CORPORATE GOVERNANCE, DISCLOSURE METHOD AND INFORMATION ASYMMETRY

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ABSTRACT

We examine whether corporate governance affects the level of information asymmetry in the capital market. We hypothesize that firms with stronger corporate governance would be more likely to voluntarily disclose corporate information using public rather than selective methods, and that this would be associated with lower levels of information asymmetry. We carefully establish the path through which corporate governance affects a firm's voluntary disclosure method based on previous literature. Surprisingly, in full sample analysis we find that firms with stronger corporate governance (as measured by Gompers et al.'s, 2003, G index) are associated with higher levels of information asymmetry (as measured by Easley et al.'s, 1996, PIN). In subsample analysis, we find that, consistent with our hypothesis, for the most weakly governed firms, stronger corporate governance is associated with lower information asymmetry, and the impact of corporate governance on information asymmetry is more pronounced than that of firms with moderate and strong corporate governance.

To further test our hypothesis, we consider the external effect of Regulation Fair Disclosure on the disclosure method to examine the corporate governance-information asymmetry relationship. Consistent with our hypothesis, our evidence suggests that by forbidding the practice of selective disclosure, the regulation significantly decreases the impact of corporate governance on information asymmetry level.

Keywords: Corporate Governance, Voluntary Disclosure, Information Asymmetry

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CHAPTER I

INTRODUCTION

One aspect of finance involves efficient borrowing and lending of funds. In the setting of a corporation, conflicts of interest arise between borrowers and lenders as a consequence of the separation of ownership and control. Broadly speaking, there are two main classes of such conflicts studied by finance researchers, namely the lemon problem of adverse selection and the agency problem of moral hazard. The former deals with the possibility that managers overstate the firm's value and mislead savers or lenders into making inappropriate investment decisions; and the latter deals with the possibility that managers improperly use or expropriate shareholder wealth. One practical solution to these problems is monitoring (and signalling) through financial disclosure. In this thesis, we focus on the effect of financial disclosure on the adverse selection problem.

Financial disclosure is a channel through which existing and potential shareholders obtain valuation information about the firm. It is the connection between corporate insiders and capital market investors. When there is new information, it could remain undisclosed, it could be mandatorily disclosed, or it could be voluntarily disclosed. Therefore, the content of disclosure reveals not only a firm's financial and operational situation, but also its managers' incentives and discretion to disclose relevant information. It reflects the power managers can exert on disclosure decision making, and this distribution of power between managers and shareholders is integrally linked to the firm's corporate governance.[1] And as information is distributed through different channels to different receivers, information asymmetry arises among market participants. In conclusion, the effect of disclosure as a connection between managers and shareholders involves the association of management power and shareholder variation. It characterizes the link between corporate governance and information asymmetry through the compound relationships between corporate governance and disclosure, and disclosure and information asymmetry.

[1] This research uses Gompers et al. (2003)'s G index to proxy firms quality of corporate governance, which they construct using 24 governance provisions. G is equal to the number of a firm's provisions. It measures the balance of power between shareholders and managers. More provisions mean a higher G and weaker corporate governance. See Chapter III for a detailed description on how G is constructed. Earlier studies include Bebchuk et al. (2009), Gompers et al. (2003) and Masulis et al. (2007).

Both parts of the corporate governance-information asymmetry relationship have been studied in previous literature. Various studies on the relationship between corporate governance and disclosure have been done on various markets around the world.[2] Since the content of mandatory disclosure is not (legally) subject to the will of managers, researchers generally focus attention on the association between corporate governance and voluntary disclosure. They consider the quality and value of voluntary disclosure as well as ownership structure and composition of the board of directors. However, in these studies, the method of disclosure (either selective or public) is not considered.

Holland (1998) is among the first to study the distinction between selective voluntary disclosure and public voluntary disclosure. When news is voluntarily disclosed, it can either be delivered through private channels, or it can be released publicly. Selective disclosure could lead to information asymmetry among news receivers. Holland (1998) provides descriptive incentives for the structural difference in mangers' voluntary disclosure choices, but does not specify any internal cause of the structural difference. On the other hand, Core (2001) separates the voluntary disclosure process into two steps. First, firms decide their optimal disclosure policy based on developing needs, usually decided by cross-sectional differences; then when information arrives, corporate governance determines the ability the firm to carry out its optimal disclosure policy.

We link Core's (2001) idea with Holland's (1998) voluntary disclosure separation theory, and outline a path between corporate governance and disclosure method. The absolute amount of voluntary disclosure is determined by cross-sectional differences. Meanwhile, the relative amount, or the method of voluntary disclosure, is determined by corporate governance. Strong governance ensures that the firm's optimal policy is followed using public disclosure as necessary; while weaker governance gives managers a greater ability to selectively release information for personal interest. As a consequence, the variation of the disclosure method across firms may bring about different levels of information asymmetry in the capital market. The above survey, together with a detailed analysis in Chapters II and III, develop the main argument in our thesis: The level of corporate governance determines a firm's information structure, and thus influences its

[2] See for example El-Gazzar (1998), Eng and Mak (2003), Lang and Lundholm (1993), Ruland et al. (1990), Schadewitz and Blevins (1998), and Williamson (1981).

level of information asymmetry.

Using a sample of 5,285 observations during the period between 1995 and 2005, we find a negative and statistically significant relationship between corporate governance and information asymmetry (in the sense that well governed firms have higher information asymmetry). This finding is supplemented by a subsample analysis on different governance levels. We find that the impact of corporate governance is more severe for weakly governed firms, and is less severe for strongly governed firms. Specifically, the weakly governed firms behave significantly differently from the other firms. The G coefficient signs are positive for weakly firms and negative for the others. Therefore, we suggest that while managers of weakly governed firms may selectively disclose information to exploit rent seeking opportunities, those of moderately governed firms may rather use selective disclosure to avoid job loss.

In further analysis, we examine how the disclosure method is related to the relationship between corporate governance and information asymmetry. The SEC enforced Regulation Fair Disclosure (Regulation FD) as an external force regulating the disclosure method. We find that Regulation FD changes the pattern of how corporate governance influences the level of information asymmetry. Generally, the degree of impact for corporate governance on information asymmetry is reduced. In particular, the decrease is more pronounced for weakly governed firms, suggesting that changes in corporate governance provide a strong internal force on the method of disclosure for firms with sufficiently weak governance. The above evidence is robust to controlling for several other key factors on information asymmetry including analyst following, capitalization, trading volume, block holder ownership, and book-to-market ratio.

Our study makes several valuable contributions to the literature. First, we outline a clear channel where disclosure method is the intermediary through which corporate governance affects market behaviour, and we clearly describe the path through which corporate governance affects a firm's voluntary disclosure method. We provide evidence suggesting that corporate governance affects market information asymmetry. Second, we examine the impact of Regulation FD in a new and unique way. We test the relationship between corporate governance and information asymmetry, and then examine the effect that Regulation FD had on this relationship to infer how the regulation affects the disclo-

sure method. We find that Regulation FD successfully changes the disclosure method of adopted firms, and equalizes the impact of corporate governance on information asymmetry for firms with different governance levels. [3] We also provide a rich review of academic studies on Regulation FD by summarizing the existing literature into four distinct approaches. In addition, our research substantially expands the growing literature on the corporate governance index constructed by governance provisions related to Gompers et al. (2003) and Bebchuk et al. (2009). We find that while the E Index developed by Bebchuk et al. (2009) may contain most of the firm value information driven by G, it does not seem to contain as much information about corporate disclosure and information asymmetry level as the G index.

The rest of the thesis is organized as follows. Chapter II provides a detailed literature review on Regulation FD, corporate governance and voluntary disclosure, and voluntary disclosure and information asymmetry. Chapter III describes the data and sample construction. Chapter IV presents our hypothesis and methodology. Chapter V presents the empirical results and robustness tests on the impact of corporate governance on information asymmetry level. Chapter VI concludes the thesis.

[3] Our study can also be viewed as an empirical test on the effectiveness of the legal institution in the capital market.

CHAPTER II

LITERATURE REVIEW

2.1 Regulation Fair Disclosure

2.1.1 An Overview of Regulation Fair Disclosure

On August 15, 2000, the U.S. Securities and Exchange Commission passed Rules 10b5-1 and 10b5-2: *Selective Disclosure and Insider Trading Regulation*, which was proposed on December 20, 1999 and would go into effect on October 23, 2000. The regulation is commonly referred to as Regulation Fair Disclosure (Regulation FD). It requires publicly traded companies to disclose relevant information to all investors simultaneously. Under the regulation, any material information disclosed in private must be publicly released within 24 hours or the next business day by filling an SEC 8-K form through the SEC's EDGAR system,[4] issuing a press release, or making a broadcasting or internet announcement. Although for violations, responsible individuals are subjected to fines up to one million dollars for issuers and fifty thousand dollars for executives, the regulation covers only officers, directions, investor relations officers, public relations officers, and other authorized spokespeople, and it applies only to the communications between the above authorized spokespeople and the investment community.

2.1.1.1 The history of U.S. insider trading regulation

The U.S. government addresses concerns about preventing insider trading fraud through two main manners: the common law and the SEC rules.

The first attempt in trading regulation happened in 1909 when the Supreme Court made its decision that firms must disclose inside information or they should abstain from using it to trade. However, the question "who is an insider?" was not answered at that time. Later, a more comprehensive version was proposed after the NYSE collapse during the late 1920's to the early 1930's. In 1933, section 17 of the Securities Act received sanction to forbid frauds in security sale, and this action was later reinforced in the Securities Exchange Act of 1934, which defined and prohibited certain forms of trading frauds.

[4] In 2004 the SEC proposed Rule (33-8496) which encourage firms to voluntarily file disclosure reports in the extensible business reporting language (XBRL). See Debreceny et al. (2005) for a descriptive valuation of this rule.

The SEC's Rule 10b-5 in 1942 was based on the 1934 Act, and it concerned both informed buying and informed selling. Although the term "insider trading" was not clearly defined in all three rules, "insider" was referred to as corporate officers, directors and owners of at least 10% of a firm's stock in the 1934 Act. The 1942 rule broadened this definition by including corporate "outsiders" and people who receive illicit tips into the list.

The Insider Trading Sanctions Act of 1984 was the first to prohibit traders from trading on material information, and the Insider Trading and Securities Fraud Enforcement Act of 1988 recoded the 1984 Act, adding information "tippers" to the covering list. Both acts entitled the SEC the right to charge up to three times the amount of any illegal gain from insider trading. However, the definition of "material information" was not clearly explained. As a substitute, the existing definitions from the case law in practice were applied. Mainly based on the Basic v. Leviuson and TSC Industries v. Northway cases, the case law considers that information is material "*if there is a substantial likelihood that a reasonable shareholder would consider it important in making an investment decision*" (Bethel, 2007, pg 337).

Even in the latest Regulation FD this important term is still not defined. However, FD is the first to clearly provide specific types of "material" information such as "*earnings information, mergers, acquisitions, tender offers, joint ventures, or changes in assets, new products or discoveries, changes in control or management, changes in an auditor, or defaults on senior securities, bankruptcies or receiverships*" (Bethel, 2007, pg 337). And instead of setting an "affirmative burden" to disclose information, the regulation requires wide distribution of information once the officer delivers a message.

Later in 2004 the SEC issued additional guidance on filing form 8-K disclosure to better support Regulation FD. Such issues, together with FD and other previous rules, help the SEC to better adapt to emerging changes in the capital market arising from ongoing technological innovation.

2.1.1.2 Why did the SEC put Regulation FD into action?

The SEC believed that the practice of selective disclosure leads to (1) a loss of investors' confidence in the integrity and fairness of the capital market; (2) the same negative impact as insider trading, which was illegal even though selective disclosure

was not; (3) a commoditization of material information under which stock issuers might tip analysts who give favoured reports and exclude analysts who refused to do so. (Hamilton and Trautmann, 2000)

Some of the SEC's rationales were supported by academic theory from previous research. For example, Holden and Subrahmanyam (1992) show that as informed traders operate aggressively, their common private information is incorporated into stock prices very rapidly. Diamond and Verrecchia (1991) show that having a large amount of public information serves to reduce information asymmetry and the associated risk to market makers. Foster and Viswanathan (1996) show that the differences between initial information sources for informed traders determine their specific "monopoly power" over other traders and market makers. Therefore, if selective disclosure is prohibited and every investor receives identical information, none of them will have a superior position in the market. In that case, asymmetry disappears, information is reflected by price very quickly, and there is no abnormal profit available for informed traders.

Empirical evidence also supports the SEC's proposal on regulating selective disclosure. Frankel et al. (1999) and Bowen et al. (2002) show that conference calls are informative but not all investors have equal access to this information. It creates a selective disclosure problem, and leads to an information gap between the analysts' community and ordinary investors.

2.1.1.3 Debates among affected parties before the sanction

After Regulation FD was proposed, the SEC received over 6,000 letters supporting the rule, mainly from individual investors. Many of them expressed their frustration when they sometimes saw prices moving sharply, but they did not receive any related news until quite a long time later. Other supporters believed that, besides enhancing capital market confidence, the new regulation would encourage the flow of information to investors and would reduce financial analysts' existing reliance on firm-provided information.

Opponents of the regulation were mainly from the analysts' community as well as some stock issuers who frequently used conference calls as information disclosure media. They argued that as some key words in the regulation, such as "material information" and "non-exclusive disclosure", did not provide explicit definitions and measures for com-

pliance, the regulation might bring about a "chilling effect," under which firms would provide less and substandard information to prevent being caught violating the regulation. They also argued that individual investors could get lost without professional interpretation from analysts when firms released data simultaneously to all parties.

2.1.2 Academic Studies on Regulation FD

One of the points against the new regulation was the fear that if firms did not know how to comply because of the imprecise, ambiguous wording, then they would provide as little information as possible to avoid being punished by the SEC. As shown in a survey conducted by the National Investor Relation Institute (NIRI) in 2000, 42% of 462 investor relation professionals said they would limit their communication practice. However, according to a later survey by NIRI in 2001 after Regulation FD went into effect, only 24% of the 577 professionals said they did reduce information disclosure, compared to 48% who said there were no change on their conducts and 27% who admitted that they were giving even more information.[5] Another NIRI survey showed that 90% of firms now allowed full access for all investors to conference calls, compared to 60% before Regulation FD.[6] It seems at a glance that by the implementation of Regulation FD, the SEC substantially achieved its goal.

However, there are also plenty of surveys telling different stories. According to the Wall Street Journal on October 17, 2005, although information flows are not curtailed by the regulation, the planned result to stop the practice of selective disclosure is also inadequate. For instance, 97% firms continue the one-to-one meetings with analysts and institutional investors, and 71% of them still provide earning guidance in the breakout sessions after brokerage house presentations. What was worse, a CFA institute survey in 2003 showed that only 45% members voted that information from stock issuers was of good quality, compared to 60% in 1999.[7]

Sparked by the debatable anecdotal evidence listed above, considerable academic

[5] See Mathew et al. (2004)

[6] See Duarte et al. (2008).

[7] See M. Rapport, Corporate governance (a special report); Five years later: critics felt regulation FD would choke off the flow of corporate information. Here's why it didn't happen, Wall St J, East Ed (2005), p. R 8 New York, N.Y. Oct. 17.

research has involved Regulation FD. These studies can be grouped into four distinct approaches as follows: (1) to investigate market behaviour; (2) to study analysts' behaviour; (3) to see how information asymmetry changes, and (4) to learn how firms react to the regulation, that is, how corporate performance changes after the regulation.

2.1.2.1 The market behaviour approach

Research on Regulation FD begins with studies on how the general market behaviour changes and the meaning of these changes. Early evidence from Zitzewitz (2002) shows that multi-forecasting days account for over 70% of new information in the first quarter after Regulation FD, compared to 35% before the regulation. Zitzewitz concludes that the regulation reduces selective disclosure to analysts without reducing total information. Most studies about the market behaviour approach employ the return volatility as a proxy for stock informative level. For example, Heflin et al. (2003) observe that stock price deviation, a measure of market information that is referred to as "information gap," becomes smaller after the regulation. This observation is further supported by Francis et al. (2006) who apply both event volatility and general return volatility as information proxies. Bailey et al. (2003) observe an increase in trading volume, but a decline in return volatility around earning releases after Regulation FD. They claim that the decline is due to decimalization which happened almost at the same time as Regulation FD. Similarly, Eleswarapu et al. (2004) observe a decline in return volatility around mandatory earnings announcements. They conclude that information flow is unchanged because the decline loses its statistical significance when voluntary announcements are taken into account.

In contrast, Mathew et al. (2004), observing abnormal return volatility around earning announcements, conclude that information flow increased after Regulation FD, with small firms bearing a larger impact. Bushee et al. (2004) examine price volatility and individual investors' trading activity during periods around conference calls. They believe that the high price volatility after Regulation FD reveals that price is more informative following its implementation. Similarly, Ahmed and Scheible (2007) find that the regulation reduces the differences in information quality among investors.

To sum up, a large amount of research has been done on the market behaviour approach, and the general results support the SEC's achievement of a better capital market environment.

2.1.2.2 The analysts' information effect approach

Early research in this approach focuses mostly on analysts' forecasts. For instance, Heflin et al. (2003) and Bailey et al. (2003) both study market behaviour and analysts' behaviour, but they obtain dissimilar results about analysts' forecast dispersion: Heflin et al. (2003) find no change in forecast dispersion while Bailey et al. (2003) observe an increase. However, both agree that there is no change in analysts' forecast accuracy, one of the key factors in Regulation FD studies. Although Heflin et al. (2003) observe a smaller forecast error, and they explain that other factors beyond the regulation change, such as the economic environment, may have lead to the decline.

The majority of studies on analysts' behaviour come out after 2005 with innovative ideas. While Agrawal et al. (2006) and Yang and Mensah (2006) still focus on the analysts' forecast accuracy and dispersion, Mohanram and Sunder (2006) focus more on a dynamic view that analysts are putting more effort into searching out their own sources of information after Regulation FD. In their opinion, analysts now switch their focus from well-followed firms to less followed firms to capture unique information discovery. Large brokerage analysts lose their superior forecast power, which levels the playing field. Likewise, Gintschel and Markov (2004) notice that highly ranked brokerage houses and optimistic analysts are affected by Regulation FD to a greater degree. However, by excluding high-tech firms from their sample, in order to control for the economic recession coincident with Regulation FD, Gomes et al. (2007) find that analysts shift to large firms after the regulation is implemented. Ferreira and Smith (2006) also study the information changes of analysts rating. They find that investors continue to respond to analysts' recommendations in the same way as before.

On the other hand, Arya et al. (2005) stand on the critical side of the regulation. In their theoretical model, selective disclosure can stave off analysts herding behaviour because parties are able to incorporate a more diverse set of information into their reports. The regulation, by ruling out the practice of selective disclosure, heightens herding behaviour and leaves investors worse off. As a response, Mensah and Yang (2008) apply a similar empirical model and they find that Regulation FD does not increase herding behaviour, but slightly increases "anti-herding" behaviour instead.

As an alternative to equity analysis, Jorion et al. (2005) study the impact of

Regulation FD on credit analysis. They observe an increase in the information content of rating changes after the regulation. One explanation for this result is that credit analysis is excluded from FD's blacklist. Nevertheless, it is found that the increase is more pronounced for larger firms with a greater analyst following. The evidence overwhelmingly shows that the SEC achieves its goal to limit the practice of selective disclosure, especially for large firms.

In conclusion, most of academic researchers agree that there is little impairment to analysts' ability, but results in this approach are still unsettled.

2.1.2.3 **The information asymmetry approach**

One reason that the SEC arranged to stop the practice of selective disclosure is related to its goals to maintain investors' confidence and belief in the integrity of the capital markets. Selective disclosure, by causing information asymmetry between informed traders and dealers and uninformed traders, grants a small portion of market participants with superior ability to profit from private information to the detriment of ordinary, uninformed investors. Stimulated by this problem, the third approach to studying Regulation FD directly concerns whether the regulation solves the selective disclosure problem or not. Two main methods used by researchers are: (1) to examine the information asymmetry with the bid-ask spread and (2) to estimate the probability of information-based trading.

The bid-ask spread method. Basically, the bid-ask spread is considered to be composed of four parts: order-processing cost, inventory-holding cost, monopoly charges or competition discounts, and adverse selection cost due to information asymmetry between dealers and informed traders (Huang and Stoll, 1997). The pioneers of the adverse selection approach to studying Regulation FD assume that the first three parts are unaffected by information dissemination changes associated with the implementation of the regulation. In this case, any changes in bid-ask spread would reflect changes in information asymmetry. Sunder (2002) tests the difference in bid-ask spread between matched pairs of "open" and "restricted" firms during pre- and post-regulation periods. Sunder finds that after the regulation, the difference in bid-ask spread between the two groups is eliminated. Her result suggests that Regulation FD helps to reduce the level of information asymmetry in the stock market. Although Sunder's result is in favour of the SEC's goal, her

methodology is criticized by several other authors, since the other three components of the bid-ask spread could also be influenced by the regulation.

Further studies extend Sunder's (2002) work by decomposing the adverse selection part separately from the bid-ask spread through various theoretical models. Straser (2002) and Eleswarapu et al. (2004) both use Huang and Stoll's (1996) model, but reach contradictory conclusions. While Straser observes a higher adverse selection component after the regulation, Eleswarapu et al. find that at earning announcements, this component declined, and the decrease is more pronounced for smaller and less liquid stocks. Later, by jointly applying three other models to decompose the adverse selection component, Chiyachantana et al. (2004) confirm that Regulation FD does help to reduce information asymmetry. On the other hand, Lee et al. (2004) find no significant change in the adverse selection component, whereas Sidhu et al. (2008) find that the adverse selection component increases after Regulation FD.

The probability of information-based trading method. The inconsistent results from the bid-ask spread approach suggest that researchers may need to explore new measurements of the degree of selective disclosure. The probability of informed trading approach is one of the most feasible. There are several theoretical models available for this approach, such as Easley et al.'s (1996) (EKOP) model used by Straser (2002) and Duarte et al. (2008) and the Hasbrouck (1991) model used by Collver (2007).

Under the EKOP setting, Straser (2002) uses a sample of 137 days of intraday data for 130 matched pairs to examine the impact of Regulation FD on "open" and "closed" firms respectively.[8] It is shown that PIN increases after Regulation FD. To explain the result, Straser separates market leaked information into two parts, the private information and the private component of public information. According to Straser, as private information decreases with the prohibition of selective disclosure, analysts put more effort into finding signals from public information. As a result, financial analysts discover more from public messages, and the private component of public information

[8] According to Straser (2001, pg 10) "open" firms "*consist of companies that claim to have provided public disclosure of all material information as required by Regulation FD prior to its institution*." While "closed" firms "*consist of companies that prior to Regulation FD released their information strictly to analysts and/or shareholders.*" The classification is developed from the results of a Business Week survey in August 2000.

increases. This increase in the private component outweighs the decrease of selectively leaked information, and thus the overall PIN increases.

Straser uses a relatively small sample in her study because of the need to control for pair matching. Duarte et al. (2008) supplement Straser's work by using 3,000 firms from NYSE and over 2,000 firms from NASDAQ, and a longer event window period is applied as well. They find a marginally significant increase in the median of PIN, and the significance is further weakened by their firm level chi-squared tests. They do not provide an explicit explanation for the result. Collver (2007) extends this approach by applying Hasbrouck's (1991) summary informativeness statistic to measure informed trading. A decrease in the informed trading index is observed.

2.1.2.4 The corporate governance approach

This approach is less developed compared to the previous three approaches. Studies about this approach focus on testing how firms react to the regulation, and most of them provide a descriptive background check. For example, Straser (2002), Heflin et al. (2003) and Bailey et al. (2003) observe that firms' public disclosure increases in general, especially in the first quarter right after regulation FD. Bushee et al. (2004) find that the regulation has a small negative impact on managers' decision to hold conference calls.

Obviously, since Regulation FD is a rule affecting firms' disclosure activities, new features in the corporation information environment may emerge, which could lead to changes in corporate capital structure and corporate governance. For instance, different degrees of information disclosure could alter the information asymmetry between shareholders and managers, and could change the cost for potential shareholders to seek information about stocks. Duarte et al. (2008) show that while NYSE/AMEX stocks' cost of capital has no significant change, the cost of capital of NASDAQ stocks experiences a moderate increase. Gomes et al. (2007) also observe a rising cost of capital, mostly in small firms.

The above review of various studies on Regulation FD highlights the conflicts that arise between the SEC's goals and the actual outcome, and suggests the importance of further understanding the cost and benefits of the regulation. This has important implications for other jurisdictions considering the implementation of similar regulations on information disclosure.

2.2 Corporate Governance and Voluntary Disclosure

"*The information disclosed…describes what the corporate insiders want to be disclosed about the corporation's activities and performance.*" (Melis, 2004, pg 32)

The conflict of interest between principle and agent is one of the most frequently studied problems in finance. In a business entity, such conflict arises between shareholders and management, or ownership and control. If there is not an effective method to restrict managers' behaviour, they can easily expropriate investors' money for their own interest. The incentive of expropriating investors' money can lead the managers to behave in two ways: they may cheat existing investors, and/or they may cheat potential investors. The former activity is called the "agency problem" (Jensen and Meckling, 1976); and the latter activity is called the "information problem" (or "lemon problem," Akerlof, 1970).

When investors enter the capital market with their savings, their investment selection criteria are usually based on information that is provided by managers. If managers do not disclose all relevant information that reflects firms' value, then investors may have biased estimates of value, and hence they may make unsuitable investment choices. On the other hand, after savings are placed into the firms, investors often do not show much interest in actively participating in management activities. Therefore, investors' impression of firm value relies heavily on manager's clarification, which gives managers the opportunity to engage in self-serving behaviour.

The above analysis explains the importance of information disclosure as a key element in solving the conflict of interest problem and in protecting shareholder rights. In the current capital market, business entities are required to disclose accounting information. Additional information can be provided on a voluntary basis. Since mandatory disclosure is a minimum requirement of corporate disclosure, most academic studies focus on voluntary disclosure decisions.

There exist various explanations about why firms make voluntary disclosure. Basically, six motives are mentioned in previous literature: the capital markets transactions hypothesis, the corporate control contest hypothesis, the stock compensation hypothesis, the litigation cost hypothesis, the management talent signalling hypothesis, and the proprietary cost hypothesis (Healy and Palepu, 2001). The capital market hypothesis claims that mangers use voluntary disclosure as a tool to solve the "lemon problem," to reduce

information asymmetry on the capital market, and thus reduce the cost of capital when they seek external financing. The corporate control contest hypothesis says that managers voluntarily disclose additional information to explain poor performance when they feel the firm is undervalued and when managers face the possibility of job loss. The stock compensation hypothesis says that managers publish news to avoid being classed as "insiders" when they exercise their options or trade their stocks. And they also disclose information to allow accurate valuation before issuing option or stock compensation. The litigation cost hypothesis has two sides; managers could increase voluntary disclosure to avoid being sued for inadequate disclosure, or they could decrease disclosure, especially around earning forecast announcements, if they are afraid that their information is biased or inaccurate. The management talent signalling hypothesis states that managers are more likely to disclose good news in order to distinguish themselves from their colleagues. Finally, the proprietary cost hypothesis argues that managers' decision about whether to disclose certain information depends on their belief about whether the news will reduce firm value. They choose not to disclose if the news is likely to "*damage the competitive position*" (Healy and Palepu, 2001, pg 424).

While each of the above hypotheses has its own rationale and empirical evidence, their common theme is the relationship between managers and investors, interpreted as a balance of power. Therefore, we seek to identify a clear relationship between corporate governance and voluntary disclosure. Core (2001) breaks down the voluntary disclosure process into two steps. First, firms decide their optimal disclosure policy based on developing needs, which are usually decided by cross-sectional differences. For example, firms with differing degrees of commitment to industrial standards may apply different disclosure policies. Then, as news arrives, the firm's corporate governance determines the firm's ability to enforce its optimal disclosure policy.

In our study, when the regulatory environment allows it, managers may choose between making public announcements to all investors and selectively disclosing the news to certain parties. Selective disclosure allows managers the opportunity to act in their own interest against the interests of ordinary shareholders, creating the possibility of an agency problem. Therefore corporate governance does not determine the absolute degree of firms' voluntary disclosure, but it rather determines the relative position in volun-

tary disclosure. For instance, if the power of shareholders is relatively strong, then managers will be less likely to use information for their own interest, whereas if the power of management is relatively strong, there will be few restrictions on how managers disclose information. This is how we link corporate governance to how managers make voluntary disclosure.

As Eng and Mak (2003) stated, the link between disclosure and corporate governance is first noted by Williamson (1981). Since then there have been many studies testing the relationship between corporate governance and voluntary disclosure in the U.S. as well as globally.[9] On the corporate governance side, most of the above research focuses on ownership structure and board composition as proxies for the balance of power between shareholders and managers. Researchers using ownership structure as measurement proxies focus on management ownership (Eng and Mak, 2003, and Ruland et al., 1990), large outside shareholder ownership (Eng and Mak, 2003, and Ruland et al., 1990), institutional ownership (El-Gazzar, 1998, and Schadewitz and Blevins, 1998), and government ownership (Eng and Mak, 2003). While researchers using board composition as measurement proxies focus on the proportion of independent directors on the board (Eng and Mak, 2003, Ho and Wong, 2001, and Forker, 1992), the existence of an audit committee on the board (Forker, 1992, Ho and Wong, 2001, Collier, 1993, and McMullen, 1996), the existence of a dominant person in the firm (Forker, 1992, and Ho and Wong, 2001), and the existence of a related person on the board (Ho and Wong, 2001).

Meanwhile, on the voluntary disclosure side, most of studies focus on either the amount of voluntary disclosure (Ruland et al., 1990, El-Gazzar, 1998, and Schadewitz and Blevins, 1998), or the quality of voluntary disclosure measured by self-constructed scores or AIMR scores based on analysts rating (Eng and Mak, 2003, and Lang and Lunholm, 1993). To our knowledge, only Holland (1998) provides descriptive incentives for the structural difference in voluntary disclosure choices, but Holland does not specify the internal and endogenous relationship between corporate governance and voluntary disclosure structure as we put forward in this thesis.

[9] See for example, Ruland et al. (1990) in the United States, McKinnon and Dalimunthe (1993) in Australia, Meek et al. (1995) in United Kingdom and Continental European, Ben Ali et al. (2007) in France, Ho and Wong (2001) in Hong Kong, and Eng and Mak (2003) in Singapore.

2.3 Voluntary Disclosure and Information Asymmetry

"*…companies identified two distinct or extreme areas for corporate disclosure. The first was where market failure created a clear-cut domain for private disclosure only. The second was where regulation created a distinct area for mandatory public disclosure. In between these two … lay a wide area for company discretion concerning public versus private disclosure choices.*" (Holland, 1998, pg 29)

The information structure of a firm refers to the three categories of information within a firm: that subject to mandatory disclosure, that which is voluntarily disclosed, and that which is undisclosed. Of the information that is disclosed, managers can either publish news through a public channel, (e.g. filling SEC forms, issuing press release, etc.), or they can release news to privileged groups through a selective channel, (e.g. public limited conference calls, presentations to brokerage houses, meetings with institutional shareholders, reports to analysts, etc.). In this thesis, we refer to these as *public disclosure* and *selective disclosure* respectively.

Evidence suggests that voluntary public information can reduce the level of information asymmetry among market participants, and thus can help to form a sound and efficient market. Analytically, Barry and Brown (1985), Diamond (1985), Diamond and Verrecchia (1991) and Kim and Verrecchia (1994) argue that more information generally reduces information risk on prices; likewise voluntary disclosure serves to reduce information asymmetry among traders. Empirically, Leuz and Verrecchia (2000), Healy et al. (1999) and Welker (1995) investigate links between voluntary disclosure and stock liquidity. Their findings are mixed. While Welker and Leuz and Verrecchia find that firms with better quality disclosure have lower bid-ask spreads, Healy et al. find that firms with a larger amount of disclosure have significantly higher bid-ask spreads. In addition, Botosan and Plumlee (2002) test the capital market effect of voluntary disclosure on the cost of capital, and they find that the cost of capital decreases with more disclosure. Trabelsi et al. (2004) and Trabelsi et al. (2008) study the performance pattern and incentives of internet financial reporting, and find that internet disclosure helps to reduce analysts' forecasting error. Most (but not all) of the above evidence is consistent with the idea that public voluntary disclosure serves to reduce information asymmetry and information risk.

On the other hand, there is not much documentation on the capital market conse-

quence of private information. Admati (1985) , Wang (1993), Dow and Gorton (1995) and Easley and O'Hara (2004) all model the activities of informed and uninformed traders, and they find that because of the different degree of available information, informed traders and uninformed traders invest in different portfolios. Specifically, informed traders construct their portfolios on the efficient frontier associated with their superior information. Since uninformed traders have inferior information, they cannot "replicate" the informed traders' portfolios, thus their portfolios will always locate below the informed traders' efficient frontier. As selective disclosure causes information asymmetry to arise between these two parties, it makes informed traders better off at the expense of uninformed traders.

Easley and O'Hara (2004) develop a framework to consider both public information and private information together. They provide an analytical model to demonstrate how a firm's information structure affects its capital market behaviour. Their finding suggests that for stocks with more private information and less public information, uninformed investors require a higher rate of return as compensation because more private information increases information asymmetry and the information risk uninformed investors face. Easley and O'Hara (2004) pg 1578 conclude "*If, as our analysis suggests, the quality of information affects asset pricing, then how information is provided to the market is clearly important.*" Although they claim that the results of Easley et al. (2002) can be viewed as an empirical test of their analysis, in fact Easley et al. (2002) test the different roles of private and public information independently, rather than testing both simultaneously. To our knowledge, there are no empirical studies examining this issue directly.

The association between concepts discussed in section 2.1 (the role of Regulation Fair Disclosure), section 2.2 (corporate governance and voluntary disclosure), and section 2.3 (voluntary disclosure and information asymmetry) is as follows: As an internal force, the balance of power between shareholders and management decides how managers follow the corporation's optimal disclosure policy, and the relative position is reflected as the information structure of the firm, which decides the level of information asymmetry between informed and uninformed traders. To test the endogenous level of corporate governance as the internal force, we study Regulation FD and treat it as an external force

on the firm's information structure.

CHAPTER III

SAMPLE CONSTRUCTION AND DATA DESCRIPTION

3.1 Main Regression Variables

3.1.1 PIN

In this thesis we use the probability of information-based trading (PIN) as a proxy to measure the level of information asymmetry among market participants. Ranging from 0 to 1, PIN estimates the probability that any random trade is made by an informed trader. A large PIN value is associated with a high level of information asymmetry.[10] PIN is derived by Easley et al. (1996) (EKOP, hereafter) from a microstructure model mimicking the trading process in a risk-neutral, perfectly competitive market. The game tree in Figure 3.1 describes the trading process.

[Insert Figure 3.1
Tree Diagram of the Trading Process]

An information event may occur at the beginning of each day with probability α. A low signal arrives with conditional probability δ, and a high signal with conditional probability $1 - \delta$. If the information event does not occur, then only uninformed traders trade in the market, and although it is not strictly necessary, EKOP assumes buy orders and sell orders arrive at the same rate ε. Informed traders arrive at the rate μ, but they trade only on days in which an information event has occurred. Therefore, given a low signal on a particular day, the seller arrival rate is $\varepsilon + \mu$, and the buyer arrival rate is ε because informed traders sell their shares but do not buy after observing the low signal. Similarly, when there is a high signal, the seller arrival rate is ε, and the buyer arrival rate is $\varepsilon + \mu$. The parameters α, δ, ε and μ are estimated using maximum likelihood based on the number of buy orders and sell orders observed each day. Assuming that the arrivals follow independent Poisson processes, the estimation of PIN is given as

[10] Duarte and Young (2009) and Mohanram and Rajgopal (2009) discuss whether PIN is associated with the cost of capital. Our study, using PIN as a measurement of risk, does not involve this issue.

$$PIN = \frac{\alpha\mu}{\alpha\mu + 2\varepsilon}. \tag{1}$$

Our PIN data are obtained from the website of Professor Stephen Brown of Maryland University. Brown calculates quarterly PIN estimates for the entire database of the Centre of Research on Security Price (CRSP) from the first quarter of 1993 to the second quarter of 2006. The sample includes stocks listed on the New York Stock Exchange (NYSE), the American Stock Exchange (AMEX), and the National Association of Securities Dealers Automated Quotations (NASDAQ).

To be compatible with the other variables in this research, the quarterly PIN data are converted to annual data by taking the arithmetic average of the four quarters each year, ignoring all missing values. To achieve a better estimation of the effect of Regulation FD, a maximum symmetric time frame surrounding the event year 2000 is selected as the event window, containing eleven years of data from 1995 to 2005.

The parameters α, ε and μ which EKOP use to derive PIN are estimated using a likelihood function suggested by Easley et al. (1996) using

$$\begin{aligned} L\big((B,S)\big|\theta\big) = {} & (1-\alpha)e^{-\varepsilon T}\frac{(\varepsilon T)^B}{B!}e^{-\varepsilon T}\frac{(\varepsilon T)^S}{S!} \\ & + \alpha\delta e^{-\varepsilon T}\frac{(\varepsilon T)^B}{B!}e^{-(\mu+\varepsilon)T}\frac{[(\mu+\varepsilon)T]^S}{S!} \\ & + \alpha(1-\delta)e^{-(\mu+\varepsilon)T}\frac{[(\mu+\varepsilon)T]^B}{B!}e^{-\varepsilon T}\frac{(\varepsilon T)^S}{S!}. \end{aligned} \tag{2}$$

Here B and S are the estimated daily numbers of buy and sell orders, with trade signs being estimated using Lee and Ready's (1991) algorithm, and T is the number of days in each estimation period (quarters in Brown's calculation).

Previous studies, such as Easley et al. (2002), Vega (2006) and Yan and Zhang (2006), are concerned about the possible situation in which corner solutions may lead to biased PIN estimation. For example, Yan and Zhang (2006) illustrate a case in which PIN has the correct estimation if α is between 0 and 1. However, if α equals 0, PIN becomes 0, and if α equals 1, PIN increases from 0.131 to as large as 0.801. Such problems require special attention. Although the possible effect of corner solutions cannot be fully ruled out, the negative impacts can be reduced by filtering out questionable extreme values in the PIN data.

[Insert Table 3.1

PIN Data Distribution by Every 0.1]

As listed in Table 3.1, about 84% of PIN observations lie within the range 0.1-0.4. The percentage of each category descends gradually as the range increases. However, the range 0.9-1.0 contains fully 10 percent more observations than range 0.8-0.9.

[Insert Table 3.2

0.90-1.00 PIN Data Distribution by Every 0.01]

Table 3.2 further decomposes the range 0.9-1.0 by a finer partition of 0.01. It turns out that most observations lie in the sub-range 0.99-1.00. If PIN equals 1, then for the specific firm during the particular period, information events happen on every trading day and uninformed traders' arrival rate is zero. Although theoretically this possibility cannot be fully ruled out, we believe that the unusually high number of PIN observations close to 1 is a consequence of a parameter corner solution problem rather than a measurement of extremely frequent information events.

[Insert Table 3.3

0.00-0.10 PIN Data Distribution by Every 0.01]

Similarly, the range 0.0-0.1 is further investigated. As shown in Table 3.3, there exists an unusual number of observations in the sub-range 0.00-0.01, and theoretically it means that almost no information event occurs for the specific firm during the particular period. Although firms could choose to keep their financial status and operating activities transparent enough to the public, we believe this is emblimatic of problematic parameter estimations. Therefore, the suspicious PIN data in the ranges 0.00-0.01 and 0.99-1.00 are excluded from further analysis to maintain a more precise estimation of the information asymmetry on the capital market.

[Insert Figure 3.2

Plot of quarterly and annual PIN during 1993 and 2006]

Figure 3.2 shows how the quarterly mean and the annual mean of PIN behave from 1993 to 2006. A downward trend is observed during the period, which means that information asymmetry tends to become lower as time goes by. Such a trend could be the result of introducing advanced communications technology, implementing new arbitrage techniques, or changing trading habits of market participants such as an increased preva-

lence of day trading, etc. As in Figure 3.2, the trend seems to become steeper after 2001, the year after Regulation FD is implemented. Although there could be other possible explanations, it could be that the implementation of Regulation FD plays an important role in the falling tendency of the information asymmetry level. Also, PIN displays a low value every year in the first quarter, suggesting strong seasonality. In fact, when the Winters Smoothing Method is applied, the null hypotheses that the seasonality parameter equals zero and the trend parameter equals zero are strongly rejected.

3.1.2 The G Index

In this study, the balance of power in corporate governance is measured by the Corporate Governance Index (G) constructed by Gompers et al. (2003). The original data source is the Investor Responsibility Research Centre (IRRC). The IRRC generates a non-exclusive list of corporate anti-takeover provisions for publicly listed firms every two or three years in Corporate Takeover Defences (Rosenbaum 1990, 1993, 1995, 1998, 2000, 2002, 2004, 2006). According to Bebchuk et al. (2009, pg 796) "*[i]n any given year of publication, the firms in the IRRC volume accounted for more than 90% of the total U.S. stock market capitalization*". The IRRC gathers its data from a variety of public sources, for example, "*corporate by-laws and charters, proxy statements, annual reports" and "10-K and 10-Q documents filed with the SEC*" (Gompers et al., 2003, pg 110).

[Insert Table 3.4
IRRC Corporate Governance Provisions]

Gompers et al. (2003) construct the G Index with the IRRC corporate governance provisions. A list of the provisions is presented in Table 3.4. They generally limit shareholder activism and increase managers' ability to curtail shareholders activism, for example, by allowing managers to defend a hostile takeover. The G index is constructed by giving one point to a firm if the firm adopts a provision on the list. Only two of the twenty-eight provisions are considered pro shareholders, namely Cumulative Voting and Secret Ballot. For the two exceptions, points are added to firms that do not adopt the provisions. Therefore, a higher G index is associated with more controlling power residing with managers relative to shareholders, it is more difficult for shareholders to replace managers, and corporate governance is weaker. In addition, both firm-level provisions and state-level laws are listed by the IRRC, and some of them have the same core con-

cepts thus can be viewed as mutual substitutes. To address this overlapping problem, only one point is given no matter whether the firm has only one of the provisions or both. Hence the G index has a theoretical possible range from 0 to 24.

The G data is obtained from Yale University's Professor Andrew Metrick's personal webpage, and it contains 5,624 firms with 14,000 observations from 1990 to 2006. The G data has two identifiers: company name and exchange ticker. We match it with the CRSP database to associate each firm with a CRSP permanent number. To begin with, the ticker symbol is used with the effective date of the exchange ticker data in CRSP and the date in G data are matched as a supplement. After this step, 4,952 firms with 11,376 observations are matched, and 2,713 observations remain unsettled. We then manually match the remaining firms. Our hand checking process is composed of three rounds. First, firms with the same tickers but different ways of recording names in the two datasets are picked out. Then, we examine full names of the firms recorded by abbreviated characters in either data set and match them together. In the final round we exam the incorporation states and company history of each firm including mergers, acquisitions, delisting, share buy-backs, name changes, and so on. 13,847 observations in G dataset are matched with the CRSP database totally. A list of the sample construction process on G is presented in Figure 3.3.

Since the IRRC do not publish reports every year, the G data is only available for the reporting years: 1990, 1993, 1995, 1998, 2000, 2002, 2004, and 2006. Following Gompers et al. (2003), the gaps between reporting years are filled by assuming that the G value for each firm is constant until the value is updated in the next report. Thus a firm's G value equals its previous reported value in non-reporting years. The G dataset is expanded to 28,573 observations after this step. Next, we match the G dataset with the PIN dataset which returns 21,251 firm-year observations. In particular, there are 16,993 observations for the event window 1995 to 2005.

[Insert Figure 3.3
Sample Construction Process of G and
Table 3.5
Summary Statistics of G by Reporting Year]

Table 3.5 presents the summary statistics of G for each reporting year. Following

Gompers et al. (2003), G is grouped into 3 subsets. Firms with values less than 6 are allocated to the "Low" group, and firms with values above 13 are allocated to the "High" group. The rest are allocated to the "Medium" group. The "Low" group contains 10.1% of the entire sample, and the "High" group contains 5.01%. The mean and the median of G remain constant between 1990 and 2006. The standard deviation of G becomes lower through time. As in Table 3.5, both percentage of the "High" group and percentage of the "Low" group drop continuously from 1990 to 2006, and the percentage of observations with the median value of G, 9, grows. The distribution of G becomes more concentrated through time.

In 1998 the IRRC expands its database by 28% with the inclusion of over three hundred new firms. Most of these are small firms with extremely low G values. The population mean drops more than 5 percent in 1998, mostly because the "Low" group grows by 184 percent in that year. In their next report in 2000, the IRRC excludes many of these firms.

3.2 Control Variables

3.2.1 Analysts Following

Previous literature has shown that coverage by financial analysts is one of the determinants of market liquidity and information asymmetry. For example, Skinner (1990) and Brennan et al. (1993) find that firms with a larger analysts' coverage incorporate news into price quickly, and Brennan and Subrahmanyam (1996) find that adverse selection cost is lower for firms with a higher analyst following. Specifically, Easley et al. (1998) and Duarte et al. (2008) use PIN as a proxy for market information asymmetry and find that PIN becomes lower with higher analysts coverage. Therefore, we consider analysts' following to be an important control variable for PIN.

The Annual Analysts Following Index (AAF) is gathered and converted from the Institutional Brokers' Estimate System (I/B/E/S) data. The I/B/E/S database contains monthly recommendation data collected from analysts' forecasting reports by Thomson Reuters Inc. Our I/B/E/S monthly data has 12,925 firms with 867,848 observations, covering a period from November 1993 to December 2007. The primary identifiers for I/B/E/S are I/B/E/S tickers, CUSIP numbers, stock exchange tickers, and company names are also provided as secondary identifiers. We follow the Wharton Research Data Service

method to match I/B/E/S with the CRSP database. First, the two datasets are linked by CUSIP numbers. Then, the unmatched data from the first round are linked by exchange tickers and effective periods. 7,491 stocks with 637,351 observations are matched in total, consisting 73% of the original I/B/E/S dataset. To be consistent with the other variables, these monthly formatted data are converted into yearly format by taking the arithmetic average of the 12 months each year. The output, AFF data set, contains 51,963 observations. After merging AAF with G and PIN by CRSP permanent number, 15,406 valid observations remain. A summary of the above mentioned sample construction process is shown in Figure 3.4.

[Insert Figure 3.4
Main Regression Variables Construction Process]

3.2.2 Other Control Variables

Effects of many other control variables on PIN are also tested in previous literature. We consider some of them here in this thesis.

3.2.2.1 Market characteristics

Trading Volume. The impact of trading volume on PIN is tested by Easley et al. (1996) and Dennis and Weston (2001). The data used in this thesis is from the CRSP database. It is converted from monthly form to annual form by the same method as the analysts following data described in Section 3.2.1

Capitalization. Previous research tests the impact of market capitalization on PIN (Brown et al., 2004 and Easley et al., 2002). Moreover, Mohanram and Rajgopal (2009) find that PIN and firm size have a negative correlation. We get the annual year-end market capitalization data from the CRSP database.

3.2.2.2 Institutional characteristics

Book-to-Market Ratio. The relationship between book-to-market ratio and PIN is tested in Easley et al. (2002). They show that the book-to-market ratio is positively correlated with PIN. Also, Gompers et al. (2003) test the relationship between G and book-to-market ratio and they find a positive correlation. Data of annual book value per share is obtained from Compustat, and year-end market price is collected from CRSP. They are matched by the initial eight digits of CUSIP identifiers.

Institutional Ownership. Previous research, such as Brown et al. (2004) and Dennis and Weston (2001), also examine the impact of institutional ownership on PIN. We use the block holder data obtained from Andrew Metrick's personal webpage. Metrick provides block holders' data from 1996 to 2001 based on IRRC survey data. The sample of the block holder data includes S&P 500 stocks as well as large firms frequently mentioned in business journals. The "Sumblks" variable, which is the percentage held by all block holders for that firm-year, is used in our research as a proxy for institutional ownership. To fit Metrick's data into our event window period, the block holder value in 1995 is assumed the same as in 1996, and block holder values from 2002 to 2005 are assumed unchanged since 2001.[11]

There are 5,285 observations in the merged dataset for regression analysis. A list of regression variables and detailed definitions are presented in Table 3.6. The summary sample statistics of each variable and their correlations are presented in Tables 3.7 and 3.8.

[Insert Table 3.6
Definitions of Regression Variables,
Table 3.7
Summary Statistics of Regression Variables
Table 3.8
Pearson Correlation Coefficients of Regression Variables and
Table 3.9
Pearson Correlation Coefficients of Regression Variables on Regulation FD]

Table 3.8 reports the results of Pearson correlation coefficients the correlations among PIN, G and the control variables. Information asymmetry level is negatively associated with corporate governance, the annual average analysts' following number, market capitalization and trading volume, and it is positively associated with the book-to-market value and institutional ownership. It suggests that for strongly governed firms, the level of information asymmetry is relatively low, while for weakly governed firms, the information asymmetry level is relatively high. The correlations between AAF and Capitaliza-

[11] The mean of Sumblks grows inconstantly from 21.65 to 25.01 between 1996 and 2001, but without further guidance, we assume it remains constant thereafter.

tion, AAF and Volume, and Capitalization and Volume are relatively high with values at 0.422, 0.481 and 0.522. Since high correlation between independent variables could possibly lead to multicollinearity problems, when running the full regressions these three variables are carefully examined by dropping each of them at a time to see how the coefficients of the other variables change. It is shown that dropping any of the three variables do not lead to substantial changes in the full regression results. The baseline regressions also help to explain this issue.

A comparison of the correlation coefficients for the main regression variables before and after Regulation FD is included in Table 3.9. The time horizon is between 1995 and 2005. The years 1995 to 1999 are recognized as pre-Regulation FD, and the years 2001 to 2005 are recognized as post-Regulation FD. The implementation year 2000 is excluded from the correlation analysis. Fisher's Z Transformation is used to examine whether significant differences exist between the correlation coefficients. A notable result in Panel A is that the correlation value between PIN and G decreases by 49% after Regulation FD, which is significant at the 5% level, suggesting that the corporate governance-information asymmetry relationship is less reliable when there is a restriction on selective disclosure.

CHAPTER IV

HYPOTHESES AND METHODOLOGY

4.1 Hypotheses

With respect to the interaction between information asymmetry and firm's corporate governance, we derive the following related questions.

- Does the balance of power between shareholders and mangers influence the level of information asymmetry? If so, then how does it influence? To what degree and through what path? Are the patterns the same for different levels of corporate governance?
- Is the relationship between corporate governance and information asymmetry affected by changes in the disclosure method? Does Regulation FD achieve its desired goal to force firms to publicly disclose the information which was selectively disclosed prior to the regulation?

4.1.1 Corporate Governance, Disclosure, and Information Asymmetry

A firm's disclosure policy is designed to fulfill its development needs. These needs are unique for each individual firm. They are different across industries and across firms in different developing phases, and vary with the firm's commitment to its investors.[12] When new information arrives that is not mandated to be disclosed by regulations, the optimal disclosure policy indicates whether the information should be disclosed, and managers ultimately decide whether and through which channel, public or selective, the information should be issued. However, to what degree the manager can make choices which reflect her personal interest is determined by the firm's corporate governance. This firm-level disclosure decision process is outlined in Figure 4.1.

[Insert Figure 4.1
Disclosure Decision Process]

As we discussed in Chapter II, a firm's disclosure method, or information structure, has a significant effect on the level of information asymmetry among investors. Public disclosure delivers the firm's financial status and operating activities to all inves-

[12] See Core (2001) for a detailed discussion about the literature on this topic.

tors thus reducing information asymmetry, and selective disclosure delivers such information to particular groups and thus increases information asymmetry. For our information asymmetry measurement proxy PIN, public disclosure decreases the probability of a private information event α, thus PIN decreases; while selective disclosure decreases α and PIN increases. The path through which corporate governance affects market information asymmetry level is shown in Figure 4.2.

[Insert Figure 4.2
Information Impact Path]

Our theory suggests that the disclosure channel is the intermediary through which corporate governance affects market behaviour, and we clearly describe the path through which corporate governance affects a firm's voluntary disclosure method.[13] Also, we test the relative impact of public and selective disclosure on information asymmetry simultaneously. To our knowledge, there is no previous work that clearly examines these points.

Hypothesis 1a: (Untestable in our framework) Firms with better corporate governance (i.e. more shareholder power) use more public and fewer selective disclosure methods.

Hypothesis 1b: (Testable) Firms with better corporate governance have less information asymmetry in the capital market.

Hypothesis 1c: (Testable) There is a threshold level of corporate governance beyond which improved corporate governance has little influence on the disclosure method and the level of information asymmetry. In particular, the corporate governance-information asymmetry relationship is more pronounced for poorly governed firms.

4.1.2 Regulation FD and Disclosure Method

Regulation FD aims to stop the practice of selective disclosure to develop a sound and efficient capital market. All information needs to go public once a selective disclosure is made. Therefore, Regulation FD can be viewed as an external force that alters a corporation's disclosure method. The function of the regulation on disclosure and its connection with corporate governance and information asymmetry is shown in Figure 4.3.

[13] Masulis et al. (2007) examine how governance provisions affect shareholder wealth through the investment choice channel.

[Insert Figure 4.3
Internal and External Forces on Disclosure Structure]

The effectiveness of Regulation FD is of great importance to both policy makers and other stakeholders. As we discussed in Chapter II, previous research examines the regulation through several different approaches, including market behaviour, analysts' reactions, information asymmetry proxies, and firm reactions. While the first three approaches analyze market outcomes, some studies using the last approach focus directly on the change in disclosure method. However, because whether certain news was to be selectively disclosed or publicly disclosed cannot be distinguished without Regulation FD, there is no established way to directly measure the change of disclosure method affected by the regulation. So far, most studies using this approach focus on investigating the change on the quantities of public disclosure as a substitute.[14] Our research tests Regulation FD from a different aspect. Because the disclosure method is unobservable, and it plays a crucial function in the connection illustrated in Figure 4.3, we test the relationship between corporate governance and information asymmetry instead, and then we examine the impact of Regulation FD on this relationship. If corporate governance stands as an internal force affecting the disclosure method and the regulation stands as an external force, then how these two forces interact to form the disclosure method and further affect information asymmetry in the capital market is of great interest to academics and practitioners.

Hypothesis 2a: Regulation FD, as an external force on disclosure method reduces the effect of corporate governance on information asymmetry.

Hypothesis 2b: The impact of Regulation FD on the corporate governance-asymmetry relationship is more pronounced for poorly governed firms.

4.2 Methodology

Our main model tests the influence of corporate governance on the level of information asymmetry, controlling for firm-level variables that also affect the level of information asymmetry.

[14] These studies include Straser (2002), Heflin et al. (2003) and Bailey et al. (2003).

$$Information\ Asymmetry$$

$$= f(Corporate\ Governance, Control\ Variables, Year) \quad (3)$$

Our proxy for information asymmetry is PIN, and corporate governance is measured by the G index. Control variables are collected from the factors shown to have significant impact on PIN in previous literature, including analyst following, market characteristics, and institutional characteristics. Considering that PIN has a downward trend over time, a year dummy variable is also included. Firm level annual data is used in the regression.

4.2.1 The Basic Model

Hypothesis 1b in Section 4.1.1 is tested by the basic models in Equations 4 and 5:

$$PIN_{i,t} = \alpha + \beta_1 * G_{i,t} + \beta_2 * Year_t + \varepsilon_{i,t}, \quad (4)$$

$$PIN_{i,t} = \alpha + \beta_1 * G_{i,t} + \beta_2 * Year_t + \beta_3 * Controls_{i,t} + \varepsilon_{i,t}. \quad (5)$$

Equation 4 tests the simple relationship between PIN and G, while in Equation 5 other factors affecting PIN are applied as control variables. The Ordinary Least Squares method is applied to the regression.

4.2.2 Different Corporate Governance Levels

To see whether different levels of corporate governance have different relationships between PIN and G, we test separately the regressions in Equation 4 for the "High", "Medium" and "Low" groups described in Chapter III. Two group dummy variables are applied to detect whether there exist any significant differences among the coefficients α and the coefficients β_1 in the three independent regressions. Both dummy on intercept and dummy on slope are tested in Equations 6 and 7:

$$PIN_{i,t} = \alpha_1 + \alpha_2 * D_{1_{i,t}} + \alpha_3 * D_{2_{i,t}} + \beta_1 * G_{i,t} + \beta_2 * G_{i,t} * D_{1_{i,t}} + \beta_3 * G_{i,t} * D_{2_{i,t}} + \gamma * Year_t + \varepsilon_{i,t}, \quad (6)$$

$$PIN_{i,t} = \alpha_1 + \alpha_2 * D_{1_{i,t}} + \alpha_3 * D_{2_{i,t}} + \beta_1 * G_{i,t} + \beta_2 * G_{i,t} * D_{1_{i,t}} + \beta_3 * G_{i,t} * D_{2_{i,t}} + \gamma_1 * Year_t + \gamma_2 * Controls_{i,t} + \varepsilon_{i,t}. \quad (7)$$

The dummy variable D_1 equals to 1 for all firms that fall in the category of the "High" group, and zero otherwise. Similarly, the dummy variable D_2 equals to 1 for all

firms in the category of "Low" group, and zero otherwise. The parameters α_2 and α_3 test the difference in the intercept terms in Equation 6 and 7 between the "High" group and the "Medium" group and the "Low" group and the "Medium" group respectively. The coefficients β_2 and β_3 test similar differences in the slopes of G.

4.2.3 The Effect of Regulation FD

Using eleven years of data around Regulation FD, the approach we employ is a long-term event study. As argued by Agrawal et al. (2006), it takes time for financial analysts and firms to adjust to the regulation. Likewise, the impact of governance provisions on information asymmetry could take a long time to take effect. Gompers et al. (2003, pg 108) claim that the ordinary short term "*event-study methodology cannot identify the impact of governance provisions*" and suggest a long-term approach instead.

To see if Regulation FD alters the way corporate governance affects information asymmetry, we separate the data into two groups. The 5 years data before Regulation FD, from 1995 to 1999, is assigned to the "Before" group, and the 5 years data after Regulation FD, from 2001 to 2005, is assigned to the "After" group. Separate regressions under Equation 4 are taken for each group to obtain separate coefficients, and a dummy variable is used to test if the two groups of coefficients are identical in Equations 8 and 9:

$$PIN_{i,t} = \alpha_1 + \alpha_2 * D_{i,t} + \beta_1 * G_{i,t} + \beta_2 * G_{i,t} * D_{i,t} + \gamma * Year_t + \varepsilon_{i,t}, \tag{8}$$

$$\begin{aligned} PIN_{i,t} = \alpha_1 + \alpha_2 * D_{i,t} + \beta_1 * G_{i,t} + \beta_2 * G_{i,t} * D_{i,t} + \gamma_1 * Year_t \\ + \gamma_2 * Controls_{i,t} + \varepsilon_{i,t}. \end{aligned} \tag{9}$$

The dummy variable D equals 1 for all the firms in the "After" group, and zero otherwise. The parameter α_2 measures the difference on intercept before and after Regulation FD, and the parameter β_2 measures the difference on slope of G before and after the regulation.

CHAPTER V

EMPIRICAL EVIDENCE AND ROBUSTNESS CHECKS

5.1 Empirical Evidence

5.1.1 Initial Regressions

In this thesis we test the joint relationship among corporate governance, voluntary disclosure method, and information asymmetry. Because the method of voluntary disclosure is unobservable, we examine the relationship between corporate governance and information asymmetry directly. Our basic regression tests the simple relationship between the proxies of corporate governance and of information asymmetry, namely the G index and PIN. The long-term downward trend of PIN is controlled by a year variable.[15] Given the fact that there exist many other factors affecting the market information asymmetry level, three sets of control variables are also considered. In the baseline regression, the key control variable, annual average analysts following, is included. And in the full regression, a set of market characteristics variables and a set of institutional characteristics variables are included as well. Regression results and important parameters of the three regressions are presented in Table 5.1.1.

[Insert Table 5.1.1
Regressions Analysis of Corporate Governance and Information Asymmetry]

The results for the basic regressions suggest that G has a negative impact on PIN, with a coefficient of -0.002, which means that for one unit increase in G there is 0.2% unit decrease in PIN. While this coefficient is statistically significant, it does not seem to be economically significant. The regression explains 4.7% of PIN. The negative coefficient suggests that for firms in which managers have less power, the information asymmetry level is higher. This result contradicts Hypothesis 1b; however, one explanation for this could be due to a non-linear relationship between PIN and G. If G is low enough, there may be little or no reduction to PIN for any further decrease in G. This motivates us to re-examine the relationship for the High, Medium, and Low G subsamples.

There are several other possible explanations for this result. The first explanation

[15] Year dummies are also tested as a substitute for the year trend variable. Similar results are reported in Table 5.1.5.

comes from the corporate control contest hypothesis described in Chapter II. Managers in firms with fewer anti-takeover provisions face more risk of losing job, so they use selective disclosure to explain poor performance, and thus decrease the likelihood of job lose. Another explanation is the management talent signal hypothesis in Chapter II. Less powerful managers face more risk of being replaced, thus they have more incentive to disclose through a selective channel to potential employers to distinguish themselves from their competitors. A third explanation involves the conflict of interest between large shareholders and small shareholders. As discussed by Shleifer and Vishny (1997), firms that have a dominant (non-managing) shareholder usually have fewer pro-manager provisions, so managers of such firms have less power. Furthermore, in this case large shareholders may pressure managers to disclose information to them at the expense of minority shareholders.[16]

The significance level and signs of the G coefficients do not change between the baseline regression and the full regression, and the adjusted R squared statistic increases dramatically to 0.249 with the inclusion of analysts following.

5.1.2 Group Difference

The corporate governance for firms with high G should have more impact on information asymmetry than the corporate governance for low G firms, because poorly governed firms may tend to have more private information events, while for firms with adequate governance, information asymmetry may not be sensitive to changes in governance. As discussed in Chapter III, we follow Gompers et al. (2003) in constructing our G-based subsamples. The "High" group contains firms with G over 13; the "Low" group contains firms with G less than 6, and the rest are included in the "Medium" group. Table 5.1.2 shows the regression results for each of the three groups.

[Insert Table 5.1.2
Group Analysis on Corporate Governance and Information Asymmetry]

The results for the basic regressions are presented in Panel A. Consistent with our hypothesis, the "High" group has a positive and significant coefficient β_1 of G, and the coefficient of G for the "Low" group is not significantly different from zero. Also, the

[16] However, Reza and Wilson (2007) find that Canadian family-controlled firms tend to have a lower PIN, which seems to contradict this theory.

adjusted R-squared statistic for the "High" group is higher than that for the "Low" group, which means that corporate governance explains more information asymmetry for more powerful managers firms. The above evidence suggests that for firms with strong corporate governance (low G), manager's power may not be an important factor in the disclosure method decision process (at least for small changes); while for firms with weak corporate governance (high G), the power of managers is likely to be an important concern in determining its disclosure method. Not surprisingly because of their large proportion, the medium G firms are not substantially different from the full sample.

One of the notable results in Table 5.1.2 is that the sign of the G coefficient for the "High" group is positive, and at over 1% per unit G, it is also economically significant, unlike our basic regression results for the whole population in Table 5.1.1. The positive sign suggests that for these weakly governed firms, information asymmetry level grows with the power of mangers. This finding is consistent with our theory that more powerful managers have greater influence on disclosure choices, thus more information is disclosed selectively, which leads to higher information asymmetry. Moreover, the difference in G coefficients between the "High" group and the other two groups is significant, while the difference between the "Low" group and the rest is not significant. The G coefficient of the "High" group is significantly higher than the coefficient of the other two groups. It suggests that the "High" group firms behave differently from ordinary firms in that the impact of corporate governance on information asymmetry is significantly larger than the other two groups. Evidence from the baseline regression and the full regression reported in Panel B and Panel C further confirms this finding. The group dummies, measuring differences between the "High" firms and the other firms, are significant at 1% level and 5% level for the baseline regression and the full regression respectively. And the group dummies measuring the differences between the "Low" firms and the rest are not significant. The above finding is illustrated in Figure 5.1.

[Insert Figure 5.1
Analysis on Information Asymmetry by Different Governance Level]

5.1.3 The Influence of Regulation FD

If our theory is true, then the change of disclosure method should alter the degree of impact that corporate governance has on information asymmetry. As Regulation FD

acts on the disclosure method directly, an event study on the regulation is applied as another assessment of the theory. The regression results for the event study are presented in Table 5.1.3.

[Insert Table 5.1.3
Event Study Analysis on Corporate Governance and Information Asymmetry]

After the implementation of Regulation FD, the significance levels of the G coefficient estimations do not change, but the coefficients of G decrease. Tested by an event dummy variable, the decrease is significant at 1% level. The above evidence suggests that Regulation FD significantly changes the corporate governance-information asymmetry relationship, which implies that firms' disclosure method could be the channel in the relationship.

5.1.4 Influence of Regulation FD on Different Groups

As discussed in Section 5.1.2, for the "High" group, corporate governance has a strong and significant on information asymmetry, while for the "Low" group, it shows no significant evidence of such a relationship. In fact, the evidence from Panel C of Table 5.1.2 shows that while for the "High" firms, G is one of the most influential factors on PIN, for the "Low" firms PIN is more likely to be determined by the control variables. In this section, we examine whether the relationship between G and PIN for the sub-groups is changed with the implementation of Regulation FD. Regression results are presented in Table 5.1.4.

[Insert Table 5.1.4
Event Study Analysis on Group Differences]

Panels A, B and C provide regression results for the High, Low and Medium groups respectively. In Panel A, the coefficient of G on PIN is positive and significant before the implementation of Regulation FD, while the coefficient after Regulation FD is not significant. The decrease of coefficient values, tested by an event dummy variable, is significant at the 1% level. In Panel B, neither of the G coefficients before or after the regulation is significant, and the difference is not significant either. And in Panel C, the G coefficient for the full regression is not significant before the regulation, but it becomes negative and significant later. To sum up, for all three groups, the values of G coefficients decrease with the implementation of Regulation FD. This evidence suggests that the im-

pact of corporate governance on information asymmetry is reduced by the new rule on disclosure methods. The evidence also suggests that the impact of Regulation FD is more pronounced for high G firms. A possible explanation could be that before the regulation, powerful managers selectively disclosed information thus increased the information asymmetry level on the capital market. Meanwhile, less powerful managers publically disclosed information following the firms' optimal disclosure policy, and had little impact on the level of information asymmetry. Regulation FD forces managers to publicly disclose all information once any selective disclosure is made. As a result, after the regulation, powerful managers are less able to alter their disclosure method for personal interest, and thus their impact on the level of information asymmetry decreases.

Another notable result in Table 5.1.4 is that in Panel A the coefficient of AAF is not significant before Regulation FD, but it becomes significant after the regulation, while in Panel B and Panel C both the AAF coefficients are significantly different from zero. This evidence suggests that analysts' following becomes one of the main factors determining information asymmetry level after Regulation FD along with the decreased impact of corporate governance. The change suggests that Regulation FD successfully reforms firms' disclosure method and it helps to reduce information asymmetry, particularly for those firms with the weakest corporate governance.

5.1.5 Discussion

The evidence presented in the earlier sections in this chapter suggests that corporate governance is a factor influencing the level of information asymmetry in the capital market. One reason for this association may be because of an intermediary link with the method of voluntary disclosure. Although our findings are consistent with this theory in the sense that improvements in corporate governance could tend to reduce selective disclosure, particularly for those firms having the worst corporate governance, which could in turn tend to reduce the level of information asymmetry, they are not conclusive evidence of this theory, because we lack a measure for selective (vs. public) disclosure. Therefore, we can only provide circumstantial evidence supporting Core's (2001) and Holland's (1998) hypotheses.

This finding is further supported by observing the change in the relationship between corporate governance and information asymmetry following the implementation of

Regulation FD. If selective voluntary disclosure is the principle channel through which corporate governance is related to information asymmetry, then the regulation is likely to have the most significant effect (in terms of a reduction in the strength of this relationship) on those firms having the worst corporate governance. Therefore, this finding also provides circumstantial evidence for Core's (2001) and Holland's (1998) hypotheses.

5.2 Robustness Checks

Our work in this thesis is subject to various constraints. Four of the most important concerns are tested in this chapter as robustness checks for our hypotheses.

5.2.1 The Distribution of PIN

Figure 5.2 presents the density histogram of PIN. Compared to a normal distribution, the PIN data histogram is right-skewed and it has fat tail. To mitigate the impact of PIN's distribution on regression results, a logistic transformation of PIN is also tested as a robustness check. The transformation is

$$\text{LOGPIN} = \text{Log}\left(\frac{\text{PIN}}{1-\text{PIN}}\right). \tag{10}$$

As shown in Figure 5.3, the logistically transformed PIN data fits the normal distribution better than the original PIN data. The regression results of G on LOGPIN are presented in Tables 5.2.1.1, 5.2.1.2, 5.2.1.3 and 5.2.1.4.

[Insert Figure 5.2 and 5.3, Table 5.2.1.1, 5.2.1.2, 5.2.1.3 and 5.2.1.4]

The evidence from these regressions on LOGPIN is similar to our main regression results. In Table 5.2.1.1, the parameter of G is negative and significant. In Table 5.2.1.2, the "High" group's G parameter is positive and significant, while the G parameter for the "Low" group is not significantly different from zero. The difference between the "High" group and the "Medium" and "Low" groups is significant except in the full regressions, while the difference between the "Low" group and the rest is not significant. In Table 5.2.1.3, both the "Before" group and the "After" group have negative and significant G coefficients, and the difference between them is significant. In Table 5.2.1.4, the "High" group has a significant decrease in the G coefficient before and after Regulation FD, and the difference for the "Low" group is also significant. This evidence suggests that the internal relationship proved by our empirical model is robust to the distribution of the in-

formation asymmetry proxy.

5.2.2 The Entrenchment Index

As discussed in Chapter IV, the G index is constructed by giving one point to the firm with each of the corporate governance provisions reported by the IRRC. Although Gompers et al. (2003) find that G is significantly associated with the net profit margin and return, Bebchuk et al. (2009) argue that the G index is a noisy measurement of firm value. Bebchuk et al. construct an entrenchment index (E) using 6 of the most discussed provisions: classified board, bylaw amendment limitations, charter amendment limitations, supermajority, golden parachutes, and poison pill. They show that the E index is more relevant to stock return and firm value than the other 18 provisions. Later researchers, such as Masulis et al. (2007), take both G and E Index into consideration. Masulis et al. show that both indices are significantly related to acquisition returns.

The E Index is tested here as a robustness check for our empirical evidence. Tables 5.2.2.1, 5.2.2.2 and 5.2.2.3 list the regressions results of E on PIN. As in Table 5.2.2.1, the association of corporate governance and information asymmetry is negative and significant. Table 5.2.2.3 examines the difference on E coefficient before and after Regulation FD. The change for both basic and baseline regressions are not significant. To further test the relationship between PIN and E, we group the E index data by the number of provisions. Firms with E lower than 2 is allocated to the "Low" group, and firms with E higher than 3 is allocated to the "High" group. In Table 5.2.2.2 it turns out that there is no significant difference on the PIN and E relation between these two groups. Also, the adjusted R-Squared statistics in Table 5.2.2.1 are lower than the corresponding ones in Table 5.1.1. One possible reason could be that the E Index does not carry as much important information on the disclosure method, although it might contain important information on firm value and return. It is likely that all 24 provisions are valuable determinants about the balance of power between shareholders and managers.

[Insert Table 5.2.2.1, 5.2.2.2 and 5.2.2.3]

5.2.3 The Unbalanced G Sample

The IRRC follows the S&P 500 Index as well as some of the large corporations frequently mentioned by business journals on each report. Therefore, each IRRC report covers different sample firms, and the G index contains unbalanced samples. As we dis-

cussed in Chapter III, the IRRC database grows by 24.9% in 1998 compared to the prior record year 1995. Such a growth causes the population mean to drop from 9.3 in 1995 to 8.8 in 1998 by about 5%. In 2000, most of these firms were discarded from the data base and the mean of population climbs back to 9.0.

To rule out the effect of an unstable sample, we test firms remaining in the G index throughout the five record years during each event window as a robustness check. We consider firms with unchanged CRSP permanent number to be one firm, regardless name changes, ticker changes, acquirers and mergers. There are 741 such firms in our sample set. Table 5.2.3.1 presents summary statistics of this subset.

[Insert Table 5.2.3.1
Summary Statistics of G for Firms Staying in IRRC]

The sample mean and medium gradually increase from 1995 to 2005, and more firms move from low G to high G. The percentage of firms with G less than 6 gradually decreases, while the percentage of firms with G over 13 increases. This finding is different from that in Table 3.5 which presents the summary statistics of the whole G population. In Table 3.5, both the "Low" group and the "High" group become smaller and smaller as time goes by, and the moving tendency is toward the population median, while in Table 5.2.3.1 the trend of the samples is towards the "High" group. Another distinct difference is that in Table 3.5, there are more samples in the "Low" group than in the "High" group for the whole G population, while in Table 5.2.3.1 the number of firms in the "High" group outweighs the "Low" group. Such distributional differences could affect the relationship between PIN and G.

As we discussed earlier in this chapter, managers have more power on the decision of disclosure choices in high G firms. Therefore we expect to see a stronger link between G and PIN with the selected subsample. Regression results for this subsample are presented in Tables 5.2.3.2, 5.2.3.3, 5.2.3.4 and 5.2.3.5.

[Insert Table 5.2.3.2, 5.2.3.3, 5.2.3.4 and 5.2.3.5]

The evidence in Table 3.2 confirms the negative and significant relationship between G and PIN. The adjusted R-squared statistic is higher than the one in Table 5.1.1, which is consistent with our hypothesis that for high G firms, corporate governance matters more in disclosure method. Table 3.3 confirms the significant difference between the

"High" group and the others, and the insignificant difference between the "Low" group and the others. Table 3.4 confirms the significant change with the implementation of Regulation FD. Table 3.5 confirms our hypothesis that Regulation FD affects disclosure method by eliminating external factors. To sum up, our empirical evidence is not subject to the unbalanced sample selections.

5.2.4 The Double Counting Trading Volume in NASDAQ Market

The NASDAQ market is well-known for overstating trading volume. Since it is mostly a dealer market, many trades are double-counted, which leads to the boosting of trading volume. The NASDAQ trading volume is also boosted by frequent inter-dealer transactions in which trades occur between dealers only. As shown in Atkins and Dyl (1997), such activities severely boost NASDAQ trading volume by up to 50%.

Aware of this situation, in 1998 the National Association of Securities Dealers (NASD) proposed the Riskless Principal Trade Reporting (RPTR) Rule, which was implemented in February 2001. The Rules intend to prevent dealers from actual trades in matching asks and bids, thus protect dealers from potential loss, and eliminate the double-counting. These rules, along with the emerging of Electronic Communication Network (ECN) trading, help to reduce the degree of overstating trading volume in NASDAQ market. As tested in Anderson and Dyl (2005), the median of NASDAQ trading volume dropped by 38% since RPTR. By 2006, about 75% of NASDAQ trades are through ECN. (Anderson and Dyl, 2007).

The double-counting trading volume can affect our research in three ways: (1) the analysis of PIN during Regulation FD, as the implementation of RPTR is in the same period; (2) trading volume as a control variable when analyzing PIN on G, since we consider trading volume as a combination of NYSE and NASDAQ markets; and (3) PIN itself is sensitive to volume since it is constructed based on the estimated buyer and seller arrival rates.

To rule out the effect of the double counting problem, we test a sample set of only NYSE firms as a robustness check. Separate summary statistics of PIN and G on the NYSE, NASDAQ and AMEX markets are presented in Table 5.2.4.1.

[Insert Table 5.2.4.1
Summary Statistics of PIN and G on NYSE, NASDAQ and AMEX]

As shown in Table 5.2.4.1., the 12,654 observations in NYSE market have a higher mean G index (9.571 compared to 8.178 and 8.346) and a lower mean of PIN (0.143 compared to 0.193 and 0.175) than the 8,513 observations on the other two markets. As in Section 5.2.3, we hypothesize that NYSE having a high G will have a strong relationship between PIN and G. This hypothesis is confirmed in Table 5.2.4.2. The coefficient of G is negative and significant, and the adjusted R-squared statistic is 360 percent higher than that in Table 5.1.1 for the whole population. The change from Regulation FD is presented in Table 5.2.4.3. The regulation has a significant impact on NYSE stocks. The group difference from Regulation FD is presented in Tables 5.2.4.4 and 5.2.4.5, with the same findings as our main regression results in Section 5.1.

[Insert Table 5.2.4.2, 5.2.4.3, 5.2.4.4 and 5.2.4.5]

CHAPTER VI

CONCLUSION

Voluntary disclosure is a channel through which corporate information is passed on to the capital market. The decision to voluntarily disclose information is determined by corporate controllers. Moreover, corporate controllers also determine whether voluntarily disclosing information will be done through public or selective means. Therefore, the balance of power between managers and shareholders and the level of managerial entrenchment could have a substantial effect on not only what information is disclosed, but also how it is disclosed. For example, a powerful manager may experience fewer restrictions in the use of selective, rather than public, information disclosure, and such managers are likely to disclose in a self-serving manner. Managers with a moderate level power may use selective disclosure to avoid job loss. The role of disclosure method as the connection between corporate governance and information asymmetry is consistent with the results of our event study on Regulation FD. The regulation seems to successfully alter firms' disclosure method, and reduces the strong impact of governance changes on information asymmetry for weakly governed firms.

Our research is subject to several of limitations. First, we do not test the causality of corporate governance and information asymmetry level. We cannot rule out the possibility that asymmetric information in the capital market can inversely affect the approval of new governance provisions or the submission of opposing resolutions. Second, the original source of the G data and the block holder data is the IRRC, which covers only S&P 500 and other large firms. Therefore, it is possible that our data set excludes small firms and experiences a large firm bias. Thus caution is needed when extrapolating the conclusions to small firms.

There remain several untested questions in this thesis. First, different effects from the components of the corporate governance index on disclosure method and information asymmetry can be further examined, and other proxies for corporate governance can be tested. Second, other market characteristics associated with disclosure methods, such as bid-ask spread, information credibility and analysts forecast accuracy, can be tested. Industrial differences may also affect the relationship. We leave these questions for future research.

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Table 3.1

PIN Data Distribution by Every 0.1

This table decomposes the value of PIN into 10 categories by every 0.1. The sample consists of 398,756 quarterly PIN estimations between the first quarter of 1993 and the second quarter of 2006 for firms listed on NYSE, AMEX and NASDAQ. A detailed definition of PIN is in Section 3.1.1.

Range by 0.1	Frequency	Percentage	Cumulative Frequency	Cumulative Percent
0.0-0.1	28,946	7.26	28,946	7.26
0.1-0.2	144,319	36.19	173,265	43.45
0.2-0.3	132,550	33.24	305,815	76.69
0.3-0.4	55,674	13.96	361,489	90.65
0.4-0.5	17,648	4.43	379,137	95.08
0.5-0.6	7,744	1.94	386,881	97.02
0.6-0.7	4,788	1.20	391,669	98.22
0.7-0.8	3,093	0.78	394,762	99.00
0.8-0.9	1,793	0.45	396,555	99.45
0.9-1.0	2,201	0.55	398,756	100.00

Table 3.2

0.90-1.00 PIN Data Distribution by Every 0.01

This table decomposes the subgroup of PIN from 0.90 to 1.00 into 10 categories by every 0.01.The sample consists of 2,201 quarterly PIN estimations valued between 0.90 and 1.00 from the first quarter of 1993 to the second quarter of 2006 for firms listed on NYSE, AMEX and NASDAQ. A detailed definition of PIN is in Section 3.1.1.

Range by 0.01	Frequency	Percentage	Cumulative Frequency	Cumulative Percent
0.90-0.91	99	4.50	99	4.50
0.91-0.92	69	3.13	168	7.63
0.92-0.93	80	3.63	248	11.27
0.93-0.94	58	2.64	306	13.90
0.94-0.95	31	1.41	337	15.31
0.95-0.96	29	1.32	366	16.63
0.96-0.97	17	0.77	383	17.40
0.97-0.98	9	0.41	392	17.81
0.98-0.99	4	0.18	396	17.99
0.99-1.00	1,805	82.01	2,201	100.00

Table 3.3
0.00-0.10 PIN Data Distribution by Every 0.01

This table decomposes the subgroup of PIN from 0.00 to 0.10 into 10 categories by every 0.01.The sample consists of 28,960 quarterly PIN estimations valued between 0.00 and 0.01 from the first quarter of 1993 to the second quarter of 2006 for firms listed on NYSE, AMEX and NASDAQ. A detailed definition of PIN is in Section 3.1.1.

Range by 0.01	Frequency	Percentage	Cumulative Frequency	Cumulative Percent
0.00-0.01	1,779	6.14	1,779	6.14
0.01-0.02	279	0.96	2,058	7.11
0.02-0.03	424	1.46	2,482	8.57
0.03-0.04	605	2.09	3,087	10.66
0.04-0.05	986	3.40	4,073	14.06
0.05-0.06	1,756	6.06	5,829	20.13
0.06-0.07	3,055	10.55	8,884	30.68
0.07-0.08	4,863	16.79	13,747	47.47
0.08-0.09	6,686	23.09	20,433	70.56
0.09-0.10	8,527	29.44	28,960	100.00

Table 3.4
IRRC Corporate Governance Provisions

Provisions	Contents
Delay	
Blank Check	Preferred stocks that the board determines holders' rights.
Classified Board	Directors are in different classes serving overlapping terms.
Special Meeting	Require majority shareholder support for a special meeting.
Written Consent	Limitations on action by Written Consent.
Protection	
Compensation Plans	Extra compensations under change in control.
Indemnification Contracts	Contracts indemnifying managers from lawsuit expenses.
Golden Parachutes	Compensation to senior executives under change in control.
Director Indemnification	Bylaws/charter indemnifying managers from lawsuit expenses.
Limitations on Liability	Charter amendments that limit directors' personal liability.
Severance Agreements	Positions/compensation not contingent under change in control.
Voting	
Bylaw Amendment	Limit shareholders' ability to amend the governing documents.
Charter Amendment	Limit shareholders' ability to amend the governing documents.
Cumulative Voting (+)	Allows a shareholder to allocate total votes in any manner.
Secret Ballot (+)	Independent third party sworn to secrecy count proxy votes.
*Supermajority**	Higher votes for combinations than threshold requirements.
Unequal Voting	Limit voting rights of some shareholders and expand others.
Other	
Antigreenmail*	Prevent shareholder selling at premium for not seeking control.
Directors' Duties*	Considering constituencies besides shareholders in a merger.
Fair Price*	Limit the range of prices a bidder can pay in two-tier offers.
Pension Parachutes	Prevent using pension fund of object to finance acquisition.
Poison Pill	Provide holders with special rights in a triggering event
Silver Parachutes	More employees are eligible for golden parachutes benefits.
State	
Antigreenmail law*	Prevent shareholder selling at premium for not seeking control.
Business Combination Law	Pause certain transactions approved by Board of Directors
Cash-out Law	Sales to control shareholder at highest recent acquired price
Directors' Duties Law*	Considering constituencies besides shareholders in a merger.
Fair price Law*	Limit the range of prices a bidder can pay in two-tier offers
Control Share Acquisition Law*	Higher votes for combinations than threshold requirements.

Table 3.5
Summary Statistics of G by Reporting Year

This table provides summary statistics of G, the Governance Index over time. The sample consists of 14,000 annual G data from 1990 to 2006 for firms covered by the IRRC Corporate Takeover Defences (Rosenbaum 1990, 1993, 1995, 1998, 2000, 2002, 2004 and 2006). Firms are allocated into 3 groups following Gompers et al. (2003). The Low group is composed of firms with G ≤ 5, and the High group is composed of firms with G ≥ 14. The rest are in the Medium group. A detailed definition of G is in Section 3.1.2.

	1990	1993	1995	1998	2000	2002	2004	2006	Total
Governance Index									
Minimum	1.0	2.0	2.0	2.0	2.0	1.0	2.0	2.0	1.0
Maximum	17.0	17.0	17.0	18.0	19.0	18.0	18.0	18.0	19.0
Mean	8.9	9.2	9.3	8.8	9.0	9.0	9.0	9.0	9.0
Median	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
Mode	10.0	9.0	9.0	10.0	9.0	8.0	8.0	9.0	9.0
Std Dev	2.9	2.9	2.8	2.8	2.7	2.6	2.6	2.5	2.7
Number of Firms									
G ≤ 5 (Low)	183	170	145	267	185	167	169	140	1,426
G = 6	144	106	125	199	192	163	154	159	1,242
G = 7	171	158	146	213	221	222	215	223	1,569
G = 8	173	154	172	233	229	276	317	283	1,837
G = 9	170	196	194	212	255	254	282	315	1,878
G = 10	186	176	185	238	251	271	281	247	1,835
G = 11	158	176	173	203	208	218	230	224	1,590
G = 12	106	129	150	145	150	128	155	146	1,109
G = 13	89	103	114	117	109	101	95	85	813
G ≥14(High)	87	95	92	87	87	94	85	74	701
Total	1,467	1,463	1,496	1,914	1,887	1,894	1,983	1,896	14,000
% of Low	12.5%	11.6%	9.7%	13.9%	9.8%	8.8%	8.5%	7.4%	10.2%
% of High	5.9%	6.5%	6.1%	4.5%	4.6%	5.0%	4.3%	3.9%	5.0%
% of G = 9	11.6%	13.4%	13.0%	11.1%	13.5%	13.4%	14.2%	16.6%	13.4%

Table 3.6

Definitions of Regression Variables

Variable	Definition
PIN	Probability of Information-based Trading
G	The Corporate Governance Index
AAF	Annual Average Analysts Following
Capitalization	Year-end market capitalization
Volume	Annual Average trading volume
Book-to-Market	Year-end book-to-market ratio
Block	Percentage of shares held by all block holders

Table 3.7

Summary Statistics of Regression Variables

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
PIN	5,285	0.139	0.055	736.453	0.013	0.703
G	5,285	9.503	2.723	50,223	2.000	18.000
AAF	5,285	10.007	6.940	52,888	1.000	39.417
Capitalization	5,285	7,949,178	23,522,136	42,011,400,000	8,178	507,216,640
Volume	5,285	195,777	439,534	1,034,681,829	297	13,188,100
Book-to-Market	5,285	0.389	0.377	2,057	0.000	10.979
Block	5,285	23.034	17.221	121,735	0.000	92.600

Table 3.8
Pearson Correlation Coefficients of Regression Variables

The sample contains 5,285 observations during 1995 and 2005. Pearson correlation coefficients between regression variables are provided.

	PIN	G	AAF	Cap	Vol	BM	Block
PIN	1.000	-0.108	-0.447	-0.263	-0.248	0.171	0.273
		(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)
G		1.000	-0.011	-0.057	-0.062	0.006	-0.251
			(0.443)	(<0.001)	(<0.001)	(0.643)	(<0.001)
AAF			1.000	0.422	0.481	-0.223	-0.291
				(<0.001)	(<0.001)	(<0.001)	(<0.001)
Capitalization				1.000	0.522	-0.163	-0.199
					(<0.001)	(<0.001)	(<0.001)
Volume					1.000	-0.080	-0.173
						(<0.001)	(<0.001)
Book-to-Market						1.000	0.118
							(<0.001)
Block							1.000

Table 3.9
Pearson Correlation Coefficients of Regression Variables on Regulation FD

The sample contains 4,733 observations during 1995 and 2005. The years 1995 to 1999 are recognized as before Regulation FD, and 2001 to 2005 are recognized as after the regulation. The year 2000 is excluded from the analysis. Panel A provides Pearson correlation coefficients between regression variables. Panel B provides a comparison of correlation coefficients. *P*-values are shown in parentheses. A detailed description is in Section 3.2.2.

	PIN	G	AAF	Cap	Vol	BM	Block
Panel A: Pearson Correlation Coefficients							
After							
PIN	1.000	-0.123	-0.478	-0.310	-0.247	0.209	0.293
		(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)
G		1.000	-0.048	-0.047	-0.069	0.000	-0.235
			(0.013)	(0.014)	(0.000)	(0.986)	(<0.001)
AAF			1.000	0.424	0.512	-0.245	-0.271
				(<0.001)	(<0.001)	(<0.001)	(<0.001)
Capitalization				1.000	0.641	-0.178	-0.215
					(<0.001)	(<0.001)	(<0.001)
Volume					1.000	-0.102	-0.199
						(<0.001)	(<0.001)
Book-to-Market						1.000	0.080
							(<0.001)
Block							1.000
Before							
PIN	1.000	-0.059	-0.439	-0.255	-0.246	0.234	0.279
		(0.008)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)
G		1	0.029	-0.06	-0.107	-0.033	-0.286
			(0.195)	(0.007)	(<0.001)	(0.133)	(<0.001)
AAF			1	0.445	0.572	-0.248	-0.312
				(<0.001)	(<0.001)	(<0.001)	(<0.001)
Capitalization				1	0.578	-0.185	-0.186
					(<0.001)	(<0.001)	(<0.001)
Volume					1	-0.191	-0.193
						(<0.001)	(<0.001)
Book-to-Marke						1	0.144
							(<0.001)
Block							1.000

	PIN	G	AAF	Cap	Vol	BM	Block
Panel B: Comparison of Correlation Coefficients Before and After Regulation FD							
Difference $H_0: \rho_1 = \rho_2$							
PIN	0	2.104	1.651	2.023	0.012	6.410	-0.362
		(0.035)	(0.099)	(0.043)	(0.990)	(0.000)	(0.717)
G		0	2.644	-0.386	-1.308	-0.663	-1.875
			(0.008)	(0.699)	(0.191)	(0.507)	(0.061)
AAF			0	0.884	2.948	-5.351	-1.545
				(0.377)	(0.003)	(0.000)	(0.122)
Capitalization				0	-2.936	-3.622	1.042
					(0.003)	(0.000)	(0.297)
Volume					0	-4.888	0.099
						(0.000)	(0.921)
Book-to-Market						0	3.665
							(0.000)
Block							0

Table 5.1.1

Regressions Analysis of Corporate Governance and Information Asymmetry

This table provides regression results for the whole population. The sample consists of 5,285 observations between 1995 and 2005. The dependent variable is PIN. In Basic Regression only G and year are included. In Baseline Regression AFF is also considered. In Full Regression all other control variables are considered as well. Variable definitions are in Table 3.6. *T*-statistics are presented in parentheses. ***and ** indicates significance at 0.01 and 0.05 level respectively.

	(1)	(2)	(3)
	Basic Regression	Baseline Regression	Full Regression
G	-0.002***	-0.002***	-0.001***
	(-6.886)	(-8.140)	(-4.890)
AAF		-0.004***	-0.003***
		(-37.688)	(-25.734)
Capitalization			0.000***
			(-6.305)
Volume			0.000**
			(2.503)
Book-to-Market			0.013***
			(7.633)
Block			0.000***
			(11.671)
Year	-0.003***	-0.003***	-0.004***
	(-14.105)	(-16.045)	(-18.748)
Intercept	0.179***	0.216***	0.191***
	(59.826)	(76.207)	(57.520)
Adjusted R Square	0.047	0.249	0.285
Degree of Freedom	5282	5281	5277

Table 5.1.2
Group Analysis on Corporate Governance and Information Asymmetry

This table provides regression results for the High, Low, and Medium groups respectively. The sample period is between 1995 and 2005. The dependent variable is PIN. Variable definitions are in Table 3.6. Column (4) provides statistics of the difference between coefficients of the High group and the other two groups, and Column (5) provides statistics of the difference between the Low group and the other two groups. The differences are tested with a High group dummy variable and a Low group dummy variable respectively. Panel A, Panel B and Panel C provide the regression results for Basic Regression, Baseline Regression and Full Regression correspondingly. *T*-statistics are presented in parentheses, with ***, ** and * indicates significance at 0.01, 0.05 and 0.1 level respectively.

	(1)	(2)	(3)	(4)	(5)
Variable	High	Low	Medium	High-(Low+Medium)	Low-(High+Medium)
Panel A: Basic Regression					
G	0.011***	-0.003	-0.002***	0.013***	-0.001
	(3.756)	(-0.591)	(-3.985)	(3.730)	(-0.318)
Year	-0.004***	-0.002	-0.003***		
	(-4.608)	(-1.612)	(-13.340)		
Intercept	-0.006	0.182***	0.175***	-0.184***	0.017
	(-0.145)	(8.837)	(43.473)	(-3.656)	(1.002)
Adjusted R Square	0.094	0.007	0.042		
Degree of Freedom	343	409	4524		
Panel B: Baseline Regression					
G	0.007**	0.001	-0.002***	0.008***	0.003
	(2.467)	(0.240)	(-6.071)	(2.691)	(0.862)
AAF	-0.003***	-0.004***	-0.004***		
	(-7.177)	(-8.923)	(-35.915)		
Year	-0.004***	-0.001	-0.004***		
	(-5.489)	(-1.172)	(-15.473)		
Intercept	0.087**	0.195***	0.216***	-0.115***	-0.007
	(1.997)	(10.300)	(57.964)	(-2.562)	(-0.493)
Adjusted R Square	0.213	0.169	0.254		
Degree of Freedom	342	408	4523		

	(1)	(2)	(3)	(4)	(5)
Variable	High	Low	Medium	High-(Low+Medium)	Low-(High+Medium)
Panel C: Full Regression					
G	0.007**	0.002	-0.001***	0.008**	0.002
	(2.314)	(0.587)	(-3.364)	(2.505)	(0.638)
AAF	-0.002***	-0.003***	-0.003***		
	(-4.118)	(-5.205)	(-24.784)		
Capitalization	0.000***	0.000**	0.000***		
	(-3.105)	(-2.510)	(-5.861)		
Volume	0.000	0.000**	0.000**		
	(0.865)	(2.232)	(2.223)		
Book-to-Market	-0.002	0.042***	0.012***		
	(-0.266)	(5.776)	(6.376)		
Block	0.000**	0.001***	0.000***		
	(2.058)	(4.189)	(9.936)		
Year	-0.004***	-0.002**	-0.004***		
	(-5.245)	(-2.425)	(-17.840)		
Intercept	0.085*	0.151***	0.192***	-0.108**	-0.005
	(1.952)	(8.056)	(45.312)	(-2.467)	(-0.309)
Adjusted R Square	0.251	0.279	0.286		
Degree of Freedom	338	404	4519		

Table 5.1.3
Event Study Analysis on Corporate Governance and Information Asymmetry

This table provides regression results for the event study analysis on Regulation FD. The years 1995 to 1999 are recognized as before Regulation FD, and 2001 to 2005 are after. The year 2000 is excluded from the analysis. The dependent variable is PIN. Columns (3), (6) and (9) are statistics of the differences on coefficients before and after the regulation tested with a dummy variable using a *t*-test. *T*-statistics are presented in parentheses. *** and * indicates significance at 0.01 and 0.1 level respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Basic Regression			Baseline Regression			Full Regression		
	After	Before	After-Before	After	Before	After-Before	After	Before	After-Before
G	-0.003***	-0.001***	-0.001**	-0.003***	-0.001***	-0.002***	-0.002***	0.000	-0.002***
	(-6.285)	(-3.495)	(-2.228)	(-8.662)	(-3.288)	(-3.965)	(-6.539)	(-0.198)	(-3.902)
AAF				-0.004***	-0.003***		-0.003***	-0.003***	
				(-28.992)	(-23.366)		(-20.339)	(-16.047)	
Capitalization							0.000***	0.000**	
							(-7.285)	(-2.475)	
Volume							0.000***	0.000***	
							(3.873)	(3.716)	
Book-to-Market							0.013***	0.028***	
							(4.638)	(9.089)	
Block							0.000***	0.001***	
							(7.676)	(8.751)	
Year	-0.002***	-0.010***		-0.001	-0.010***		-0.001*	-0.012***	
	(-2.652)	(-13.141)		(-1.628)	(-15.246)		(-1.827)	(-17.858)	
Intercept	0.176***	0.195***	0.026***	0.211***	0.225***	0.030***	0.183***	0.195***	0.027***
	(22.509)	(43.255)	(4.141)	(30.525)	(53.616)	(5.471)	(24.624)	(40.793)	(5.038)
Adjusted R Square	0.018	0.082		0.25	0.278		0.291	0.338	
Degree of Freedom	2711	2016		2710	2015		2706	2011	

Table 5.1.4
Event Study Analysis on Group Differences

This table provides regression results for event study analysis on Regulation FD by groups. The dependent variable is PIN. Panel A, B and C provide regression results for the High group, the Low group and the Medium group, respectively. Column (3), (6) and (9) are statistics of the differences on coefficients before and after the regulation tested with a event dummy variable. *T*-statistics are presented in parentheses. ***, ** and * indicates significance at 0.01, 0.05 and 0.1 level respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Basic Regression			Baseline Regression			Full Regression		
	After	Before	After-Before	After	Before	After-Before	After	Before	After-Before
					Panel A: High				
G	-0.002	0.030***	-0.031***	-0.002	0.028***	-0.023***	-0.003	0.027***	-0.023***
	(-0.449)	(6.279)	(-5.025)	(-0.663)	(5.235)	(-3.783)	(-0.842)	(5.156)	(-3.852)
AAF				-0.004***	-0.001		-0.003***	-0.001	
				(-7.408)	(-0.771)		(-3.799)	(-0.835)	
Capitalization							0.000**	0.000	
							(-2.425)	(-1.021)	
Volume							0.000	0.000**	
							(-0.576)	(2.337)	
Book-to-Market							0.009	0.005	
							(0.894)	(0.308)	
Block							0.000	0.001***	
							(-0.043)	(3.621)	
Year	-0.003	-0.009***		-0.002	-0.008***		-0.001	-0.009***	
	(-1.191)	(-2.844)		(-1.017)	(-2.826)		(-0.587)	(-3.003)	
Intercept	0.178***	-0.261***	0.465***	0.217***	-0.228***	0.342***	0.212***	-0.230***	0.339***
	(2.865)	(-3.735)	(5.078)	(3.934)	(-2.780)	(3.787)	(3.797)	(-2.886)	(3.802)
Adjusted R Square	0.009	0.283		0.229	0.287		0.280	0.395	
Degree of Freedom	193	117		192	116		188	112	

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Basic Regression			Baseline Regression			Full Regression		
	After	Before	After-Before	After	Before	After-Before	After	Before	After-Before
	Panel B: Low								
G	0.005	-0.008	0.014	0.008	-0.006	0.018**	0.007	-0.005	0.013
	(0.723)	(-1.347)	(1.487)	(1.11)	(-1.291)	(2.110)	(0.977)	(-1.178)	(1.626)
AAF				-0.002**	-0.005***		-0.002**	-0.003***	
				(-2.522)	(-10.322)		(-2.247)	(-4.879)	
Capitalization							0.000***	0.000	
							(-2.798)	(1.295)	
Volume							0.000**	0.000**	
							(2.555)	(-2.473)	
Book-to-Market							0.031*	0.047***	
							(1.771)	(5.974)	
Block							0.000	0.001***	
							(1.652)	(3.682)	
Year	0	-0.005*		0	-0.005**		0.001	-0.005***	
	(-0.028)	(-1.673)		(0.031)	(-2.209)		(0.254)	(-2.654)	
Intercept	0.135***	0.216***	-0.054	0.139***	0.25***	-0.068*	0.106**	0.197***	-0.052
	(2.929)	(7.628)	(-1.249)	(3.073)	(10.641)	(-1.727)	(2.328)	(8.729)	(-1.386)
Adjusted R Square	0.004	0.020		0.047	0.342		0.149	0.492	
Degree of Freedom	141	219		140	218		136	214	

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Basic Regression			Baseline Regression			Full Regression		
	After	Before	After-Before	After	Before	After-Before	After	Before	After-Before
	Panel C: Medium								
G	-0.002***	-0.001	-0.002**	-0.003***	-0.001*	-0.002***	-0.002***	0.000	-0.002***
	(-4.334)	(-1.193)	(-2.196)	(-6.952)	(-1.814)	(-3.419)	(-4.607)	(0.19)	(-3.184)
AAF				-0.004***	-0.003***		-0.003***	-0.003***	
				(-28.914)	(-20.967)		(-19.988)	(-15.673)	
Capitalization							0.000***	0.000***	
							(-6.8)	(-3.315)	
Volume							0.000***	0.000***	
							(3.727)	(5.027)	
Book-to-Market							0.013***	0.025***	
							(4.442)	(7.48)	
Block							0.000***	0.000***	
							(7.399)	(6.39)	
Year	-0.002**	-0.011***		-0.001	-0.011***		-0.001*	-0.013***	
	(-2.493)	(-13.664)		(-1.504)	(-15.804)		(-1.726)	(-18.02)	
Intercept	0.173***	0.189***	0.033***	0.214***	0.223***	0.036***	0.182***	0.198***	0.033***
	(19.115)	(32.302)	(4.001)	(27.048)	(40.845)	(4.962)	(21.352)	(33.03)	(4.598)
Adjusted R Square	0.011	0.100		0.269	0.288		0.310	0.339	
Degree of Freedom	2371	1674		2370	1673		2366	1669	

Table 5.1.5
Regressions Analysis Using Year Dummies

This table provides regression results for the whole population of 5,285 observations. The dependent variable is PIN. Year dummies are used instead of a year trend variable. *T*-statistics are presented in parentheses. ***, **and * indicates significance at 0.01, 0.05 and 0.1 level respectively.

	(1)	(2)	(3)
	Basic Regression	Baseline Regression	Full Regression
G	-0.002***	-0.002***	-0.001***
	(-7.458)	(-8.855)	(-5.440)
AAF		-0.004***	-0.003***
		(-38.718)	(-26.635)
Capitalization			0.000***
			(-5.695)
Volume			0.000***
			(2.785)
Book-to-Market			0.015***
			(8.723)
Block			0.000***
			(12.169)
Dummy1995	0.045***	0.045***	0.051***
	(12.172)	(13.925)	(15.834)
Dummy1996	0.040***	0.038***	0.044***
	(10.763)	(11.795)	(13.815)
Dummy1997	0.015***	0.013***	0.019***
	(4.272)	(4.011)	(6.078)
Dummy1998	0.009	0.003	0.008***
	(2.576)	(1.132)	(2.795)
Dummy1999	0.009***	0.009***	0.011***
	(2.668)	(3.021)	(3.889)
Dummy2000	0.005*	0.005*	0.006**
	(1.680)	(1.812)	(2.048)
Dummy2001	0.011***	0.008***	0.010***
	(3.457)	(2.953)	(3.540)
Dummy2002	0.003	-0.002	-0.003
	(0.801)	(-0.565)	(-1.180)
Dummy2003	0.002	-0.002	-0.001
	(0.566)	(-0.672)	(-0.386)
Dummy2004	0.004	0.002	0.003
	(1.170)	(0.746)	(1.027)
Intercept(2005)	0.148***	0.187***	0.154***
	(42.258)	(57.503)	(40.530)
Adjusted R Square	0.066	0.273	0.311
Degree of Freedom	5273	5272	5268

Table 5.2.1.1
Regression Analysis on LOGPIN

This table provides regression results for a sample consisting of 5,285 observations between 1995 and 2005. The dependent variable is LOGPIN. In Basic Regression only G and year are included. In Baseline Regression AFF is also considered. In Full Regression all other control variables are considered as well. Variable definitions are in Section 3.1.1 and Table 3.6. *T*-statistics are presented in parentheses. *** indicates significance at 0.01 level.

	(1)	(2)	(3)
	Basic Regression	Baseline Regression	Full Regression
G	-0.013***	-0.014***	-0.009***
	(-5.924)	(-7.442)	(-4.580)
AAF		-0.033***	-0.025***
		(-45.308)	(-29.264)
Capitalization			0.000***
			(-9.311)
Volume			0.000
			(-1.054)
Book-to-Market			0.105***
			(7.872)
Block			0.004***
			(12.348)
Year	-0.034***	-0.035***	-0.038***
	(-17.494)	(-20.803)	(-23.125)
Intercept	-1.545***	-1.209***	-1.419***
	(-64.275)	(-55.701)	(-56.394)
Adjusted R Square	0.064	0.326	0.372
Degree of Freedom	5282	5281	5277

Table 5.2.1.2
Group Analysis on LOGPIN

This table provides regression results for the High, Low and Medium groups respectively. The sample period is between 1995 and 2005. The dependent variable is LOGPIN. Variable definitions are in Section 3.1.1 and Table 3.6. Column (4) provides statistics of the difference between coefficients of the High group and the other two groups, and Column (5) provides statistics of the difference between the Low group and the others. The differences are tested with group dummy variables. Panels A, B and C provide the regression results for Basic, Baseline, and Full regressions correspondingly. *T*-statistics are presented in parentheses, with ***, ** and * indicates significance at 0.01, 0.05 and 0.1 level respectively.

	(1)	(2)	(3)	(4)	(5)
Variable	High	Low	Medium	High-(Low+Medium)	Low-(High+Medium)
Panel A: Basic Regression					
G	0.077***	-0.026	-0.010***	0.088***	-0.017
	(3.262)	(-0.812)	(-3.368)	(3.172)	(-0.574)
Year	-0.036***	-0.018**	-0.035***		
	(-5.635)	(-2.223)	(-16.491)		
Intercept	-2.809***	-1.509***	-1.575***	-1.245***	0.163
	(-8.027)	(-9.871)	(-48.270)	(-3.087)	(1.206)
Adjusted R Square	0.111	0.013	0.060		
Degree of Freedom	343	409	4524		
Panel B: Baseline Regression					
G	0.037*	0.004	-0.015***	0.045*	0.020
	(1.682)	(0.130)	(-5.868)	(1.920)	(0.793)
AAF	-0.028***	-0.030***	-0.033***		
	(-9.147)	(-10.520)	(-43.144)		
Year	-0.040***	-0.013*	-0.036***		
	(-6.983)	(-1.810)	(-20.013)		
Intercept	-1.909***	-1.400***	-1.190***	-0.606*	-0.061
	(-5.800)	(-10.283)	(-41.204)	(-1.767)	(-0.532)
Adjusted R Square	0.286	0.224	0.334		
Degree of Freedom	342	408	4523		

	(1)	(2)	(3)	(4)	(5)
Variable	High	Low	Medium	High-(Low+Medium)	Low-(High+Medium)
Panel C: Full Regression					
G	0.032	0.009	-0.009***	0.041*	0.013
	(1.492)	(0.337)	(-3.362)	(1.789)	(0.559)
AAF	-0.019***	-0.018***	-0.025***		
	(-4.875)	(-5.173)	(-28.207)		
Capitalization	0.000***	0.000***	0.000***		
	(-3.755)	(-3.206)	(-8.747)		
Volume	0.000	0.000	0.000		
	(0.112)	(0.557)	(-0.931)		
Book-to-Market	-0.001	0.277***	0.096***		
	(-0.014)	(5.369)	(6.823)		
Block	0.002*	0.004***	0.004***		
	(1.899)	(4.541)	(10.567)		
Year	-0.039***	-0.020***	-0.039***		
	(-6.466)	(-2.887)	(-22.100)		
Intercept	-1.930***	-1.725***	-1.400***	-0.576*	-0.0386
	(-5.939)	(-12.902)	(-43.210)	(-1.735)	(-0.340)
Adjusted R Square	0.334	0.333	0.376		
Degree of Freedom	338	404	4519		

Table 5.2.1.3
Event Study Analysis on LOGPIN

This table provides regression results for event study analysis of LOGPIN on Regulation FD. The years 1995 to 1999 are recognized as before Regulation FD and 2001 to 2005 are recognized as after. The year 2000 is excluded from the analysis. The dependent variable is PIN. Columns (3), (6) and (9) have statistics of the differences on coefficients during the regulation tested with a dummy variable. *T*-statistics are presented in parentheses. *** and ** indicates significance at 0.01 and 0.05 level rrespectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Basic Regression			Baseline Regression			Full Regression		
	After	Before	After-Before	After	Before	After-Before	After	Before	After-Before
G	-0.019***	-0.008***	-0.010**	-0.024***	-0.007***	-0.017***	-0.018***	-0.001	-0.016***
	(-5.473)	(-2.955)	(-2.272)	(-8.349)	(-2.699)	(-4.405)	(-6.324)	(-0.249)	(-4.305)
AAF				-0.038***	-0.027***		-0.030***	-0.020***	
				(-34.804)	(-27.547)		(-23.583)	(-16.716)	
Capitalization							0.000***	0.000***	
							(-10.562)	(-3.864)	
Volume							0.000***	0.000	
							(3.135)	(0.154)	
Book-to-Market							0.103***	0.199***	
							(4.614)	(9.057)	
Block							0.004***	0.004***	
							(8.405)	(8.906)	
Year	-0.030***	-0.079***		-0.021***	-0.082***		-0.022***	-0.090***	
	(-4.665)	(-13.912)		(-3.919)	(-16.833)		(-4.405)	(-19.075)	
Intercept	-1.512***	-1.448***	0.217***	-1.170***	-1.186***	0.257***	-1.402***	-1.415***	0.235***
	(-23.231)	(-42.788)	(4.292)	(-21.271)	(-39.042)	(6.008)	(-24.089)	(-41.222)	(5.671)
Adjusted R Square	0.020	0.090		0.323	0.339		0.380	0.400	
Degree of Freedom	2711	2016		2710	2015		2706	2011	

Table 5.2.1.4
Event Study Analysis on Group Differences for LOGPIN

This table provides regression results for event study analysis on Regulation FD by groups. The dependent variable is LOGPIN. Panels A and B provides regression results for the High and Low groups respectively. Columns (3), (6) and (9) have statistics of the differences in coefficients before and after the regulation tested with a dummy variable. *T*-statistics are presented in parentheses. ***, ** and * indicates significance at 0.01, 0.05 and 0.1 level respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Basic Regression			Baseline Regression			Full Regression		
	After	Before	After-Before	After	Before	After-Before	After	Before	After-Before
	Panel A: High								
G	-0.011	0.201***	-0.209***	-0.016	0.171***	-0.125***	-0.020	0.164***	-0.130***
	(-0.303)	(6.362)	(-4.270)	(-0.542)	(4.875)	(-2.700)	(-0.678)	(4.851)	(-2.863)
AAF				-0.039***	-0.009*		-0.026***	-0.006	
				(-8.758)	(-1.882)		(-4.745)	(-0.960)	
Capitalization							0.000***	0.000	
							(-3.191)	(-1.31)	
Volume							0.000	0.000	
							(-0.208)	(1.423)	
Book-to-Market							0.072	0.079	
							(0.844)	(0.749)	
Block							0.000	0.007***	
							(-0.186)	(3.760)	
Year	-0.043**	-0.079***		-0.036**	-0.079***		-0.028	-0.080***	
	(-2.120)	(-3.971)		(-2.110)	(-3.984)		(-1.634)	(-4.017)	
Intercept	-1.447***	-4.493***	3.214***	-1.066**	-3.964***	1.931***	-1.140**	-4.061***	1.964***
	(-2.706)	(-9.648)	(4.443)	(-2.341)	(-7.343)	(2.817)	(-2.507)	(-7.734)	(2.924)
Adjusted R Square	0.023	0.317		0.302	0.338		0.364	0.440	
Degree of Freedom	193	117		192	116		188	112	

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Basic Regression			Baseline Regression			Full Regression		
	After	Before	After-Before	After	Before	After-Before	After	Before	After-Before
					Panel B: Low				
G	0.045	-0.067	0.116*	0.076	-0.054	0.150**	0.063	-0.05*	0.118**
	(0.797)	(-1.575)	(1.692)	(1.392)	(-1.594)	(2.475)	(1.220)	(-1.654)	(2.078)
AAF				-0.021***	-0.036***		-0.016**	-0.021***	
				(-3.753)	(-11.242)		(-2.114)	(-5.265)	
Capitalization							0.000***	0.000	
							(-3.750)	(1.222)	
Volume							0.000	0.000***	
							(1.522)	(-3.283)	
Book-to-Market							0.220*	0.298***	
							(1.746)	(5.356)	
Block							0.003*	0.004***	
							(1.897)	(3.646)	
Year	-0.007	-0.044**		-0.005	-0.047***		-0.005	-0.048***	
	(-0.236)	(-2.138)		(-0.160)	(-2.869)		(-0.181)	(-3.254)	
Intercept	-1.898***	-1.235***	-0.442	-1.853***	-0.973***	-0.561**	-2.054***	-1.320***	-0.445*
	(-5.539)	(-5.981)	(-1.383)	(-5.650)	(-5.851)	(-1.983)	(-6.323)	(-8.210)	(-1.676)
Adjusted R Square	0.005	0.031		0.096	0.386		0.226	0.522	
Degree of Freedom	141	219		140	218		136	214	

Table 5.2.2.1
Regression Analysis on PIN with E Index

This table provides regression results for a sample consisting of 5,099 observations between 1995 and 2005. The dependent variable is PIN. In Basic Regression only E Index and year are included. In Baseline Regression AFF is also considered. In Full Regression all other control variables are considered as well. Variable definitions are in Section 5.2.2 and Table 3.6. *T*-statistics are presented in parentheses. *** and ** indicates significance at 0.01 and 0.05 level respectively.

	(1)	(2)	(3)
	Basic Regression	Baseline Regression	Full Regression
E	-0.001	-0.002***	-0.001**
	(-1.227)	(-4.761)	(-2.399)
AAF		-0.004***	-0.003***
		(-37.921)	(-25.828)
Capitalization			0.000***
			(-6.499)
Volume			0.000**
			(2.414)
Book-to-Market			0.013***
			(7.759)
Block			0.001***
			(12.727)
Year	-0.004***	-0.003***	-0.004***
	(-14.497)	(-15.957)	(-18.772)
Intercept	0.164***	0.203***	0.181***
	(78.671)	(95.843)	(71.110)
Adjusted R Square	0.040	0.243	0.284
Degree of Freedom	5354	5353	5349

Table 5.2.2.2
Group Analysis on PIN with E Index

This table provides regression results for the High, Low, and Medium groups respectively. The sample period is between 1995 and 2005. The dependent variable is PIN. Variable definitions are in Section 5.2.2 and Table 3.6. Column (4) provides statistics of the difference between coefficients of the High group and the other two groups, and Column (5) provides statistics of the difference between the Low group and the other two groups. The differences are tested with group dummy variables. Panels A, B and C provide the regression results for the Basic, Baseline, and Full regressions correspondingly. *T*-statistics are presented in parentheses, with *** indicates significance at 0.01 level.

	(1)	(2)	(3)	(4)	(5)
Variable	High	Low	Medium	High-(Low+Medium)	Low-(High+Medium)
Panel A: Basic Regression					
E	-0.001	0.001	0.001	-0.002	0.000
	(-0.289)	(0.277)	(0.504)	(-0.468)	(-0.106)
Year	-0.003***	-0.004***	-0.003***		
	(-7.756)	(-6.770)	(-10.329)		
Intercept	0.165***	0.166***	0.158***	0.007	0.006
	(11.748)	(40.161)	(28.810)	(0.422)	(0.958)
Adjusted R Square	0.046	0.034	0.037		
Degree of Freedom	1251	1310	2787		
Panel B: Baseline Regression					
E	-0.002	-0.003	-0.002	0.000	-0.001
	(-0.765)	(-0.791)	(-1.200)	(-0.043)	(-0.173)
AAF	-0.004***	-0.003***	-0.004***		
	(-18.837)	(-16.937)	(-28.658)		
Year	-0.004***	-0.003***	-0.003***		
	(-9.686)	(-6.422)	(-11.552)		
Intercept	0.207***	0.201***	0.202***	-0.001	0.002
	(16.385)	(46.990)	(39.926)	(-0.054)	(0.350)
Adjusted R Square	0.257	0.208	0.256		
Degree of Freedom	1250	1309	2786		

	(1)	(2)	(3)	(4)	(5)
Variable	High	Low	Medium	High-(Low+Medium)	Low-(High+Medium)
			Panel C: Full Regression		
E	-0.001	-0.001	-0.001	0.000	-0.001
	(-0.255)	(-0.210)	(-0.500)	(-0.061)	(-0.331)
AAF	-0.003***	-0.003***	-0.003***		
	(-10.891)	(-11.521)	(-17.363)		
Capitalization	0.000	0.000***	0.000***		
	(0.499)	(-5.832)	(-3.419)		
Volume	0.000***	0.000***	0.000		
	(-6.410)	(4.986)	(-0.289)		
Book-to-Market	0.003	0.021***	0.021***		
	(1.188)	(5.659)	(7.434)		
Block	0.001***	0.001***	0.001***		
	(6.606)	(6.704)	(8.836)		
Year	-0.003***	-0.004***	-0.004***		
	(-8.449)	(-8.483)	(-13.965)		
Intercept	0.182***	0.175***	0.178***	-0.001	0.002
	(14.399)	(33.304)	(33.071)	(-0.040)	(0.381)
Adjusted R Square	0.307	0.283	0.300		
Degree of Freedom	1246	1305	2782		

Table 5.2.2.3
Event Study Analysis with E Index

This table provides regression results for event study analysis with E Index on Regulation FD. 1995 to 1999 are recognized as before Regulation FD. 2001 to 2005 are recognized as after. Year 2000 is excluded from analysis. The dependent variable is PIN. Column (3), (6) and (9) are statistics of the differences on coefficients during the regulation tested with a event dummy variable. *T*-statistics are presented in parentheses. *** and ** indicates significance at 0.01 and 0.05 level respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Basic Regression			Baseline Regression			Full Regression		
	After	Before	After-Before	After	Before	After-Before	After	Before	After-Before
E	-0.001	-0.001	0.000	-0.004***	-0.002***	-0.001	-0.003***	0.000	-0.001
	(-1.143)	(-1.390)	(0.301)	(-4.790)	(-2.789)	(-0.957)	(-3.546)	(-0.047)	(-0.997)
AAF				-0.004***	-0.003***		-0.003***	-0.003***	
				(-28.930)	(-23.481)		(-20.218)	(-15.804)	
Capitalization							0.000***	0.000***	
							(-7.411)	(-2.680)	
Volume							0.000***	0.000***	
							(3.792)	(3.227)	
Book-to-Market							0.014***	0.027***	
							(5.017)	(8.944)	
Block							0.000***	0.001***	
							(8.625)	(9.291)	
Year	-0.002***	-0.010***		-0.001**	-0.010***		-0.001**	-0.012***	
	(-3.257)	(-13.049)		(-2.076)	(-15.153)		(-2.181)	(-17.871)	
Intercept	0.157***	0.185***	0.014***	0.194***	0.219***	0.015***	0.168***	0.193***	0.013***
	(21.952)	(57.761)	(3.095)	(30.297)	(68.544)	(3.761)	(24.681)	(52.280)	(3.249)
Adjusted R Square	0.005	0.078		0.238	0.273		0.286	0.336	
Degree of Freedom	2740	2048		2739	2047		2735	2043	

Table 5.2.3.1

Summary Statistics of G for Firms Staying in IRRC

This table provides summary statistics of G, the Governance Index, from 1995 to 2005 for firms staying in the IRRC database for the full period. It consists of 741 firms with 3,705 annual G observations. Firms are allocated into 3 groups following Gompers et al. (2003). The Low group is composed of firms with G ≤ 5, and the High group is composed of firms with G ≥ 14. The rest are in the Medium group. A detailed description can be found in Section 5.2.3.

	1995	1998	2000	2002	2004	All
Governance Index						
Minimum	2.0	3.0	2.0	3.0	3.0	2.0
Maximum	17.0	18.0	19.0	18.0	18.0	19.0
Mean	9.3	9.6	9.8	10.1	10.1	9.8
Median	9.0	10.0	10.0	10.0	10.0	10.0
Mode	9.0	10.0	10.0	10.0	11.0	10.0
Std Dev	2.9	2.8	2.7	2.6	2.5	2.7
Number of Firms						
G ≤ 5 (Low)	77	59	46	33	31	246
G = 6	57	52	39	33	27	208
G = 7	79	65	71	53	62	330
G = 8	88	88	76	85	86	423
G = 9	92	87	92	83	88	442
G = 10	80	109	108	116	107	520
G = 11	83	93	105	115	114	510
G = 12	79	68	78	86	94	405
G = 13	54	69	71	71	68	333
G ≥ 14 (High)	52	51	55	66	64	288
Total	741	741	741	741	741	3,705
Percentage of Low	10.391%	7.962%	6.208%	4.453%	4.184%	6.640%
Percentage of High	7.018%	6.883%	7.422%	8.907%	8.637%	7.773%

Table 5.2.3.2

Regression Analysis on PIN for Firms Staying in IRRC

This table provides regression results of 3,489 observations between 1995 and 2005 for firms staying in the IRRC database all along the period. The dependent variable is PIN. In Basic Regression only G and year are included. In Baseline Regression AFF is also considered. In Full Regression all other control variables are considered as well. Variable definitions are in Section 5.2.3 and Table 3.6. *T*-statistics are presented in parentheses. *** indicates significance at 0.01 level.

	(1)	(2)	(3)
	Basic Regression	Baseline Regression	Full Regression
G	-0.001***	-0.002***	-0.001***
	(-3.339)	(-6.531)	(-4.350)
AAF		-0.003***	-0.003***
		(-35.729)	(-23.641)
Capitalization			0.000***
			(-3.876)
Volume			0.000
			(0.946)
Book-to-Market			0.018***
			(8.269)
Block			0.000***
			(9.972)
Year	-0.005***	-0.004***	-0.005***
	(-16.295)	(-17.961)	(-20.293)
Intercept	0.168***	0.210***	0.186***
	(49.285)	(66.753)	(51.778)
Adjusted R Square	0.078	0.325	0.364
Degree of Freedom	3486	3485	3481

Table 5.2.3.3
Group Analysis on PIN for Firms Staying in IRRC

This table provides regression results for the High, Low, and Medium groups respectively. The sample period is between 1995 and 2005. The dependent variable is PIN. Variable definitions are in Section 5.2.3 and Table 3.6. Column (4) provides statistics of the difference between coefficients of the High group and the other two groups, and Column (5) provides statistics of the difference between the Low group and the other two groups. The differences are tested with two group dummy variables. Panels A, B and C provide the regression results for the Basic, Baseline, and Full regressions correspondingly. *T*-statistics are presented in parentheses, with ***, ** and * indicates significance at 0.01, 0.05 and 0.1 level respectively.

	(1)	(2)	(3)	(4)	(5)
	High	Low	Medium	High-(Low+Medium)	Low-(High+Medium)
Panel A: Basic Regression					
G	0.013***	0.000	-0.001*	0.014***	0.000
	(4.864)	(-0.058)	(-1.877)	(4.399)	(0.011)
Year	-0.004***	-0.003	-0.005***		
	(-5.354)	(-1.463)	(-15.598)		
Intercept	-0.038	0.169***	0.164***	-0.202***	0.015
	(-0.934)	(5.087)	(37.689)	(-4.315)	(0.685)
Adjusted R Square	0.160	0.012	0.078		
Degree of Freedom	284	172	3024		
Panel B: Baseline Regression					
G	0.009***	0.004	-0.002***	0.010***	0.005
	(3.488)	(0.573)	(-5.526)	(3.735)	(1.383)
AAF	-0.003***	-0.004***	-0.003***		
	(-8.492)	(-5.997)	(-34.592)		
Year	-0.004***	-0.002	-0.004***		
	(-6.049)	(-1.274)	(-17.427)		
Intercept	0.061	0.183***	0.211***	-0.143***	0.018
	(1.605)	(6.053)	(53.656)	(-3.550)	(-0.924)
Adjusted R Square	0.331	0.184	0.339		
Degree of Freedom	283	171	3023		

	(1)	(2)	(3)	(4)	(5)
	High	Low	Medium	High-(Low+Medium)	Low-(High+Medium)
Panel C: Full Regression					
G	0.007***	-0.001	-0.001***	0.010***	0.003
	(2.888)	(-0.222)	(-3.399)	(3.572)	(0.727)
AAF	-0.003***	-0.001	-0.003***		
	(-5.946)	(-1.331)	(-23.213)		
Capitalization	0.000*	0.000**	0.000***		
	(-1.700)	(-2.196)	(-3.551)		
Volume	0.000	0.000	0.000		
	(0.455)	(1.584)	(0.401)		
Book-to-Market	-0.004	0.080***	0.018***		
	(-0.618)	(4.597)	(8.262)		
Block	0.001***	0.001***	0.000***		
	(5.532)	(4.481)	(7.114)		
Year	-0.005***	-0.005***	-0.005***		
	(-6.369)	(-2.770)	(-19.443)		
Intercept	0.071*	0.135***	0.188***	-0.138***	-0.003
	(1.943)	(4.693)	(41.955)	(-3.507)	(-0.170)
Adjusted R Square	0.417	0.339	0.372		
Degree of Freedom	279	167	3019		

Table 5.2.3.4
Event Study Analysis for Firms Staying in IRRC

This table provides regression results for event study analysis on Regulation FD by groups. The dependent variable is PIN. Panels A and B provide regression results for the High and Low groups respectively. Columns (3), (6) and (9) have statistics on the differences in coefficients before and after the regulation tested with a dummy variable. *T*-statistics are presented in parentheses. *** and ** indicates significance at 0.01 and 0.05 level respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Basic Regression			Baseline Regression			Full Regression		
	After	Before	After-Before	After	Before	After-Before	After	Before	After-Before
G	-0.001**	-0.001	0.000	-0.002***	-0.001***	-0.001	-0.002***	0.000	-0.001
	(-2.281)	(-1.395)	(-0.405)	(-5.344)	(-2.668)	(-1.458)	(-4.124)	(-1.095)	(-1.411)
AAF				-0.004***	-0.003***		-0.003***	-0.002***	
				(-26.785)	(-21.411)		(-18.134)	(-12.201)	
Capitalization							0.000***	0.000	
							(-4.411)	(0.253)	
Volume							0.000**	0.000**	
							(2.535)	(-2.318)	
Book-to-Market							0.018***	0.024***	
							(5.315)	(7.130)	
Block							0.000***	0.001***	
							(6.116)	(7.844)	
Year	-0.004***	-0.012***		-0.003***	-0.011***		-0.003***	-0.013***	
	(-5.035)	(-11.793)		(-4.682)	(-12.400)		(-4.971)	(-14.160)	
Intercept	0.166***	0.191***	0.017**	0.208***	0.223***	0.018***	0.183***	0.198***	0.016***
	(19.373)	(34.834)	(2.328)	(28.140)	(44.852)	(2.860)	(23.110)	(36.453)	(2.624)
Adjusted R Square	0.018	0.095		0.302	0.323		0.340	0.383	
Degree of Freedom	1763	1362		1762	1361		1758	1357	

Table 5.2.3.5
Event Study Analysis on Group Differences for Firms Staying in IRRC

This table provides regression results for event study analysis on Regulation FD by groups. The dependent variable is PIN. Panels A and B provide regression results for the High and Low groups respectively. Columns (3), (6) and (9) have statistics on the differences in coefficients before and after the regulation tested with a dummy variable. *T*-statistics are presented in parentheses. ***, ** and * indicates significance at 0.01, 0.05 and 0.1 level respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Basic Regression			Baseline Regression			Full Regression		
	After	Before	After-Before	After	Before	After-Before	After	Before	After-Before
					Panel A: High				
G	0.000	0.033***	-0.033***	-0.001	0.028***	-0.025***	-0.002	0.025***	-0.026***
	(-0.080)	(8.151)	(-5.995)	(-0.458)	(6.182)	(-4.859)	(-0.703)	(6.390)	(-5.233)
AAF				-0.004***	-0.002**		-0.003***	-0.001	
				(-7.377)	(-2.437)		(-4.841)	(-1.348)	
Capitalization							0.000**	0.000	
							(-2.456)	(0.038)	
Volume							0.000	0.000	
							(0.855)	(0.039)	
Book-to-Market							0.005	0.011	
							(0.529)	(0.952)	
Block							0.000**	0.001***	
							(2.336)	(6.073)	
Year	-0.004*	-0.010***		-0.004**	-0.011***		-0.003	-0.010***	
	(-1.879)	(-3.092)		(-1.974)	(-3.197)		(-1.609)	(-3.398)	
Intercept	0.159***	-0.303***	0.493***	0.208***	-0.209***	0.375***	0.198***	-0.217***	0.377***
	(2.793)	(-5.000)	(6.057)	(4.182)	(-2.976)	(4.921)	(4.010)	(-3.493)	(5.221)
Adjusted R Square	0.022	0.446		0.271	0.479		0.344	0.641	
Degree of Freedom	160	94		159	93		155	89	

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Basic Regression			Baseline Regression			Full Regression		
	After	Before	After-Before	After	Before	After-Before	After	Before	After-Before
					Panel B: Low				
G	0.024*	-0.015*	0.039***	0.028**	-0.012*	0.042***	0.015	-0.013**	0.028**
	(1.826)	(-1.915)	(2.763)	(2.197)	(-1.766)	(3.292)	(0.986)	(-2.138)	(2.305)
AAF				-0.003**	-0.004***		0.000	-0.002**	
				(-2.201)	(-7.106)		(-0.001)	(-2.352)	
Capitalization							0.000	0.000	
							(-1.573)	(0.992)	
Volume							0.000	0.000	
							(0.681)	(-1.345)	
Book-to-Market							0.071*	0.073***	
							(1.760)	(4.167)	
Block							0.001	0.001***	
							(1.441)	(3.323)	
Year	-0.002	-0.008		-0.001	-0.006		-0.004	-0.008**	
	(-0.270)	(-1.576)		(-0.146)	(-1.473)		(-0.515)	(-2.149)	
Intercept	0.053	0.253***	-0.163**	0.054	0.273***	-0.181***	0.056	0.221***	-0.122**
	(0.638)	(6.272)	(-2.367)	(0.672)	(8.239)	(-2.933)	(0.689)	(6.795)	(-2.053)
Adjusted R Square	0.059	0.059		0.138	0.379		0.242	0.531	
Degree of Freedom	54	99		53	98		49	94	

Table 5.2.4.1

Summary Statistics of PIN and G on NYSE, NASDAQ and AMEX

This table provides summary statistics of PIN and G on the NYSE, NASDAQ and AMEX market seperately. The sample consists of 21,167 observations from 1993 to 2006. A detailed description can be found in Section 5.2.4.

	Mean	Median	Standard Deviation	Observations
PIN				
AMEX	0.193	0.181	0.078	751
NYSE	0.143	0.133	0.055	12654
Nasdaq	0.175	0.164	0.07	7762
G				
AMEX	8.178	8	2.932	751
NYSE	9.571	10	2.676	12654
Nasdaq	8.346	8	2.604	7762

Table 5.2.4.2
Regression Analysis on PIN for Firms Listed on NYSE

This table provides regression results of 4,136 observations between 1995 and 2005 for firms listed on NYSE. The dependent variable is PIN. In the Basic Regression, only G and year are included. In the Baseline Regression, AFF is also considered. In the Full Regression, all other control variables are considered as well. Variable definitions are in Section 5.2.4 and Table 3.6. *T*-statistics are presented in parentheses. *** indicates significance at 0.01 level.

	(1)	(2)	(3)
	Basic Regression	Baseline Regression	Full Regression
G	-0.001***	-0.002***	-0.001***
	(-5.924)	(-8.235)	(-4.256)
AAF		-0.004***	-0.003***
		(-46.262)	(-29.418)
Capitalization			0.000***
			(-3.679)
Volume			0.000***
			(-4.627)
Book-to-Market			0.016***
			(11.649)
Block			0.000***
			(14.69)
Year	-0.006***	-0.006***	-0.006***
	(-27.53)	(-34.765)	(-37.481)
Intercept	0.182***	0.221***	0.191***
	(66.557)	(93.248)	(70.253)
Adjusted R Square	0.169	0.456	0.513
Degree of Freedom	4069	4068	4064

Table 5.2.4.3
Group Analysis on PIN for Firms Listed on NYSE

This table provides regression results for the High, Low, and Medium groups respectively. The sample period is between 1995 and 2005. The dependent variable is PIN. Variable definitions are in Section 5.2.3 and Table 3.6. Column (4) provides statistics on the difference between coefficients of the High group and the other two groups, and Column (5) provides statistics on the difference between the Low group and the other two groups. The differences are tested with two group dummy variables. Panels A, B, and C provide the regression results for the Basic, Baseline, and Full regressions correspondingly. *T*-statistics are presented in parentheses, with ***, ** and * indicates significance at 0.01, 0.05 and 0.1 level respectively.

	(1)	(2)	(3)	(4)	(5)
	High	Low	Medium	High-(Low+Medium)	Low-(High+Medium)
Panel A: Basic Regression					
G	0.015***	-0.007	-0.001***	0.016***	-0.005
	(6.150)	(-1.359)	(-4.187)	(5.882)	(-1.449)
Year	-0.006***	-0.007***	-0.006***		
	(-8.138)	(-5.361)	(-25.978)		
Intercept	-0.054	0.220***	0.180***	-0.232***	0.035**
	(-1.502)	(8.970)	(50.328)	(-5.736)	(2.010)
Adjusted R Square	0.264	0.107	0.166		
Degree of Freedom	291	252	3520		
Panel B: Baseline Regression					
G	0.010***	-0.006	-0.002***	0.012***	-0.005
	(5.058)	(-1.471)	(-7.060)	(5.427)	(-1.496)
AAF	-0.003***	-0.004***	-0.003***		
	(-11.230)	(-9.456)	(-44.205)		
Year	-0.006***	-0.006***	-0.006***		
	(-10.537)	(-5.854)	(-33.287)		
Intercept	0.048	0.251***	0.222***	-0.170***	0.025*
	(1.549)	(11.731)	(73.443)	(-5.200)	(1.774)
Adjusted R Square	0.487	0.342	0.464		
Degree of Freedom	290	251	3519		

	(1)	(2)	(3)	(4)	(5)
	High	Low	Medium	High-(Low+Medium)	Low-(High+Medium)
Panel C: Full Regression					
G	0.008***	-0.009**	-0.001***	0.011***	-0.007**
	(4.053)	(-2.254)	(-3.943)	(5.195)	(-2.338)
AAF	-0.003***	-0.002***	-0.003***		
	(-7.888)	(-4.369)	(-28.279)		
Capitalization	0.000**	0.000	0.000***		
	(-2.190)	(0.508)	(-4.300)		
Volume	0.000	0.000*	0.000***		
	(0.327)	(-1.798)	(-4.350)		
Book-to-Market	-0.017*	0.023***	0.016***		
	(-1.958)	(2.999)	(11.919)		
Block	0.001***	0.001***	0.000***		
	(4.795)	(5.327)	(11.365)		
Year	-0.006***	-0.007***	-0.006***		
	(-9.667)	(-6.581)	(-35.819)		
Intercept	0.071**	0.220***	0.194***	-0.159***	0.034**
	(2.332)	(10.236)	(57.629)	(-5.110)	(2.538)
Adjusted R Square	0.546	0.448	0.518		
Degree of Freedom	286	247	3515		

Table 5.2.4.4
Event Study Analysis for Firms Listed on NYSE

This table provides regression results for the event study analysis on Regulation FD by groups. The dependent variable is PIN. Panels A and B provide regression results for the High and Low groups respectively. Columns (3), (6) and (9) have statistics on the differences in coefficients before and after the regulation tested with a dummy variable. *T*-statistics are presented in parentheses. *** and ** indicates significance at 0.01 and 0.05 level respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Basic Regression			Baseline Regression			Full Regression		
	After	Before	After-Before	After	Before	After-Before	After	Before	After-Before
G	-0.001***	-0.002***	0.000	-0.002***	-0.002***	0.000	-0.001***	-0.001**	0.000
	(-3.723)	(-4.192)	(0.627)	(-6.831)	(-4.754)	(-0.399)	(-3.675)	(-2.387)	(-0.389)
AAF				-0.004***	-0.003***		-0.003***	-0.002***	
				(-39.282)	(-23.915)		(-25.522)	(-12.785)	
Capitalization							0.000**	0.000	
							(-2.519)	(-1.37)	
Volume							0.000***	0.000***	
							(-3.361)	(-2.981)	
Book-to-Market							0.021***	0.024***	
							(10.797)	(8.304)	
Block							0.000***	0.000***	
							(12.097)	(8.103)	
Year	-0.008***	-0.011***		-0.008***	-0.011***		-0.008***	-0.012***	
	(-13.317)	(-14.52)		(-16.639)	(-16.967)		(-17.983)	(-18.693)	
Intercept	0.205***	0.197***	0.022***	0.245***	0.228***	0.025***	0.209***	0.198***	0.024***
	(31.467)	(43.712)	(3.875)	(48.758)	(55.82)	(5.296)	(40.191)	(42.067)	(5.486)
Adjusted R Square	0.089	0.122		0.482	0.351		0.556	0.416	
Degree of Freedom	2032	1620		2031	1619		2027	1615	

Table 5.2.4.5
Event Study Analysis on Group Differences for Firms Listed on NYSE

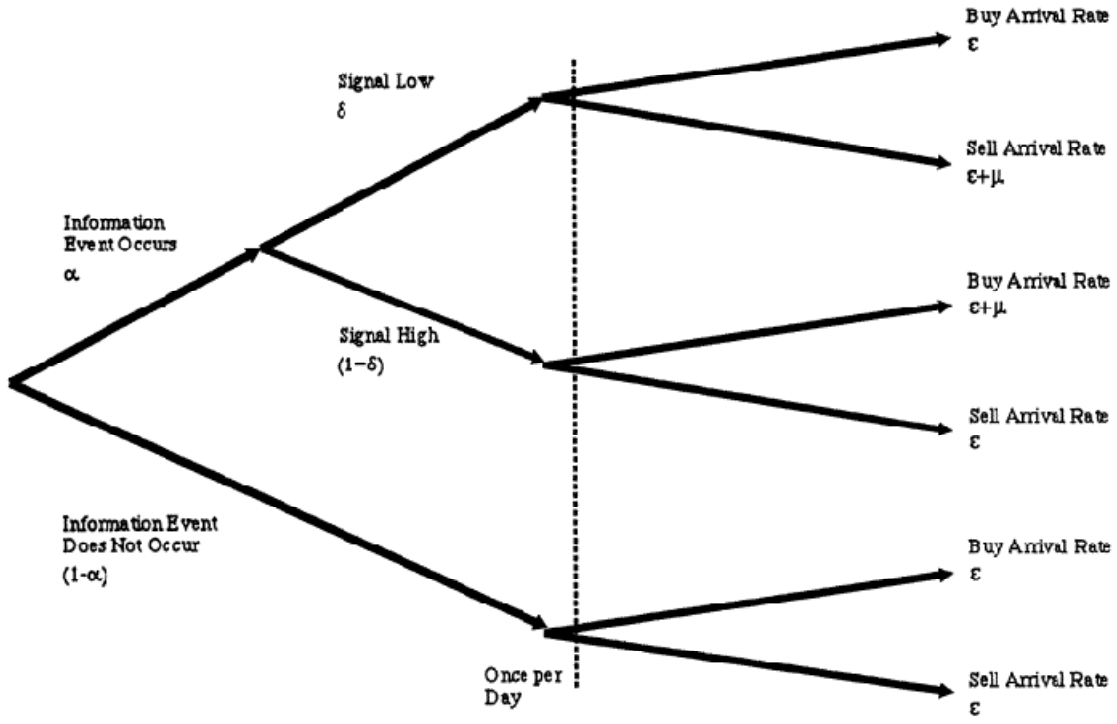
This table provides regression results for the event study analysis on Regulation FD by groups. The dependent variable is PIN. Panels A and B provide regression results for the High and Low groups respectively. Columns (3), (6) and (9) have statistics on the differences in coefficients before and after the regulation, tested with a dummy variable. *T*-statistics are presented in parentheses. ***, ** and * indicates significance at 0.01, 0.05 and 0.1 level respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Basic Regression			Baseline Regression			Full Regression		
	After	Before	After-Before	After	Before	After-Before	After	Before	After-Before
					Panel A: High				
G	0.003	0.033***	-0.030***	0.002	0.027***	-0.020***	0.001	0.021***	-0.021***
	(0.875)	(8.622)	(-6.239)	(1.12)	(6.621)	(-4.801)	(0.663)	(5.519)	(-5.292)
AAF				-0.004***	-0.002***		-0.003***	-0.002***	
				(-11.801)	(-3.027)		(-7.722)	(-2.878)	
Capitalization							0.000**	0.000	
							(-2.353)	(-0.822)	
Volume							0.000	0.000	
							(0.186)	(0.556)	
Book-to-Market							0.007	-0.055***	
							(0.779)	(-2.692)	
Block							0.000**	0.001***	
							(2.032)	(4.996)	
Year	-0.007***	-0.012***		-0.008***	-0.012***		-0.007***	-0.009***	
	(-4)	(-4.611)		(-5.559)	(-4.827)		(-5.259)	(-3.722)	
Intercept	0.145***	-0.299***	0.461***	0.186***	-0.198***	0.319***	0.185***	-0.126**	0.330***
	(3.127)	(-5.34)	(6.545)	(5.442)	(-3.117)	(5.134)	(5.347)	(-2.096)	(5.562)
Adjusted R Square	0.092	0.477		0.513	0.521		0.555	0.656	
Degree of Freedom	162	100		161	99		157	95	

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Basic Regression			Baseline Regression			Full Regression		
	After	Before	After-Before	After	Before	After-Before	After	Before	After-Before
					Panel B: Low				
G	0.002	-0.011	0.013	0.005	-0.013**	0.018*	-0.001	-0.014**	0.015
	(0.266)	(-1.527)	(1.203)	(0.58)	(-2.181)	(1.859)	(-0.109)	(-2.574)	(1.628)
AAF				-0.003***	-0.004***		-0.002**	-0.002	
				(-3.91)	(-8.075)		(-2.099)	(-2.611)	
Capitalization							0.000	0.000	
							(0.399)	(0.31)	
Volume							0.000	0.000*	
							(-0.801)	(-1.943)	
Book-to-Market							0.006	0.035***	
							(0.304)	(3.594)	
Block							0.001**	0.001***	
							(2.303)	(3.892)	
Year	-0.006	-0.011***		-0.007	-0.01***		-0.008*	-0.009***	
	(-1.459)	(-3.385)		(-1.655)	(-3.694)		(-1.935)	(-3.748)	
Intercept	0.181***	0.25***	-0.041	0.202***	0.291***	-0.063	0.205***	0.24***	-0.049
	(3.384)	(7.448)	(-0.788)	(4.092)	(10.269)	(-1.384)	(4.022)	(8.319)	(-1.160)
Adjusted R Square	0.027	0.088		0.186	0.374		0.299	0.488	
Degree of Freedom	79	144		78	143		74	139	

Figure 3.1

Tree Diagram of the Trading Process



Easley et al. (1996, pg 1409).

Figure 3.2

Plot of quarterly and annual PIN during 1993 and 2006

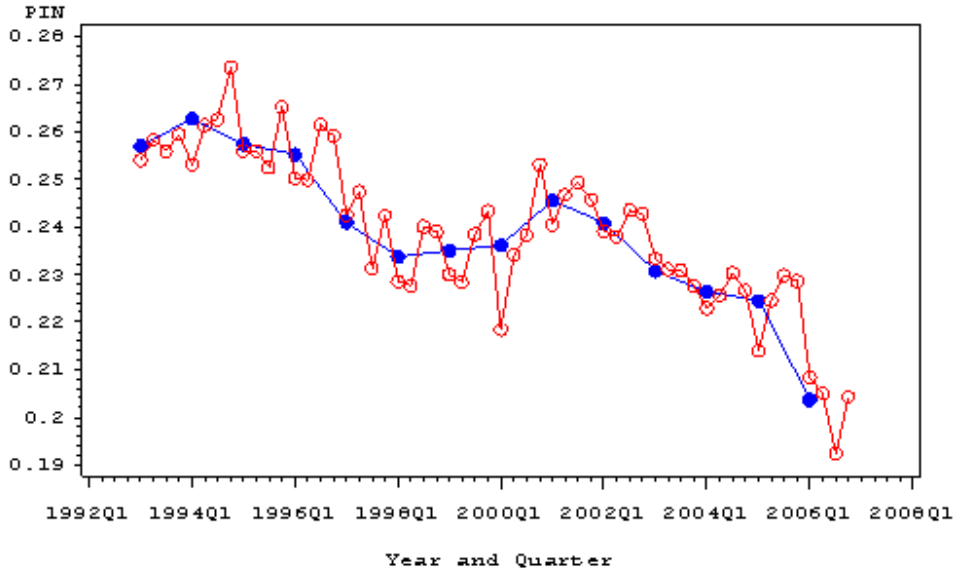


Figure 3.3
Sample Construction Process of G

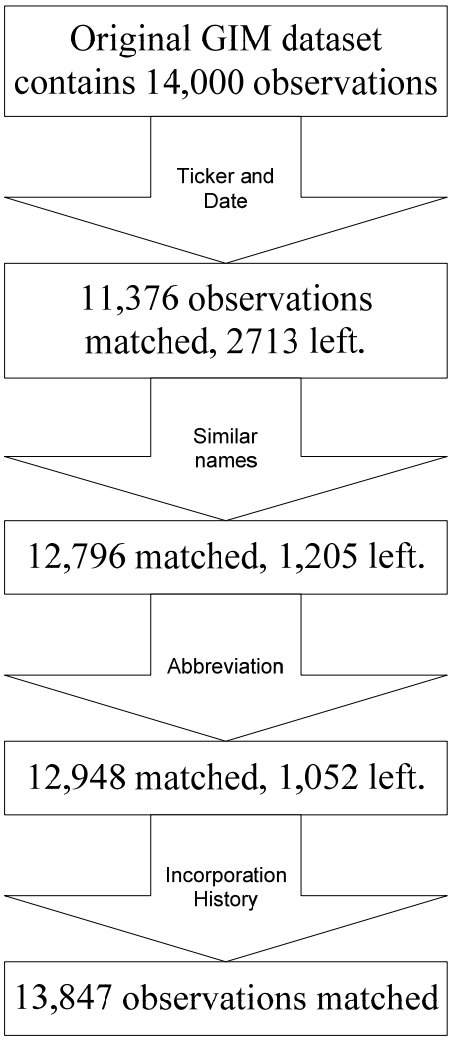


Figure 3.4
Main Regression Variables Construction Process

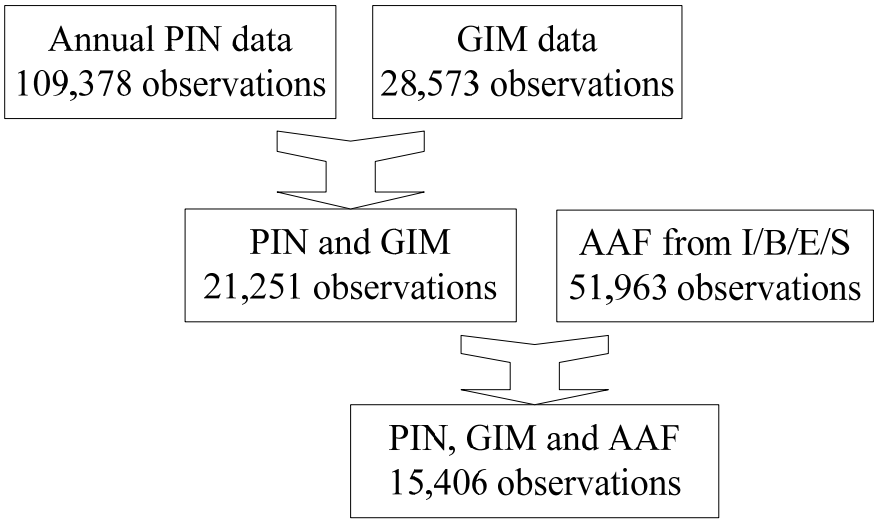


Figure 4.1
Disclosure Decision Process

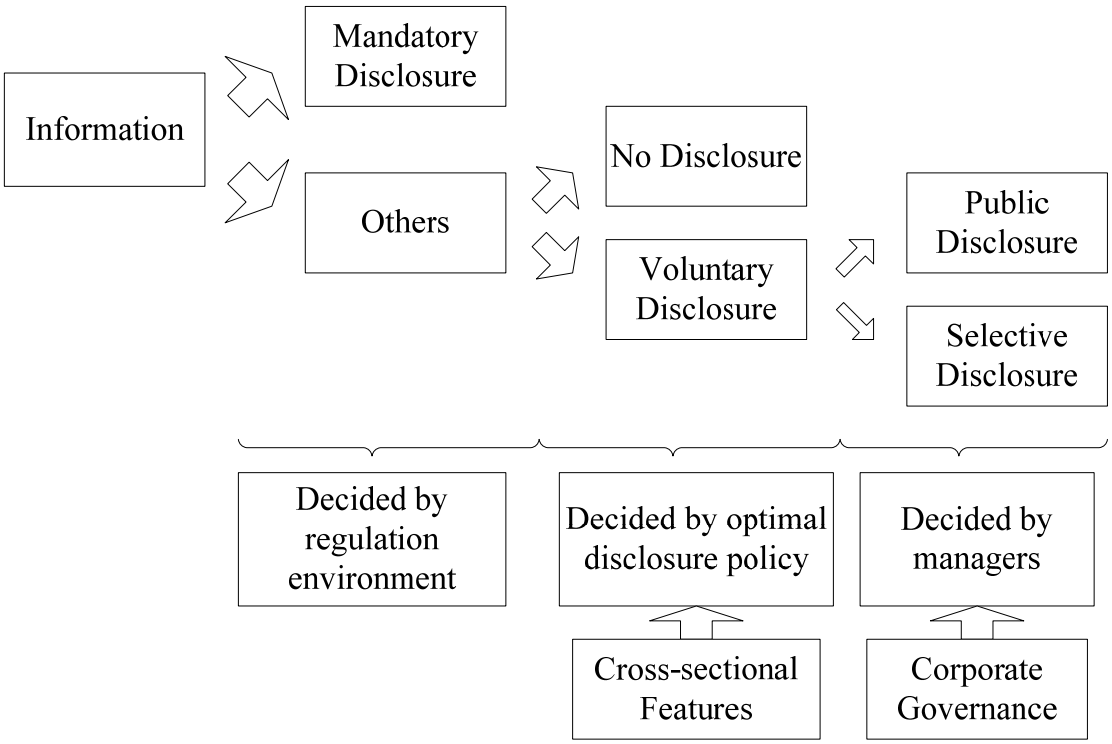


Figure 4.2
Information Impact Path

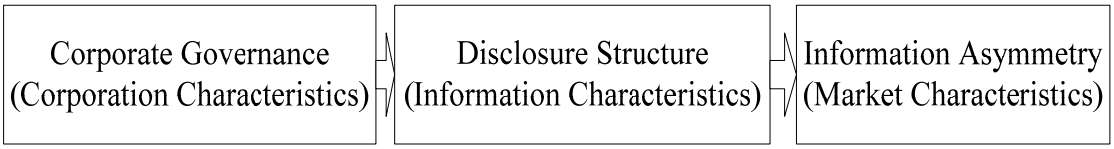


Figure 4.3

Internal and External Forces on Disclosure Structure

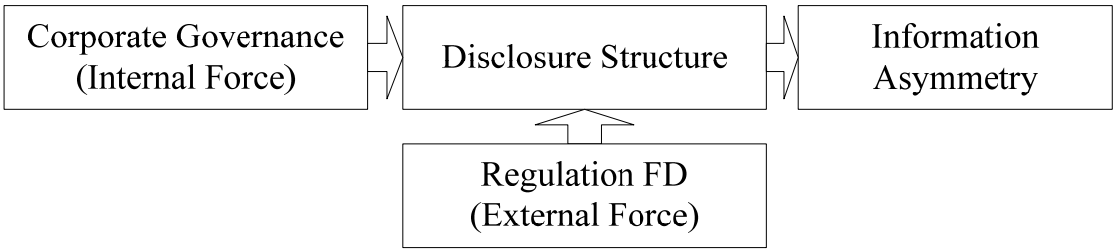


Figure 5.1
Analysis on Information Asymmetry by Different Governance Levels

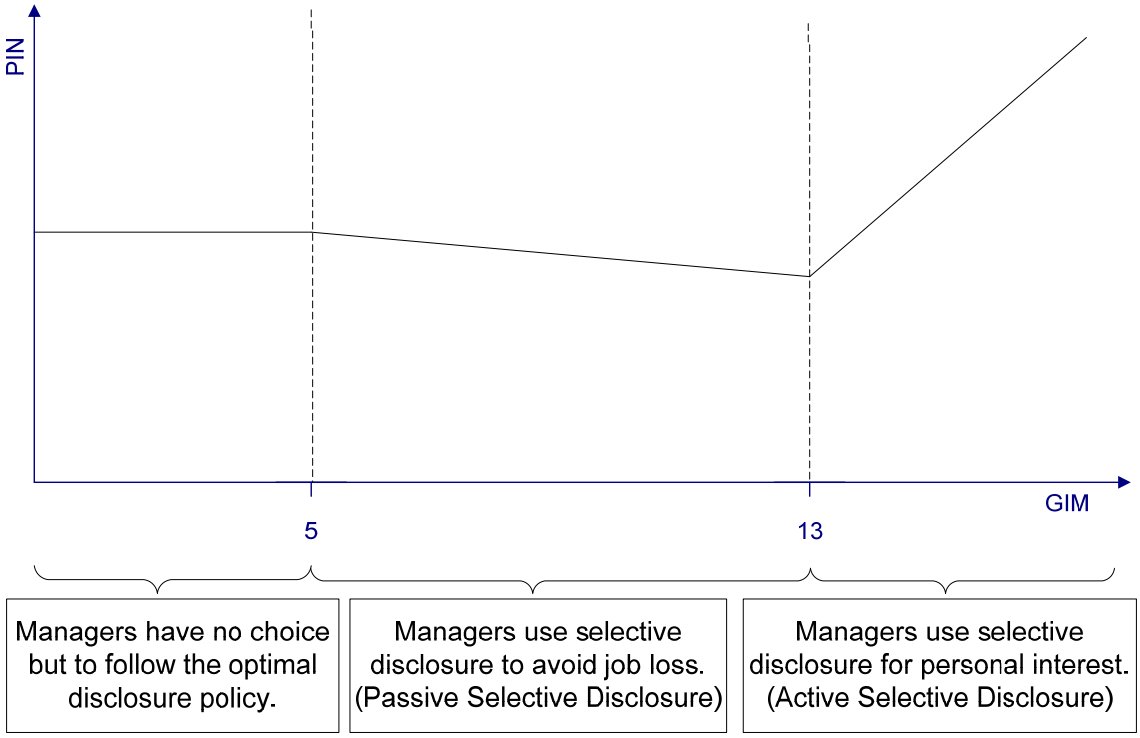


Figure 5.2
Frequency Histogram of PIN

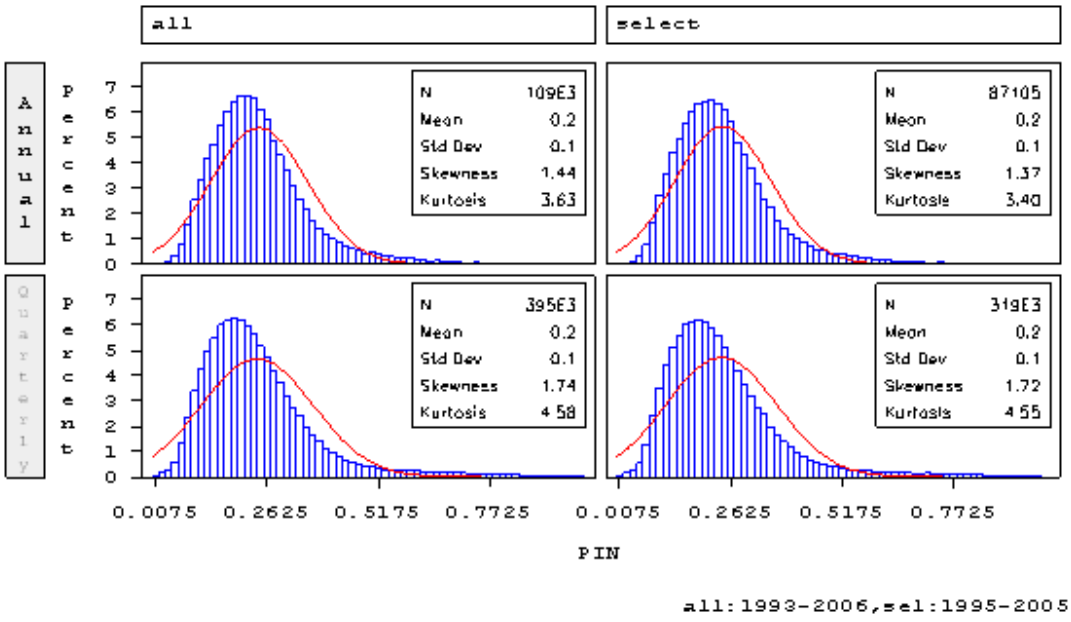


Figure 5.3
Frequency Histogram of LOGPIN