Information and the Cost of Capital, *J Finance* 59, 1553-1583.

Fama, Eugene F., 1980, Agency Problems and the Theory of the Firm, *The Journal of Political Economy* 88, 288-307.

Fama, Eugene, and Michael Jensen, 1983, Seperation of Ownership and Control, *Journal of Law and Economics* 26, 301-325.

Flannery, Mark J., Simon H. Kwan, and M. Nimalendran, 2004, Market evidence on the opaqueness of banking firms' assets, *Journal of Financial Economics* 71, 419-460.

George, Thomas J., Gautam Kaul, and M. Nimalendran, 1991, Estimation of the Bid-Ask Spread and its Components: A New Approach, *Review of Financial Studies* 4, 623-656.

Gillian, Stuart L., and Laura T. Starks, 2000, Corporate governance proposals and shareholder activism: the role of institutional investors, *Journal of Financial Economics* 57, 275-305.

Glosten, Lawrence R., and Paul R. Milgrom, 1985, Bid, ask and transaction prices in a specialist market with heterogeneously informed traders, *Journal of Financial Economics* 14, 71-100.

Gompers, Paul, and Andrew Metrick, 2001, Institutional Investors and Equity Prices, *Quarterly Journal of Economics* 116, 229-260.

Hartzell, Jay, and Laura Starks, 2003, Institutional Investors and Executive Compensation, *The Journal of Finance* 58, 2351-2373.

Hasbrouck, Joel, 1991, Measuring the Information Content of Stock Trades, *Journal of Finance* 46, 179-207.

Healy, P.M., A.P. Hutton, and K.G. Palepu, 1999, Stock Performance and Intermediation Changes Surrounding Sustained Increases in Disclosure, *Contemporary Accounting Research* 16, 485-520.

Hermalin, Benjamin E., and Michael S. Weisbach, 1991, The effects of board composition and direct incentives on firm performance., Financial Management (Financial Management Association).

Hermalin, Benjamin E., and Michael S. Weisbach, 1998, Endogenously Chosen Boards of Directors and Their Monitoring of the CEO, *American Economic Review* 88, 96-118.

Hermalin, Benjamin E., and Michael S. Weisbach, 2003, Boards of Directors as an Endogenously Determined Institution: A Survey of the Economic Literature, Economic

Policy Review (Federal Reserve Bank of New York) (Federal Reserve Bank of New York).

Ho, Chia-Cheng, Chin-Chuan Lee, Chien-Ting Lin, and C. Edward Wang, 2005, Liquidity, Volatility and Stock Price Adjustment: Evidence from Seasoned Equity Offerings in an Emerging Market, *Review of Pacific Basin Financial Markets and Policies* 8, 31-51.

Holderness, C., Randall S. Kroszner, and D. Sheehan, 1999, Were the Good Old Days that Good? Evolution of Managerial Stock Ownership and Corporate Governance since the Great Depression, *Journal of Finance* 54, 435-469.

Jakob, Keith, and Avner Kalay, 2001, Voluntary Lack of Trade and its Effects on Short Term Information Asymmetry, *Working Paper*.

Jarrell, G., and Annette Poulsen, 1987, Shark Repellants and Stock Prices: The Effects of Antitakover Amendments since 1980, *Journal of Financial Economics* 19.

Jensen, Michael C., 1986, Agency Costs of Free Cash Flow, Corporate Finance, and Takeovers, *The American Economic Review* 76, 323-329.

Jensen, Michael C., and William H. Meckling, 1976, Theory of the firm: Managerial behavior, agency costs and ownership structure, *Journal of Financial Economics* 3, 305-360.

Kavajecz, Kenneth A., and Elizabeth R. Odders-White, 2001, Volatility and market structure, *Journal of Financial Markets* 4, 359-384.

Klein, April, 1998, Firm Performance and Board Committee Structure, *Journal of Law and Economics* 41, 275-303.

Kyle, Albert S., 1985, Continuous Auctions and Insider Trading, *Econometrica: Journal of the Econometric Society* 53, 1315-1336.

Lee, Charles M. C., and Mark J. Ready, 1991, Inferring Trade Direction from Intraday Data, *Journal of Finance* 46, 733-46.

Lehn, Kenneth, Sukesh Patro, and Mengxin Zhao, 2006, Determinants of the Size and Structure of Corporate Boards: 1935-2000, *Working Paper*.

Leuz, Christian, and Robert E. Verrecchia, 2000, The Economic Consequences of Increased Disclosure, *Journal of Accounting Research* 38, 91-124.

Lin, Ji-Chai, Gary C. Sanger, and G. Geoffrey Booth, 1995, Trade Size and Components of the Bid-Ask Spread, *Review of Financial Studies* 8, 1153-1183.

Linck, James S., Jeffry M. Netter, and Tina Yang, 2006, The Determinants of Board Structure, *Working Paper*.

Maug, Ernst, 1997, Boards of directors and capital structure: Alternative forms of corporate restructuring, *Journal of Corporate Finance* 3, 113-139.

McConnell, John J., and Henri Servaes, 1990, Additional Evidence on Equity Ownership and Corporate Value, *Journal of Financial Economics* 27, 595-612.

McWilliams, Victoria B., and Nilanjan Sen, 1997, Board Monitoring and Antitakeover Amendments, *The Journal of Financial and Quantitative Analysis* 32, 491-505.

Mehran, Hamid, 1995, Executive compensation structure, ownership, and firm performance, *Journal of Financial Economics* 38, 163-184.

Morck, Randall, Andrei Shleifer, and Robert W. Vishny, 1988, Management ownership and market valuation : An empirical analysis, *Journal of Financial Economics* 20, 293-315.

Neal, Robert, and Simon M. Wheatley, 1998, Adverse selection and bid-ask spreads: Evidence from closed-end funds, *Journal of Financial Markets* 1, 121-149.

Raheja, Charu G., 2005, Determinants of Board Size and Composition: A Theory of Corporate Boards., *Journal of Financial & Quantitative Analysis* 40, 283-306.

Rosenstein, Stuart, and Jeffrey G. Wyatt, 1997, Inside directors, board effectiveness, and shareholder wealth, *Journal of Financial Economics* 44, 229-250.

Shivdasani, Anil, 1993, Board composition, ownership structure, and hostile takeovers, *Journal of Accounting and Economics* 16, 167-198.

Shleifer, Andrei, and Robert W. Vishny, 1986, Large Shareholders and Corporate Control, *Journal of Political Economy* 94, 461-488.

Shleifer, Andrei, and Robert W. Vishny, 1997, A Survey of Corporate Governance, *Journal of Finance* 52, 737-83.

Sommer, David W., 1996, The Impact of Firm Risk on Property-Liability Insurance Prices, *Journal of Risk and Insurance* 63, 501-514.

Stoll, Hans R., 1978, The Pricing of Security Dealer Services: An Empirical Study of Nasdaq Stocks, *Journal of Finance* 33, 1153-1172.

Tinic, Seha M., and Richard R. West, 1972, Competition and the Pricing of Dealer Service in the Over-the-Counter Stock Market, *Journal of Financial and Quantitative Analysis* 7, 1707-1727.

Van Ness, B., R. Van Ness, and R. Warr, 2001, How Well do Adverse Selection Components Measure Adverse Selection, *Financial Management* 30, 77-98.

Wei, Peihwang, Cheng-Ho Hsieh, and C. F. Sirmans, 1995, Captive Financing Arrangements and Information Asymmetry: The Case of REITs., Real Estate Economics (Blackwell Publishing Limited).

Table 1 – Sample Statistics: Interindustry Sample

Sample Statistics						
Variable	**N**	**Mean**	**Median**	**Standard Deviation**	**Minimum**	**Maximum**
Mean Price	4528	23.50	19.09	22.20	2	457.5
Average Spread	4528	0.019	0.015	0.016	0.001	0.092
Average Daily Volume	4528	133,360	37,986	300,749	38	4,537,294
GKN Information Asymmetry Proxy	4528	0.006	0.004	0.006	0	0.092
LSB Information Asymmetry Proxy	4528	0.004	0.002	0.005	0	0.192
Insurance	4528	0.018	-	-	-	-
Manufacturing	4528	0.402	-	-	-	-
Mining	4528	0.040	-	-	-	-
Trade	4528	0.099	-	-	-	-
Services	4528	0.162	-	-	-	-
Public Utilities	4528	0.033	-	-	-	-
Transportation	4528	0.047	-	-	-	-
Banking	4528	0.078	-	-	-	-
Other	4528	0.015	-	-	-	-
Other Finance and Real Estate	4528	0.107	-	-	-	-
MVE (1000s)	4528	1,587,035	195,525	6,617,623	2,268	114,790,000
Capital to Asset Ratio	4528	0.413	0.418	0.330	-6.194	1
Variance of Quote Midpoint	4528	0.280	0.092	1.093	0.00003	47.315

Table 2 – Selected Pearson Correlation Coefficients (N=4528)

	Exchange	Market Value of Equity	Mean Price	Average Daily Volume	Capital to Asset Ratio	Variance of Quote Midpoint
Exchange	1.000					
Market Value of Equity	0.228 <.0001	1.000				
Mean Price	0.321 <.0001	0.366 <.0001	1.000			
Average Daily Volume	-0.003 <.0001	0.723 <.0001	0.273 <.0001	1.000		
Capital to Asset Ratio	-0.174 <.0001	-0.010 <.0001	-0.166 <.0001	-0.023 0.1250	1.000	
Variance of Quote Midpoint	0.016 0.2704	0.123 <.0001	0.168 <.0001	0.117 <.0001	0.041 0.0062	1.000

Table 3 – Univariate Results

Two Sample T-Tests of Industry-level Information Asymmetry vs. Rest of Sample (N=4528) H0: Mean(Rest of sample) - Mean(Industry) = 0		
Industry	**GKN Estimate of Information Asymmetry**	**LSB Estimate of Information Asymmetry**
Insurance	0.4189 (0.6753)	0.6388 (0.5230)
Banking	-4.6258 (0.0000)	-0.9445 (0.3450)
Manufacturing	3.0616 (0.0022)	2.3423 (0.0192)
Mining	0.9955 (0.3125)	0.1089 (0.9133)
Trade	-1.5394 (0.1238)	-0.9904 (0.3220)
Services	-1.3413 (0.1799)	0.2538 (0.7997)
Public Utilities	4.6857 (0.0000)	2.3634 (0.0091)
Transportation	2.9769 (0.0029)	1.8456 (0.0650)
Other Finance And Real Estate	-3.3086 (0.0009)	-4.9234 (0.0000)
Other	0.2629 (0.7926)	-0.6546 (0.5128)

Table 4 – Regression Results: Relative Information Asymmetry Sample – Insurers vs. Non-insurers

	Log of Percentage Quoted Spread			Asymmetric Information Components					
				GKN			LSB		
	Parameter Estimate	Standard Error	p-value	Parameter Estimate	Standard Error	p-value	Parameter Estimate	Standard Error	p-value
Intercept	1.862	0.177	0.000	1.418	0.155	0.000	1.811	0.172	0.000
Insurance Indicator	0.032	0.042	0.451	0.178	0.048	0.000	0.137	0.059	0.021
Exchange (1 = NYSE/AMEX)	-0.692	0.013	0.000	-0.143	0.020	0.000	0.630	0.021	0.000
Log (Average Volume)	-0.120	0.006	0.000	-0.268	0.008	0.000	-0.283	0.009	0.000
Mean Price	-0.007	0.001	0.000	-0.004	0.001	0.000	-0.004	0.001	0.000
Midpoint Variance	0.024	0.006	0.000	0.019	0.005	0.000	0.009	0.020	0.663
Log (Market Value of Equity)	-0.234	0.013	0.000	-0.210	0.011	0.000	-0.270	0.013	0.000
Capital-to-Assets Ratio	-0.006	0.016	0.705	-0.064	0.028	0.021	0.003	0.027	0.902
N	4528			4526			4527		
Adj. R^2	0.890			0.721			0.711		

Table 5 – Regression Results: Relative Information Asymmetry Sample – Insurers vs. Other Industries

	Log of Percentage Quoted Spread			Asymmetric Information Components					
				GKN			LSB		
	Parameter Estimate	Standard Error	p-value	Parameter Estimate	Standard Error	p-value	Parameter Estimate	Standard Error	p-value
Intercept	1.877	0.171	0.000	1.537	0.163	0.000	1.861	0.183	0.000
Manufacturing	-0.014	0.044	0.747	-0.147	0.051	0.004	-0.075	0.062	0.225
Mining	0.164	0.052	0.002	0.027	0.062	0.662	0.054	0.076	0.476
Trade	-0.018	0.046	0.693	-0.124	0.056	0.028	-0.059	0.067	0.380
Services	0.031	0.046	0.494	-0.087	0.054	0.109	0.017	0.064	0.794
Public Utilities	-0.183	0.051	0.000	-0.394	0.064	0.000	-0.327	0.077	0.000
Transportation	-0.017	0.048	0.727	-0.158	0.062	0.011	-0.041	0.069	0.558
Banking	-0.039	0.045	0.385	-0.024	0.547	0.000	-0.024	0.068	0.000
Other	-0.050	0.057	0.378	-0.078	0.068	0.253	-0.050	0.078	0.522
Other Finance and Real Estate	-0.114	0.045	0.012	-0.281	0.055	0.000	-0.294	0.068	0.000
Exchange (1 = NYSE/AMEX)	-0.688	0.013	0.000	-0.142	0.021	0.000	0.634	0.212	0.000
Log (Average Volume)	-0.128	0.006	0.000	-0.283	0.009	0.000	-0.307	0.010	0.000
Mean Price	-0.007	0.001	0.000	-0.004	0.001	0.000	-0.004	0.001	0.000
Midpoint Variance	0.022	0.006	0.000	0.017	0.005	0.000	0.007	0.020	0.743
Log (Market Value of Equity)	-0.229	0.127	0.000	-0.200	0.011	0.000	-0.254	0.013	0.000
Capital-to-Assets Ratio	-0.030	0.016	0.069	-0.104	0.031	0.001	-0.052	0.031	0.091
N	4528			4526			4527		
Adj. R^2	0.894			0.727			0.719		

Table 6 - Summary Statistics

Variable	N	Mean	Median	Std. Dev.	Minimum	Maximum
Information Asymmetry (GKN)	2483	0.0038	0.0025	0.0042	0.0000	0.0625
Board Independence (%)	2483	0.6143	0.6364	0.1825	0.0833	0.9474
Institutional Ownership (%)	2483	0.5806	0.5943	0.1753	0.0042	0.9875
Inside Ownership (%)	2483	0.0510	0.0126	0.0998	0.0000	0.9991
Market Value of Equity	2483	7,720,876,933	1,833,464,850	23,815,141,882	11,374,688	476,115,537,625
Average Trading Price	2483	33.4491	28.4024	26.7163	2.0000	520.7001
Average Daily Trading Volume	2483	208,178	84,003	415,179	77	6,861,253
Standard Deviation of Stock Midpoint	2483	1.9046	1.3214	3.4466	0.0000	136.9681
NYSE Indicator	2483	0.7720	1.0000	0.4196	0.0000	1.0000
AMEX Indicator	2483	0.0169	0.0000	0.1290	0.0000	1.0000
NASDAQ Indicator	2483	0.2110	0.0000	0.4081	0.0000	1.0000
Standard Deviation of Lagged Monthly Returns	2483	0.1240	0.1117	0.0661	0.0267	1.0741
Free Cash Flow	2198	0.0841	0.0849	0.0759	-1.1113	0.4510
Long Term Debt/Total Assets	2478	0.1906	0.1737	0.1556	0.0000	1.4674
Market to Book	2483	3.9398	2.3785	15.0296	-49.3809	655.7070
Lagged Performance	2482	0.0154	0.0071	0.0702	-0.9624	0.3970
Lagged Average Daily Return	2483	0.0009	0.0009	0.0016	-0.0054	0.0129
Lagged Standard Deviation of Daily Returns	2483	0.0237	0.0215	0.0103	0.0067	0.0842
Lagged Skewness of Daily Returns	2483	0.2293	0.2650	0.9479	-7.0580	10.6030
Lagged Kurtosis of Daily Returns	2483	4.4461	2.1696	8.0902	-1.7534	146.1999
Lagged CAPM Beta	2483	0.7411	0.6579	0.4969	-0.7748	3.6184
Tobin's Q	2483	1.4791	0.9437	1.7089	0.0228	21.6056

Table 7 – Pearson Correlation Coefficients (p-values listed below)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Information Asymmetry (1)	1														
Board Independence (2)	-0.14592	1													
	<.0001														
Institutional Ownership (3)	-0.26067	0.14367	1												
	<.0001	<.0001													
Inside Ownership (4)	0.08006	-0.27106	-0.26986	1											
	<.0001	<.0001	<.0001												
Log(Market Value of Equity) (5)	-0.48414	0.10173	0.16004	-0.12283	1										
	<.0001	<.0001	<.0001	<.0001											
Log(Average Trading Volume) (6)	-0.36851	0.09914	0.27031	-0.18602	0.73524	1									
	<.0001	<.0001	<.0001	<.0001	<.0001										
Log(Average Share Price) (7)	-0.52881	0.08602	0.23383	-0.04179	0.68785	0.28742	1								
	<.0001	<.0001	<.0001	0.0373	<.0001	<.0001									
Log(Variance of Stock Price Midpoint) (8)	-0.38654	0.00255	0.33201	-0.04149	0.48297	0.46548	0.63709	1							
	<.0001	0.8991	<.0001	0.0387	<.0001	<.0001	<.0001								
Free Cash Flow (9)	-0.07311	-0.05458	0.17122	0.06121	0.10045	0.07086	0.14052	0.15042	1						
	0.0006	0.0105	<.0001	0.0041	<.0001	0.0009	<.0001	<.0001							
Market to Book (10)	-0.04484	0.00808	0.04102	-0.00098	0.10846	0.08807	0.10981	0.11255	0.00533	1					
	0.0255	0.6874	0.041	0.9611	<.0001	<.0001	<.0001	<.0001	0.8027						

Table 7 – Pearson Correlation Coefficients (cont.)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Year 1998 Indicator (11)	0.13801	-0.06062	0.0162	-0.03442	0.01779	0.04435	-0.02169	0.26369	0.02569	0.03781	1				
	<.0001	0.0025	0.4198	0.0864	0.3756	0.0271	0.28	<.0001	0.2287	0.0596					
Year 2000 Indicator (12)	-0.31501	0.09283	0.09556	0.00241	-0.04794	0.08281	-0.10093	-0.00824	-0.01894	-0.01321	-0.61437	1			
	<.0001	<.0001	<.0001	0.9046	0.0169	<.0001	<.0001	0.6816	0.3749	0.5105	<.0001				
AMEX indicator (13)	0.02134	-0.04005	-0.02295	0.03901	-0.0807	-0.11846	-0.02868	-0.02655	-0.03527	-0.01235	0.02278	-0.01578	1		
	0.2879	0.046	0.2529	0.0519	<.0001	<.0001	0.153	0.1861	0.0983	0.5386	0.2564	0.432			
NYSE indicator (14)	-0.29256	0.16535	0.11844	-0.11386	0.29685	0.09646	0.19244	-0.00362	-0.03054	-0.03267	-0.04479	-0.01227	-0.2414	1	
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	0.8568	0.1523	0.1036	0.0256	0.5412	<.0001		
NASDAQ Indicator (15)	0.29403	-0.15734	-0.11451	0.10473	-0.27969	-0.06173	-0.18878	0.01212	0.04328	0.03749	0.03884	0.0176	-0.06784	-0.95181	1
	<.0001	<.0001	<.0001	<.0001	<.0001	0.0021	<.0001	0.5461	0.0425	0.0618	0.0529	0.3807	0.0007	<.0001	

Table 8 – 2SLS Regression Results

	Information Asymmetry (GKN)	Board Independence	Institutional Ownership	Inside Ownership
Constant	0.0163 (0.0143)	1.3133 (0.0003)	1.7887 (<0.0001)	1.5367 (0.0141)
Information Asymmetry (GKN)		-15.7053 (0.0453)	-35.1016 (<0.0001)	-8.2928 (0.0020)
Board Independence	0.011 (0.0451)		-0.7229 (0.0212)	-0.54141 (<0.0001)
Institutional Ownership	-0.0096 (<0.0001)	-0.38639 (0.1044)		-0.1170 (0.1157)
Inside Ownership	0.0053 (0.7304)	-2.0313 (<0.0001)	-1.9265 (0.0005)	
Inside Ownership^2	0.1910 (0.0001)			
Log(Market Value of Equity)	-0.0001 (0.4764)	-0.01337 (0.0429)	-0.0262 (<0.0001)	-0.0855 (0.1094)
Log(Average Trading Volume)	-0.0001 (0.7368)			
Log(Average Trading Price)	-0.0030 (<0.0001)			
NYSE	-0.0019 (<0.0001)	0.0091 (0.6536)	-0.0194 (0.3233)	-0.0014 (0.8795)
AMEX	-0.0023 (0.0009)	0.0162 (0.6922)	-0.0020 (0.9627)	-0.0003 (0.9878)
Year 1998	-0.0013 (<0.0001)	-0.0178 (0.1968)	-0.0088 (0.5616)	-0.0110 (0.1397)
Year 2000	-0.0041 (<0.0001)	0.0028 (0.8991)	-0.0308 (0.2641)	-0.0031 (0.7765)
Long-term Debt/Total Assets		0.0117 (0.8085)		
Market to Book		0.0003 (0.3244)		0.0002 (0.2009)
Free Cash Flow		0.1369 (0.1648)		0.0679 (0.0872)
Lagged Performance		-0.0363 (0.6792)		
Lagged Skewness of Returns			-0.0036 (0.5311)	
Lagged Kurtosis of Returns			-0.0003 (0.6308)	
Lagged Mean Returns			3.3021 (0.3878)	
Lagged Standard Deviation of Returns			0.1989 (0.8478)	
Lagged Beta			0.0140 (0.4027)	
Tobin's Q				-0.0037 (0.1510)
Standard Deviation of Returns				-0.0252 (0.6028)
Adj. R^2	0.42	0.09	0.16	0.08
N	2,194	2,194	2,194	2,194

The dependent variable in each of the four specifications is listed across the first row. P-values are listed in parentheses.

Table 9 – Lagged Endogenous Variables: Regression Results

	Information Asymmetry (GKN)
Constant	0.0196 (<0.0001)
Board Independence	0.0031 (0.4974)
Institutional Ownership	-0.0025 (<0.0001)
Inside Ownership	-0.0000 (0.9624)
Log(Market Value of Equity)	0.0001 (0.4022)
Log(Average Trading Volume)	-0.0007 (<0.0001)
Log(Average Trading Price)	-0.0026 (<0.0001)
Log(Variance of Stock Price Midpoint)	0.0005 (<0.0001)
NYSE	-0.0019 (<0.0001)
AMEX	-0.0019 (0.006)
Adj. R^2	0.26
N	2,411

p-values in parentheses