Two Essays on Ownership and Market Characteristics

By

Honghui Chen

Dissertation submitted to the faculty of
Virginia Polytechnic Institute and State University
in partial fulfillment of the degree of
Doctor of Philosophy
in
Finance

APPROVED

_____	_____
Gregory B. Kadlec	Raman Kumar
(Co-Chair)	(Co-Chair)
_____	_____
Arthur J. Keown	Abon Mozumdar

_____

Dilip K. Shome

July, 1999

Keywords: Ownership Structure, Market Microstructure, Earnings Announcements, Analyst Following, Price Discovery

Two Essays on Ownership and Market Characteristics

By Honghui Chen
Committee Chairmen: Gregory Kadlec and Raman Kumar

Abstract

Theoretical models suggest that ownership structure may be an important determinant of securities' market characteristics. For example, the presence of informed traders leads to greater bid-ask spreads (Copeland and Galai (1983), and Glosten and Milgrom (1985)), and strategic trading of informed and discretionary liquidity traders leads to intertemporal variation in both trading volume and trading costs (Admati and Pfleiderer (1988), and Foster and Viswanathan (1990)). However, the empirical studies on the effect of ownership structure on market characteristics are limited. Prior studies focus on either one type of market characteristics or one type of owners, and usually do not address the potential endogeneity problem between market characteristics and ownership structure. This dissertation extends existing literature with two essays on ownership and market characteristics.

The first essay broadly examines the effect of ownership structure (inside ownership, institutional ownership, and individual ownership) on market characteristics such as order flow, price impact of trade, quoted spread and quoted depth. For each market characteristic examined, I establish an empirical model based on existing theories and empirical evidence. My results indicate that stocks with greater inside ownership have lower order flow, greater price impact of trade, greater quoted spread and lower quoted depth, while stocks with greater active institutional ownership and greater individual shareholders have greater order flow, smaller price impact of trade, lower

spread and greater depth. These results may have implications for corporate governance. For example, while agency theory suggests managerial ownership may align interests of managers and shareholders, this essay finds that this comes with a liquidity cost. Further, my results suggest there are liquidity benefits of individual and institutional ownership. If as suggested by Amihud and Mendelson (1989), investors require a higher rate of return for illiquid stocks, firms can target their shares to specific types of investors (for example, active institutions and individuals) to improve liquidity, and reduce their cost of capital.

The second essay is a specific application of the first essay and examines the effect of institutional ownership on price discovery around earnings announcements. I select earnings announcements as the event for my analysis because there are three well-documented regularities about earnings announcements. First, market participants anticipate the forthcoming earnings announcements. Second, the announcements of earnings news are usually accompanied by abnormal price changes and abnormal volume. Third, there is evidence that stock price continues to move in the direction of earnings surprise after the announcements of earnings news. Since results from the first essay suggest that institutional investors affect market characteristics such as price impact of trade and quoted spread, I expect that institutional participation would also affect the price discovery process around earnings announcements. My results indicate that institutional ownership is associated with greater anticipation of earnings news. Further, stocks with greater institutional ownership have a greater price response to announcements of earnings news. Finally, institutional investors have no significant effect on post-announcement drift. The results of the second essay suggest that institutional investors contribute to the price discovery process.

Acknowledgements

I am would like to express my sincere gratitude to my co-advisors, Professors Gregory Kadlec and Raman Kumar, for their constant guidance, encouragement, support, and patience over these past five years. I have been fortunate to have both of them as my advisors. I am grateful to other members of my dissertation committee, Professors Arthur Keown, Abon Mozumdar, and Dilip Shome, whose help and suggestions greatly improved the quality of my dissertation.

I am deeply indebted to Raman, who mentored me in every step of my progress. I thank Professors Arthur Keown, Dilip Shome, and John Pinkerton, who have always been there for help and advice. I thank my friends and colleagues in and out the Finance Department, for their friendship and support over these years.

I thank my parents and my sister Huilan, for their support and sacrifice over the years of my study abroad. Finally and most importantly, I thank my wife Hefang, and my daughter Jessica, whose love, understanding, and support made this dissertation possible.

Table of Contents

List of Tables

Tables for Chapter 1

Tables for Chapter 2

Chapter 1

Ownership Structure and Market Characteristics of Common Stocks

1. Introduction

Different types of market participants are believed to have different access to information, different ability in processing information, and different propensity for trading. Market microstructure models predict that heterogeneity of information and trading among market participants affects market characteristics of securities such as order flow, bid-ask spread, and price impact of trade. For example, the presence of informed traders leads to greater bid-ask spreads (Copeland and Galai (1983), and Glosten and Milgrom (1985)), and strategic trading of informed and discretionary liquidity traders leads to intertemporal variation in both trading volume and trading costs (Admati and Pfleiderer (1988), and Foster and Viswanathan (1990)).

While the type of market participant plays a central role in the theoretical models of market microstructure, empirical evidence on the relation between market participants and market characteristics is limited. Jennings, Schnatterly and Seguin (1997) examine the relation between institutional ownership and bid-ask spread while Kini and Mian (1995) examine more broadly the relation between ownership structure (i.e., institutional, block, insider) and bid-ask spread. A limitation of these studies is that they focus on a single type of market participant and/or a single market characteristic (bid-ask spread in

particular).[1] Further, these studies generally treat ownership as exogenous, failing to address the potential endogeneity between ownership and market characteristics.[2]

This paper examines the relation between ownership structure and market characteristics. Specifically, we examine the effects of inside ownership, institutional ownership, and individual ownership on order flow, price impact of trade, and quoted spread and depth. We begin with a discussion of potential model specification issues that we face and how we address them. The specification issues stem from the fact that, while theory predicts that ownership structure affects market characteristics, theory also predicts that market characteristics are related to the variables that affect ownership structure, and that market characteristics may affect ownership structure. If the above relations hold true, our failure to incorporate them into our empirical model would result in classic inference problems associated with omitted variables and endogeneity. We discuss each of these specification issues and our corresponding approaches in detail below.

Our first approach assumes that any observed effect of market characteristics on ownership structure is a result of firm characteristics such as size and risk. This approach assumes that there is no remaining effect of market characteristics on ownership structure after controlling for these firm characteristics that affect both ownership structure and market characteristics. Firm characteristics such as size, risk, and information are potentially important determinants of ownership structure. Firm size affects inside ownership through wealth constraints and institutional ownership through economies of scale and/or prudent-man investing constraints. Agency theory suggests that asymmetric information affects inside ownership. Further, prudent man rule may cause institutions to avoid idiosyncratic risk. These same firm characteristics also play important roles as

[1] In a related study, Sarin, Shastri and Shastri (1996) examine the relation between ownership structure and liquidity.

[2] Jennings, Schnatterly and Seguin (1997) examine causality between institutional ownership and bid-ask spread using Granger Causality tests.

determinants of market characteristics. For example, firm size will affect both dollar trading volume and trade frequency, and market microstructure theory predicts that asymmetric information affects price impact, quoted spread and depth. Thus, our first approach controls for these firm characteristics when examining the relation between ownership and market characteristics.

Second, it is possible that market characteristics directly affect ownership structure. Some theories of asset pricing argue that transaction costs such as bid-ask spreads and price impact are choice variables for investors in solving their portfolio problem. For example, Amihud and Mendelson (1986) argue that investors choose stocks whose spreads are consistent with their expected holding period. As a result, clienteles form whereby investors with relatively short expected holding periods hold liquid asset while those with relatively longer holding periods hold illiquid assets. If these theories are true and market participants have different expected holding periods, there is an endogeneity problem that biases standard ordinary least square estimates. However, there is little direct evidence of such clientele behavior by investors. Furthermore, traditional asset pricing theory posits that investors choose assets on the basis of their expected return and risk, and thus, spread is a second order consideration at best. Nonetheless, our second approach addresses this possible endogeneity problem using simultaneous equations to model the relation between ownership structure and market characteristics.

In our first approach, a careful and thorough investigation of firm characteristics that determine ownership structure is essential. We show that a parsimonious set of firm characteristics explain 30% to 70% of the cross-sectional variation in ownership structure. We then examine how firm characteristics and ownership structure jointly determine three sets of market characteristics.

Our first investigation of market characteristics examines the effect of ownership structure on order flow. We find that inside ownership has a negative effect on share

turnover, dollar volume, and trade frequency. We find that active institutions increase share turnover, dollar volume, trade frequency, and trade size. Passive institution ownership increases trade size and dollar volume, and does not significantly affect trade frequency or turnover. Finally, we find that the number of individual shareholders has a positive effect on turnover, dollar volume, trade frequency, and a negative effect on trade size.

Our second investigation of market characteristics focuses on the effect of ownership structure on price impact of trade. Our results indicate that stocks with greater inside ownership have greater price impact of trade. This is consistent with the notion that the degree of information asymmetry is greater for stocks with greater inside ownership. On the other hand, stocks with greater active institutional ownership have a smaller price impact of trade. A possible explanation is that the presence of active institutions increases the level of information availability and therefore reduces the degree of information asymmetry. Number of individual shareholders also has a negative effect on the price impact of trade, possibly because trades by individuals are less likely to be informed.

Our third investigation of market characteristics examines the effect of ownership structure on quoted spread and dollar depth. We find that inside ownership has a positive effect on quoted spread and a negative effect on quoted dollar depth, while active institutional ownership and number of individual shareholders have a negative effect on quoted spread and a positive effect on quoted depth. Passive institutions do not significantly affect either spread or depth.

In our second approach with simultaneous equations, we allow a selected set of market characteristics and ownership variables to be endogenously determined. We do not use a complex system with a large number of endogenous variables in this approach because without a structural model, such a system would be sensitive to model

specification errors and is likely to be unstable. We select bid-ask spread, dollar volume, and active institutional ownership as endogenous variables. We believe that these endogenous variables capture important aspects of trading costs, order flow, and ownership structure. We also believe that the strongest case of endogeneity can be made among these three variables. Results from our second approach regarding the effect of active institutional ownership on spread and dollar volume are similar to those from the first approach.

The primary contribution of the paper is that it furthers our understanding of how ownership structure affects market characteristics. We fill the gap between the theoretical predictions and empirical evidence by examining a richer set of ownership variables and a more comprehensive set of market characteristics, while controlling for firm characteristics that affect both. Our results confirm the theoretical prediction that types of owners affect the observed market characteristics.

Apart from contributing to our understanding of the effect of ownership structure on market characteristics, this paper adds to our understanding of the determinants of ownership structure. Our paper is the first to distinguish between active and passive institutions. Further, our paper is also the first to examine the determinants of individual ownership.

There are several potential implications from this study. First, it may have implication for corporate governance. While agency theory suggests a greater managerial ownership may better align interests of managers and shareholders, our study finds that this comes with a liquidity cost. Future studies on corporate governance may need to consider this liquidity cost.

Second, our study finds that both active institutions and individual shareholders improve liquidity as indicated by greater order flow and lower costs of trading. If as suggested by Amihud and Mendelson (1989), investors require a higher rate of return for

illiquid stocks, firms can target their shares to specific types of investors to improve liquidity, and reduce their cost of capital.

The remainder of the paper is organized as follows. Section 2 provides a review of theory and empirical evidence first relating ownership structure to firm characteristics, then relating market characteristics to ownership structure and firm characteristics. Section 3 describes data sources and measurements of variables. Empirical results are presented in Section 4. Section 5 concludes the paper with a discussion of directions for further research.

2. Ownership Structure and Market Characteristics

This section presents the rationale for the models we use to examine the effects of ownership structure on the market characteristics of common stock. We begin our study by first relating inside, institutional, and individual ownership to firm characteristics such as size, risk, price, and agency costs.[3] Our results suggest that a parsimonious set of firm characteristics explain 30 to 70 percent of the cross-sectional variation in the level of inside, institutional and individual ownership. We then examine the effects of firm characteristics and ownership structure on market characteristics such as order flow, price impact of trade, and quoted spread and dollar depth. For each market characteristic, we establish an empirical model based on existing theoretical models and empirical results.

[3] We are careful in selecting variables to measure firm characteristics, and avoid using market characteristics that could be affected by ownership structure.

2.1. Ownership Structure and Firm Characteristics

2.1.1. Inside Ownership

Demsetz and Lehn (1985) argue that ownership structure (inside ownership in particular) is an outcome of value-maximization process of the firm, and therefore, is determined endogenously by firm specific attributes. Our analysis of inside ownership starts with the variables specified in Demsetz and Lehn (1985) and expands the set to include variables uncovered by subsequent research.[4] These variables are related to the costs of insiders in holding the stock, and the costs and benefits of monitoring managerial behavior. We categorize these factors as size, risk, age, and agency costs.

Size: Size reflects wealth constraints that insiders face. Demsetz and Lehn (1985) argue that, the larger the size, the more difficult it is for insiders to own a given percentage of shares, and therefore, inside ownership should be decreasing in market capitalization of the firm. Moreover, they suggest that a smaller fraction of shares is required for a given degree of control in larger firms. Finally, risk aversion of investors could reduce the incentive for the insiders to commit larger amount of capital in the firm, and therefore reinforces this negative effect of size on inside ownership.

Risk: Risk has two potential implications on inside ownership. On one hand, uncertain operating environment gives rise to difficulty in monitoring managerial behavior. Owners would prefer high inside ownership to better align interests of managers and other shareholders (Demsetz and Lehn (1985)). On the other hand, uncertainty about a firm's business could reduce inside ownership because of the risk aversion of the insiders (Bergstorm and Rydgvist (1990), Cho (1998), and Himmerlberg, Hubbard and Palia (1998)). Himmerlberg, Hubbard and Palia (1998) show that, once

[4] See, for example, Agrawal and Knoeber (1996), Bergstorm and Rydgvist (1990), Cho (1998), Denis and Denis (1994), Denis and Sarin (1998), Himmelberg, Hubbard, and Palia (1998), Jensen, Solberg and Zorn (1992), etc.

other variables related to agency costs are controlled, the second effect is more significant. We relate inside ownership to both systematic risk and unsystematic risk.

Age: Age of a firm is used to investigate the life cycle effect (Holderness, Kroszner, and Sheehan (1999)). As a firm seasons, its founding insiders are likely to sell of their holdings and diversify their investment. Therefore, a seasoned firm would have a smaller percentage of inside ownership.

Agency costs: Jensen and Meckling (1976) argue that ownership by insiders aligns their interest with outside shareholders, and thus, reduces the agency costs. We use R&D expenditure, capital intensity, operating income, and regulation to proxy for potential agency costs. R&D expenditure could proxy for the growth opportunities of a firm. To the extent that it is difficult to monitor managers in firms with greater growth opportunities, the desired inside or managerial ownership in those firms will be higher. Holthausen and Larcker (1991) find that managerial ownership increases in the level of R&D spending. Moreover, firm with more assets in place, or fixed capital, are easier to monitor, therefore the desired inside or managerial ownership would be lower in firms with greater capital intensity. Additionally, firms with greater operating income to sales are likely to have greater free cash flow. According to Jensen (1986), firms with greater free cash flows desire greater inside ownership to reduce the agency costs of free cash flow. Finally, Demsetz and Lehn (1985) argue that regulation provides monitoring and discipline on managers, and thus, is associated with more diffuse ownership. We consider the two regulated industries used in their study, utility industry and financial industry.

Leverage: Leverage has several potential implications on inside ownership. First, debt reduces the need for outside equity financing, and thus, increases the potential percentage ownership of insiders (Stulz (1988)). Second, debt could reduce the agency cost of free cash flow (Jensen (1986)), and thus, reduce the need for inside ownership.

Finally, the use of financial leverage increases the risk of equity, and thus, may reduce the attractiveness of high levels of ownership by insiders.

2.1.2. Active Institutional Ownership

Compared with research on the determinants of inside ownership, research on the determinants of institutional ownership is sparse. Further, previous research does not distinguish between active and passive institutions. In our paper, we distinguish between active and passive institutions. We define an institution as passive if it invests in at least 20 stocks, and if at least 90 percent of its equity investments is in stocks with membership in S&P 500 index. We assume that all the remaining institutions are actively managed. Our definition of passive institutions implies that the key determinant of passive institutional ownership is membership in S&P 500 index. Hence, we do not discuss the determinants of passive institutional ownership and concentrate our discussion on the determinants of active institutional ownership. We start our empirical specification on the determinants of active institutional ownership with previously documented factors that are related to institutional ownership. We categorize these factors as size, risk, price, and information.

Size: Size could affect active institutional ownership in several ways. First, large capitalization stocks could imply economies of scale in information acquisition and analysis for active institutions. For example, the benefit of finding the same percentage mispricing would be much greater for a stock with one-billion-dollar market capitalization than for one with one-million-dollar market capitalization. Second, active institutions may avoid smaller size stocks for prudence consideration. Third, greater information availability for larger capitalization stocks could imply lower probability of mispricing and reduce the incentive for active institutions in investing in these stocks. We expect the first two effects to dominate the third one.

Risk: The effect of risk on institutional ownership is ambiguous. Since the investment goal of active institutional investors is to outperform the market, we expect that active institutional investors will show a preference for riskier stocks, as those riskier stocks are more likely to be the ones that provide opportunities for larger potential returns. However, the common law interpretation of "prudent man" laws could actually induce institutional investors to safer investments (Badrinath, Gay and Kale (1989), Gompers and Metrick (1998)). Extant empirical evidence on the risk preference of institutional investors is mixed. O'Brien and Bhushan (1990) find that change in systematic risk, or beta, is positively correlated with subsequent change in institutional ownership. Badrinath, Gay and Kale (1989) find that institutional investors prefer stocks with higher systematic risk but avoid stocks with higher total risk. Falkenstein (1996) documents that mutual funds display a preference for stocks with higher standard deviation of return. In this study, we relate the level of active institutional ownership to both systematic risk and unsystematic risk.

Price: Price may affect active institutional ownership via its relation to cost of trading. Given the minimum tick size, percentage bid-ask spread is lower for higher priced stocks. If active institutions prefer stocks with lower cost of trading, we expect active institutions to prefer stocks with higher price. Falkenstein (1996) documents a preference of mutual funds toward higher priced stocks.

Information availability: Information availability affects both costs and benefits of information acquisition by active institutions and hence affects active institutional ownership. The variables that we use to capture information availability include analyst coverage, number of news stories about the firm, and age. Both analyst coverage and news release increase the available information about a firm and could reduce information search costs for active institutions. This implies that active institutional ownership will be an increasing function of number of news stories and number of

analyst following for the firm. Analyst coverage and news releases, however, also reduce the benefits of information acquisition, and hence could reduce the incentives for those institutions to invest in those stocks. Finally, compared with newly listed firms, seasoned firms are likely to have more information available. Falkenstein (1996) finds that mutual funds show a significant preference for seasoned stocks. Gompers and Metrick (1998) also document a positive relation between age of a firm and the level of institutional ownership.

Inside ownership: Since inside ownership could be associated with greater information asymmetry, active institutional investors may avoid stocks with greater inside ownership. Moreover, inside ownership could put an upper bound on the percentage of shares that active institutions could own. Therefore, we expect inside ownership to have a negative impact on the level of active institutional ownership.

Investment Style: The institutional demand for stocks could depend on investment styles of institutions. We use book-to-market ratio to investigate the preference of average active institutions for value and glamour stocks, and use cumulative return over the past 12-month to investigate the effect of momentum and contrarian investments styles on active institutional ownership.

Regulation: As in the case for inside ownership, we control for the effects of regulation in the financial and utility industries. We expect that the active institutional ownership in these two industries should be lower than in other industries, as regulations could limit active institutions' incentives in their information generating activities.

S&P 500 membership: We do not have a specific hypothesis regarding the effect of S&P 500 membership on active institutional ownership. We include this variable since there is evidence that institutional ownership is greater for S&P 500 stocks. For example, Gompers and Metrick (1998) document that inclusion in the index increases the

level of institutional ownership. But they do not distinguish active institutional ownership and passive institutional ownership.

2.1.3. Individual Ownership

We believe our study is a first attempt to investigate the determinants of individual ownership. We discuss the determinants of individual ownership based on the following factors: firm visibility, risk, price, investment style, and information asymmetry. We measure individual ownership with the number of individual shareholders.

Firm visibility: Merton (1987) argues that in a capital market with incomplete information, investors only hold stocks that they know about. Therefore, a firm's visibility could affect individual ownership by increasing individual awareness of stocks. We believe that firm visibility is related to size, analyst following, number of news releases, age, and membership in S&P 500 index. We expect that number of individual shareholders increases in firm visibility.

Risk: Individuals could display an avoidance of risk for several reasons. First, compared with active institutions, individuals may be less able to manage risk. Second, wealth constraints on individuals may limit their ability to diversify. Therefore, individuals could avoid stocks with higher idiosyncratic risk. Third, risk could be related to the degree of information asymmetry. If individual shareholders have a preference or aversion to information asymmetry, the number of shareholders could depend on risk measures.

Price: Given individuals' wealth constraints, it may be difficult for individuals to hold higher priced stocks in round lots. Therefore, price could have a negative effect on individual ownership.

Information asymmetry: Individuals may be averse to holding stocks with greater degree of information asymmetry. We believe that those variables proxying for firm visibility are also related to information asymmetry. We use inside ownership and regulation as additional variables to capture information asymmetry. We expect stocks with greater inside ownership to have greater degree of information asymmetry and hence smaller number of individual shareholders. Further, if information asymmetry is lower in regulated industries, number of individual shareholders could be greater in these industries.

Investment styles: Individuals could have distinct investment styles. We use book-to-market ratio to investigate whether there is any systematic preference of individuals for value and glamour stocks, and use cumulative return over the past 12-month to investigate whether individuals as a group are momentum or contrarian investors.

2.2. Market Characteristics, Firm Characteristics, and Ownership Structure

This section discusses the market characteristics examined in our study and the effects of firm characteristics and ownership structure on these market characteristics.

2.2.1. Order Flow

The theoretical literature on trading volume examines a number of motives for trade. Trade can arise from differences in information (Kyle (1985), Kim and Verrecchia (1991)), differences of opinion (Harris and Raviv (1993), Shalen (1993), Kandel and Pearson (1995)), liquidity needs (Amihud and Mendelson (1986)), tax considerations (Lakonishok and Smidt (1986)), and portfolio rebalancing (Constantinides (1986)). Based on these theoretical models, we identify a set of firm characteristics that are related

to the "need" for trade. Furthermore, since different types of market participants may have different information sets and different trading patterns, we examine the effect of ownership structure on order flow.

We examine four different measures of order flow, i.e., share turnover, dollar volume, average trade size and frequency of trade. Share turnover is included since share turnover provides information regarding investors' holding period (Atkins and Dyl (1997)). We include dollar volume since it captures the economic magnitude of trade. We investigate trade frequency and average trade size since they could have different information content about price evolution. For example, Jones, Kaul and Lipson (1994) document that trading frequency contains information about price movements, and that average trade size does not provide any additional information after controlling for the trading frequency. Easley and O'Hara (1992) suggest that higher trading frequency implies occurrence of an information event for the stock. In the model of Harris and Raviv (1993), trading frequency reflects differences of opinion among investors.

Firm Characteristics and Order Flow

S&P 500 membership: Tkac (1999) suggests that there could be two confounding effects of S&P 500 membership on turnover. Indexing by certain institutions would reduce turnover, while index arbitrage could increase turnover. What we observe would depend on which of these two effects dominates the other.

Information flow: The arrival of information leads investors to update their assessment of risk and expected return tradeoff of stocks, and thus, increases investors' need for portfolio rebalancing. Moreover, upon the arrival of information, there may be a short-term increase in differences in investors' interpretation of information before the price reaches a new equilibrium level. Therefore, the rate of information flow should have a positive impact on trade frequency. Under the assumption that the rate of

information does not reduce average trade size, its positive effect on trade frequency also implies a positive effect on share turnover, and dollar volume. Existing studies support the positive effect of information flow on volume. For example, Bessembinder, Chan and Seguin (1996) document that firm specific information flow increases trading volume for the firm, while Mitchell and Mulherin (1994) find that news releases have positive effect on market wide trading volume. We use number of news stories reported in Dow Jones News Retrieval as a measure of the rate of information flow.

Trading costs: Given that trading costs reduce the incentives for investors to trade, we must control for the costs of trading when examining the determinants of order flow. A potential problem here is that while cost of trading affects order flow, order flow also affects the cost of trading. To avoid the problems that may result from this endogeneity, we do not use any direct measure of trading cost such as bid-ask spread in our regression, and instead use price as a proxy for trading costs. To test for the robustness of this approach, we later allow bid-ask spread and dollar volume to be endogenously determined in a system of simultaneous equations.

Risk: Risk is likely to affect order flow in several ways. First, risk could affect order flow in that the portfolio rebalancing needs are likely to be greater for riskier stocks. Second, there may be greater tax-related trading for riskier stocks. Third, difference of opinion may be greater for riskier stocks since uncertainty is greater for these stocks. Fourth, degree of information asymmetry may be greater for riskier stocks, and there could be greater information motivated trading. All these would suggest that trading would be more active for riskier stocks. We examine the effect of both systematic risk and unsystematic risk in our analysis.

Analyst coverage: Analyst coverage could increase trade frequency. Greater analyst following implies greater amount of information generated for the stocks and hence more trades motivated by analysts' information releases. Assuming that analyst

coverage does not reduce average trade size, we expect that greater trade frequency to be reflected as greater share turnover and greater dollar trade volume.[5]

Size: Order flow may be greater in absolute term as measured by dollar volume, trade size, and trade frequency for larger capitalization stocks. The effect of size on turnover, a measure that is scaled by size, is ambiguous. If the two-fund-separation theory is true, and all the investors hold a mix of value weighted market portfolio and risk free asset, size should not have any effect on turnover. However, if size is a proxy for information availability, or the scale of shareholder base, it could have a positive effect on turnover.

Ownership Structure and Order Flow

Inside ownership: Legal constraints on insiders may reduce their trade frequency. Moreover, insiders may refrain from trading for corporate control reasons. Furthermore, insiders may have a negative effect on order flow if other market participants fear to trade with insiders. Therefore, we expect inside ownership to have a negative effect on trade frequency, dollar volume, and turnover.

Active institutional ownership: As actively managed institutions are likely to trade more frequently than average investors, stocks with greater active institutional holdings should have greater trading frequency. Moreover, average holdings of active institutional investors are likely to be larger than the holdings of average investors. Consequently, active institutional ownership could have a positive impact on average trade size. The positive effects of active institutional ownership on trading frequency and average trade size imply that active institutional ownership would have a positive effect on share turnover and dollar volume.

[5] In fact, Brennan and Subrahmanyam (1998) find that analyst coverage indirectly increases average trade size by reducing costs of trade.

Passive institutional ownership: Since passively managed institutions trade only for liquidity reasons and portfolio rebalancing needs, they are expected to have a negative effect on trade frequency. While passive institutions are likely to trade less frequently, the holdings of passive institutions are expected to be larger than those of average investors, and therefore the passive institutions could have a positive impact on average trade size. The effect of passive institutions on share turnover and dollar volume is ambiguous.

Number of individual shareholders: The number of individual shareholders could affect order flow for several reasons. First, consensus could be more difficult to achieve among more people. If difference of opinion is a motivation for trade, greater number of individual investors could imply greater trade frequency. Second, if the probability of liquidity needs is similar across individuals, greater number of individual investors also implies a greater need for liquidity trades. Third, individuals may take greater advantage of tax-loss selling, and therefore greater number of individuals could imply greater tax-related trades. Since average holdings of individual shareholders are likely to be smaller compared with inside shareholders and institutions, we expect that number of individual shareholders to have a negative effect on trade size. Thus, the effect on share turnover and dollar volume is ambiguous.

2.2.2. Price Impact of Trade

Theoretical models predict that trade by individuals with superior information exerts adverse selection costs on other market participants.[6] According to these models, a market with greater information asymmetry among traders is characterized with larger price impact of trade. The superior information of informed traders could arise from their

[6] See, for example, Bagehot (1971), Copeland and Galai (1983), Glosten and Milgrom (1985), Kyle (1985), and Easley and O'Hara (1987).

special access to information and/or their superior inference ability. In our analysis, we control for firm characteristics that may affect information asymmetry, when we examine the effect of ownership structure on price impact of trade. As in Brennan and Subrahmanyam (1995), we use Kyle's λ (Kyle (1985)) to measure the price impact of trade.

Firm Characteristics and Price Impact of Trade

Price: As Brennan and Subrahmanyam (1995), we include price in our analysis of price impact of trade. Price is included in most of previous studies on bid-ask spread to account for minimum tick size. To the extent that price impact of trade is a fixed portion of price movement, price impact would also be affected by price discreteness. Therefore, it is necessary to control for price when examining the determinants of price impact of trade.

Risk: Since the degree of information asymmetry is usually positively related to the idiosyncratic risk of the stocks, we control for unsystematic risk. Further, both systematic risk and unsystematic risk are expected to affect trade volume, which may in turn affect price impact of trade. Therefore, we include both systematic risk and unsystematic risk in our regression.

Information flow: The availability of information reduces information advantage of informed traders. Consequently, a stock with more frequent information flow is expected to have smaller degree of information asymmetry, and a hence a smaller price impact of trade.

Analyst coverage: Brennan and Subrahmanyam (1995) find evidence suggesting that greater analyst coverage leads to lower information asymmetry. We expect that

analyst coverage increases available information regarding firm value, and hence, reduces the degree of information asymmetry and hence the price impact of trade.

Size: While infinite demand elasticity for stocks is a standard assumption of financial theory, there is evidence that the demand curve is downward sloping (Shleifer (1986)). Size is likely to be positively related to the demand elasticity. It is therefore necessary to control for size when investigating price impact of trade.

S&P 500 index membership: Membership in S&P 500 index could affect the price impact of trades in several ways. First, if information is more widely available for the index stocks, the degree of information asymmetry may be smaller and hence the price impact of trading may be smaller for the index stocks. However, models by Gorton and Pennacchi (1993) and Subrahmanyam (1993) suggest that for uninformed liquidity traders, a basket of securities has lower adverse selection costs, and therefore is a preferable trading vehicle than the component securities of the basket. Migration of liquidity traders to the basket market could cause the adverse selection costs for the component securities to increase. Stocks in a basket of securities such as the S&P 500, could therefore have greater adverse selection costs, when compared with stocks not in the baskets.

Residual Volume: While existing studies show that volume has a negative effect on the bid-ask spread, there is no theoretical model predicting an effect of volume on price impact of trade. A potential argument for including volume is that volume could proxy for fixed component of trading costs. Glosten and Harris (1988) suggest the price impact of trade should increase with the fixed component of trading costs. They argue that given a trade is executed, the value of information must be greater if the fixed cost of trading is larger. We therefore expect price impact of trade to be negatively related to volume. In the previous section, we suggest that volume is a function of firm characteristics and ownership structure. To measure the effect of ownership structure on

price impact of trade, we first regress dollar volume on the firm characteristics and ownership structure, and then use the residual volume as a control variable in our analysis of price impact of trade.[7]

Ownership Structure and Price Impact of Trade

Inside ownership: Compared with other owners, insiders have special access to firm specific information. Their superior access to information is one of the key assumptions in many signaling models.[8] Therefore, we expect greater inside holdings to be associated with greater degree of information asymmetry and hence with greater price impact of trade.

Active institutional ownership: Compared with individual investors and passive institutional investors, active institutional investors are expected to devote more resources to information acquisition and analysis. Moreover, active institutional investors are often believed to be more sophisticated than individual investors in processing information.[9] The information possessed by active institutional investors could be correlated, since these institutions are likely to base their inference on the same public sources of information. Admati and Pfleiderer (1988) and Holden and Subrahmanyam (1992) predict that, competition among informed investors on correlated information causes prices to reflect information faster, and therefore reduces the degree of information asymmetry and the price impact of trade.

[7] This approach also has an econometric benefit. Given that a great portion of variation in volume is explained by a set of firm characteristics and ownership variables, there will be a severe collinearity problem in our regression if volume is used. Our approach avoids this collinearity problem.

[8] See, for example, Allen and Faulhaber (1989), John and Williams (1985), Miller and Rock (1985), Myers and Majluf (1984), etc.

[9] For example, Hand (1990) provides some empirical evidence that the proportion of non-institutional holding is positively related to price reaction to the temporal component of earnings news. He suggests that the sophisticated institutional investors are better able to interpret the permanent and temporal components of earnings news. Moreover, Brennan (1995) argues that individual investors often know little of the dynamics of the stock markets.

Passive institutional investors: Passive institutions usually trade for liquidity reasons and their trade should have little information content. Consequently, we do not expect the level of passive institutional ownership to have any direct effect on price impact of trade.

Number of individual shareholders: Compared with insiders and active institutions, the individual shareholders are likely to be least informed. A large number of individual shareholders would imply a greater probability of non-information motivated trade, and hence a smaller price impact of trade. This relation is documented by Glosten and Harris (1988), who find that number of outside shareholders has a negative effect on the adverse-selection costs of trade.

2.2.3. Quoted Spread and Depth

Theoretical models on quoted spread attribute spread to order processing costs (Demsetz (1968), Tinic (1972), Copeland and Stoll (1990), etc.), inventory control costs (Ho and Stoll (1981)), and adverse selection costs (Bagehot (1971), Copeland and Galai (1983), Glosten and Milgrom (1985), Easley and O'Hara (1987)). Empirical evidence of Stoll (1989), Hasbrouck (1988) and Madhavan and Smidt (1991) suggests that the inventory-control costs are relatively minor, and that order processing costs and adverse selection costs are the primary determinants of quoted spread. We therefore concentrate our discussion of determinants of quoted spread on order processing costs and adverse selection costs.

In addition to examining the effects of ownership structure on quoted spread, we investigate how ownership structure affects quoted depth. Lee, Mucklow and Ready (1993) show that quoted spread and depth jointly determine trading costs. It is therefore necessary to examine quoted depth along with quoted spread. Since there is no

theoretical model for quoted depth, we assume that the same set of factors will affect both spread and depth.

Order processing costs refer to the costs of time, exchange fees, office supply, communications, and financing costs of the inventory. If this is the case, the average order processing costs per dollar traded should be a decreasing function of order flow (the trade size and the frequency of trade). We expect ownership variables to have an impact on the order processing component through their impact on order flow. Given that quoted spread and depth are determined jointly, we expect that ownership structure will also affect the quoted depth via its effect on order processing costs.

Adverse selection costs are related to the bid-ask spread in that specialist needs to cover losses from trading with informed traders. These costs are directly related to the degree of information asymmetry, which in turn is related to the type of market participants.

Firm Characteristics, Spread and Depth

Price: As in the previous section, we include price to control for the effect of minimum tick size in the model for spread. We do not include price in the model of quoted depth since there is no economic reason for price to affect quoted dollar depth.

Risk: Risk could affect the quoted spread and depth in two ways. First, it can affect order flow and hence the order processing costs of trading. Second, it may affect the degree of information asymmetry and therefore the adverse selection costs of trading. As before, we use both the systematic and unsystematic risk in our regressions.

Information flow: In previous two sections, we argue that information availability increases trading and that it reduces the adverse selection costs of trading. We therefore

expect that information flow would have a negative effect on quoted spread and a positive effect on quoted depth.

Analyst coverage: In the previous section, we suggest that analyst coverage reduces information asymmetry and hence the price impact of trade. Furthermore, analyst coverage is expected to increase order flow, which in turn would reduce the order processing costs of market making. Therefore, we expect analyst coverage to have a negative effect on quoted spread and a positive effect on quoted depth.

Size: As before, we include size to account for demand elasticity for stocks. We expect that spread to be narrower and depth to be greater for stocks with greater market capitalization.

S&P 500 index membership: Membership in S&P 500 index could affect both order processing costs and adverse selection costs of market making. First, membership can affect order flow and thus affect order processing costs. Second, as suggested earlier, migration of liquidity traders to the index-based basket securities could cause an increase in the adverse selection costs of these stocks, which could in turn increase spread and decrease depth.

Residual volume: Theoretical studies predict that volume has a negative effect on the order processing costs of the bid-ask spread and hence the spread. The negative effect of volume on bid-ask spread is documented in many empirical studies.[10] We have suggested that volume itself is a function of other firm characteristics and ownership structure. To measure the effect of ownership structure on quoted spread and depth, we use the residual volume in our analysis of spread and depth.

Ownership Structure, Spread and Depth

[10] See, for example, Benston and Hagerman (1974), Branch and Freed (1977), etc.

Inside ownership: As suggested in previous two sections, greater inside holding is expected to reduce order flow and increase the degree of information asymmetry. These two effects imply that inside ownership would have a positive effect on quoted spread and a negative effect on quoted depth.

Active institutional ownership: Active institutional ownership could affect spread and depth in two ways. First, active institutions are expected to have a positive impact on order flow in terms of trade frequency and trade size. Therefore, they should have a negative effect on order processing cost of trading, and thus a negative effect on bid-ask spread and a positive effect on quoted depth. Second, we suggest in the previous section that active institutional ownership is expected to reduce price impact of trade. This would reinforce the negative effect of active institutional ownership on spread and the positive effect of active institutions on the quoted depth.

Passive institutional investors: We have argued that passive institutions usually trade for liquidity reasons and their trade should have little information content. Therefore, passive institutions should not affect adverse selection costs of trading. Since we do not know exactly the effect of passive institutional ownership on order flow, we are uncertain of its effect on processing costs. Thus, the effect of passive institutions on spread and depth is ambiguous.

Number of individual shareholders: Stocks with larger number of individual shareholders are expected to have smaller adverse selection costs of trading. This effect of individual holdings would imply a smaller quoted spread and larger quoted depth. Active trading of stocks with greater number of individual traders implies that order processing costs would be smaller, which in turn would reinforce the negative effect of individual shareholders on spread and the positive effect on depth.

3. Data Sources and Measure of Variables

This section discusses the data used in our analysis and the measurements of various proxy variables in our study. Section 3.1 contains a detailed description of the sample selection process. Section 3.2 presents the variables used in this study and how they are measured. Section 3.3 reports the summary statistics. Section 3.4 reports some of preliminary results based on simple sorting by firm characteristics and ownership structure.

3.1. Sample Selection

We begin our sample selection with the universe (1,983) of U.S. domiciled common stocks listed on either the New York Stock Exchange (NYSE) or the American Stock Exchange (AMEX) as of June 1991. We exclude those stocks with greater than 10% change in number of shares outstanding from June 1991 through December 1991, since our measures of market characteristics could be affected by changes in number of shares outstanding. This requirement reduces the sample size to 1,743. We are unable to find transaction data from the Institute for the Study of Security Markets (ISSM) 1991 file for 13 stocks, and are left with 1,730 stocks. Additionally, the requirement of at least two years of monthly returns for market beta estimation reduces the sample to 1,635 stocks. We are unable to find 39 stocks in Standard and Poor's Compustat annual data files, and are left with 1,596 stocks. The requirement of 13-F institutional ownership data from CDA Spectrum and inside ownership information from Compact Disclosure, which is also based on information from CDA Spectrum, reduces our sample to 1,445 stocks. Estimates of Kyle's lambda are negative for 21 stocks and are excluded from the sample.

We also exclude two stocks for their extraordinary high prices.[11] Finally, we obtain number of shareholders from Compustat, and supplement the missing data from Compact Disclosure. We are unable to obtain number of shareholders for 22 stocks and our final sample contains 1,400 stocks.

3.2. Measures of Variables

3.2.1. Firm Characteristics

We use the natural logarithm of market capitalization of a stock (*LSIZE*) at the end of June 1991 to measure size. Price and number of shares outstanding for each stock at the end of June 1991 are obtained from 1997 Center for Research in Security Prices (CRSP) file. We use the natural logarithm of the closing price (*LPRICE*) at the end of June 1991 as our measure of price. We measure age with the length in years from the first return date to June 1991, as provided in 1997 CRSP monthly return file. The natural logarithm of the age (*LAGE*) is used as our measure for age.

We use a method adopted by Fama and French (1992) to obtain estimate of systematic risk and firm specific risk. More specifically, for each stock, we regress 24 to 60 months of return before June 1991 (where available) on concurrent and one-month lagged value weighted market return. The sum of the regression coefficients of concurrent and lagged value-weighted market returns is our beta estimate (*BETA*) and used as a proxy for systematic risk. The standard deviation of residuals from the beta estimation regression (*STDRES*) is used as the estimate for firm specific risk.

[11] These are Berkshire Hathaway (BRK) with a price of $8,400, and Capital Cities Abc Inc (CCB) with a price of $428.875 at the end of June 1991.

We obtain the number of analysts providing earnings forecasts for the next fiscal year at the end of June 1991 from Institutional Brokerage Earnings System (I/B/E/S) history file. We treat stocks with no annual earnings forecasts as having no analyst following. We use the natural logarithm of one plus the number of analysts (*LNANA*) as our measure of analyst coverage. We obtain number of news stories for a stock that appear in Dow Jones News Service during the prior 12 months. As in Mitchell and Mulherin (1994), we use news stories to proxy for public information flow. The natural logarithm of one plus number of news stories (*LNEWS*) is used in our analysis.

We identify stocks with SIC code of 6000-6999 as in the financial industry and stocks with an SIC code from 4800-4999 as in the utility industry.[12] In our regression analysis, we introduce dummy variables *FINANCIAL* and *UTILITY*, which take a value of one if a stock belongs to the corresponding industry and zero otherwise. The SIC code for each sample stock is obtained from the Compustat Annual File.

We obtain accounting data items such as R&D expenditure, book value of long term debt, net value of plant property and equipment, book value of total assets, sales, etc., from COMPUSTAT annual files. We measure leverage with the ratio of long term debt to total assets (*DEBT/TA*). Unlike Himmerlberg, Hubbard and Palia (1998), who measure capital intensity with fixed capital (plant, property, and equipment) to sales ratio, we use the ratio of fixed capital to total asset as a measure of capital intensity (*PPE/TA*). We use this measure since we feel that a ratio of assets to assets is more appropriate than a ratio of assets to cash flow. We use research and development expenditure to sales to measure the R&D expenditure (*R&D/SALES*). We use the ratio of net operating income to sales (*NOI/SALES*) to proxy for the degree of free cash flow. We use the book value of equity at the end of fiscal year to the concurrent market value of equity to measure book to market ratio (*BK/MKT*).

[12] This classification follows Roll (1992).

3.2.2. Ownership Variables

Institutional ownership at the end of June 1991 is obtained from Spectrum 13F institutional holding file. Spectrum does not specify whether a particular institution is actively or passively managed. We distinguish between active and passive institutions under the assumption that passive institutions mainly hold stocks in the S&P 500 index. We treat institutions that hold at least 20 stocks and with over 90% of the holdings in index stocks as passive institutions. All the remaining institutions are treated as active institutions. We measure active institution ownership (*ACTPCNT*) and passive institution ownership (*PASPCNT*) as the percentage of a stock's outstanding shares held by active institutions and passive institutions from SPECTRUM, respectively.

Inside ownership (*INSDPCNT*) is measured with the percentage of a stock's outstanding shares held by officers and directors as reported by COMPACT DISCLOSURE. We treat an inside institution as an institution rather than as an insider.

To measure the number of individual shareholders (*NINDVDL*), we first obtain the number of shareholders from COMPUSTAT. We supplement number of shareholders in COMPUSTAT with COMPACT DISCLOSURE. We then subtract number of insiders and number of institutions to obtain the number of individual shareholders.[13]

3.2.3. Market Characteristics

We divide number of shares traded each day by the number of shares outstanding to obtain daily share turnover. The median of daily share turnover (*MDTNOVR*) over the six-month period from July 1991 to December 1991 is used as a measure of share

[13] We notice that our measure is likely to understate the real number of individual shareholders. A part of shares held by individuals may be held in "street name", under which different owners in a brokerage would be counted as one owner. However, we do not expect there to be any systematic bias cross-sectionally.

turnover in our analysis.[14] Similarly, median of daily dollar trade volume (*MDDVOL*) over the same period is used as a measure of dollar volume. We measure trade size with the median of dollar volume per trade (*MDSIZE*) over the same six-month period, and trading frequency with median number of trades per day (*MDTRADE*) over the same period. The turnover is calculated from 1997 CRSP daily return file, while dollar volume, average trade size and number of trades per day are calculated from 1991 ISSM file.

We obtain our estimates of Kyle's λ, price impact of trade, with a model developed by Glosten and Harris (1988).[15] Let D_t be the sign of trade t (+1 for buy orders and -1 for sell orders). Trades are signed according to an algorithm developed by Lee and Ready (1991). Let q_t be the signed volume of trade t (product of D_t and volume). The model for estimating λ is

$$\Delta p_t = \lambda q_t + \psi(D_t - D_{t-1}) + \varepsilon_t \qquad (1)$$

Where Δp_t is the price change from t-1 to t, ψ is the fixed cost of each trade, and ε_t is the price movement due to arrival of public information. Following Brennan and Subrahmanyam (1995), we scale λ with the average price level during the period over which λ is calculated. Since the distribution of λ/price is highly skewed, we use the natural logarithm of λ/price (*LLAMBDA*) in our regression analysis, as in Brennan and Subrahmanyam (1995).

Spread and depth for each stock are obtained using ISSM data. Only the BBO (best bid and offer) eligible quotes originating from the primary exchange during NYSE trading hours are used to calculate average spread and depth. Percentage spread is defined as the ask price less the bid price divided by the mid-point of the two prices.

[14] We use median of share turnover since we notice that the distribution of daily share turnover for individual stocks is highly skewed. Lo and Wang (1998) also use median turnover in their cross-sectional analysis of turnover. For the same reason. we use median of dollar volume, trade frequency, and trade size for each stock in our analysis.

[15] See Brennan and Subrahmanyam (1995) for a detailed discussion.

McInish and Wood (1985) show that quoted spread is U-shaped over the day. To account for this intraday variation in quoted spread, time-weighted percentage spread is calculated for each stock on each day, where the weight used is the length of time during which the quote is valid (McInish and Wood (1985)). The median of these daily time-weighted-spreads of a stock from July 1991 through December 1991 is then used as a measure of percentage spread for that stock. We use dollar depth to measure depth and define dollar depth of a quote as the average of dollar ask size and dollar bid size of that quote. Time-weighted quoted dollar depth for each stock is obtained for each day, and the median of time-weighted daily quoted depth is used as a measure of depth. We use the natural logarithms of our quoted spread (*LSPREAD*) and depth (*LDEPTH*) in our regression analysis.

3.2.4. Summary Statistics

Table 1 provides a detailed description of the variables in this study. Table 2 reports summary statistics of the pre-transformed variables. The mean (median) market capitalization of our sample stocks is $1,629 ($228) millions. The skewness of size suggests use of logarithm of size (*LSIZE*) in our regression analysis. The mean and median prices of our sample stocks are $21.21 and $16.50, respectively.

The mean (median) percentage holdings by active institutions is 33.45 (33.38), while the corresponding number for passive institutions is 3.49 (0.65). The average percentage inside holding is 15.08, and the median percentage inside holding is 6.70. The mean and median of number of individual shareholders are 22,098 and 3,957, respectively.

The mean (median) of daily share turnover in our sample are 0.15% (0.12%). The mean and median of average trade size in our sample are $25,080 and $13,515,

respectively. The mean and median of percentage spread are 3.00 and 1.38, respectively, while the mean and median of dollar depth are $69,318 and $30,601, respectively. The skewness of these variables suggest that we use a natural logarithm transformation in our regression analysis.

3.3. Preliminary Univariate Results

Before proceeding to regression analysis, we provide some univariate results for portfolios of firms sorted by specific variables. More specifically, we sort sample stocks into five quintiles by different firm characteristics and ownership variables. We report mean and median of variables of interests for each quintile in Table 3.

Panel A of Table 3 presents the results for sample stocks sorted by market capitalization. It reveals that while inside ownership is a decreasing function of market capitalization, active institutional ownership is increasing in size, though not monotonically. Number of individual shareholders increases monotonically in size. Both turnover and dollar volume generally increase in size. Price impact of trade and spread decrease monotonically in size, while quoted depth increases with size. This panel shows that both ownership structure and market characteristics are closely related to market capitalization, and suggests the importance of controlling for market capitalization when we investigate the effect of ownership structure on market characteristics.

Panel B and Panel C present the results for sample stocks sorted by their systematic risk and unsystematic risk, respectively. We find that different owners show different preference to risk. First, inside ownership increases in both systematic risk and unsystematic risk. Second, while active institutional ownership appears to be lower in higher unsystematic risk quintiles, we observe that active institutional owners show a preference for stocks with moderate level of systematic risk and an avoidance of stocks

with both high and low levels of systematic risk. Third, number of individual shareholders is a decreasing function of both systematic risk and unsystematic risk. We find that dollar volume generally decreases in both systematic risk and unsystematic risk. However, we find that turnover increases with systematic risk, but remains flat over unsystematic risk quintiles. We find that while price impact of trade is monotonically increasing in unsystematic risk, there is no clear pattern between price impact of trade and systematic risk based on simple sorting. This result suggests that unsystematic risk is more important than systematic risk in determining price impact of trade. We find that spread increases in both systematic risk and unsystematic risk, and depth decreases with both systematic risk and unsystematic risk. The sorting by unsystematic risk provides greater difference in spread and depth between the highest and lowest quintiles, suggesting that unsystematic risk may be more important in determining spread and depth based on simple sorting. Results from Panel B and Panel C also suggest the importance of controlling for risk factors when examining the effect of ownership structure on market characteristics.

In Panel D, we form quintiles by inside ownership. We note that inside ownership is a decreasing function of market capitalization. We find that all measures of order flow are monotonically decreasing in inside ownership. Further, we find that price impact of trade and spread increase in inside ownership, and that depth decreases in inside ownership. Results from this panel suggest that inside ownership has a negative effect on order flow and a positive effect on the cost of trading.

In Panel E, we form quintiles by active institutional ownership. We observe that there is no monotonic relation between market capitalization and active institutional ownership. We find that both turnover and trade size increase in active institutional ownership quintile. Further, we find that even though frequency of trade and dollar volume is greater in higher active institutional ownership quintiles, the relation is not

monotonic. The results suggest that order flow is greater for stocks with greater active institutional ownership. Finally, we find that both price impact of trade and spread decrease in active institutional ownership quintiles, and that depth is greater for higher active institutional ownership quintiles. These results suggest that cost of trading is lower for stocks with greater active institutional ownership.

In Panel F, we form quintiles by number of individual shareholders. We observe that number of individual shareholders is positively related to market capitalization. We find that all measures of order flow are monotonically increasing in individual shareholder quintiles, suggesting that order flow is greater for stocks with greater number of individuals. Finally, we find that both price impact of trade and spread decrease in individual shareholder quintiles, while depth increases in individual shareholder quintiles. These results suggest that cost of trading is lower for stocks with greater number of individual shareholders.

4. Results

This section presents our empirical results. Section 4.1 discusses the relations between firm characteristics and ownership structure. Section 4.2 discusses the effects of firm characteristics and ownership structure on market characteristics of common stocks. Section 4.3 adopts a system of simultaneous equations as an approach to address the potential endogeneity problem.

4.1. Determinants of Ownership Structure

4.1.1. Inside Ownership

Since inside ownership is skewed, we use both the log transformation and logistic transformation of inside ownership. We find that the two transformations provide qualitatively similar results, while logistic transformation provides better distributional properties for both inside ownership and residuals from the regression. However, in later analysis of market characteristics, we use log-transformed inside ownership as independent variable to facilitate interpretation. Therefore, we report our results with log-transformation of inside ownership. The results with logistically transformed inside ownership are provided in Appendix A.1.

Table 4 reports coefficients from the regression of inside ownership on the determinants of inside ownership. As expected, size has a negative impact on inside ownership, which suggests that wealth constraint and risk aversion reduce the inside ownership for large firms.

We find that idiosyncratic risk (*Log(STDRES)*) has a significantly positive effect on inside ownership, while systematic risk has a significantly negative on inside ownership. This suggests that both the negative effect of risk aversion and the positive effect of monitoring needs have a role in determining inside ownership. For stocks with greater idiosyncratic risk, the monitoring needs are more important and therefore the inside ownership is greater. For stocks with greater systematic risk, the need for monitoring may not be that greater, and the negative effect of insiders' risk aversion dominates.

Consistent with our hypothesis and previous evidence, we find inside ownership to be significantly lower in regulated utility and financial industries. As expected, we find

age has a significantly negative effect on inside ownership, suggesting that insiders may diversify their holdings as the firm seasons.

Leverage has no significant effect on inside ownership. This result is consistent with result from Jensen, Solberg, and Zorn (1992), which finds no effect of leverage on the level of insider ownership when inside ownership, debt ratio, and dividend policy are considered simultaneously. Contrary to our hypothesis, R&D expenditure has a significantly negative impact on inside ownership. We do not have an explanation for this result, although we notice that the sign and significance of R&D are not consistent and robust in different studies.[16] Neither our measure of capital intensity (*PPE/TA*) nor our measure for free cash flow (*NOI/SALES*) is significant in determining inside ownership.

We desire a parsimonious empirical model for the determinants of ownership structure so that our later analysis of ownership on market characteristics can be tractable. Therefore, we drop the insignificant variables and use our regression model 4 from Table 4 as our final model for the determinants of inside ownership.

4.1.2. Active Institutional Ownership

As in the case for inside ownership, we find that both log-transformation and logistic-transformation of active institutional ownership provide qualitatively similar results. Our results reported in Table 5 are based on log-transformed active institutional ownership. Results based on logistical-transformation of active institutional ownership are provided in Appendix A.2.

As documented in Falkenstein (1996), our results show that active institutions prefer stocks with higher prices. This could result from the fact that active institutions

[16] Himmerlberg, Hubbard and Palia (1998) report a similar relation in their pooled regression. However, the sign and significance change when they control for unobservable firm characteristics.

prefer the lower transaction costs of these stocks. We do not find size to be a significant variable in the determining active institutional ownership.[17]

Both systematic risk and unsystematic risk are significant in determining active institutional ownership. In our sample, active institutional investors prefer stocks with greater beta, or systematic risk. This is consistent with the results of O'Brien and Bhushan (1990), and Badrinath, Gay and Kale (1989). We also find that active institutions avoid stocks with larger unsystematic risk, which is consistent with Badrinath, Gay and Kale (1989)'s finding of institutional avoidance of larger total risk. The preference of active institutions for stocks with greater systematic risk is consistent with the idea that active institutions are seeking stocks with greater expected returns, while the avoidance of stocks with higher unsystematic risk by active institutions is consistent with the common law interpretation of prudent man rule.

Information factors are significant in explaining active institutional ownership. As documented in Falkenstein (1996), we find seasoned stocks generally have greater portion of their shares held by active institutions. Moreover, stocks with greater analysts following are also associated with greater active institutional ownership, which is consistent with evidence of O'Brien and Bhushan (1990). Unlike Falkenstein's (1996) evidence on mutual funds preference, we do not find that stocks with greater news stories are associated with greater active institutional ownership. This could result from the fact that we control for other factors such as analyst coverage and inside ownership, which are not considered in his study. Finally, we find that active institutional ownership is lower for stocks with greater inside ownership. It is not clear, however, whether this is a result of greater information asymmetry for stocks with higher inside ownership, or it is simply because higher inside ownership puts an upper bound on the percentage of shares available for institutional investors.

[17] In results not reported here, we find that when either analyst following or price is not included in regression, the coefficient of size becomes significantly positive.

Stocks in the regulated financial and utility industries have lower active institutional ownership. This is consistent with the notion that regulation makes it difficult for active institutions to make information discovery in these industries.

Finally, membership in S&P 500 index implies smaller active institutional ownership. Our results would suggest that previous documented greater institutional ownership for stocks in S&P 500 index probably are due to passive institutions.

As in the empirical model for inside ownership, insignificant variables are dropped for tractability. Model 4 from Table 5 is selected as our empirical model for determinants of active institutional ownership, which includes information factors, inside ownership, risk factors, S&P 500 membership, and regulation factors. It explains about 50% of the cross-sectional variation in active institutional ownership.

4.1.3. Individual Ownership

Table 6 reports determinants of individual ownership. The dependent variable is the natural logarithm of number of individual shareholders. Consistent with Merton's (1987) theory of capital market with incomplete information, we find that most of the measures of firm visibility have a significantly positive effect on the number of individual shareholders. Specifically, number of individual shareholders is greater for stocks that are larger, more seasoned, in the S&P 500 index, and with more news stories. The only insignificant measure of visibility is analyst following, suggesting that probably institutions are the major clients of analyst services.

We find that price has a significantly negative effect on number of individual shareholders, suggesting that wealth constraints by individuals coupled with individuals' desire for holding round lots of stocks may cause individuals to stay away from higher priced stocks.

We find that unlike active institutions who prefer systematic risk, individuals are averse to both systematic risk and unsystematic risk. While the aversion of individuals to systematic risk and unsystematic risk could be because individuals are not skilled in managing risk, the aversion to idiosyncratic risk could also result from individuals' lower ability in diversifying their holdings. Alternatively, individuals could avoid stocks with higher unsystematic risk because they dislike potential information asymmetry of these stocks.

Variables for information asymmetry are also significant in determining number of individual shareholders. Negative coefficient of inside ownership suggests that individuals shy away from stocks with greater inside ownership for fear of informational disadvantage. An alternative possibility is that a greater percentage of inside holdings could put an upper bound of shares available for individual shareholders. Consistent with our hypothesis of individuals' preference for stocks with lower information asymmetry, we find that greater number of individuals in regulated industries.

Two variables for investment styles are insignificant in our regression, suggesting that individuals as a group do not have any investment preference for momentum or value investments. It is possible individuals pursue diverse investment styles and these effects are offsetting each other when individuals are measured as a group.

4.2. Market Characteristics

4.2.1. Determinants of Order flow

Table 7 reports coefficient estimates from regressions of order flow on firm characteristics and ownership structure. We estimate a separate regression for each of our four different measures of order flow (share turnover, trading volume, trade

frequency, and trade size). We first discuss the effects of firm characteristics and then the effects of ownership structure on order flow.

The Effect of Firm Characteristics on Order Flow

The effects of S&P 500 membership on order flow are somewhat mixed. Table 7 shows that S&P 500 membership has an insignificant effect on share turnover (column 1) and dollar volume (column 2).[18] However, these results mask significant effects that S&P 500 membership has on the components of share turnover and dollar volume – trade frequency and trade size. In particular, S&P 500 membership has a significantly positive effect on trade frequency (column 3), and a significantly negative effect on trade size (column 4). We suggest that there may be two reasons that reinforce each other. First, it could be that large liquidity trades in S&P 500 stocks are executed in basket securities such as S&P 500 futures contracts, as opposed to the individual securities to reduce adverse selection costs (Gorton and Pennacchi (1993) and Subrahmanyam (1993)).[19] This would result in a smaller average trade size in the underlying component securities of the index. Second, recall that, S&P 500 membership is associated with a greater number of individual shareholders. Later we report evidence that individual investors trade more frequently but in smaller quantities. These two effects combined would explain the smaller trade size and greater trade frequency for stocks in S&P 500 index.

Analyst coverage and rate of information flow (*LNEWS*) have a significantly positive effect on all measures of order flow. These results are consistent with several existing studies.[20] A possible explanation for these results is that information releases

[18] The insignificant effect on share turnover is consistent with Tkac (1999), who suggests that there could be two confounding effects of S&P 500 membership. Passive indexing by certain institutions would reduce trading while index arbitrage could increase trading.

[19] The uninformed liquidity traders are those who are at an informational disadvantage at firm level. They may have superior information at market level. For example, a market-timer who can perfectly forecast the future market performance may not have information regarding individual stocks.

[20] See, for example, Mitchell and Mulherin (1994), Bessembinder, Chan and Seguin (1996), and Brennan and Subrahmanyam (1998).

cause market participants to update their beliefs, and therefore to trade. Alternatively, if divergence of opinion results in trading, and the release of information increases the degree of disagreement among the investors, the news releases could have a positive effect on order flow. Our result on analyst coverage is consistent with the notion that sell-side analysts may promote stocks to generate revenues for their affiliated brokerage firms.

Price has a positive effect on share turnover, dollar volume and trade size. For a given minimum tick size, the percentage trading cost is lower for stocks with higher price. Our result confirms the negative relation between share turnover and transaction costs. This result is consistent with the findings of Lo and Wang (1998). Our analysis of trade frequency and trade size suggests that trade size is greater, while the trade frequency is smaller for higher-priced stocks.

We find that both systematic and unsystematic risk are positively related to order flow. The positive coefficients of these risk measures are consistent with several empirical studies and theories on trading. First, for higher risk stocks, there may be greater possibilities for tax-loss selling and/or portfolio rebalance trading. Second, there could be more trading due to greater difference of opinion for riskier stocks. Third, information motivated trades may be greater for riskier stocks. The last two explanations suggest that unsystematic risk rather than systematic risk should be more important in determining order flow, which is supported by more significant coefficients of idiosyncratic risk in all four regressions.

As expected, we find that size has a significantly positive effect on dollar volume, trade frequency, and trade size, suggesting that economic magnitude of trade is greater for larger stocks. However, the effect of size on scaled measure of order flow (share turnover) is insignificant, which is not consistent with either the positive effect reported

in Lo and Wang (1998), or the negative effect documented in Tkac (1999).[21] The insignificant coefficient of size is consistent with the two-fund separation theory.[22]

The Effect of Ownership Structure on Order Flow

We now consider the effects of ownership structure on order flow. Table 7 shows that the coefficients of ownership variables are generally consistent with our hypothesis. The coefficients of inside ownership are significantly negative in regressions of share turnover, dollar volume, trade frequency, and trade size. This is consistent with our hypothesis that insiders may refrain from trading for legal and/or corporate control reasons. Further, other market participants may refrain from trading stocks with greater inside ownership to avoid trading with the informed traders.

The effects of active institutional ownership on order flow are also consistent with our hypothesis. In particular, the coefficient of active institutional ownership is significantly positive in the regression of every measure of order flow. This suggests that active institutional investors trade more as compared with other market participants, both in terms of trade size and trade frequency.

Passive institutional ownership has varying effects on the four measures of order flow. Consistent with our hypothesis that passive institutional investors trade larger quantities, the coefficient of passive institutional holdings is significantly positive in the regression of trade size. While our hypothesis predicts a negative effect of passive institutional ownership on trade frequency, the coefficient of passive institutional ownership is insignificant. The positive effect of passive institutions on trade size

[21] We find that when analyst following is not included in the regression equation as in Lo and Wang (1998), however, the coefficient of size turns to be significantly positive, suggesting that probably size is picking up the effect of analyst following when the analyst variable is omitted. Tkac (1998) uses relative turnover measure in her regression. The implication of her regression could be different from ours.

[22] According to the two-fund separation theory, market participants would hold value-weighted market portfolio and size should have a coefficient of zero. See Lo and Wang (1998) for a detailed explanation.

coupled with insignificant effect on trade frequency is reflected as a positive effect on trade volume and an insignificant effect on share turnover.

Finally, the effect of individual investors on order flow is largely consistent with our hypothesis. The number of individual investors has a positive and significant effect on share turnover, dollar volume, and trade frequency. We offer several explanations for this. First, consensus may be difficult to achieve among a large number of investors. If difference of opinion is a motivation for trade, the trade frequency for stocks with greater number of individual shareholders could be greater. Second, if liquidity need is similar across individual investors, greater number of investors implies a greater aggregate need for liquidity trading. Third, individuals may take greater advantage of tax-loss selling. The effect of individual shareholders on trade size is significantly negative, probably because holdings of individual shareholders are likely to be smaller when compared with those of institutions.

4.2.2. Determinants of Price Impact of Trade

Table 8 reports coefficient estimates from regressions of price impact of trade on firm characteristics and ownership structure. As before, we first discuss the effects of firm characteristics and then the effects of ownership structure.

The Effect of Firm characteristics on Price Impact of Trade

While we expect a negative effect of price, the coefficient of price is significantly positive but less than one. This is consistent with the results documented by Brennan and Subrahmanyam (1995). They suggest that while the marginal cost of trading a given dollar amount decreases in stock price, the marginal cost of trading a given number of shares increases in price.

Neither of the coefficients of risk measures is significant in our regression. This result could be due to two confounding effects. On one hand, greater information asymmetry for riskier stocks could imply a greater price impact of trade. On the other hand, the positive effect of risk measures on order flow we documented in previous section may reduce price impact of trade. Our result indicates that neither effect dominates the other.[23]

As expected, we find that stocks with greater number of news stories and greater analyst following have smaller price impact of trade. This result suggests that news release and analyst coverage increase the information availability and reduces the information advantages of privately informed traders.

Size has a negative effect on the price impact of trade, consistent with our hypothesis that demand elasticity is greater for stocks with larger market capitalization. Further, it may also reflect greater information availability for large capitalization stocks. If as suggested by Glosten and Harris (1988) that adverse selection cost of trading is positively related to the fixed component of trading costs, it is also consistent with the argument that the fixed component of trading cost is lower for larger capitalization stocks.

We find that the price impact of trade is greater for stocks in the S&P 500 index. While counter-intuitive at first glance, this result is consistent with the theoretical predictions of Gorton and Pennacchi (1993) and Subrahmanyam (1993). These models suggest that for uninformed liquidity traders, a basket of securities has lower adverse selection costs and is therefore a preferable trading vehicle than the component securities of the basket. Migration of liquidity traders to the market for the basket security could

[23] When we use dollar volume in regression as reported in Appendix A.4, we find that the coefficient of unsystematic risk is significantly positive, suggesting that once the effect via volume is controlled for, unsystematic risk increases price impact of trade.

cause the adverse selection costs for the component securities to increase.[24] Stocks for which a basket of securities exists could, therefore, have greater adverse selection costs, when compared with stocks not in the baskets.

Finally, we find that residual dollar volume has a negative effect on the price impact of trade.[25] This result is consistent with the conjecture of Glosten and Harris (1988), that adverse selection cost of trade should be positively related to the fixed component of trading cost. If volume proxies for the fixed component of trading cost, volume should have a negative effect on price impact of trade.

The Effect of Ownership Structure on Price Impact of Trade

We now consider the effects of ownership structure on the price impact of trade. We find that price impact of trade is greater for stocks with greater inside ownership, suggesting that insiders possess superior information. Our result is stronger when compared with the result reported in Glosten and Harris (1988), possibly because we control for other firm characteristics and use a more comprehensive set of measures of ownership structure in this study.

As expected, the effect of active institutional holdings on price impact of trade is significantly negative, suggesting that active institutional investors may reduce information asymmetry. This result is consistent with the theoretical predictions of Admati and Pfleiderer (1988), that competition among the informed investors (active institutional investors, in this case) leads to greater information availability and smaller price impact of trade. Further, this result could in part due to greater volume for stocks

[24] Jegadeesh and Subrahmanyam (1993) find that bid-ask spreads of S&P 500 index stocks increase significantly after introduction of S&P 500 index futures contract.

[25] We use residual dollar volume instead of dollar volume because we expect that ownership structure to affect price impact of trade via volume. If we use volume in regression, we would not be able to capture the indirect effect of ownership structure on price impact of trade. Further, our regression of dollar volume show that over 90 percent of volume is explained by a set of firm characteristics. Using dollar volume as independent variable would induce severe collinearity. Our approach avoids this problem.

with greater active institutional ownership, which reduces fixed component of trading cost. Consistent with our hypothesis that passive institutional investors do not directly affect price impact of trade, we find that the coefficient of passive institutional holdings is insignificant.

We find that the price impact of trade is smaller for stocks with great number of individual shareholders. This result suggests that individual shareholders may be perceived as uninformed. It is also possible that the greater volume of stocks with greater number of individual shareholders reduces the fixed component of trading and, hence, the adverse selection costs of trading. Our result is also consistent with Glosten and Harris (1988).

4.2.3. Determinants of Quoted Spread and Depth

In this section, we examine the effects of firm characteristics and ownership structure on quoted spread and depth. We estimate separate regressions for both quoted spread and depth. Table 9 reports coefficient estimates from regressions when residual dollar volume is used as an independent variable.[26] As before, we first discuss the effects of firm characteristics and then the effects of ownership structure.

The Effect of Firm Characteristics on Quoted Spread and Depth

Consistent with results from previous studies, price has a significantly negative effect on the bid-ask spread. As expected, size has a negative effect on bid-ask spread and a positive effect on quoted depth. This finding is not surprising given our earlier results that size has a positive effect on volume and a negative effect on price impact of trade.

[26] In Appendix A.7 and A.8, we also report regression results when dollar volume is used as independent variable in the regressions.

We find that systematic risk has a positive effect on quoted spread and an insignificant effect on quoted depth. However, we find that unsystematic risk has an insignificant effect on quoted spread but a positive effect on quoted depth. These two results jointly suggest that systematic risk reduces the liquidity quoted by specialists and unsystematic risk increases the liquidity quoted by specialists. While these results seem to be puzzling, we recall from Table 7, where we find that the unsystematic risk has a much stronger effect on order flow than the systematic risk. It is conceivable that while adverse selection costs may be greater for stocks with greater unsystematic risk, the order processing costs could be smaller due to greater order flow for these stocks. Quotes posted by specialists reflect that the latter effect dominates the first effect.[27]

We find that both analyst coverage and number of news stories reduce quoted bid-ask spread and increase quoted depth. These results are consistent with our earlier results that both analyst coverage and number of news stories increase order flow and reduce the price impact of trade, or the adverse selection cost of trade, which is directly related to quoted spread and depth.

Finally, while S&P 500 membership does not significantly affect the quoted spread, it has a significantly negative effect on quoted dollar depth. The combined result suggests that the membership in the S&P 500 index reduces liquidity for the stock in terms of quoted spread and quoted dollar depth. This result is consistent with the migration of liquidity traders to the basket of securities such as S&P 500 futures contract.

The Effect of Ownership structure on Quoted Spread and Depth

We now examine the effect of ownership structure on quoted spread and depth. As expected, inside ownership has a significantly positive effect on quoted spread and a

[27] Appendix A.7 show that when we include dollar volume instead of residual dollar volume, we find that spread is wider for riskier stocks.

significantly negative effect on quoted depth. Analysis in previous sections suggests that these effects result from two sources. First, the smaller order flow for the stocks with greater inside ownership implies a greater average fixed cost of market making. Second, the greater price impact of trade for stocks with greater inside ownership implies that the adverse selection cost component of market making will be larger.

We find that stocks with greater active institutional holdings are associated with narrower bid-ask spreads and greater quoted depth. The positive effect of active institutional ownership on order flow, and the reduced price impact of trade for stocks with greater institutional ownership are two possible reasons for this result.[28] We do not find any significant effect of passive institutions on spread or depth.

Finally, we find that stocks with greater number of individual shareholders have narrower spread and greater depth. We believe that this effect stems from two sources. First, greater dollar volume for the stocks with greater number of shareholders reduces order processing costs. Second, smaller price impact of trade for these stocks suggests that adverse selection costs would be lower.

4.3. A Simultaneous Equation Approach

Our first approach assumes that the potential endogeneity between ownership structure and market characteristics is caused by omitted firm characteristics, and a careful accounting for these characteristics eliminates the endogeneity. To the extent that there is any remaining endogeneity between market characteristics and ownership structure, ordinary least square (OLS) regression estimates will be biased. In the second approach, we address the endogeneity problem by estimating simultaneous equations.

[28] In Appendix A.7 and Appendix A.8, we show that when dollar volume is included, the coefficient of active institutional ownership becomes significantly positive in the regression of spread and insignificant in the regression of depth. Together the results indicate that the main effect of active institution on specialist's quotes is via order flow.

An added benefit of this approach is that unlike in our first approach, where we assume that trading costs are determined by trading volume and ignore the effect of trading costs on volume, we allow trading volume and trading costs to be simultaneously determined in the system of equations.

We do not use a complex system with a large number of endogenous variables in this approach because without a structural model, such a system would be sensitive to model specification errors, and is likely to be unstable. We select bid-ask spread, dollar trading volume, and active institutional ownership as three endogenous variables for two reasons. First, in our opinion, these three endogenous variables measure important aspects of trading costs, order flow, and ownership structure. Second, the strongest case for endogeneity can be made among these three variables. For example, active institutional ownership is likely to affect both trading volume and trading costs, and both bid-ask spread and trading volume could affect active institutional ownership if active institutions consider trading costs when making their investment and trading decisions. Further, trading volume and bid-ask spread are interrelated. The exogenous variables in the system are the firm characteristics that affect one or more of the three endogenous variables. Lacking a structural model, we investigate the system using three alternative specifications. In the first specification, the system has the following three equations:

$$LSPREAD = a_0 + a_1\, LPRICE + a_2\, LSTDRTN + a_3\, LMDDVOL + \varepsilon_1 \qquad (2)$$

$$LMDDVOL = b_0 + b_1\, LSPREAD + b_2\, INDEX + b_3\, LNANA + b_4\, LNEWS + b_5\, LSIZE + b_6\, BETA + b_7\, LSTDRES + b_8\, LACTPCNT + \varepsilon_2 \qquad (3)$$

$$LACTPCNT = c_0 + c_1\, LSPREAD + c_2\, INDEX + c_3\, LNANA + c_4\, LNEWS + c_5\, LSIZE + c_6\, BETA + c_7\, LSTDRES + c_8\, LAGE + c_9\, FINANCIAL + c_{10}\, UTILITY + \varepsilon_3 \qquad (4)$$

The first equation is the basic model on the determinants of bid-ask spread used in previous studies.[29] In this equation, the bid-ask spread is affected by trading volume, but not by the active institutional ownership. Dollar trading volume is determined in the second equation with bid-ask spread, active institutional ownership, and other firm characteristics identified in our OLS regression as the determinants. The last equation is on the determinants of institutional ownership. This equation differs from our OLS model in that we allow active institutional ownership to depend directly on bid-ask spread, rather than on price, a variable that is used to proxy for trading costs in the OLS model.

Our second specification is a slight variation of the original specification, and allows for a greater level of endogeneity. More specifically, we include active institutional ownership as an additional determinant of bid-ask spread in equation (2). In equation (4), we include trading volume as an additional determinant of active institutional ownership.

The third specification is another variation of the first specification. We replace trading volume with active institutional ownership in equation 2. The comparison of the results from this specification with the other two allows us to examine the direct effect of active institutional ownership on the bid-ask spread, as well as the indirect effect of active institutional ownership on bid-ask spread through its effect on trading volume.

4.3.1. Simultaneous Equation Regression Results

Table 10 reports the two-stage least square estimation results from the system of equations. The results of the first specification are presented in Panel A. In column (1), we find that the bid-ask spread is positively related to the standard deviation of returns

[29] See, for example, Benston and Hagerman (1974), Branch and Freed (1977), Stoll (1978), etc.

and negatively related to trading volume and price. Column (2) shows that bid-ask spread does not have a significant effect on trading volume after controlling for the positive effect of active institutional ownership on trading volume. This is consistent with our view that the effect of trading costs on order flow is likely to be of second order importance. Column (3) shows that active institutional investors display a preference for stocks with lower spread.

The results for the second specification are presented in Panel B of Table 10. We find that after controlling for the effect of trading volume, volatility, and price, the coefficient of active institutions is significantly positive in the equation for spread. A possible explanation for this apparently counter intuitive result is that the active institutional ownership affects the bid-ask spread in two ways. First, as we can see from the results of the second equation, that active institutional ownership has a significantly positive effect on trading volume, and this increase in trading volume decreases the spread. However, in the first equation, this negative effect of active institutional ownership on the bid-ask spread is captured by trading volume. The positive coefficient on active institutional ownership after controlling for the negative effect through trading volume may reflect the specialist's concern that some of the active institutional trading may be informed. However, in our opinion the net effect of increase in institutional ownership would be lowering of the bid-ask spread. This is confirmed by the results of the third specification, which are presented in Panel C.

Panel C shows that when trading volume is not included in the equation for the bid-ask spread, the coefficient of active institutional ownership becomes negative. This confirms our earlier conclusion from Panel B that the net effect of active institutions on spread is negative. The other results from the second approach are qualitatively similar to the OLS regressions.

The new results from this approach suggest that active institutional investors prefer stocks with greater trading volume and lower spreads. Active institutional investors increase the trading volume, which leads to lower spreads. However, after controlling for this negative effect of active institutional ownership on the bid-ask spread through an increase in trading volume, there may be a smaller positive effect of active institutions on the spread.

5. Conclusions and Future Research

This paper investigates the effect of ownership structure on the market characteristics of common stocks. Our study extends existing studies by examining a richer set of ownership variables and a more comprehensive set of market characteristics. In our analysis, we recognize the fact that while ownership structure (inside ownership and institutional ownership) directly affects the market characteristics (order flow, price impact of trade, quoted spread and depth) of a given stock, market participants also select stocks based on these market characteristics. We adopt two different approaches to address this potential endogeneity problem.

Our first approach assumes that any observed effect of market characteristics on ownership structure such as active institutional ownership is a result of firm characteristics such as size and risk. This approach assumes that there is no remaining effect of market characteristics on ownership structure after controlling for the firm characteristics that affect both ownership structure and market characteristics. Controlling for firm characteristics that affect ownership structure, OLS regressions find that ownership structure affects the observed market characteristics. Our results are as follows.

We find that inside ownership has a negative effect on order flow. More specifically, our results suggest that inside ownership reduces trade frequency, share turnover, and daily trading volume. Furthermore, we find that inside ownership has a positive effect on price impact of trade, suggesting that there is greater information asymmetry for stocks with greater inside ownership. Finally, the negative effect of inside ownership on order flow and the positive effect of inside ownership on price impact of trade are reflected as a wider bid-ask spread and a lower quoted depth.

We find that active institutional ownership has a positive effect on order flow. We also find that active institutional ownership has a negative effect on the price impact of trade, suggesting that there is lower information asymmetry for stocks with greater active institutional ownership. The positive effect of active institutional ownership on order flow and the negative effect of active institutional ownership on the price impact of trade are reflected as a smaller quoted spread and greater quoted depth. Compared with active institutions, the effect of passive institutions on market characteristics is weaker. The only significant effect of passive institutions is a positive effect on trade size and dollar volume.

We find that individual shareholders increase trade frequency, share turnover, and dollar volume, and reduce average trade size. Further, we find that individual shareholders have a negative effect on price impact of trade. Finally, we find that stocks with greater number of individual shareholders have smaller quoted spread and greater quoted depth.

Our second approach uses a simple system of simultaneous equations where bid-ask spread, dollar volume and active institutional ownership are determined endogenously. Our simultaneous regressions generally confirm our OLS regression results.

One limitation of this essay is that it does not distinguish between different types of institutions, i.e., mutual funds, pension funds, insurance companies, etc. It is possible that the information gathering activity and trading patterns differ across different types of institutions. The results from this essay only provide information regarding how active institutions affect market characteristics in aggregate. Future studies could extend this essay by examining the effects of different types of active institutions, such as mutual funds, pension funds, insurance companies, etc.

Another limitation is that this essay only examines a cross-sectional relation between ownership structure and market characteristics. Future studies could examine the time-series relation between ownership structure and market characteristics, and shed some lights on how changes in ownership structure affect market characteristics.

This study can also be extended into several other directions. First, while this study finds that ownership structure affects the observed market characteristics in general, future study could examine how ownership affects the processing of information around firm specific events. The second essay in this dissertation is one step in this direction. Second, given that ownership structure affects the price impact of trade, quoted spread and quoted depth, it would be interesting to examine how ownership structure affects the price impact of block trades. Third, we could extend this research to examine the effect of ownership structure on stock return volatility and return auto-correlation.

References

Admati, A. and P. Pfleiderer, 1988, A theory of intraday patterns: Volume and price variability, Review of Financial Studies 1, 3-40.

Agrawal, Anup and Charles R. Knoeber, 1996, Firm performance and mechanisms to control agency problems between managers and shareholders, *Journal of Financial and Quantitative Analysis* 31, 377-398.

Ahn, Hee-Joon, Charles Q. Cao, and Hyuk Choe, 1996, Tick size, spread, and volume, Journal of Financial Intermediation 5 (1), 2-22.

Allen, F. and G. R. Faulhaber, 1989, Signaling by underpricing in the IPO market, Journal of Financial Economics 23 (2), 303-324.

Amihud, Yakov and Haim Mendelson, 1986, Asset pricing and the bid-asked spread, Journal of Financial Economics 17 (2), 223-249.

Amihud, Yakov and Haim Mendelson, 1989, Liquidity and cost of capital: implications for corporate management, Journal of Applied Corporate Finance 2 (3), 65-73.

Atkins, Allen B., Edward A. Dyl, 1997, Transactions costs and holding periods for common stocks, Journal of Finance 52 (1). 309-25.

Bacidore, Jeffrey M., 1997, The impact of decimalization on market quality: an empirical investigation of the Toronto Stock Exchange, Journal of Financial Intermediation 6 (2), 92-120.

Badrinath, S. D., G. Day Gay, and Jayant R. Kale, 1989, Patterns of institutional investment and the managerial "safety-net" hypothesis, Journal of Risk and Insurance 56, 605-629.

Bagehot, W., The only game in town, Financial Analyst Journal 27 (2), 1971, 12-14, 22.

Benston, George J. and Robert L Hagerman, 1974, Determinants of bid-asked spreads in the over-the-counter market, Journal of Financial Economics 1 (4), 353-364.

Bergstorm, C., and R. Kristian, 1990, The determinants of corporate ownership: an empirical study on Swedish data, Journal of Banking and Finance 14, 237-253.

Bessembinder, Hendrik, Kalok Chan and Paul J. Seguin, 1996, An empirical examination of information, differences of opinion, and trading activity, Journal of Financial Economics 40 (1), pp. 105-134.

Branch, Ben and Walter Freed, 1977, Bid-asked spreads on the Amex and the big board, Journal of Finance 32 (1), 159-163.

Brennan, M. J., 1995, The individual investor, Journal of Financial Research 18 (1), 59-74.

Brennan, M. J., and A. Subrahmanyam, 1995, Investment analysis and price formation in the securities markets, Journal of Financial Economics 38 (3), 361-381.

Brennan, M. J., and A. Subrahmanyam, 1998, The determinants of average trade size, Journal of Business 71 (1), 1-25.

Chiang, R. and P.C. Venkatesh, 1988, Insider holdings and perceptions of information asymmetry: A note, Journal of Finance 43, 1041-1048

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

Constantinides, George M., 1986, Capital market equilibrium with transaction costs, Journal of Political Economy 94 (4), 842-862.

Copeland, T. E., and D. Galai, 1983, The information effects of the bid-ask spread, Journal of Finance 38 (5), 1457-1469.

Demsetz, H. and K. Lehn, 1985, The structure of corporate ownership: causes and consequences, Journal of Political Economy 93, 1155-1177.

Denis, David J. and Atulya Sarin, 1998, Ownership and board structures in publicly traded corporations, forthcoming, Journal of Financial Economics.

Denis, David J. and Diane K. Denis, 1994, Majority owner-managers and organizational efficiency, Journal of Corporate Finance 1, 91-118.

Easley, D. and M. O'Hara, 1987, Price, trade size, and information in the security markets, Journal of Financial Economics 19 (1), 69-90.

Easley, David and Maureen O'Hara, 1992, Time and the process of security price adjustment, Journal of Finance 47, 577-606.

Falkenstein, Eric G., 1996, Preferences for stock characteristics as revealed by mutual fund portfolio holdings, Journal of Finance 51, 111-135.

Foster, F. D. and S. Viswanathan, 1990, A theory of interday variations in volumes, variances, and trading costs in securities markets, Review of Financial Studies 3, 593-624.

George, Thomas J., Gauam Kaul, and M. Nimalendran, 1991, estimation of the bid-ask spread and its components: A new approach, Review of Financial Studies 4, 623-656

Glosten, L. R., and P. R. Milgrom, 1985, Bid, ask, and transaction prices in a specialist market with heterogeneously informed traders, Journal of Financial Economics 14 (1), 71-100.

Glosten, Lawrence and Lawrence Harris, 1988, Estimating the components of the bid-ask spread, Journal of Financial Economics 21, 123-142

Gompers, Paul A. and Andrew Metrick, 1998, Are the hundred-million-dollar managers just like everyone else? An analysis of the stock ownership of large institutions, working paper, Harvard Business School.

Gorton, Gary B. and George G. Pennacchi, 1993, Security baskets and index-linked securities, Journal of Business 66 (1), 1-27.

Hand, John R., 1990, A Test of the Extended Functional Fixation Hypothesis, The Accounting Review 65 (4), 740-763.

Harris, M. and A. Raviv, 1993, Differences of opinion make a horse race, Review of Financial Studies 6, 473-506.

Hasbrouck, Joel, 1988, Trades, quotes, inventories, and information, Journal of Financial Economics 22 (2), 229-252.

Himmelberg, C. P., R. G. Hubbard, and D. Palia, 1998, Understanding the determinants of managerial ownership and the link between ownership and performance, Journal of Financial Economic, forthcoming.

Ho, Thomas and Hans R. Stoll, 1981, Optimal dealer pricing under transactions and return uncertainty, Journal of Financial Economics 9 (1), 47-73.

Holden, C. W., and A. Subrahmanyam, 1992, Long-lived private information and imperfect competition, Journal of Finance 47 (1), 247-270.

Holderness, C. G., R. S. Kroszner, and D. P. Sheehan, 1999, Were the good old days that good? Changes in managerial stock ownership since the greater depression, Journal of Finance 54 (2), 435-470.

Holthausen, R. W. and D. F. Larker, 1991, Organizational structure and financial performance, Working Paper, The Whaton School, University of Pennsylvania.

Jegadeesh, N. and A. Subrahmanyam, 1993, Liquidity effects of the introduction of the S&P 500 index futures contract on the underlying stocks, Journal of Business 66 (2), 171-187.

Jennings, William W., Karen Schnatterly and Paul J. Seguin, 1997, Institutional ownership, information and liquidity, Working Paper, University of Michigan

Jensen, G. R., D. P. Solberg, and T. S. Zorn, 1992, Simultaneous determination of insider ownership, debt, and dividend policy, Journal of Financial and Quantitative Analysis 27 (2), 247-263.

Jensen, Michael C., 1986, Agency costs of free cash flow, corporate finance, and takeovers, American Economic Review 76, 323-329.

Jensen, Michael C., and William H. Meckling, 1976, Theory of the firm: Managerial behavior, agency costs and ownership structure, Journal of Financial Economics 3 (4), 305-360.

John, K. and J. Williams, 1985, Dividends, dilution, and taxes: a signaling equilibrium, Journal of Finance 40 (4), 1053-1070.

Jones, Charles, Gautam Kaul, and Marc L. Lipson, 1994, Transactions, volume, and volatility, Review of Financial Studies 7(4), 631-651.

Kandel, Eugene, Neil D. Pearson, 1995, Differential interpretation of public signals and trade in speculative markets, Journal of Political Economy 103 (4), 831-872.

Kim, Oliver and Robert E. Verrecchia, 1991, Trading volume and price reactions to public announcements, Journal of Accounting Research 29 (2), 302-321.

Kini, Omesh, and S. Mian, 1995, Bid-Ask spread and ownership structure, Journal of Financial Research 18 (4), 401-414.

Kothare, Meeta and Paul A. Laux, 1995, trading costs and the trading systems for Nasdaq stocks, Financial Analysts Journal 51, March-April, 42-53

Kyle, A. S., 1985, Continuous auctions and insider trading, Econometrica 53(6), 1315-1336.

Lakonishok, J. and S. Smidt, 1986, Capital gain taxation and volume of trading, Journal of Finance 41 (4), 951-976.

Lee, C. M., B. Mucklow, and M. Ready, 1993, Spreads, depths, and the impact of earnings information: An intraday analysis, Review of Financial Studies 6(2), 345-367

Lee, Charles M. C. and Mark Ready, 1991, Inferring trade direction from intradaily data, Journal of Finance 46, 733-746

Lo, Andrew and Jiang Wang, 1998, Trading volume: definitions, data analysis, and implications of portfolio theory, MIT Working Paper.

Madhavan, Ananth and Seymour Smidt, 1991, A Bayesian model of intraday specialist pricing, Journal of Financial Economics 30, 99-134

McInish, Thomas and Robert A. Wood, 1985, An investigation of transactions data for the NYSE stocks, Journal of Finance 40 (3), 723-739.

Merton, Robert C., 1987, Presidential address: A simple model of capital market equilibrium with incomplete information, Journal of Finance 42, 483-510.

Miller, M. H. and K. Rock, 1985, Dividend policy under asymmetric information, Journal of Finance 40 (4), 1031-1051.

Mitchell, Mark L. and J. H. Mulherin, 1994, The impact of public information on the stock market, Journal of Finance 49 (3), 923-950.

Myers, S. C. and N. S. Majluf, 1984, Corporate financing and investment decisions when firms have information that investors do not have, Journal of Financial Economics 13 (2), 187-221.

O'Brien, Patricia and Ravi Bhushan, 1990, Analyst following and institutional ownership, Journal of Accounting Research 28, Supplement 55-76.

Roll, Richard, 1992, Industrial structure and the comparative behavior of international stock market indices, Journal of Finance 47 (1), 3-41.

Sarin, Atulya, Karen Shastri and Kuldeep Shastri, 1996, Ownership structure and stock market liquidity, Working Paper, University of Pittsburgh.

Shalen, C. T., 1993, Volume, volatility, and the dispersion of beliefs, Review of Financial Studies 6, 405-434.

Shleifer, Andrei, 1986, Do demand curves for stocks slope down? Journal of Finance 41 (3), 579-590.

Stoll, Hans R, 1978, The pricing of security dealer services: an empirical study of NASDAQ stocks, Journal of Finance 33 (4), 1153-1172.

Stoll, Hans R., 1989, Inferring the components of the bid-ask spread, Journal of Finance 44, 1152-1173

Stulz, Rene M., 1988, Managerial control of voting rights: financing policies and the market for corporate control, Journal of Financial Economics 20, 25-54.

Subrahmanyam, Avanidhar, 1991, A theory of trading in stock index futures, Review of Financial Studies 4 (1), 17-51.

Subrahmanyam, Avanidhar, 1991, Risk aversion, market liquidity, and price efficiency, Review of Financial Studies 3, 417-441

Tinic, Seha M., 1972, The Economics of Liquidity Services, Quarterly Journal of Economics 86 (1), 79-93.

Tkac, Paula A., 1999, A trading volume benchmark: theory and evidence, Journal of Financial and Quantitative Analysis 34 (1), 89-114.

Verrecchia, R. E., 1981, On the relationship between volume reaction and consensus of investors: Implications for interpreting tests of information content, Journal of Accounting Research 19, 271-283.

Table 1. Description of Variables in This Study

This table provides a description on the variables used in this study, and the sources for all the data items. Discussions of these variables appear in section 2.

Variables	Description	Source
Firm characteristics		
LSIZE	Log of market capitalization as of June 1991.	1997 CRSP daily return file.
LPRICE	Log of price as of June 1991.	1997 CRSP daily return file.
BETA	Beta of a stock, obtained using method of Fama and French (1992).	Based on 1997 CRSP monthly return data.
STDRES	Standard deviation of residuals from beta estimation regression.	Based on 1997 CRSP monthly return data.
STDRTN	Standard deviation of daily mid-point return from July 1991 to December 1991.	Based on 1997 CRSP daily return file and 1991 ISSM file
LNANA	Log (1 + number analysts), where number of analysts is the number of earnings forecasts for next fiscal year as of June 1991.	1997 I/B/E/S monthly summary historical file.
LNEWS	Log(1+news), where news is the number of news stories about a stock that appear in Dow Jones News Service during the prior 12-month	Dow Jones News Retrieval
LAGE	Log(Age), where age is the number of years return data of a stock is available on CRSP file	Based on 1997 CRSP monthly return data.
DEBT/TA	Ratio of debt to total assets	1991 Compustat annual data file
R&D/SALES	Ratio of R&D expenditure to total sales	1991 Compustat annual data file
PPE/TA	Ratio of fixed capital such as plant, property, and equipment to total assets	1991 Compustat annual data file
NOI/SALES	Ratio of net operating income to total sales	1991 Compustat annual data file

TABLE 1 (CONTINUED)

UTILITY	Dummy variable which equals to 1 for a stock in utility industry, and 0 otherwise	Based on SIC code from 1991 Compustat annual data file
FINANCIAL	Dummy variable which equals to 1 for a stock in financial industry, and 0 otherwise	Based on SIC code from 1991 Compustat annual data file
BK/MKT	Ratio of book value to market value	1991 Compustat annual data file
RTN(-1)	Cumulative return over the past 12 months	Based on 1997 CRSP monthly return data.
INDEX	Dummy variable which equals to 1 for a stock in S&P 500 index, 0 otherwise	

Ownership variables

ACTPCNT [LACTPCNT]	Percentage of a stock's outstanding shares held by active institutional investors [Log (1+ACTPCNT)]	Spectrum
INSDPCNT [LINSDPCNT]	Percentage of a stock's outstanding shares held by insiders [Log (1+INSDPCNT)]	Compact Disclosure
PASPCNT [LPASPCNT]	Percentage of a stock's outstanding shares held by passive institutional investors [Log (1+ PASPCNT)]	Spectrum
NINDVDL [LNINDVDL]	Number of individual shareholders defined as total number of shareholders, less number of insiders and institutions. [Log (NINDVDL)]	Compustat, Spectrum, Compact Disclosure

Market characteristics

MDTNOVR	Turnover is median of daily share turnover from July to December 1991.	Based on data from CRSP daily file.
MDDVOL	Median daily dollar trade volume over the sample period from July to December 1991.	Based on data from 1991 ISSM file.

TABLE 1 (CONTINUED)

MDTRADE	Median daily number of trades	Based on data from 1991 ISSM file
MDSIZE	median dollar volume per trade	Based on data from 1991 ISSM file
LLAMBDA	Log (λ/price), where lambda is obtained using a method of Glosten and Harris (1988)	Based on data from 1991 ISSM file
LSPREAD	Log(median of daily percentage spread), where daily percentage spread is obtained with method of McInich and Wood (1985)	Based on data from 1991 ISSM file
LDEPTH	Log(median of daily dollar depth), where daily dollar depth is obtained with a method similar to the one used for daily percentage spread.	Based on data from 1991 ISSM file

Table 2. Summary Statistics

This table provides the mean, median, and the first and third quartiles for the variables used in this study. The sample consists of 1,400 stocks.

Variables	Mean	Median	Q1	Q3
Panel A. Firm Characteristics				
SIZE ($ million)	1628.657	228.492	44.351	1211.950
PRICE	21.209	16.500	6.500	29.563
# of ANALYSTS	8.911	5.000	1.000	15.000
R&D/SALES	0.035	0.000	0.000	0.011
DEBT/TA	0.218	0.198	0.058	0.319
NOI/SALES	0.048	0.107	0.046	0.183
PPE/TA	0.341	0.290	0.141	0.531
BETA	1.217	1.181	0.870	1.534
STDRES (%)	10.357	9.020	6.455	12.506
AGE (years)	24.114	19.750	10.750	28.917
NEWS	22.171	12.000	8.000	23.000
RTN(-1)	-0.011	-0.014	-0.217	0.172
BK/MKT	1.087	0.714	0.438	1.101
Panel B. Ownership Structure				
ACTPCNT (%)	33.452	33.378	16.650	48.263
PASPCNT (%)	3.491	0.654	0.000	5.546
INSDPCNT (%)	15.076	6.695	1.270	23.025
NINDVDL	22097.821	3957.000	1443.500	15309.500
Panel C. Market Characteristics				
MDTNOVR (%)	0.151	0.116	0.054	0.208
MDSIZE ($ 000)	25.080	13.515	4.561	37.080
MDTRADE	48.976	17.000	5.000	58.000
MDDVOL ($ 000)	2820.635	266.113	26.028	2191.294
λ/price (* 1000)	0.089	0.013	0.004	0.063
MDSPREAD (%)	3.004	1.382	0.746	2.985
MDDEPTH ($ 000)	69.318	30.601	9.650	92.066

Table 3. Firm Characteristics, Ownership Structure, and Market Characteristics

Preliminary Univariate Results

This table provides results based on simple sorting. All sample stocks are grouped into quintiles based on specific firm characteristics or ownership variable used in sorting. The description of variables is presented in Table 1. Numbers in the first and second lines of each cell are the mean and median of each quintile, respectively.

Panel A. Sorted by Size

QUINTILE	SIZE ($ millions)	INSDPCNT	ACTPCNT	NINDVDL	MDTNOVR (%)	MDDVOL ($ 000)	λ/price (* 1,000)	MDSPREAD	MDDEPTH ($ 000)
1	12.931	23.55	13.57	2215.1	0.065	10.5	0.328	8.832	5.181
(Lowest)	10.853	18.84	10.22	1166.5	0.042	6.4	0.200	7.120	4.014
2	69.418	20.14	27.41	3693.9	0.116	74.1	0.082	3.081	15.928
	64.731	13.21	24.47	2171.0	0.079	44.9	0.046	2.478	12.778
3	249.288	16.36	39.19	5776.8	0.167	398.9	0.025	1.655	35.696
	228.492	8.45	39.26	3017.0	0.124	267.5	0.015	1.436	30.651
4	924.522	9.97	44.33	16021.0	0.207	1818.8	0.009	0.924	82.097
	856.004	2.75	46.23	8944.0	0.163	1481.2	0.005	0.847	73.042
5	6887.127	5.36	42.76	82782.4	0.198	11801.0	0.003	0.527	207.686
(Highest)	3803.278	0.90	42.98	34118.5	0.173	7285.0	0.002	0.501	172.883

Panel B. Sorted by Beta

QUINTILE	BETA	INSDPCNT	ACTPCNT	NINDVDL	MDTNOVR (%)	MDDVOL ($ 000)	λ/price (* 1,000)	MDSPREAD (%)	MDDEPTH ($ 000)
1	0.48	10.78	28.57	59368.6	0.116	3443.9	0.093	1.999	97.909
(Lowest)	0.50	1.95	26.70	9839.5	0.093	537.9	0.007	0.895	51.031
2	0.93	14.48	35.23	19572.6	0.124	4305.8	0.086	2.499	76.612
	0.94	5.96	36.93	3551.5	0.111	266.2	0.013	1.133	32.472
3	1.18	14.19	38.14	13109.0	0.144	2686.1	0.075	2.524	64.414
	1.18	6.16	39.91	4007.5	0.120	362.8	0.012	1.228	32.762
4	1.45	16.16	35.87	12160.8	0.181	2738.1	0.091	2.895	67.744
	1.44	7.47	36.97	3889.0	0.144	253.9	0.013	1.604	31.031
5	2.04	19.78	29.45	6278.2	0.187	929.2	0.102	5.102	39.911
(Highest)	1.92	13.07	25.74	2342.0	0.138	90.4	0.024	2.666	18.303

Panel C. Sorted by STDRES

QUINTILE	STDRES	INSDPCNT	ACTPCNT	NINDVDL	MDTNOVR (%)	MDDVOL ($ 000)	λ/price (* 1,000)	MDSPREAD (%)	MDDEPTH ($ 000)
1	4.82	4.77	36.14	75650.3	0.129	7934.9	0.027	0.700	151.720
(Lowest)	4.90	0.79	36.40	25146.0	0.116	2218.9	0.003	0.630	100.999
2	6.90	8.49	44.89	15018.5	0.164	3444.8	0.038	1.084	85.519
	6.85	2.87	46.50	7134.5	0.153	1400.0	0.006	0.860	64.159
3	9.05	15.89	37.43	9437.1	0.154	1589.7	0.064	1.863	52.195
	9.02	8.67	37.46	3019.5	0.123	217.2	0.015	1.508	27.368
4	11.73	22.30	31.40	6291.7	0.157	815.9	0.108	3.558	36.997
	11.65	15.68	28.19	1944.0	0.105	67.6	0.029	2.501	14.802
5	19.28	23.92	17.39	4091.5	0.149	317.9	0.209	7.814	20.158
(Highest)	17.17	19.59	11.37	1612.0	0.085	15.4	0.070	5.880	7.706

Panel D. Sorted by inside ownership

QUINTILE	INSDPCNT	SIZE ($ million)	MDTNOVR (%)	MDTRADE	MDSIZE ($ 000)	MDDVOL ($ 000)	λ/price (* 1,000)	MDSPREAD (%)	MDDEPTH ($ 000)
1	0.365	4688.827	0.178	111.504	44.832	7807.969	0.019	1.222	156.566
(Lowest)	0.330	1635.804	0.152	69.500	34.705	2285.256	0.003	0.668	118.234
2	2.013	1646.303	0.186	58.400	31.076	3158.569	0.058	2.277	76.868
	1.875	455.966	0.155	31.000	24.122	688.038	0.008	1.071	50.984
3	7.051	619.563	0.159	28.889	20.645	1194.189	0.077	3.054	43.865
	6.695	145.139	0.119	13.000	11.348	145.806	0.020	1.657	22.258
4	19.225	872.912	0.131	29.023	17.470	1382.049	0.125	3.955	43.630
	18.675	91.644	0.086	8.500	7.789	58.416	0.031	1.997	16.773
5	46.725	315.680	0.099	17.063	11.377	560.400	0.167	4.510	25.661
(Highest)	43.245	74.695	0.054	6.000	5.528	33.388	0.054	2.628	10.723

Panel E. Sorted by active institutional ownership

QUINTILE	ACTPCNT	SIZE ($ million)	MDTNOVR (%)	MDTRADE	MDSIZE ($ 000)	MDDVOL ($ 000)	λ/price (* 1,000)	MDSPREAD (%)	MDDEPTH ($ 000)
1	7.405	124.013	0.077	8.461	4.134	96.317	0.291	7.752	12.404
(Lowest)	7.664	16.832	0.041	3.750	2.331	8.481	0.139	5.807	5.041
2	19.926	1027.501	0.110	32.380	12.436	1087.876	0.089	2.981	49.526
	20.053	96.203	0.077	10.000	7.007	71.438	0.034	2.060	16.313
3	33.327	2357.604	0.155	65.513	25.852	3608.874	0.032	1.848	89.943
	33.378	328.298	0.114	28.000	16.751	400.463	0.010	1.206	40.832
4	45.305	3152.198	0.180	82.755	40.151	5756.951	0.020	1.291	109.328
	45.421	801.904	0.154	43.000	31.211	1478.488	0.006	0.895	69.836
5	61.296	1481.969	0.231	55.770	42.828	3553.159	0.016	1.148	85.388
(Highest)	59.637	666.503	0.215	40.500	37.680	1543.706	0.005	0.858	73.752

Panel F. Sorted by number of individual shareholders

QUINTILE	NINDVDL	SIZE ($ million)	MDTNOVR (%)	MDTRADE	MDSIZE ($ 000)	MDDVOL ($ 000)	λ/price (* 1,000)	MDSPREAD (%)	MDDEPTH ($ 000)
1	653.1	94.924	0.086	7.3	8.09	148.8	0.238	4.992	13.584
(Lowest)	682.0	32.445	0.045	4.0	4.47	15.6	0.094	2.772	7.017
2	1784.9	193.640	0.126	12.8	12.13	337.3	0.138	4.665	21.170
	1774.0	75.063	0.076	7.0	6.26	40.2	0.043	2.303	12.288
3	4139.8	550.922	0.166	29.4	20.94	1086.5	0.046	2.525	43.780
	3956.0	186.172	0.128	16.0	12.20	217.5	0.015	1.493	26.800
4	11806.2	1303.746	0.182	51.4	31.96	2528.0	0.022	1.915	74.389
	10892.5	631.366	0.149	40.5	24.07	898.8	0.007	0.953	56.256
5	92096.7	5998.777	0.192	143.9	52.24	9999.9	0.004	0.929	193.585
(Highest)	43749.0	2598.980	0.167	105.0	46.48	4817.2	0.002	0.599	158.553

Table 4. Determinants of Inside Ownership

This table provides results of our empirical model on the determinants of inside ownership. The dependent variable is log(*1+INSDPCNT*). Model 4 is our final model after eliminating insignificant factors. Numbers in the first and second lines of each cell are the parameter estimates and the corresponding t-statistics, respectively.

Independent Variables	Model 1	Model 2	Model 3	Model 4
INTERCEPT	3.198 10.050	3.190 10.027	3.198 10.138	3.156 10.096
LSIZE	-0.139 -7.352	-0.141 -7.488	-0.142 -7.572	-0.145 -7.854
BETA	-0.219 -3.251	-0.219 -3.245	-0.204 -3.088	-0.195 -2.981
Log(STDRES)	0.454 4.511	0.457 4.540	0.469 4.673	0.466 4.647
LAGE	-0.337 -8.375	-0.334 -8.318	-0.335 -8.433	-0.334 -8.409
DEBT/TA	0.222 1.333	0.212 1.278		
RND/SALES	-0.254 -2.297	-0.141 -3.030	-0.146 -3.132	-0.143 -3.084
RNDDMY	0.044 0.664	0.049 0.737		
PPE/TA	-0.214 -1.340	-0.225 -1.408	-0.151 -0.993	
NOI/SALES	-0.046 -1.124			
FINANCIAL	-0.418 -3.890	-0.417 -3.880	-0.399 -4.050	-0.356 -4.031
UTILITY	-0.881 -7.672	-0.881 -7.669	-0.841 -7.628	-0.888 -8.894
Adj. R^2 (%)	32.98	32.97	32.96	32.96

Table 5. Determinants of Active Institutional Ownership

This table provides results of our empirical model on the determinants of active institutional ownership. The dependent variable is log(*1+ACTPCNT*). Model 4 is our final model after eliminating insignificant factors. Numbers in the first and second lines of each cell are the parameter estimates and the corresponding t-statistics, respectively.

Independent Variables	Model 1	Model 2	Model 3	Model 4
INTERCEPT	2.334 18.853	2.359 19.791	2.377 20.077	2.331 20.403
INDEX	-0.284 -5.732	-0.282 -5.702	-0.268 -5.552	-0.287 -6.152
LSIZE	0.030 1.380	0.028 1.296		
BETA	0.268 7.872	0.271 8.020	0.271 8.026	0.265 7.898
STDRES	-0.020 -4.596	-0.020 -4.863	-0.020 -4.878	-0.021 -5.046
INSDPCNT	-0.009 -9.771	-0.009 -9.897	-0.009 -9.837	-0.009 -9.795
LPRICE	0.222 7.738	0.216 7.921	0.238 11.047	0.236 10.991
LAGE	0.056 2.544	0.056 2.541	0.057 2.608	0.053 2.437
LNANA	0.224 8.101	0.225 8.158	0.246 10.997	0.236 11.094
LNEWS	-0.052 -1.937	-0.049 -1.843	-0.036 -1.472	
BK/MKT	0.005 0.579			
RTN(-1)	-0.018 -0.368			
FINANCIAL	-0.206 -4.379	-0.201 -4.362	-0.201 -4.360	-0.204 -4.440
UTILITY	-0.407 -7.619	-0.406 -7.601	-0.402 -7.540	-0.407 -7.643
Adj. R^2 (%)	53.32	53.37	53.35	53.31

Table 6. Determinants of Individual Ownership

This table provides results of our empirical model on the determinants of individual ownership. The dependent variable is *LNINDVDL*. Model 3 is our final model after eliminating insignificant factors. Numbers in the first and second lines of each cell are the parameter estimates and the corresponding t-statistics, respectively.

Independent Variables	Model 1	Model 2	Model 3
INTERCEPT	5.355 29.435	5.354 30.572	5.371 30.771
INDEX	0.280 3.841	0.279 3.840	0.262 3.675
LSIZE	0.619 19.391	0.620 19.576	0.597 23.271
BETA	-0.117 -2.338	-0.117 -2.365	-0.120 -2.410
STDRES	-0.015 -2.320	-0.014 -2.337	-0.014 -2.268
PINSD	-0.012 -9.216	-0.012 -9.311	-0.012 -9.231
LPRICE	-0.694 -16.446	-0.692 -17.271	-0.688 -17.227
LAGE	0.310 9.568	0.311 9.588	0.317 9.870
LNANA	-0.048 -1.189	-0.049 -1.211	
LNEWS	0.352 8.932	0.351 9.055	0.350 9.026
BK/MKT	0.030 0.422		
RTN(-1)	0.004 0.328		
FINANCIAL	0.169 2.446	0.174 2.565	0.170 2.509
UTILITY	0.979 12.464	0.979 12.486	0.966 12.437
Adj. R^2 (%)	75.47	75.50	75.49

Table 7. Determinants of Order Flow

This table reports the regressions of four measures of order flow on firm characteristics and ownership structure. The dependent variables are log-transformed median daily share turnover , median daily dollar volume, median daily number of trades, and median dollar volume per trade, respectively. Numbers in the first and second lines of each cell are the parameter estimates and the corresponding t-statistics, respectively.

Independent Variables	Dependent Variable			
	MDTNOVR	MDDVOL	MDTRADE	MDSIZE
INTERCEPT	-7.440 -23.389	-3.899 -14.361	-2.359 -11.966	-1.673 -12.503
Firm Characteristics				
INDEX	-0.048 -0.602	0.110 1.545	0.338 6.551	-0.203 -5.787
LSIZE	-0.046 -1.383	0.791 27.162	0.501 23.679	0.297 20.673
LPRICE	0.149 3.547	0.246 6.711	-0.228 -8.586	0.477 26.423
LNANA	0.312 8.116	0.352 10.410	0.200 8.171	0.138 8.303
LNEWS	0.247 6.502	0.259 7.771	0.172 7.089	0.086 5.211
BETA	0.167 3.607	0.109 2.678	0.037 1.259	0.057 2.812
Log(STDRES)	0.927 11.485	0.802 11.359	0.534 10.412	0.289 8.295
Ownership structure				
LINSDPCNT	-0.109 -5.355	-0.089 -4.995	-0.072 -5.562	-0.018 -2.031
LACTPCNT	0.387 10.511	0.282 9.185	0.098 4.394	0.187 12.360
LPASPCNT	0.047 1.089	0.120 3.177	0.007 0.272	0.108 5.835
LNINDVDL	0.054 2.249	0.037 1.744	0.095 6.197	-0.054 -5.167
Adj R^2 (%)	48.40	93.95	89.18	94.32

Table 8. Determinants of Price Impact of Trade

This table reports the regression of price impact of trade on firm characteristics and ownership structure. The dependent variable is the natural logarithm of Kyle's lambda scaled by price. RMDDVOL is the residual from the regression of LMDDVOL on other independent variables. Numbers in the first and second lines of each cell are the parameter estimates and the corresponding t-statistics, respectively.

Independent Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
INTERCEPT	-0.336 -1.408	-0.383 -1.622	0.614 2.572	-0.305 -1.273	0.226 0.714	1.101 3.369
Firm Characteristics						
INDEX	0.300 4.174	0.316 4.442	0.240 3.513	0.380 4.213	0.319 4.425	0.288 3.370
LSIZE	-0.723 -21.622	-0.722 -21.813	-0.718 -22.616	-0.719 -21.444	-0.683 -18.658	-0.679 -19.367
LPRICE	0.530 13.040	0.508 12.564	0.667 16.627	0.531 13.052	0.474 10.407	0.600 13.604
LNANA	-0.471 -11.401	-0.440 -10.665	-0.368 -9.196	-0.458 -10.847	-0.469 -11.387	-0.348 -8.562
LNEWS	-0.174 -4.279	-0.150 -3.702	-0.192 -4.971	-0.170 -4.174	-0.141 -3.319	-0.146 -3.642
BETA	-0.074 -1.459	-0.077 -1.545	0.054 1.104	-0.068 -1.344	-0.092 -1.801	0.034 0.701
Log(STDRES)	0.039 0.454	-0.074 -0.856	0.003 0.035	0.016 0.189	-0.025 -0.280	-0.124 -1.462
RMDDVOL	-0.366 -10.671	-0.366 -10.779	-0.366 -11.249	-0.366 -10.676	-0.366 -10.695	-0.366 -11.330
Ownership Structure						
LINSDPCNT		0.113 5.418				0.063 2.962
LACTPCNT			-0.458 -12.477			-0.448 -12.121
LPASPCNT				-0.070 -1.466		-0.018 -0.391
LNINDVDL					-0.068 -2.684	-0.063 -2.484
Adj R^2 (%)	79.19	79.60	81.27	79.20	79.28	81.54

Table 9. Determinants of Quoted Spread and Depth

This table reports the regressions of LSPREAD and LDEPTH on firm characteristics and ownership structure. RMDDVOL is the residual from the regression of LMDDVOL on other independent variables. Numbers in the first and second lines of each cell are the parameter estimates and the corresponding t-statistics, respectively.

Independent Variables	LSPREAD		LDEPTH	
INTERCEPT	2.776 59.261	3.072 46.025	-0.749 -7.577	-1.583 -12.140
Firm Characteristics				
INDEX	-0.032 -2.300	-0.024 -1.377	-0.034 -1.054	-0.075 -1.960
LSIZE	-0.116 -17.673	-0.097 -13.536	0.482 39.616	0.450 37.168
LPRICE	-0.588 -73.720	-0.611 -67.805		
LNANA	-0.047 -5.834	-0.040 -4.829	0.248 13.478	0.198 10.990
LNEWS	-0.053 -6.605	-0.036 -4.402	0.213 11.882	0.156 8.722
BETA	0.033 3.369	0.030 2.977	0.038 1.684	0.028 1.268
Log(STDRES)	0.012 0.739	-0.027 -1.568	0.209 5.844	0.324 9.237
RMDDVOL	-0.151 -22.421	-0.151 -22.871	0.433 28.110	0.433 30.010
Ownership Structure				
LINSDPCNT		0.009 1.955		-0.054 -5.646
LACTPCNT		-0.018 -2.353		0.122 7.567
LPASPCNT		-0.001 -0.064		0.012 0.612
LNINDVDL		-0.032 -6.086		0.047 4.219
Adj. R^2 (%)	97.40	97.50	93.10	93.94

Table 10. Two-Stage-Least Square Regressions

This table reports results from two-stage-least square regressions that allow spread, volume, and active institutional ownership to be endogenously determined. In Panel A, spread depends on volume, standard deviation of return, and price. In Panel B, we add active institutional ownership to the spread equation. In Panel C, we only include price, standard deviation of return, and active institutional ownership in the spread equation. Numbers in the first and second lines of each cell are the parameter estimates and the corresponding t-statistics, respectively.

Panel A.

	LSPREAD	LMDDVOL	LACTPCNT
Endogenous Variables			
LSPREAD		-0.037 -0.434	-0.425 -9.099
LMDDVOL	-0.147 -50.134		
LACTPCNT		0.837 6.577	
Exogenous Variables			
LPRICE	-0.479 -52.209		
LSTDRTN	0.225 17.931		
INDEX		0.338 5.158	-0.297 -5.795
LNANA		0.271 6.162	0.256 8.999
LNEWS		0.320 8.863	-0.062 -2.254
LSIZE		0.815 24.001	-0.034 -1.322
BETA		-0.047 -0.811	0.256 7.153
LSTDRES		0.676 8.979	-0.137 -2.282
LAGE			0.105 4.627
FINANCIAL			-0.168 -3.494
UTILITY			-0.410 -7.291

Panel B

	LSPREAD	LMDDVOL	LACTPCNT
Endogenous Variables			
LSPREAD		-0.037 -0.434	-0.320 -6.109
LMDDVOL	-0.156 -43.745		0.252 4.221
LACTPCNT	0.107 4.963	0.837 6.577	
Exogenous Variables			
LPRICE	-0.516 -42.623		
LSTDRTN	0.204 14.914		
INDEX		0.338 5.158	-0.346 -6.687
LNANA		0.271 6.162	0.143 3.679
LNEWS		0.320 8.863	-0.130 -4.130
LSIZE		0.815 24.001	-0.233 -4.348
BETA		-0.047 -0.811	0.207 5.587
LSTDRES		0.676 8.979	-0.281 -4.120
LAGE			0.107 4.787
FINANCIAL			-0.133 -2.762
UTILITY			-0.390 -7.019

Panel C.

	LSPREAD	LMDDVOL	LACTPCNT
Endogenous Variables			
LSPREAD		-0.037 -0.434	-0.425 -9.099
LMDDVOL			
LACTPCNT	-0.381 -9.965	0.837 6.577	
Exogenous Variables			
LPRICE	-0.625 -25.427		
LSTDRTN	0.110 3.908		
INDEX		0.338 5.158	-0.297 -5.795
LNANA		0.271 6.162	0.256 8.999
LNEWS		0.320 8.863	-0.062 -2.254
LSIZE		0.815 24.001	-0.034 -1.322
BETA		-0.047 -0.811	0.256 7.153
LSTDRES		0.676 8.979	-0.137 -2.282
LAGE			0.105 4.627
FINANCIAL			-0.168 -3.494
UTILITY			-0.410 -7.291

Appendix A.1. Determinants of Inside Ownership

This table provides results of our empirical model on the determinants of inside ownership. The dependent variable is logistically-transformed *INSDPCNT*, i.e., log(*INSDPCNT*/(100-*INSDPCNT*)). Numbers in the first and second lines of each cell are the parameter estimates and the corresponding t-statistics, respectively.

Independent Variables	Model 1	Model 2	Model 3	Model 4
INTERCEPT	-0.727 -1.437	-0.739 -1.460	-0.696 -1.388	-0.804 -1.616
LSIZE	-0.226 -7.504	-0.228 -7.633	-0.230 -7.710	-0.238 -8.085
BETA	-0.258 -2.406	-0.257 -2.401	-0.243 -2.306	-0.220 -2.110
Log(STDRES)	0.615 3.838	0.619 3.865	0.633 3.970	0.626 3.925
LAGE	-0.535 -8.363	-0.530 -8.313	-0.536 -8.491	-0.534 -8.445
DEBT/TA	0.255 0.963	0.241 0.913		
RND/SALES	-0.418 -2.380	-0.256 -3.452	-0.263 -3.560	-0.257 -3.479
RNDDMY	0.107 1.012	0.114 1.079		
PPE/TA	-0.470 -1.846	-0.485 -1.910	-0.383 -1.584	
NOI/SALES	-0.066 -1.019			
FINANCIAL	-0.696 -4.068	-0.694 -4.059	-0.637 -4.067	-0.527 -3.753
UTILITY	-1.952 -10.679	-1.951 -10.676	-1.879 -10.711	-1.998 -12.578
Adj. R^2 (%)	37.04	37.04	37.03	36.97

Appendix A.2. Determinants of Active Institutional Ownership

This table provides results of our empirical model on the determinants of active institutional ownership based on logistical transformation of active institutional ownership, i.e., the dependent variable is log(*ACTPCNT*/(100-*ACTPCNT*)). Numbers in the first and second lines of each cell are the parameter estimates and the corresponding t-statistics, respectively.

Independent Variables	Model 1	Model 2	Model 3	Model 4
INTERCEPT	-2.316 -12.387	-2.289 -12.715	-2.268 -12.687	-2.354 -13.641
INDEX	-0.429 -5.735	-0.427 -5.724	-0.412 -5.643	-0.446 -6.339
LSIZE	0.034 1.046	0.032 0.987		
BETA	0.393 7.639	0.396 7.760	0.396 7.766	0.384 7.585
STDRES	-0.024 -3.682	-0.024 -3.864	-0.024 -3.876	-0.025 -4.073
PINSD	-0.014 -10.271	-0.014 -10.407	-0.014 -10.368	-0.014 -10.311
LPRICE	0.343 7.907	0.337 8.186	0.362 11.144	0.360 11.069
LAGE	0.070 2.111	0.071 2.116	0.072 2.168	0.064 1.946
LNANA	0.345 8.262	0.346 8.299	0.370 10.950	0.351 10.923
LNEWS	-0.085 -2.106	-0.082 -2.060	-0.068 -1.826	
BK/MKT	0.009 0.650			
RTN(-1)	-0.001 -0.014			
FINANCIAL	-0.291 -4.109	-0.283 -4.066	-0.283 -4.065	-0.289 -4.161
UTILITY	-0.662 -8.198	-0.660 -8.184	-0.656 -8.143	-0.665 -8.265
Adj. R^2 (%)	51.86	51.91	91.91	91.83

Appendix A.3. Ownership Structure and Order Flow

This table provides detail regression results of order flow. The dependent variables are log-transformed median daily share turnover, median daily dollar volume, median daily number of trades, and median dollar volume per trade, respectively. Numbers in the first line and second line of each cell are the parameter estimates and the corresponding t-statistics, respectively.

Panel A. Ownership Structure and Share Turnover

Independent Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
INTERCEPT	-6.070 -26.472	-6.028 -26.888	-7.062 -29.908	-6.116 -26.652	-6.739 -22.155	-7.440 -23.389
Firm Characteristics						
INDEX	0.010 0.148	-0.014 -0.218	0.038 0.593	-0.123 -1.459	-0.012 -0.179	-0.048 -0.602
LSIZE	-0.028 -0.863	-0.028 -0.887	-0.010 -0.326	-0.036 -1.107	-0.075 -2.130	-0.046 -1.383
LPRICE	0.203 5.269	0.233 6.170	0.074 1.914	0.202 5.273	0.269 6.228	0.149 3.547
LNANA	0.449 11.531	0.407 10.614	0.343 8.937	0.428 10.789	0.447 11.530	0.312 8.116
LNEWS	0.283 7.346	0.250 6.595	0.301 8.165	0.276 7.170	0.243 6.050	0.247 6.502
BETA	0.253 5.296	0.258 5.511	0.147 3.150	0.243 5.072	0.274 5.695	0.167 3.607
Log(STDRES)	0.707 8.771	0.870 10.693	0.749 9.710	0.744 9.113	0.784 9.382	0.927 11.485
Ownership Structure						
LINSDPCNT		-0.157 -8.035				-0.109 -5.355
LACTPCNT			0.415 11.320			0.387 10.511
LPASPCNT				0.118 2.626		0.047 1.089
LNINDVDL					0.080 3.330	0.054 2.249
Adj R^2 (%)	41.56	44.17	46.56	41.81	41.99	48.40

Panel B. Ownership Structure and Median Daily Dollar Volume

Independent Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
INTERCEPT	-2.991 -15.204	-2.938 -15.209	-3.624 -18.061	-3.065 -15.616	-3.492 -13.362	-3.899 -14.361
Firm Characteristics						
INDEX	0.233 3.930	0.215 3.688	0.273 4.749	0.042 0.574	0.216 3.638	0.110 1.545
LSIZE	0.824 29.889	0.823 30.417	0.820 30.772	0.815 29.634	0.788 26.135	0.791 27.162
LPRICE	0.283 8.446	0.307 9.300	0.192 5.705	0.282 8.477	0.333 8.860	0.246 6.711
LNANA	0.462 13.587	0.428 12.703	0.394 11.716	0.431 12.476	0.461 13.579	0.352 10.410
LNEWS	0.292 8.707	0.265 8.011	0.304 9.367	0.282 8.459	0.262 7.504	0.259 7.771
BETA	0.185 4.452	0.189 4.632	0.100 2.434	0.172 4.142	0.201 4.805	0.109 2.678
Log(STDRES)	0.619 8.842	0.744 10.515	0.642 9.491	0.672 9.509	0.675 9.319	0.802 11.359
Ownership Structure						
LINSDPCNT		-0.126 -7.364				-0.089 -4.995
LACTPCNT			0.305 9.899			0.282 9.185
LPASPCNT				0.167 4.265		0.120 3.177
LNINDVDL					0.061 2.902	0.037 1.744
Adj. R^2 (%)	93.30	93.54	93.73	93.38	93.33	93.95

Panel C. Ownership Structure and Median Daily Number of Trades

Independent Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
INTERCEPT	-1.393 -9.842	-1.349 -9.772	-1.612 -10.871	-1.411 -9.930	-2.379 -12.904	-2.359 -11.966
Firm Characteristics						
INDEX	0.371 8.695	0.355 8.547	0.384 9.061	0.326 6.089	0.338 8.061	0.338 6.551
LSIZE	0.560 28.191	0.559 28.880	0.558 28.330	0.557 27.998	0.489 22.973	0.501 23.679
LPRICE	-0.291 -12.074	-0.271 -11.463	-0.323 -12.963	-0.291 -12.085	-0.193 -7.301	-0.228 -8.586
LNANA	0.246 10.027	0.217 9.008	0.222 8.933	0.238 9.517	0.243 10.138	0.200 8.171
LNEWS	0.230 9.536	0.208 8.779	0.234 9.771	0.228 9.426	0.172 6.968	0.172 7.089
BETA	0.038 1.270	0.041 1.416	0.009 0.284	0.035 1.161	0.069 2.346	0.037 1.259
Log(STDRES)	0.363 7.214	0.468 9.256	0.372 7.427	0.376 7.349	0.474 9.277	0.534 10.412
Ownership Structure						
LINSDPCNT		-0.105 -8.618				-0.072 -5.562
LACTPCNT			0.105 4.626			0.098 4.394
LPASPCNT				0.039 1.394		0.007 0.272
LNINDVDL					0.119 8.094	0.095 6.197
Adj. R^2 (%)	88.21	88.80	88.38	88.22	88.73	89.18

Panel D. Ownership Structure and Median Dollar Trade size

Independent Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
INTERCEPT	-1.689 -16.928	-1.680 -16.856	-2.109 -21.257	-1.745 -17.655	-1.242 -9.429	-1.673 -12.503
Firm Characteristics						
INDEX	-0.116 -3.859	-0.119 -3.972	-0.089 -3.153	-0.257 -6.924	-0.101 -3.373	-0.203 -5.787
LSIZE	0.273 19.546	0.273 19.572	0.271 20.553	0.266 19.247	0.306 20.095	0.297 20.673
LPRICE	0.574 33.784	0.579 33.937	0.514 30.869	0.574 34.219	0.530 27.996	0.477 26.423
LNANA	0.204 11.817	0.198 11.377	0.159 9.540	0.181 10.397	0.205 11.997	0.138 8.303
LNEWS	0.062 3.641	0.057 3.346	0.070 4.353	0.055 3.265	0.088 5.014	0.086 5.211
BETA	0.131 6.213	0.132 6.258	0.075 3.672	0.121 5.801	0.117 5.544	0.057 2.812
Log(STDRES)	0.272 7.658	0.294 8.062	0.288 8.592	0.311 8.752	0.222 6.070	0.289 8.295
Ownership Structure						
LINSDPCNT		-0.022 -2.555				-0.018 -2.031
LACTPCNT			0.202 13.273			0.187 12.360
LPASPCNT				0.124 6.301		0.108 5.835
LNINDVDL					-0.054 -5.140	-0.054 -5.167
Adj. R^2 (%)	93.33	93.36	94.07	93.51	93.49	94.32

Appendix A.4. Ownership Structure and Price Impact of Trade

(Dollar Volume in Regression)

This table reports regression results when dollar volume is used as an independent variable in the regression equations for price impact of trade. Numbers in the first line and second line of each cell are the parameter estimates and the corresponding t-statistics, respectively.

Independent Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
INTERCEPT	-1.690 -6.752	-1.662 -6.653	-0.758 -2.871	-1.693 -6.712	-1.340 -4.089	-0.326 -0.932
Firm Characteristics						
INDEX	0.405 5.777	0.410 5.852	0.343 5.009	0.399 4.555	0.416 5.905	0.328 3.836
LSIZE	-0.350 -8.419	-0.364 -8.713	-0.407 -9.945	-0.350 -8.415	-0.330 -7.580	-0.389 -8.975
LPRICE	0.658 16.264	0.642 15.739	0.739 18.324	0.658 16.257	0.624 13.687	0.690 15.397
LNANA	-0.261 -6.130	-0.254 -5.950	-0.219 -5.244	-0.262 -6.067	-0.262 -6.155	-0.219 -5.197
LNEWS	-0.042 -1.035	-0.035 -0.854	-0.077 -1.941	-0.042 -1.038	-0.023 -0.551	-0.051 -1.251
BETA	0.010 0.206	0.005 0.104	0.092 1.884	0.010 0.198	-0.001 -0.026	0.074 1.512
Log(STDRES)	0.319 3.761	0.250 2.835	0.246 2.976	0.321 3.709	0.278 3.156	0.169 1.906
LMDDVOL	-0.453 -14.333	-0.435 -13.553	-0.379 -11.927	-0.453 -14.249	-0.448 -14.171	-0.366 -11.330
Ownership Structure						
LINSDPCNT		0.058 2.808				0.031 1.430
LACTPCNT			-0.342 -9.062			-0.345 -9.057
LPASPCNT				0.006 0.120		0.026 0.573
LNINDVDL					-0.041 -1.653	-0.050 -1.952
Adj R^2 (%)	80.38	80.48	81.46	80.37	80.40	81.54

Appendix A.5. Ownership Structure and Quoted Spread
(Residual Dollar Volume in Regression)

This table reports the regressions of LSPREAD on firm characteristics and ownership structure. RMDDVOL is the residual from the regression of LMDDVOL on other independent variables. Numbers in the first and second lines of each cell are the parameter estimates and the corresponding t-statistics, respectively.

Independent Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
INTERCEPT	2.776 59.261	2.768 59.460	2.810 56.936	2.779 59.068	3.059 49.865	3.072 46.025
Firm Characteristics						
INDEX	-0.032 -2.300	-0.030 -2.124	-0.035 -2.451	-0.026 -1.461	-0.023 -1.646	-0.024 -1.377
LSIZE	-0.116 -17.673	-0.116 -17.771	-0.116 -17.665	-0.116 -17.563	-0.096 -13.521	-0.097 -13.536
LPRICE	-0.588 -73.720	-0.592 -74.301	-0.583 -70.429	-0.588 -73.700	-0.616 -69.914	-0.611 -67.805
LNANA	-0.047 -5.834	-0.042 -5.203	-0.044 -5.270	-0.046 -5.575	-0.046 -5.832	-0.040 -4.829
LNEWS	-0.053 -6.605	-0.049 -6.118	-0.053 -6.690	-0.052 -6.548	-0.036 -4.386	-0.036 -4.402
BETA	0.033 3.369	0.033 3.333	0.038 3.754	0.034 3.405	0.024 2.484	0.030 2.977
Log(STDRES)	0.012 0.739	-0.006 -0.355	0.011 0.663	0.010 0.619	-0.019 -1.146	-0.027 -1.568
RMDDVOL	-0.151 -22.421	-0.151 -22.574	-0.151 -22.451	-0.151 -22.416	-0.151 -22.803	-0.151 -22.871
Ownership Structure						
LINSDPCNT		0.018 4.484				0.009 1.955
LACTPCNT			-0.016 -2.175			-0.018 -2.353
LPASPCNT				-0.006 -0.615		-0.001 -0.064
LNINDVDL					-0.034 -6.988	-0.032 -6.086
Adj R^2 (%)	97.40	97.43	97.40	97.40	97.48	97.50

Appendix A.6. Ownership Structure and Quoted Depth
(Residual Dollar Volume in Regression)

This table reports the regressions of LDEPTH on firm characteristics and ownership structure. RMDDVOL is the residual from the regression of LMDDVOL on other independent variables. Numbers in the first and second lines of each cell are the parameter estimates and the corresponding t-statistics, respectively.

Independent Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
INTERCEPT	-0.749 -7.577	-0.674 -7.016	-1.042 -9.700	-0.767 -7.731	-1.325 -11.520	-1.583 -12.140
Firm Characteristics						
INDEX	-0.034 -1.054	-0.051 -1.647	-0.011 -0.342	-0.079 -1.977	-0.079 -2.518	-0.075 -1.960
LSIZE	0.482 39.616	0.489 41.429	0.465 37.954	0.480 39.253	0.464 38.744	0.450 37.168
LNANA	0.248 13.478	0.223 12.355	0.228 12.341	0.241 12.797	0.239 13.321	0.198 10.990
LNEWS	0.213 11.882	0.191 10.908	0.223 12.588	0.210 11.741	0.155 8.345	0.156 8.722
BETA	0.038 1.684	0.041 1.880	0.008 0.336	0.035 1.538	0.063 2.855	0.028 1.268
Log(STDRES)	0.209 5.844	0.284 7.991	0.240 6.749	0.222 6.098	0.240 6.861	0.324 9.237
RMDDVOL	0.433 28.110	0.433 29.011	0.433 28.520	0.433 28.135	0.433 28.925	0.433 30.010
Ownership Structure						
LINSDPCNT		-0.087 -9.574				-0.054 -5.646
LACTPCNT			0.107 6.477			0.122 7.567
LPASPCNT				0.040 1.873		0.012 0.612
LNINDVDL					0.062 5.683	0.047 4.219
Adj R^2 (%)	93.10	93.52	93.29	93.11	93.48	93.94

Appendix A.7. Ownership Structure and Quoted Spread
(Dollar Volume in Regression)

This table reports the regressions of LSPREAD on firm characteristics and ownership structure. RMDDVOL is the residual from the regression of LMDDVOL on other independent variables. Numbers in the first and second lines of each cell are the parameter estimates and the corresponding t-statistics, respectively.

Independent Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
INTERCEPT	2.341 46.550	2.341 46.499	2.260 41.597	2.329 45.981	2.561 39.215	2.483 34.719
Firm Characteristics						
INDEX	0.001 0.098	0.001 0.099	0.007 0.480	-0.020 -1.117	0.008 0.563	-0.007 -0.428
LSIZE	0.004 0.444	0.004 0.435	0.009 1.027	0.004 0.461	0.017 1.939	0.022 2.535
LPRICE	-0.547 -67.254	-0.547 -66.553	-0.554 -66.753	-0.547 -67.271	-0.569 -62.654	-0.574 -62.676
LNANA	0.020 2.321	0.020 2.319	0.016 1.885	0.017 1.972	0.019 2.275	0.013 1.504
LNEWS	-0.010 -1.265	-0.010 -1.259	-0.007 -0.892	-0.011 -1.343	0.001 0.174	0.003 0.361
BETA	0.060 6.077	0.060 6.070	0.053 5.293	0.059 5.947	0.053 5.351	0.046 4.609
Log(STDRES)	0.102 6.004	0.102 5.750	0.109 6.375	0.109 6.286	0.077 4.378	0.094 5.169
LMDDVOL	-0.145 -22.896	-0.145 -22.446	-0.152 -23.223	-0.147 -22.999	-0.143 -22.636	-0.151 -22.871
Ownership Structure						
LINSDPCNT		0.000 0.044				-0.005 -1.102
LACTPCNT			0.030 3.836			0.025 3.190
LPASPCNT				0.019 1.998		0.017 1.880
LNINDVDL					-0.026 -5.197	-0.026 -5.010
Adj R^2 (%)	97.43	97.42	97.45	97.43	97.50	97.50

Appendix A.8. Ownership Structure and Quoted Depth
(Dollar Volume in Regression)

This table reports the regressions of LDEPTH on firm characteristics and ownership structure. Numbers in the first and second lines of each cell are the parameter estimates and the corresponding t-statistics, respectively.

Independent Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
INTERCEPT	0.179 1.700	0.191 1.828	0.299 2.483	0.196 1.845	-0.447 -3.751	-0.352 -2.465
Firm Characteristics						
INDEX	-0.094 -2.934	-0.102 -3.179	-0.103 -3.189	-0.064 -1.589	-0.145 -4.614	-0.107 -2.692
LSIZE	0.103 5.584	0.118 6.343	0.100 5.393	0.103 5.565	0.079 4.390	0.085 4.610
LNANA	0.077 3.937	0.069 3.531	0.080 4.084	0.081 4.088	0.065 3.413	0.068 3.549
LNEWS	0.119 6.491	0.110 6.036	0.113 6.120	0.120 6.541	0.054 2.851	0.055 2.909
BETA	-0.038 -1.632	-0.034 -1.477	-0.029 -1.243	-0.036 -1.552	-0.011 -0.471	-0.007 -0.297
Log(STDRES)	0.045 1.233	0.089 2.369	0.031 0.827	0.036 0.955	0.077 2.170	0.076 2.020
LMDDVOL	0.395 27.505	0.383 26.546	0.404 26.874	0.397 27.475	0.399 28.794	0.399 27.100
Ownership Structure						
LINSDPCNT		-0.045 -4.744				-0.017 -1.715
LACTPCNT			-0.036 -2.039			-0.008 -0.442
LPASPCNT				-0.027 -1.228		-0.035 -1.677
LNINDVDL					0.099 10.046	0.093 8.594
Adj R^2 (%)	92.99	93.10	93.00	92.99	93.46	93.47

Chapter 2

Institutional Ownership, Analyst Following, and Price Discovery Around Quarterly Earnings Announcements

1. Introduction

Institutional investors are often portrayed as distinct from other market participants. They are believed to have better access to information and better skills in inferring price implications of publicly available information as compared with individual investors. Institutional investors are also believed to have different trading patterns as compared with other investors. The differential access to information, differential ability in processing information, and differential trading patterns of institutional investors are likely to affect the price discovery process of securities. The informational role of security analysts is similar to that of institutional investors, as security analysts also collect and analyze information on specific companies and provide forecasts of future earnings, with the primary difference being that security analysts do not directly engage in trading activities. When security analysts disseminate information to investors, it would be incorporated into stock prices. Therefore, the level of analyst following is also expected to affect the price discovery process of stocks.

Extant literature provides conflicting evidence on the relation between institutional ownership and the speed of price adjustments to market-wide news. Badrinath, Kale and Noe (1995) document that the participation of institutional investors increases the speed of price adjustment to market wide information. However, Mcqueen, Pinegar and Thorley (1996) suggest that concentration of institutional investors decreases the speed of price reaction to good common information. Sias and Starks (1997a) present evidence

that, even though the trading patterns of institutional investors increase daily return autocorrelation of individual stocks, the price adjustment is still quicker for stocks with higher level of institutional ownership. While these studies examine the effect of institutional ownership on the speed of price adjustment to market-wide information, there is very little direct evidence on the effect of institutional ownership on price adjustment to firm-specific information. This study fills this gap by examining the effect of institutional ownership on security price adjustments around quarterly earnings announcements.

In addition, this study examines the role of security analysts on the price discovery process. Security analysts play an important role in gathering and analyzing information for specific companies that they follow, especially with respect to earnings information. Extant literature suggests that buy and sell recommendations of analysts have investment value (e.g., Womack (1996)). There is also evidence that analyst coverage increases pricing efficiency of the stocks. For example, Brennan, Jegadeesh and Swaminathan (1993) document that stocks followed by more analysts react faster to market wide information than stocks followed by fewer analysts. Moreover, Brennan and Subrahmanyam (1995) suggest that greater analyst coverage increases market depth for the stocks. The effect of analyst following on the price discovery process to firm specific news, however, remains largely unexplored.

We select quarterly earnings announcements as our laboratory for examining the contribution of institutional investors and security analysts to the price discovery process for the following reasons. First of all, there are a number of well-documented regularities around earnings announcements that could be potentially related to institutional ownership and analyst following. Earnings announcements are known to have valuation implications for the underlying stock. Significant abnormal trading volume and abnormal returns are observed around earnings announcements (e.g., Bamber (1987), Foster, Olsen,

and Shevlin (1984), Lee, Mucklow, and Ready (1993), and Morse (1981)). Additionally, price adjustment to the information content of earnings announcements begins long before the actual announcement date, which indicates that market participants collect, analyze and anticipate part of the information content of earnings announcements (e.g., Ball and Brown (1968), Foster, Olsen, and Shevlin (1984), Seppi (1992)). Finally, extant literature suggests that stock price continues to move in the direction of earnings surprises after announcement of earnings news.[30] If institutional investors and security analysts facilitate the price discovery process, it would be reflected in price movements around quarterly earnings announcements.

We find that greater involvement of institutional investors in a stock is associated with greater anticipation of earnings news as reflected in stock price changes before the announcement. Upon the announcement of earnings news, the price reaction is greater for firms with higher level of institutional ownership. This study finds no significant linkage between institutional ownership and post-earnings drift. In the paper, we suggest that this lack of relation could arise from two offsetting effects of institutional investors, i.e., the conducive effect from the faster reaction of institutional investors, which should reduce the post-announcement drift, and the propensity of some institutional investors to follow positive feedback trading strategy, which may increase the post-announcement drift. This study finds that the anticipation of earnings news and the reaction to the announcement is positively related to the analyst following for the stock, while there is weak evidence that the degree of post announcement drift is negatively related to the analyst following. The difference in the effects of institutional investors and analyst following on post earnings drift could result from the fact that unlike institutional investors, analysts do not directly engage in trading.

[30] For a survey on post-earnings announcement drift, see Bernard (1992).

The remainder of the paper is organized as follows. Section I provides a review of the related literature and develops testable predictions. Section II describes the data sources and presents the results of the preliminary analysis. Section III estimates the regression models and reports the results. Section IV summarizes and concludes this paper.

2. Earnings Announcements, Institutional Ownership, and Analyst Following

2.1. Market Reaction around Earnings Announcements

We choose earnings announcements to study the effect of institutional ownership and analyst following on the price discovery process for several reasons. There are a number of well-documented regularities around earnings announcements that could be potentially related to institutional ownership and analyst following. Earnings announcements are known to have valuation implications for the underlying stock. Significant abnormal trading volume and abnormal returns are observed around earnings announcements.[31] Additionally, price adjustment to the information content of earnings announcements begins long before the actual announcement date, which indicates that market participants collect, analyze and anticipate part of the information content of earnings announcements (e.g., Ball and Brown (1968), Foster, Olsen, and Shevlin (1984), Seppi (1992)). This degree of anticipation is greater for larger firms than for small firms (e.g., Atiase (1985)). The market reaction to earnings announcements is likely to be affected by the level of institutional ownership and analyst following.

[31] E.g., Bamber (1987), Foster, Olsen, and Shelvin (1984), Lee, Mucklow, and Ready (1993), and Morse (1981).

Finally, numerous studies (e.g., Ball and Brown (1968), Watts (1978), Foster, Olsen, and Shevlin (1984), Bernard and Thomas (1989, 1990), etc.) have documented post-earnings drift, i.e., continued price movement in the direction of earnings surprises after announcement of earnings news. Furthermore, this post-earnings drift is found to be inversely related to firm size (Foster, Olson, and Shevlin (1984), Bernard and Thomas (1989, 1990)). We discuss two possible explanations for the post-earnings drift in our study. The drift could be a result of market's under-reaction to the earnings surprise. Under this explanation, the market does not fully incorporate the price implications of the earnings surprise immediately, and that this information is reflected in the price gradually, resulting in the post-earnings drift. This may be partially a result of analysts not fully incorporating the information revealed in the earnings surprise into the future earnings forecast, as suggested by Abarbanell and Bernard (1992). The other explanation is that, the drift could be a result of momentum trading strategies of some investors, which are triggered by the unusual price changes and volume that accompany earnings announcements.

2.2. The Role of Institutional Investors in the Price Discovery Process

Institutional investors are likely to benefit from economies of scale in information collection and analysis, and therefore have lower marginal cost of gathering information (Lev (1988)). Consequently, they are likely to devote more resources to information collection and analysis, and possess better information than individual investors. Moreover, the trading patterns of institutional investors could be different from other investors. For example, the difference in the trading behavior between institutional investors and individual investors has been offered as a possible explanation for seasonalities in stock returns.[32]

[32] E.g., Lakonishok and Maberly (1990), Abraham and Ikenberry (1994), Sias and Starks (1995, 1997b).

If institutional investors anticipate the forthcoming earnings news earlier as a result of their information gathering activities, and if they trade on their information, the prices of stocks with higher level of institutional ownership would reflect more earnings news before the announcement day. An empirically testable hypothesis is that the anticipation of any earnings change as reflected in the stock price prior to the announcements, should be positively related to the level of institutional ownership, after controlling for the level of earnings surprise and the market capitalization of the stock.

In addition to the greater amount of information possessed by institutional investors, they may also have superior skills in processing information. Kim and Verrecchia (1994) provide a model in which certain investors possess better information because of their superior ability in processing public information, and they can turn public information release into their information advantages. These better skilled investors are more likely to be institutional investors.[33] Empirical evidence on price and volume reaction to earnings announcements suggests that there is considerable surprise at the announcement of earnings news, despite the anticipation by market participants. If institutional investors can better analyze the implications of the earnings surprise at the announcement, the announcement period reaction should be faster for stocks with higher level of institutional ownership. This faster reaction to earnings news for stocks with greater institutional ownership would manifest itself as a larger immediate reaction when compared to stocks with lower institutional ownership, for which the reaction may be slower. Moreover, Kim, Krinsky, and Lee (1997) document that abnormal trading volume during quarterly earnings announcement increases in the level of institutional ownership. Their result suggests that institutional investors are more responsive to

[33] For example, Hand (1990) provides some empirical evidence that the proportion of non-institutional holding is positively related to price reaction to the temporal component of earnings news. He suggests that the sophisticated institutional investors are better able to interpret the permanent and temporal components of earnings news. Moreover, Brennan (1995) argues that individual investors often know little of the dynamics of the stock markets.

quarterly earnings news and more likely to trade on new information. Lee (1992) documents that the response of large trades to earnings news is quick and intense, while that of small trades is sluggish. Compared with individual investors, institutional investors are more likely to be the initiators of large trades. Accordingly, conditioning on the level of earnings surprises, the announcement period reaction should be greater for stocks with higher levels of institutional ownership.

Finally, if the presence of institutional investors results in greater anticipation of earnings news and a faster reaction at the announcement, the post-earnings drift should be smaller for stocks with higher level of institutional ownership. Some institutional investors, however, may also engage in positive feedback trading strategies, i.e., making trading decisions that are positively correlated with past stock returns (e.g., Nofsinger and Sias (1997)). The abnormal price changes and trading volume at the announcements of earnings surprise could trigger momentum trading by some institutional investors, resulting in a positive autocorrelation in observed returns. Such trading behavior and the resulting price pattern after earnings announcement could increase the post-announcement drift. As a result, the level of institutional ownership could be positively related to post-earnings drift, which could be interpreted as a delayed reaction to earnings surprise. The effect of institutional ownership on the post-announcement abnormal return therefore remains an empirical issue.

2.3. The Role of Security Analysts in the Price Discovery Process

Security analysts also collect and analyze information on specific companies and provide forecasts of future earnings. The larger the number of analysts that forecast the earnings for a given firm, the greater would be the amount of information generated. When investors trade on recommendations and forecasts of the analysts, this information

would be incorporated into prices. Therefore, analyst following would increase the anticipation of earnings news as reflected in the stock price changes prior to the announcement of earnings.

Empirical studies suggest that security analysts also contribute to the price discovery process. For example, Brennan, Jegadeesh and Swaminathan (1993) document that stocks with greater analyst coverage react faster to market-wide common information than stocks with lower analyst coverage, and that returns on portfolios of stocks with greater analyst following lead those of stocks with fewer analyst following. Moreover, Brennan and Subrahmanyam (1995) document that stocks with greater analyst coverage have greater market depth. The greater market depth and greater investor interest for stocks with greater analyst coverage imply a greater propensity for investors to trade on information following earnings announcement. Consequently, the full implications of earnings news may be incorporated into the price faster for stocks with greater analyst following. The faster adjustment of prices for stocks with greater analyst coverage would manifest itself as a larger immediate price reaction when compared to stocks with lower analyst coverage, for which the reaction may be slower.

If the presence of analysts for a given stock results in a complete and unbiased reaction at the earnings announcement, there should be no post announcement drift. However, empirical evidence indicates that individual security analysts may fail to fully appreciate the time-series properties of the earnings process. For example, Abarbanell and Bernard (1992) present evidence suggesting that Value Line analysts under-react to earnings surprises in that they do not fully incorporate the information released in the earnings surprise into their forecasts for future earnings, and that this under-reaction explains about 50 percent of the post-earnings-announcement drift. To the extent that the post earnings drift is present and reflects a delayed reaction, or under-reaction to the earnings surprise, the greater pre-announcement price anticipation and greater

announcement period price reaction imply that the extent of post-announcement drift should be smaller for stocks with greater analyst coverage. Moreover, the conducive effect of analyst following of reducing the post-announcement drift is unlikely to be offset by trade induced price patterns, since analysts, unlike institutional investors, do not directly engage in trading.

3. Data and Preliminary Analysis

3.1. Data Sources

Quarterly earnings per share (*EPS*), mean analyst forecasted EPS, and number of analyst following (*ANLST*) for each stock are obtained from Institutional Brokers Estimate System (I/B/E/S) 1996 monthly history file. The corresponding earnings announcement dates for each quarter are obtained from the Standard and Poor's Compustat quarterly files, i.e., Primary-Secondary-Tertiary File, Full Coverage File and Research File. The earnings announcement date reported in COMPUSTAT is used as event day 0 in this study.[34] We obtain 60 days of return data before and after the earnings announcements from the Center for Research of Security Prices (CRSP) 1996 NYSE/AMEX/NASDAQ daily return file. Furthermore, we obtain 13-F institutional ownership[35] data for each calendar quarter from Compact Disclosure, from the third quarter of 1990 through the second quarter of 1996. If ownership data for a particular quarter is not available, data from the previous quarter is used. Our final sample consists of 5,181 stocks and 59,573 quarterly earnings announcements.

[34] Penman (1987) compares Compustat dates with Wall Street Journal dates. He finds that for a sample of 1,866 reporting dates, over 96% of the Compustat dates are within +/- 1 day of WSJ dates.
[35] 13-F institutions are those with at least $100 million assets under management.

3.2. Abnormal Return Calculation

This study uses size adjusted abnormal returns to measure abnormal price changes. Specifically, each stock is assigned to an NYSE/AMEX/NASDAQ size decile according to its market capitalization at the end of previous year. To obtain the abnormal return for each stock, the average return of the corresponding size decile portfolio on the same day is subtracted from the stock return. Let $R_{j,t}$ be the return on stock *j* on date *t*, $R_{s,t}$ be the average return for day *t* on the corresponding size decile portfolio *s* at the end of previous year. The abnormal return is defined as $AR_{j,t} = R_{j,t} - R_{s,t}$. Cumulative abnormal return (CAR) over a period is obtained by summing up abnormal returns over that period.

This study defines the period from event day –60 to event day –3 as the pre-announcement period. While previous studies use day –2 through day 0 as the announcement period, this study uses the window from day –2 through day 1. Day 1 is included in the announcement period since the earnings announcement dates on Compustat files are sometimes the announcement dates on Dow Jones News Wire or Press Release Wire, where the announcements are made after the market closes. Under these circumstances, the investors would not be able to trade on the news until market opens on day 1. Finally, the post announcement period is defined over the 59-day window from day 2 to day 60.

3.3. Measure of Earnings Surprises:

Earnings surprise is measured as the difference between realized EPS and average analyst expected EPS. This surprise is scaled by the price to obtain the standardized unexpected earnings (SUE). Specifically,

$$SUE_{i,q} = \frac{EPS_{i,q} - E(EPS_{i,q})}{P_{i,qt}},$$

where $SUE_{i,q}$ is the SUE for stock i for quarter q, $EPS_{i,q}$ is the EPS for stock i in quarter q, $E(EPS_{i,q})$ is the mean analyst forecasted EPS for stock *i* in quarter q, and $P_{i,qt}$ is the price for stock i at date t relative to earnings announcement date for quarter q. In the results reported, closing price on the day prior to the abnormal return accumulation date is used to scale the earnings surprise, i.e., price on day -61 is used to scale earnings surprise for analysis of pre-announcement CAR, and price on day -3 is used to scale earnings surprise for analysis of announcement CAR, etc.[36] To reduce the influence of outliers, the *SUE*s are ranked into 10 deciles based on SUEs of all the stocks that meet the data requirements in the same calendar quarter. This method is similar to the approach adopted in many previous studies.[37]

3.4. Descriptive Statistics

Descriptive statistics on size, institutional ownership, and analyst coverage are provided in Panel A of Table I. The mean and median values of firm size are $ 1,482.71 million and $ 265.63 million, respectively. The mean percentage institutional ownership for the sample is 41.63, while the median percentage institutional ownership is 40.89. The average number of analyst following a stock is five, while the median number of analyst following is only three.

Panel B of Table I shows the correlation coefficients between natural logarithm of size, percentage institutional ownership, and number of analyst following. As expected, size, institutional ownership, and analyst following are significantly and positively

[36] We used prices from different dates to scale earnings surprises, and the results are not sensitive to a specific price date as long as the price used is prior to the cumulative abnormal returns accumulation date. We also use expected EPS to scale earnings surprises, and the results are similar to those reported here.

[37] Foster, Olsen and Shelvin (1984), Bernard and Thomas (1989, 1990), use the SUE decile breakpoints of previous quarter to assign SUE deciles. They take this approach to reduce the hindsight bias in assigning SUE deciles, so that only the available information at the time of SUE decile formation is used. Bernard and Thomas (1990), however, find that the use of current quarter SUEs creates little bias. Additionally, we are only interested in the price discovery process, not the profitability of a particular investment strategy in this study. Therefore, we use current quarter SUE information in forming SUE deciles.

correlated. The Pearson correlation coefficient between log(size) and percentage institutional ownership is 0.462, and the correlation coefficient between log(size) and number of analyst coverage is 0.731, both statistically significant at 0.001 level. Percentage institutional ownership and analyst following are also significantly correlated with a coefficient of 0.436.

3.5. Abnormal Returns around Quarterly Earnings Announcements

The cumulative abnormal return (CAR) for each SUE decile is obtained for the pre-announcement period, the announcement period, and the post-announcement period. A bootstrapping procedure is used to estimate the statistical significance for the CARs for the following reason. If the quarterly earnings surprises have positive serial-correlation at the firm level as suggested by Abarbanell and Bernard (1992), the pooled time-series cross-sectional observations in this study fail to meet the independence assumption of the traditional t-test, and the statistical power of the traditional t-test will be overstated.

The bootstrapping procedure is performed as follows. First, we randomly draw 6,000 quarterly earnings announcements from the universe of our sample, and obtain the mean CAR for the pseudo portfolio. The process is repeated 1,000 times and the empirical distribution of the CARs for the pseudo portfolios is obtained. The CAR of each SUE decile is then compared with the empirical distribution of CARs to obtain the statistical significance, under the null hypothesis that the SUE ranking does not provide any information related to abnormal returns.

The results presented in Table II show that SUE ranking is related with abnormal returns around quarterly earnings announcements. Abnormal returns are generally significantly negative for SUE deciles one through four, and significantly positive for SUE deciles seven through ten. Both the pre-announcement period CAR and the

announcement period CAR increase monotonically in SUE deciles. The average pre-announcement period CAR increases from -6.25 percent for SUE decile one to 6.11 percent for SUE decile ten, and the mean announcement period CAR is -2.65 percent for SUE decile one and 3.63 percent for SUE decile ten. The degree of post-announcement drift is not monotonic in SUE decile. For stocks with negative earnings surprises, the drift is smaller in magnitude when compared to stocks with positive earnings surprises. The overall post-announcement drift reported in this study is smaller than previous studies. The smaller post-announcement drift observed in our sample could result from the following factors. The post-announcement drift could be weaker in the later time-period of this study than those reported by earlier studies. For example, a recent Wall Street Journal article points out that the stocks responded much faster to earnings news during 1995-1998 period as compared with the 1983-1989 period.[38] Furthermore, our sample selection criteria limit our sample to larger stocks, and the previously documented drift is more pronounced for smaller capitalization stocks.

3.6. Abnormal Returns, Institutional Ownership and Analyst Following

This section examines the differences in cumulative abnormal returns around quarterly earnings announcement between stocks with higher level of institutional ownership (analyst following) and lower level of institutional ownership (analyst following). Each quarter, stocks are assigned to SUE quintiles according to their corresponding SUE. Within each NYSE/AMEX/NASDAQ size decile, each stock is assigned to one of the three equal-sized institutional ownership (analyst following) portfolios: low, medium, or high, according to its level of institutional ownership (analyst

[38] See, Ip, Greg, "Big News on Your Stock? Hold on to Your Hat", The Wall Street Journal, April 27, 1998, C1.

following). The difference in CARs between the high and low institutional ownership (analyst following) stocks is obtained for both SUE quintile one and SUE quintile five.

The statistical significance of the difference is obtained through bootstrapping. Within both the highest SUE quintile and the lowest SUE quintile, two pseudo high and low institutional ownership (analyst following) portfolios are generated and the difference in the CARs is obtained. The size of each pseudo portfolio is one third the size of the corresponding SUE quintile. This process is repeated 1,000 times to form the empirical distribution of the differences in CARs between the pseudo high and low institutional ownership (analyst following) portfolios. The difference in CARs between the high and low institutional ownership (analyst following) portfolios is then compared with the empirical distribution to obtain the statistical significance. The differences in size, percentage institutional ownership, and number of analyst following between the two extreme institutional ownership (analyst following) portfolios are similarly examined.

Panel A of Table III shows that the high institutional ownership portfolio and the low institutional ownership portfolio are similar in their average market capitalization. This is not surprising since the market capitalization is controlled in the way the two portfolios are constructed. However, the two portfolios differ significantly in average percentage institutional ownership. It further shows that for the lowest SUE quintile (negative earnings surprise), the pre-announcement CAR for the high institutional ownership portfolio is -5.62 percent, compared with -4.60 percent for the low institutional ownership portfolio. The difference of -1.02 percent in the pre-announcement CAR between the two portfolios has a bootstrapped p-value of 0.020. For the highest SUE quintile (positive earnings surprise), the pre-announcement CAR for the high institutional ownership portfolio is 5.39 percent, 0.94 percent higher than that for the low institutional ownership portfolio. The difference has a bootstrapped p-value of

0.019. The pre-announcement period abnormal returns are consistent with our hypothesis of greater anticipation of earnings news by institutional investors. During the announcement period, for SUE quintile one (negative earnings surprise), high institutional ownership portfolio has an announcement period CAR of -2.54 percent, while the low institutional ownership portfolio has an announcement period CAR of -2.11 percent. The difference of -0.43 percent is significant with a p-value of 0.023. For SUE quintile five (positive earnings surprise), the mean announcement period CAR is 3.31 percent for high institutional ownership portfolio, compared with that of 2.49 percent for low institutional ownership portfolio. The difference of 0.82 percent is significant with a p-value of 0.001. These results are consistent with our hypothesis of greater price reaction to earnings news for stocks with higher institutional ownership. For the post-announcement period, there is no significant difference in the abnormal returns between the high and low institutional ownership portfolios.

Panel B of Table III provides the abnormal returns for the three time periods for the high and the low analyst coverage portfolios, while controlling for market capitalization. During both the pre-announcement period and the announcement period, the abnormal returns are significantly larger in magnitude for the high analyst coverage portfolio as compared with the low analyst coverage portfolio. This is true for both the highest SUE quintile (positive earnings surprise) and the lowest SUE quintile (negative earnings surprise). These results are consistent with our hypotheses of greater anticipation of earnings news, and greater price reaction at the announcement of earnings news for stocks with greater analyst coverage. The results for these two portfolios during the post announcement period are mixed. There is no significant difference in the post announcement period abnormal returns between the high and the low analyst coverage portfolios for the highest SUE quintile (positive earnings surprise). This result is not consistent with the hypothesis of lower drift for stocks with greater analyst coverage. For

the lowest SUE quintile (negative earnings surprise), however, the post announcement period CAR of -0.86 for the low analyst coverage portfolio is significantly lower than the CAR of 0.19 for the high analyst coverage portfolio. This result for the negative earnings surprises is consistent with the hypothesis of lower drift for stocks with greater analyst coverage. In fact, there is no drift for the high analyst coverage portfolio. The greater reaction at the announcements and no subsequent drift for the high analyst coverage portfolio in the negative earnings surprise quintile, compared to the smaller reaction at the announcement with a significant subsequent drift for the low analyst coverage portfolio, is further evidence of a faster reaction for stocks with greater analyst coverage.

4. Regression Analysis

4.1. Description of Regression Model and Independent Variables:

We turn to regression analysis to investigate the distinct effects of institutional ownership and analyst following on the price discovery process. We use size to control for alternative sources of information. Previous studies document that size is negatively correlated with the abnormal returns around earnings announcements. Therefore, for similar positive earnings surprises, larger capitalization stocks should have smaller abnormal returns as compared to smaller capitalization stocks, while for similar negative earnings surprises, larger stocks should have less negative abnormal returns as compared to smaller stocks. To allow for the differential effect of size, institutional ownership, and analyst following on positive and negative earnings surprises, two dummy variables are introduced in the regression, one for positive earnings surprises and the other for negative earnings surprises. The positive earnings surprise dummy (*PDMY*) is set to one if the Standardized Unexpected Earnings (*SUE*) is in decile seven and above, and zero

otherwise. Similarly, the negative earnings surprise dummy (*NDMY*) takes value of one if the SUE is in decile four or below, and zero otherwise.[39] This approach is useful in identifying any directional asymmetry in stock price adjustments to earnings news.

The following regression equation is estimated for the pre-announcement period, the announcement period, and the post-announcement period cumulative abnormal returns.

$$CAR = b_0 + b_1\, SUE\ Decile + b_2\, PDMY * Log(SIZE) + b_3\, NDMY * Log(SIZE) +$$
$$b_4\, PDMY * Log(1+PINST) + b_5\, NDMY * Log(1+PINST) +$$
$$b_6\, PDMY * Log(ANLST) + b_7\, NDMY * Log(ANLST) + e \qquad (1)$$

In equation (1), *SIZE* is the market capitalization of the stock at the end of previous year, while *PINST* is the percentage of outstanding shares owned by institutional investors at the end of previous quarter, and *ANLST* is the number of analysts providing earnings forecasts for the quarter. *SUE Decile* is scaled to range from zero to one. The coefficient b_1 is expected to be positive during the pre-announcement period and announcement period. The existence of post-announcement drift suggests a positive b_1 during post-announcement period as well. The coefficient of the interaction between the positive (negative) earnings surprise dummy variable and size measures the size effect on positive (negative) earnings surprises. Existing empirical evidence suggests that b_2 should be negative and b_3 should be positive in the regressions of pre-announcement, announcement, and post-announcement CARs. If the involvement of institutional investors results in a greater anticipation of earnings news prior to the announcements, we should expect coefficient b_4 to be positive and coefficient b_5 to be negative in the regression of pre-announcement period CAR. Moreover, for the regression of the announcement period CAR, a positive b_4 and a negative b_5 will be consistent with the

[39] An alternative scheme that assigns positive (negative) earnings surprise dummy a value of 1 for SUEs in SUE deciles 8-10 (1-3), and a value of zero otherwise, yields similar regression results.

hypothesis that institutional investors contribute to price discovery at the earnings announcements. Finally, in the regression of the post-announcement CAR, the hypothesis that the participation of institutional investors leads to a lower degree of post-earnings drift suggests a negative b_4 and a positive b_5. Positive feedback trading by institutional investors, however, would imply a positive b_4 and a negative b_5.

For the regression of the pre-announcement CAR, b_6 is expected to be positive and b_7 is expected to be negative if analyst following results in a greater price anticipation. In the regression of the announcement CAR, a positive b_6 and a negative b_7 would suggest that security analysts contribute to the price discovery process at the earnings announcements. Finally, a negative b_6 and a positive b_7 in the regression of the post-announcement CAR would be consistent with the hypothesis that more analyst following results in a lower post-announcement drift.

We use Fama and MacBeth (1973) method to obtain statistical inference. Specifically, regression equation (1) is estimated on a quarterly basis, and the time-series averages of regression coefficients and the corresponding t-statistics are obtained.

4.2. Regression Results

Table IV presents the regression results on the effects of institutional ownership and analyst following on the abnormal returns around quarterly earnings announcements. Consistent with results from previous studies, the coefficient of SUE decile is significant and positive in the regression of the pre-announcement abnormal returns, suggesting that stock prices anticipate forthcoming earnings news. The positive and significant coefficient of SUE decile for the announcement period abnormal returns indicates that the market is surprised at the announcements and reacts to the new information. The coefficient of SUE decile is insignificant for the post-announcement abnormal returns.

For both the pre-announcement and announcement abnormal returns, the signs and significance of the coefficients for size are consistent with results from previous studies (e.g., Foster, Olsen and Shevlin (1984), Bernard and Thomas (1989)). In the regression of the post-announcement abnormal returns, the coefficient of size is insignificant.

The coefficient of the interaction term between the positive earnings surprise dummy and institutional ownership is significant and positive, while the coefficient of the interaction term between the negative earnings surprise dummy and institutional ownership is insignificant, which suggests that institutional investors contribute more to the price discovery process prior to the announcements of positive earnings surprises. Seppi (1992) documents that large block transactions anticipate the forthcoming earnings surprises. If institutional investors are the initiators of these block trades, our results are consistent with his findings.

For the announcement period abnormal returns, the coefficient of the interaction term between the positive earnings surprise dummy and institutional ownership is positive and significant, while that of the interaction between the negative earnings surprise dummy and institutional ownership is negative and significant. Significantly higher (lower) abnormal returns realized by higher institutional ownership stocks during the four-day announcement period for positive (negative) earnings surprises are consistent with the hypothesis that institutional investors are better able to process earnings news and are more responsive to new information. Their involvement in a stock results in a quicker price discovery, which is manifested in the higher level of abnormal return during the announcement period. This finding is consistent with the results of Potter (1992), that the announcement period return variability increases with the level of institutional ownership. Moreover, if institutional investors are better skilled in processing earnings news, our results could be linked to the theoretical models of Admati

and Pfleiderer (1988), and Holden and Subrahmanyam (1992), in which the competition among informed traders leads to a quicker adjustment of prices.

The regression results for the post announcement period indicate that there is no significant relation between the post earnings drift and institutional ownership. As suggested earlier, this lack of a significant relation could be a result of two offsetting effects. The faster reaction of institutional investors would tend to reduce the drift, while the momentum trading strategies of some institutional investors could induce positive auto-correlation in the returns, which would increase the drift.

Turning to the results on analyst following, we find that the interaction term between the analyst following and the positive (negative) earnings surprise dummy is positive (negative) and significant in the regression of the pre-announcement abnormal returns. Stocks with more intense analyst coverage realize higher pre-announcement abnormal returns for positive earnings surprises, while for negative earnings news, intense analyst coverage leads to a greater price decreases during the pre-announcement period. These results are consistent with the hypothesis that analyst coverage increases the anticipation of earnings news.

In the regression of the announcement period abnormal returns, the coefficient of the interaction term between the positive (negative) earnings surprise dummy and the number of analysts is positive (negative) and significant. The announcement period abnormal return is greater for stocks with greater analyst following. This result is consistent with the hypothesis that the reaction to earnings surprise will be quicker for stocks with greater analyst coverage. It is also consistent with the findings of Brennan, Jegadeesh, and Swaminathan (1993), that stocks followed by more analysts react faster to market-wide information.

While there appears to be no significant relation between post announcement abnormal returns and analyst following for negative earnings surprises, the post

announcement abnormal returns are significantly negatively related to the number of analysts for positive earnings surprises. This result is consistent with the hypothesis that the post earnings drift will be lower for stocks with greater analyst following.

In results not reported here, we find that the magnitude and significance of the coefficients of both institutional ownership and analyst coverage remain virtually unchanged, whether the other variable is included or not. These results suggest that institutional ownership and analyst following are two distinct forces that independently contribute to the price discovery process at the earnings announcements.

4.3. Robustness Check

In results not reported here, we also perform robustness checks. To control for the effect of possible outliers, the extreme 1% (5%) CARs in each regression are winsorized, i.e., observations with CAR below 0.5 (2.5) percentile or above 99.5 (97.5) percentile are replaced with the values of corresponding percentiles in the regression. The magnitude and the significance of regression coefficients remain qualitatively similar with the winsorization, which suggests that the results are not sensitive to extreme observations.

5. Conclusions

This study examines the roles of institutional investors and security analysts in the price discovery process around quarterly earnings announcements. To our knowledge, this is the first study to examine their roles in the price discovery process around firm specific events. The results suggest that both institutional investors and security analysts independently contribute to the price discovery process. Their participation in the underlying security is associated with greater anticipation of quarterly earnings news.

Conditional on earnings surprises, stocks with higher level of institutional ownership and greater analyst following generally have greater price response to the announcement of earnings news. The post earnings announcement drift is not related to institutional ownership. The lack of relation could arise from two offsetting effects of institutional investors, i.e., the conducive effect from the faster reaction of institutional investors, which should reduce the post-announcement drift, and the propensity of some institutional investors to follow positive feedback trading strategy, which may increase the post-announcement drift. There is weak evidence that stocks with greater analyst coverage have lower post-earnings drift, providing additional evidence of a faster reaction to earnings surprise for these stocks. In conclusion, evidence from this study suggests that both institutional investors and security analysts have a distinct role in the price discovery process around firm specific events.

References

Abarbanell, Jeffery S. and Victor L. Bernard, 1992, Tests Of Analysts' Overreaction/Underreaction To Earnings Information As An Explanation For Anomalous Stock Price Behavior, Journal of Finance 47(3), 1181-1208.

Abraham, Abraham and David L. Ikenberry, 1994, The individual investor and the weekend effect, Journal of Financial and Quantitative Analysis 29 (2), 263-278.

Admati, Anat and Paul Pfleiderer, 1988, A Theory of Intraday Patterns: Volume and Price Variability, Review of Financial Studies 1(1), 3-40.

Atiase, Rowland Kwame, 1985, Predisclosure Information, Firm Capitalization, and Security Price Behavior Around Earnings Announcements, Journal of Accounting Research 23, 21-36.

Badrinath, S. G., Jayant R. Kale, and Thomas H. Noe, 1995, Of Shepherds, Sheep, and the Cross-autocorrelations in Equity Returns, The Review of Financial Studies 8(2), 401-430.

Ball, R. and P. Brown, 1968, An Empirical Evaluation of Accounting Income Numbers, Journal of Accounting Research 6, 159-177.

Bamber, Linda Smith, 1987, Unexpected Earnings, Firm Size and Trading Volume Around Quarterly Earnings Announcements, The Accounting Review 62 (3), 510-532.

Bernard, Victor, 1992, Stock Price Reactions to Earnings Announcements: A Summary of Recent Anomalous Evidence and Possible Explanations, in R. Thaler, ed., Advances in Behavioral Finance (Russell Sage Foundation, New York, NY).

Bernard, Victor, and Jacob K. Thomas, 1989, Post-Earnings-Announcement Drift: Delayed Price Response or Risk Premium, Journal of Accounting Research 27 (Supplement), 1-36.

Bernard, Victor, and Jacob K. Thomas, 1990, Evidence that Stock Prices Do Not Fully Reflect the Implications of Current Earnings for Future Earnings, Journal of Accounting and Economics 13, 305-340.

Brennan, Michael J., 1995, Individual Investors, Journal of Financial Research 53, 59-74.

Brennan, Michael J., Narasimhan Jegadeesh and Bhaskaran Swaminathan, 1993, Investment Analysis and the Adjustment of Stock Prices to Common Information, Review of Financial Studies 6 (4), 799-824.

Brennan, Michael J., Avanidar Subrahmanyam, 1995, Investment Analysis and Price Formation in Securities Markets, Journal of Financial Economics 38 (3), 361-381.

Fama, Eugene F. and James D. MacBeth, 1973, Risk, Return, and Equilibrium: Empirical Tests, Journal of Political Economy 81 (3), 607-636.

Foster, George, Chris Olsen, and Terry Shevlin, 1984, Earnings Releases, Anomalies, and the Behavior of Security Returns, The Accounting Review 59 (4), 574-603.

Hand, John R., 1990, A Test of the Extended Functional Fixation Hypothesis, The Accounting Review 65 (4), 740-763.

Holden, Craig W. and Avanidhar Subrahmanyam, 1992, Long-lived Private Information and Imperfect Competition, Journal of Finance 47, 247-270.

Kim, Jeong-Bon, Itzhak krinsky and Jason Lee, 1997, Institutional Holdings and Trading Volume Reactions to the Announcement of Quarterly Earnings, Journal of Accounting, Auditing, and Finance 12 (1), 1-14.

Kim, Oliver, and Robert E. Verrecchia, 1994, Market Liquidity and Volume around Earnings Announcements, Journal of Accounting and Economics 17, 41-67.

Lakonishok, Josef and Edwin Maberly, 1990, The weekend effect: Trading patterns of individual and institutional investors, Journal of Finance 45 (1), 231-244.

Lee, Charles M. C., 1992, Earnings News And Small Traders: An Intraday Analysis, Journal of Accounting and Economics 15(2/3), 265-302.

Lee, C. M., B. Mucklow, and M. Ready, 1993, Spreads, depths, and the impact of earnings information: An intraday analysis, Review of Financial Studies 6(2), 345-367.

Lev, Baruch, 1988, Toward a Theory of Equitable and Efficiency Accounting Policy, The Accounting Review 63 (1), 1-22.

Mcqueen, Grant, Michael Pinegar, and Steven Thorley, 1996, Delayed Reaction to Good News and the Cross-Autocorrelation of Portfolio Returns, Journal of Finance 51 (3), 889-919.

Morse, Dale, 1981, Price and Trading Volume Reaction Surrounding Earnings Announcement, A Closer Examination, Journal of Accounting Research 19, 374-383.

Nofsinger, John R., and Richard W. Sias, 1997, The Behavior of Institutional and Individual Investors: Tests of Feedback Trading, Working Paper, Washington State University.

Penman, S. H., 1987, The Distribution of Earnings News Over Time and Seasonalities in Aggregate Stock Returns, Journal of Financial Economics 18, 199-288

Potter, Gorton, 1992, Accounting Earnings Announcements, Institutional Investor Concentration, and Common Stock Returns, Journal of Accounting Research 30 (1), 146-155.

Sias, Richard W., and Laura T. Starks, 1995, The day-of-the-week anomaly: The role of institutional investors, Financial Analysts Journal 51 (3), 58-67.

Sias, Richard W., and Laura T. Starks, 1997a, Return Auto Correlation and Institutional Investors, Journal of Financial Economics 46 (1), 103-131.

Sias, Richard W., and Laura T. Starks, 1997b, Institutions and Individuals at the Turn-of-the-Year, Journal of Finance 52 (4), 1543-1562.

Watts, Ross L., 1978, Systematic ‘Abnormal’ Returns After Quarterly Earnings Announcements, Journal of Financial Economics 6, 127-150.

Womack, Kent, 1996, Do Brokerage Analysts' Recommendations Have Investment Value?, Journal of Finance 51 (1), 137-167.

Table 1. Sample Description

Quarterly earnings per share (EPS), average analysts expected EPS, and number of analyst following are obtained from 1996 I/B/E/S monthly history file. Earnings announcement dates are taken from 1996 Compustat quarterly files. Daily return data are obtained from CRSP 1996 NYSE/AMEX/NASDAQ daily return file. Ownership data for each calendar quarter is obtained from Compact Disclosure. This study covers 59,573 announcements of 5,181 firms from the 3rd quarter of 1990 to the 2nd quarter of 1996.

Panel A. Sample Descriptive Statistics

	Mean	Median	1st Quartile	3rd Quartile	Standard Deviation
Size ($1,000,000)	1,482.71	265.63	90.97	970.97	4,802.76
Percentage of Institutional Holding	41.63	40.89	24.30	58.79	21.68
Number of Analysts	4.99	3	2	7	4.64

Panel B. Correlation Matrix

	Size	Percentage of Institutional Holding	Number of Analysts
Size	1.000	0.462 (0.001)	0.731 (0.001)
Percentage of Institutional Holding		1.000	0.436 (0.001)
Number of Analysts			1.000

Table 2. Cumulative Abnormal Returns Around Quarterly Earnings Announcements

Abnormal return is the daily return of the stock less the average return of NYSE-AMEX-NASDAQ firms of same size decile, based on its market capitalization at the end of previous year. The abnormal returns are cumulated from day -60 to day -3, from day -2 to day 1, and from day 2 to day 60 to obtain the pre-announcement, the announcement, and the post-announcement periods cumulative abnormal returns (*CAR*s), respectively, where day 0 is the earnings announcement day as given in COMPUSTAT. SUE is the standardized unexpected earnings based on the average I/B/E/S analyst expected EPS. Each quarter, stocks are assigned to SUE deciles according to their SUEs in that quarter. This study covers 5,181 firms and 59,573 earnings announcements from 3rd quarter of 1990 to 2nd quarter of 1996.

The statistical significance is obtained through bootstrapping. One thousand random sample of 6,000 announcements each are drawn to obtain the empirical distribution of CARs. The mean CAR of each SUE decile is then compared with the empirical distribution to obtain the statistical significance.

SUE Deciles	CAR[-60,-3]	CAR[-2,1]	CAR[2,60]
1	-6.25**	-2.65**	0.31
2	-4.12**	-1.90**	-1.35**
3	-2.58**	-1.18**	-1.47**
4	-2.27**	-0.99**	-1.55**
5	0.52	0.02	0.32
6	2.40**	0.50	0.81
7	2.74**	1.19**	1.54*
8	4.00**	1.83**	1.58*
9	4.42**	2.22**	1.73**
10	6.11**	3.63**	2.76**

** CAR is above (below) 99.9 (0.1) percentile of the empirical distribution for SUE deciles 6-10 (1-5).

* CAR is above (below) 99.0 (1.0) percentile of the empirical distribution for SUE deciles 6-10 (1-5).

Table 3. Institution Ownership, Analyst Following, And Cumulative Abnormal Returns Around Quarterly Earnings Announcements

SUE is the standardized unexpected earnings based on the average I/B/E/S analyst expected EPS. Each quarter, stocks are assigned to SUE quintiles according to their SUEs in that quarter. Within each NYSE/AMEX/NASDAQ decile, each stock is assigned to low, medium, or high institutional ownership (analyst following) portfolios, according to its level of institutional ownership (analyst following). Abnormal return is the daily return of the stock less the average return of NYSE-AMEX-NASDAQ firms of same size decile, based on market capitalization at the end of previous year. The abnormal returns are cumulated from day -60 to day -3, from day -2 to day 1, and from day 2 to day 60 to obtain the pre-announcement, the announcement, and the post-announcement periods cumulative abnormal returns (CAR), respectively, where day 0 is the earnings announcement day as given in COMPUSTAT. The difference in CARs between the high and low institutional ownership (analyst following) stocks is reported for both SUE quintile one and SUE quintile five.

The statistical significance of the difference is obtained through bootstrapping. Within both the highest SUE quintile and the lowest SUE quintile, two pseudo high and low institutional ownership (analyst following) portfolios are generated and the difference in the CARs is obtained. The size of each pseudo portfolio is one third the size of the corresponding SUE quintile. This process is repeated 1,000 times to form the empirical distribution of the differences in CARs between the pseudo high and low institutional ownership (analyst following) portfolios. The difference in CARs between the high and low institutional ownership (analyst following) portfolios is then compared with the empirical distribution to obtain the statistical significance. The p-values for the differences are reported in the parenthesis. Panel A reports the results based on the institutional ownership portfolios, while Panel B reports the results based on the analyst following portfolios.

Panel A. Institutional Ownership and cumulative abnormal returns

SUE	Institutional Ownership	Log(Size)	Number of Analysts	Percentage Institutional Ownership	CAR[-60,-3]	CAR[-2,1]	CAR[2,60]
Lowest Quintile	High	11.82	3.81	58.70	-5.62	-2.54	-0.91
	Low	11.94	2.77	19.30	-4.60	-2.11	-0.23
	High-Low	-0.120 (0.100)	1.04 (0.001)	39.40 (0.001)	-1.02 (0.020)	-0.43 (0.023)	-0.68 (0.180)
Highest Quintile	High	12.28	4.69	54.80	5.39	3.31	1.93
	Low	12.31	3.31	17.19	4.45	2.49	2.66
	High-Low	-0.03 (0.190)	1.38 (0.001)	37.61 (0.001)	0.94 (0.019)	0.82 (0.001)	-0.73 (0.160)

Panel B. Analyst following and cumulative abnormal returns

SUE	Analyst Coverage	Log(Size)	Number of Analysts	Percentage Institutional Ownership	CAR[-60,-3]	CAR[-2,1]	CAR[2,60]
Lowest Quintile	High	11.93	5.88	39.79	-6.34	-2.59	0.19
	Low	11.97	1.61	31.24	-3.81	-2.15	-0.86
	High-Low	-0.04 (0.095)	4.27 (0.001)	8.54 (0.001)	-2.53 (0.001)	-0.44 (0.016)	1.06 (0.012)
Highest Quintile	High	12.40	7.17	43.58	6.78	3.59	2.33
	Low	12.28	1.88	33.96	3.89	2.27	2.02
	High-Low	0.12 (0.001)	5.29 (0.001)	9.62 (0.001)	2.89 (0.001)	1.32 (0.001)	0.32 (0.214)

Table 4. Institutional Ownership, Analyst Following, And The Cumulative Abnormal Returns Around Quarterly Earnings Announcements

---- Regression Results

Abnormal return is the daily return of the stock less the average return of NYSE-AMEX-NASDAQ firms of same size decile, based on market capitalization at the end of previous year. The abnormal returns are cumulated from day -60 to day -3, from day -2 to day 1, and from day 2 to day 60 to obtain the pre-announcement, the announcement, and the post-announcement periods cumulative abnormal returns (CARs), respectively, where day 0 is the earnings announcement day as given in COMPUSTAT. *SUE* is the standardized unexpected earnings based on the average I/B/E/S analyst expected EPS. *SIZE* is the market capitalization of the stock at the end of previous year. *ANLST* is the number of analysts making quarterly earnings forecast before the earnings announcements. *PINST* is the percentage of outstanding shares of a stock held by institutional investors at the end of previous quarter. Each quarter, *SUE* is ranked from 1 to 10 and assigned to 10 deciles. *SUE* decile is then scaled to range from 0 to 1. *PDMY* is the dummy variable for higher *SUE* decile rankings that takes value 1 if *SUE* is in the top 4 deciles, and value zero otherwise. *NDMY* is the dummy variable for lower *SUE* decile rankings, and takes value of 1 if *SUE* is in the bottom four deciles, and zero otherwise. This study covers 5,181 firms and 59,573 earnings announcements from 3rd quarter of 1990 to 2nd quarter of 1996.

The coefficients reported in the table are the time-series averages of coefficients from quarterly cross-sectional regression. The corresponding t-statistics are reported in the parenthesis.

Independent Variables	Abnormal Returns		
	Pre-announcement	Announcement	Post-Announcement
Intercept	-5.85** (-7.15)	-3.27** (-14.15)	0.54 (0.69)
SUE Decile	14.57** (15.81)	7.18** (17.12)	0.26 (0.28)
PDMY * LOG(SIZE)	-0.60** (-6.50)	-0.20** (-6.91)	0.07 (0.20)
NDMY * LOG(SIZE)	0.25* (2.30)	0.14** (4.56)	0.06 (0.68)
PDMY * LOG(1+PINST)	1.26 (3.70)**	0.42** (5.16)	0.27 (0.74)
NDMY * LOG(1+PINST)	-0.61 (-1.63)	-0.28** (-2.91)	-0.71 (-1.78)
PDMY * LOG(ANLST)	0.90** (6.18)	0.36** (5.70)	-0.62** (-3.91)
NDMY * LOG(ANLST)	-1.23** (-4.96)	-0.31** (-5.03)	0.11 (0.47)
Avg. ADJ R^2 (%)	5.20	6.78	1.00

**: Significant at 0.01 level
*: Significant at 0.05 level

Vita

Honghui Chen was born in September, 1968, in Zhejiang Province, China. He completed his B.S. in Operations Research from Fudan University, Shanghai in July 1990. He joined the Department of Statistics at Virginia Tech in January 1992 and completed his M.S. in statistics in December 1993. He enrolled in the doctoral program in finance at Virginia Tech in August 1994 and graduated in July 1999. He will join the University of Baltimore as an Assistant Professor of Finance starting fall 1999.