

Corporate Governance Quality and Market Liquidity Around Quarterly Earnings Announcements

Kiridaran Kanagaretnam

McMaster University

Tel: (905) 525-9140

E-mail: giri@mcmaster.ca

Gerald J. Lobo

University of Houston

Tel: (713) 743-4838

E-mail: gjlobo@uh.edu

Dennis J. Whalen

Otterbein College

Tel: (614) 823-1161

E-mail: dwhalen@otterbein.edu

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Abstract

We examine the relationship between the quality of corporate governance and liquidity changes in the equity market around quarterly earnings announcements. We measure changes in market liquidity around earnings announcements as changes in bid-ask spreads and depths. Using principal components analysis, we identify three factors that capture the information in the eight individual corporate governance variables we examine. We then use ordinary least squares and two-stage least squares to estimate the relations between market liquidity changes and these three factors, which we label board independence, board effectiveness, board activity, and directors' and officers' percentage stock holdings. Our results indicate that changes in bid-ask spreads at the time of earnings announcements are significantly negatively related to board independence, board activity, and the percentage stock holdings of officers and directors. We also find that depth changes are significantly positively related to board effectiveness, board activity, and the percentage stock holdings of officers and directors. Our results are consistent with the hypothesis that firms with higher levels of corporate governance have increased market liquidity around quarterly earnings announcements.

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1. Introduction

We examine the relationship between the quality of corporate governance and liquidity changes in the equity market around quarterly earnings announcements. Prior research indicates that more effective boards increase the quality and quantity of information disclosed by the firm, thereby reducing information asymmetry. Prior research also indicates that market liquidity increases as information asymmetry is reduced. Based on the findings of these two streams of research, we hypothesize that market liquidity is positively related to the quality of corporate governance.

Corporate governance encompasses the controls and procedures that exist to ensure that management acts in the interest of shareholders. In addition to reducing the likelihood that management, acting in its self-interest, takes actions that deviate from maximizing the value of the firm, corporate governance mechanisms also affect the information disclosed by the firm to its shareholders. These mechanisms make it less likely that management, acting in its self-interest, does not fully disclose relevant information to shareholders or discloses information that is less than credible.

Many corporate governance studies consider the relationship between board attributes and the quality and quantity of information disclosures. One line of this research focuses on earnings announcements. Vafeas (2000) finds a negative relationship between the informativeness of earnings and the size of the board of directors. Dey (2005) examines the impact of corporate governance quality on the credibility of financial reporting. She reports that board composition, audit committee effectiveness,

and the presence of chief executives who also serve as board chairmen are significantly related to the credibility of earnings releases.

Other studies focus on how corporate governance affects earnings forecasts and earnings management. Ajinkya, Bhojraj and Sengupta (2005) find that firms with a higher percentage of institutional ownership and outside directors are more likely to issue forecasts and that these forecasts are more specific and accurate, and less optimistically biased. Similarly, Karamanou and Vafeas (2005) document that firms with more effective corporate governance mechanisms are more likely to issue forecasts. They also find that forecast accuracy and the market response to the forecast increases with the effectiveness of the board and audit committee. Klein (2002a) examines whether audit committee and board characteristics are related to earnings management by the firm. She finds a negative relationship between both audit committee independence and board independence and abnormal accruals. Her results suggest that boards structured to be more independent of the CEO are more effective in monitoring the corporate financial accounting process. Xie, Davidson and DeDalt (2003) report that firms whose boards have greater outside representation and that meet more frequently exhibit lower levels of earnings management. Lobo and Zhou (2001) also find an inverse relationship between corporate disclosure quality and earnings management.

These research findings suggest that boards that do a more effective job of monitoring management enhance the quality and the frequency of information released by management. These information releases include not only actual reported earnings but also voluntary disclosures such as management forecasts and other information releases. Diamond (1985) and Verrecchia (2001) demonstrate that, in addition to reducing the

precision of private information relative to the precision of public information, increased disclosure reduces the incentive for private information search. This suggests that information asymmetry is lower for firms whose boards are more effective.

We examine the relationship between several board attributes which proxy for the quality of corporate governance and market liquidity around earnings announcements. Market liquidity reflects the magnitude of bid-ask spreads and the extent to which sufficient depth is available at quoted prices. The market microstructure literature posits that information asymmetry (i.e., the extent to which informed traders possess an information advantage over uninformed traders) adversely impacts market liquidity. A positive bid-ask spread enables the equity specialist to profit from trades with uninformed traders, thus offsetting losses resulting from trades with informed traders (Copeland and Galai, 1983; Glosten and Milgrom, 1985). The Kyle (1985) model emphasizes the role of depth in assessing market liquidity. If information asymmetry decreases with the effectiveness of the board, then the bid-ask spread will decrease and depth will increase around earnings announcements.

The earnings announcement is an ideal time to examine information asymmetry in the equity market. The fact that these information disclosures are scheduled in advance provides informed investors with a distinct trading advantage. Indeed, many empirical studies focus on changes in market liquidity around earnings announcements (e.g., Lee, Mucklow, and Ready, 1993; Krinsky and Lee, 1996) and also the extent to which analyst forecast properties impact these changes (e.g., Affleck-Graves, Callahan and Chipalkatti, 2002; Kanagaretnam, Lobo, and Whalen, 2005). Our study contributes to this literature

by focusing on a different aspect of the information environment.¹ We investigate the impact of corporate governance quality, as proxied by several board attributes, on the information environment. Effective board monitoring of management should not only increase the frequency of these disclosures but also enhance their quality and thereby increase market liquidity around earnings announcements.²

Using principal components analysis, we identify three factors that capture the information in our eight individual corporate governance variables. We label these factors board independence, board effectiveness, and board activity, based on the characteristics of the individual corporate governance variables that are related to each factor. We measure changes in market liquidity around earnings announcements as changes in bid-ask spread and depth. We then estimate the relations between market liquidity changes and board independence, board effectiveness, board activity, and directors' and officers' percentage stock holdings using both ordinary least squares and two-stage least squares estimation.

Our results indicate that changes in bid-ask spreads at the time of earnings announcements are significantly negatively related to board independence, board activity, and the percentage stock holdings of officers and directors. We also find that depth changes are significantly positively related to board effectiveness, board activity, and the percentage stock holdings of officers and directors. Our results are consistent with the

¹ Libby, Mathieu and Robb (2003) examine the relationship between a limited number of board attributes and market liquidity around earnings releases for a sample of Canadian stocks. They find a positive relationship between market liquidity and the number of outside directors on both the board and the audit committee and a negative relationship between market liquidity and director stock holdings.

² Welker (1995) shows that increased disclosures reduce bid-ask spreads thus increasing market liquidity.

hypothesis that firms with higher levels of corporate governance have increased market liquidity around quarterly earnings announcements.

These findings have important implications for not only regulators and investors, but also the company itself. Recent corporate scandals have compelled regulators to focus on corporate governance issues in order to protect the investing public. The Securities and Exchange Commission recently adopted a NYSE proposal which requires that the nominating/governance committees of publicly traded companies be composed entirely of independent directors. In addition, corporate information releases which are credible and complete enhance the ability of traders to make informed investment decisions. Companies should also be concerned with corporate governance quality as it will affect liquidity in the equity market and, therefore, their cost of equity capital.

The remaining sections of the paper are organized as follows. Section 2 presents the research hypotheses. Section 3 describes the data and sample selection. Section 4 presents the empirical analysis and Section 5 concludes the paper.

2. Hypothesis Development

We consider the relationship between corporate governance quality and liquidity changes in the equity market around quarterly earnings announcements. Previous research demonstrates that corporate governance quality has an impact on both the quantity and quality of corporate information disclosures. These disclosures, in turn, have been shown to affect the level of information asymmetry in the equity market. This suggests that corporate governance quality should impact market liquidity around earnings releases.

Investors possess varying degrees of information about the companies in which they invest. Informed traders transact with the advantage of superior information while uninformed traders transact for liquidity reasons. The market microstructure literature (Glosten and Milgrom, 1985; Copeland and Galai, 1983) suggests that a positive bid-ask spread will enable the equity specialist to profit from trades with uninformed traders and thereby offset losses incurred from trades with informed traders. Other studies (Mann and Ramanlal, 1996; Kavajecz, 1999) find that security dealers will change quoted depths when managing their information risk. Market liquidity should decline when information asymmetry increases as the equity specialist widens the bid-ask spread and lowers quoted depths.

Companies disseminate information to investors through a variety of channels. Some of these information releases are mandated, such as quarterly earnings announcements, while other releases are voluntary, such as management earnings forecasts. Kim and Verrecchia (1994) suggest that earnings releases will reduce information asymmetry as they disseminate information to all market participants. However, they also recognize that information asymmetry may remain at an elevated level following the releases as some traders are better able to process the information. Empirical studies that focus on earnings announcements generate mixed results. Morse and Ushman (1983) find no significant increase in equity bid-ask spreads around earnings releases. Lee, Mucklow, and Ready (1993) find that equity bid-ask spreads increase and depths decline around earnings announcements while Krinsky and Lee (1996) report that asymmetric information increases in the equity market prior to and following earnings releases.

Several studies (Diamond, 1985; Verrecchia, 2001) examine the consequences of voluntary information disclosures and conclude that such releases benefit investors. Information asymmetry declines as these public information releases “level the playing field” for all investors. Also, the need for investors to engage in costly information-gathering activities is reduced. Coller and Yohn (1997) find that the issuance of management earnings forecasts reduces information asymmetry among investors and decreases bid-ask spreads in the equity market. Yohn (1998) demonstrates that less accurate forecasts increase information asymmetry in the equity market around earnings releases.

More recent research (Ajinkya, Bhojraj, and Sengupta, 2005; Karamanou and Vafeas, 2005) focuses on the impact of board effectiveness on both the quality and quantity of corporate information disclosures. Both studies report that companies with more effective boards issue more frequent earnings forecasts and that these forecasts are more accurate. Higher board quality, therefore, should be associated with both more frequent and more accurate earnings forecasts and increased market liquidity around earnings announcements.

Companies which disclose less information are also more likely to manage earnings (Lobo and Zhou, 2001). Richardson (2000) demonstrates that there is a positive relationship between information asymmetry and the level of earnings management. It follows that higher board quality should reduce the level of earnings management and thereby increase market liquidity.

Other studies consider the relationship between board quality and investor perception of reported earnings. Vafeas (2000) finds that earnings are more informative

for companies with more effective boards while Dey (2005) reports that earnings credibility increases with board quality. These findings suggest that higher corporate governance quality should be associated with less information asymmetry and, therefore, increased market liquidity around earnings announcements.

Our hypotheses are stated as follows:

H1a: The bid-ask spread change around earnings announcements is negatively related to corporate governance quality.

H1b: The depth change around earnings announcements is positively related to corporate governance quality.

3. Sample Selection, Data and Variable Definitions

We consider quarterly earnings announcements for the June and September quarters of the year 2000 made by firms whose stock is listed on either the NYSE or the AMEX. We select firms that are not in the utility or finance sectors, and have December fiscal year-ends.^{3,4} We exclude American Depository Receipts. Earnings announcement times are obtained from The Dow Jones News Service and the PR Newswire. We are able to identify times for 1,170 earnings announcements; a large majority of these announcements, 1,069, occur when the exchanges are closed. Previous research emphasizes the importance of distinguishing between announcements made during trading hours and those made outside of trading hours. Genotte and Trueman (1996)

³ We exclude firms from the utility and finance sectors because regulatory disclosure requirements might result in lower levels of information asymmetry for firms in these sectors than for firms in non-regulated sectors.

⁴ We also restrict our sample to firms that are followed by at least 4 analysts (as of the latest IBES consensus forecast immediately preceding the date of the announcement), since prior literature (Roulstone, 2003) finds that firms that are not covered by analysts, or covered by a smaller number of analysts, have higher information asymmetry.

contend that it takes longer for information to be incorporated into security prices following announcements made during non-trading periods due to the accumulation of orders from liquidity traders prior to the start of trading. Francis, Pagach, and Stephan (1992) provide evidence consistent with this prediction. Since approximately ninety percent of the earnings announcements in our sample occur outside of trading hours, we exclude from further consideration any announcement made when the exchanges are open (i.e. the period between 9:30 AM and 4:00 PM Eastern Standard Time).

The event window consists of the four-trading-day period which brackets each announcement. The pre-event period is the two trading days prior to each announcement and the post-event period is the two trading days following each announcement. The non-event period consists of the two-trading-day period which commences four calendar weeks prior to the date of each announcement (similar to Krinsky and Lee, 1996).

The data on board quality are obtained from the Investor Responsibility Research Center (IRRC) database for board practices for the year 1999. The IRRC database covers firms that have their annual general meeting during the first seven months of the year 2000. The IRRC database is based on the firms' proxy statements filed with the SEC. Merging the IRRC database with the sample of earnings announcements results in 634 earnings announcements for 345 firms. Thus, our initial sample consists of 2,536 firm-day observations for the four-trading-day period.⁵

⁵ The IRRC covers only about 1200 firms from the Standard and Poor's Super 1500 firms that hold their annual meeting between January 1 and July 31st. We lose 435 earnings announcements when we merge our data with the IRRC database.

Our study examines the relationship between corporate governance quality and changes in equity bid-ask spreads and depths around earnings releases. We define the percentage spread and quoted depth (in round lots) as follows:⁶

$$\%SPREAD = (\text{Ask Price} - \text{Bid Price}) / ((\text{Ask Price} + \text{Bid Price})/2)$$

$$DEPTH = \text{Shares available at bid} + \text{Shares available at ask}$$

We calculate the percentage spread and quoted depth for every NYSE/AMEX opening, closing or regular quote posted between 9:30 AM and 4:00 PM EST for each day in the non-event and event periods. We exclude quotes posted on the regional exchanges or NASDAQ (i.e., the third market). We then determine the average percentage spread and average quoted depth for the two-day non-event period (i.e., each quote over this period is weighted equally) and for each of the four days in the event period and compute changes in spreads and depths as follows:

CSPREAD = difference between the average percentage spread for each of the four days in the announcement period and the non-event period average

CDEPTH = difference between the average quoted depth for each of the four days in the announcement period and the non-event period average

Empirical Measures of Corporate Governance Quality

We use a set of corporate governance variables that are available in the IRRC database and that are frequently used in research on corporate governance (see for example, Ashbaugh, Collins and LaFond, 2005; Dey, 2005; Gompers, Ishi and Metrick,

⁶ Previous studies also consider the percentage spread (Venkatesh and Chiang, 1986; Affleck-Graves et al., 2002) and quoted depth (Lee et al., 1993; Libby, Mathieu, and Robb, 2002) when examining information asymmetry around earnings announcements.

2003; Klein, 1998). These variables include the percentage of independent directors on the board (*PCTONBD*), the percentage of independent directors on the audit committee (*PCTONAUD*), the personal or business relationship of outside directors (*REL*), board size (*BDSIZE*), the existence of independent nominating, corporate governance and executive committees (*COMM*), the retirement age of board directors (*RETAGE*), the number of audit committee meetings during the fiscal year (*NCMTGAUDIT*), and the number of board meetings during the fiscal year (*NUMBDMTG*).⁷

We discuss the rationale for utilizing each of these variables and their empirical constructs in this and the following paragraphs. The typical board of directors is comprised of both inside and outside directors. Inside directors are employees of the firm. Outside directors, who are not employees of the firm, are considered to be independent from management and free from any business or other relationship that could materially interfere with the exercise of their judgment. Audit committees also typically include directors who are employees of the firm and directors who are independent of management. The variables *PCTONBD* and *PCTONAUD* represent the percentage of independent directors on the board and audit committees, respectively.

Klein (2002a) finds a negative relationship between both audit and board committee independence and abnormal accruals. This suggests that boards structured to be more independent of the CEO are more effective monitors of the financial accounting process. Hermalin and Weisbach (2003) find that boards with a greater percentage of

⁷ Existence of a compensation committee and an audit committee are two other variables used extensively in past research to proxy for governance quality. However, all firms in our sample have both a compensation committee and an audit committee. We also included a variable to capture the dual role of CEO as chair of the board. However, this variable does not load with any of our three governance factors. Also, when we use this as a separate explanatory variable in the liquidity regressions, the variable does not have any statistically significant association with the liquidity measures.

outside directors are more likely to dismiss an ineffective manager. Also, Xie, Davidson and DeDalt (2003) indicate that companies which have greater outside representation on the board exhibit a lower level of earnings management. Lobo and Zhou (2001) find an inverse relationship between earnings management and corporate disclosure quality. This implies that a higher percentage of independent directors on the board should improve the quality of corporate disclosures and thereby increase market liquidity around earnings releases.

The indicator variable *REL* reflects the personal, business, and/or financial relationship between an outside director and the company. It equals +1 if an outside director has a family, business, or financial relationship with the company. These relationships should lessen the monitoring effectiveness of such directors and thereby decrease market liquidity.

The size of the board of directors is captured by the variable *BDSIZE*. Larger boards make it possible to supply expertise and manpower. Herman (1981) suggests board size as a proxy for directors' expertise. Klein (2002b) indicates that larger boards are more effective monitors of management due to their ability to carry out more tasks than smaller boards. A larger board of directors should therefore increase market liquidity around earnings releases.

The CEO often has the responsibility to nominate board members. The existence of an independent nominating committee, which is responsible for identifying and nominating executives and directors, should enhance the monitoring effectiveness of the board as directors chosen by such a committee should have no ties to the CEO. The governance committee is responsible for conducting the board's governance review and

monitoring compliance with corporate governance guidelines. The Securities and Exchange Commission recognized the importance of these committees when it adopted a NYSE proposal in 2003 requiring all listed companies to have a nominating/governance committee composed solely of independent directors. The executive committee typically has the authority to act on behalf of the board of directors when the board is not meeting.

The indicator variable *COMM* equals +3 if the board of directors has separate nominating, corporate governance and executive committees. The variable equals +2 if the board has two of the committees and the variable equals +1 if the board has only one of the committees. Huang, Lobo and Zhou (2005) provide evidence that firms with a governance committee employ lower discretionary accounting accruals than firms without such a committee. Their results suggest that governance committees are effective in restraining managerial accounting discretion. Companies with a greater number of these committees should have more effective monitoring of management and increased market liquidity around earnings announcements.

The indicator variable *RETAGE* takes the value of +1 if the mandatory retirement age of the board of directors is greater than 72 years. A board of directors composed of older members is considered to be less efficient, since most of the older members, particularly those nearing retirement age, are present in name only without actively participating in board activities. Thus, companies whose board members are compelled to retire at a certain age should have a higher level of corporate governance quality.

The variables *NUMBDMTG* and *NCMTGAUDIT* reflect the number of board and audit committee meetings, respectively, during the fiscal year. Boards and audit committees which meet more frequently should be more effective monitors of

management (Conger, Finegold, and Lawler, 1998). In addition, Xie, Davidson and DeDalt (2003) find that the level of earnings management is lower for companies whose boards meet more frequently. Since there is a negative relationship between the level of earnings management and corporate disclosure quality (Lobo and Zhou, 2001), market liquidity around earnings announcements should increase for companies whose board and audit committees meet more frequently.

We use principal components analysis to group the individual corporate governance variables into composite factors that capture different dimensions of corporate governance quality (please see Appendix 1 for a detailed description of the factor analysis). This results in the identification of three composite factors that retain 60.18 percent of the variance in the individual corporate governance variables. We use varimax orthogonal rotation to minimize the number of variables that have high loadings on each factor so that we can more easily interpret the factors. We require that each individual variable have a minimum factor loading of 0.60 in absolute value on the factor with which it is associated.

The individual corporate governance variables associated with factor one (*F1*) are *PCTONBD*, *PCTONAUD* and *REL*. We label this factor the board independence factor. Factor two (*F2*), labeled the board effectiveness factor, is highly associated with *BDSIZE*, *COMM* and *RETAGE*. Variables *NUMBDMTG* and *NCMTGAUDIT* have high loadings on factor three (*F3*). We label this factor the board activity factor. These factors are consistent with the groupings in Dey (2005) and Larcker, Richardson and Tuna (2005).

In addition to these three factors, we include the percentage stock holdings of officers and directors (*DOHOLDINGS*) as an explanatory variable in our analysis.

Officers and directors with a greater percentage of company stock are more likely to act in the interests of shareholders (McConnell and Servaes, 1990). Klein (2002a) finds that the level of earnings management is inversely related to the stock holdings of the CEO. Warfield, Wild and Wild (1995) hypothesize that the level of managerial ownership affects both the informativeness of earnings and the magnitude of discretionary accounting accrual adjustments. Their results show that managerial ownership is positively associated with earnings' explanatory power for returns and inversely related to the magnitude of accounting accrual adjustments. Given the above, we expect market liquidity around earnings announcements to increase with director and officer stock holdings.

Control Variables

Consistent with prior research, we use firm size, stock return volatility and stock price as control variables for the spread analysis. Previous studies (Lang and Lundholm, 1993; King et al., 1992) contend that there is a positive relationship between firm size and information disclosures (i.e., larger firms have more informative disclosures than smaller firms). Atiase (1985) and Freeman (1987) find that a greater percentage of earnings information is reflected in stock prices prior to earnings announcements for larger firms than for smaller firms, suggesting that there is more information asymmetry around the earnings releases of smaller firms. Firm size (*SIZE*) is computed as the natural logarithm of total firm assets at the end of the second and third quarters of the year 2000. Market makers are likely to quote higher spreads when faced with higher market risk; therefore, we expect a positive association between stock return volatility (*VOLATILITY*) and spread. Stock price should be negatively related to spread changes because

information asymmetry is higher for lower-priced stocks. Stock price (*PRICE*) is computed as the daily average trade price.

We use shares outstanding (*SHARES*) and daily trading volume (*VOLUME*) as control variables for the depth analysis. Firms with a larger number of shares outstanding have a broader investment base, contributing to more trading volume and more liquidity trading (Roulstone, 2003). Therefore, we expect shares outstanding to be positively associated with market depth. Greater depth facilitates higher trading volume; therefore, we expect a positive association between *VOLUME* and market depth.

We obtain equity trade and quote data from the Transactions and Quotes (TAQ) database. Data from the regional exchanges or NASDAQ (i.e., the third market) are not considered. The final 2,027 firm-day observations are obtained after deleting observations with values of *CSPREAD* and *CDEPTH* in the top and bottom 1%, and observations that have abnormal influence on the regressions as indicated by their R-Student values. We also delete firm-day observations with *DOHOLDINGS* greater than 50%, to eliminate owner-manager firms.⁸

Table 1, Panel A reports descriptive statistics for the market liquidity measures, the raw governance variables, and the governance factors. As expected, the mean and median values of *CSPREAD* are positive, whereas the mean and median values of *CDEPTH* are negative. This demonstrates that specialists increase the spread and decrease the depth during the announcement period relative to the non-announcement period. Most firms have a majority of independent directors on both their boards and

⁸ From the original sample of 2,536 firm-day observations, we lose 316 firm-day observations due to missing values for the variables total assets and volatility, 10 firm-day observation with *DOHOLDINGS* greater than 50%, 93 firm-day observations due to censoring and 90 firm-day observations that have abnormal influence on the regressions; this results in a final sample of 2,027 firm-day observations.

audit committees, and 33 percent of outside directors have a business or family or other financial relationship with their company. The median board size is 10 directors and boards have a median of 2 of the following 3 independent committees: nominating, corporate governance, and executive committees. Only 13 percent of the sample firms have a retirement age for directors of 72 years or lower. The median number of board meetings and audit committee meetings is 7 and 3 per year. Mean (median) directors and officers stock holdings are approximately 6 (3) percent of shares outstanding.

Table 1, Panel B presents the correlation matrix for the variables used in the regression analysis. As expected, *CSPREAD* is significantly negatively related to the board independence factor (*F1*) and the board monitoring factor (*F3*); however, it is not significantly related to the board effectiveness factor (*F2*) or to the percentage of directors and officers holdings. *CDEPTH* is significantly positively related to the board monitoring factor (*F3*) and to directors and officers holdings, as expected, but unrelated to the board independence factor (*F1*) and to the board effectiveness factor (*F2*). Consistent with prior research, *CSPREAD* is negatively related to *CDEPTH*. The correlations between *CSPREAD* and the control variables, *PRICE* and *SIZE*, have the expected signs. *CDEPTH* is positively related to *PRICE* and *VOLUME*, however, it is not significantly related to *SHARES*.

4. Empirical Analysis

Univariate Tests

We begin our analysis by comparing *CSPREAD* and *CDEPTH* around earnings announcements conditional on high and low values of each of the three corporate governance factors (board independence, board effectiveness and board activity) and

directors' and officers' holdings (*DOHOLDINGS*). We report the results of these univariate comparisons in Panels A – D of Table 2.

As hypothesized, *CSPREAD* is significantly lower around earnings announcements for firms with high levels of board independence (*F1*) and board activity (*F3*). However, we do not observe significant differences in *CSPREAD* across firms with high levels of board effectiveness (*F2*) and *DOHOLDINGS*. The results also indicate that *CDEPTH* is significantly higher for firms with higher levels of board effectiveness (*F2*), board activity (*F3*) and *DOHOLDINGS*. These results are consistent with our hypotheses. Firms whose boards are more independent, more effective, more active, and whose directors and officers have a higher percentage of stock holdings enhance the quality of information disclosures thereby increasing market liquidity around earnings releases.

Multivariate Tests

Simple OLS Regressions

The univariate tests described in the preceding section do not control for the effects of firm specific and other factors on *CSPREAD* and *CDEPTH*. We report the results of multivariate tests incorporating such controls in this section. For comparison with prior research (for example, Affleck-Graves et al. 2002; Yohn 1998), we first report the results of individually estimating the following regressions of change in spread and change in depth on the board quality factors and control variables using ordinary least squares (hereafter, OLS):

$$\begin{aligned} \text{CSPREAD} = & \beta_0 + \beta_1 \text{F1} + \beta_2 \text{F2} + \beta_3 \text{F3} + \beta_4 \text{DOHOLDINGS} + \beta_5 \text{SIZE} + \beta_6 \text{PRICE} \\ & + \beta_7 \text{VOLATILITY} + \beta_8 \text{DVQ} + \varepsilon \end{aligned} \quad [1]$$

$$CDEPTH = \gamma_0 + \gamma_1 F1 + \gamma_2 F2 + \gamma_3 F3 + \gamma_4 DOHOLDINGS + \gamma_5 SIZE + \gamma_6 VOLATILITY + \gamma_7 SHARES + \gamma_8 VOLUME + \gamma_9 DVQ + \varepsilon \quad [2]$$

where,

CSPREAD = difference between the average percentage spread for each of the four days in the announcement period and the benchmark period average

CDEPTH = difference between the average depth for each of the four days in the announcement period and the benchmark period average

F1 = board independence factor

F2 = board effectiveness factor

F3 = board activity factor

DOHOLDINGS= percentage stock holdings of directors and officers

PRICE = daily average trade price

SIZE = natural logarithm of firm total assets at the end of the second / third quarter

VOLATILITY = stock return volatility measured as the standard deviation of the past 12 monthly stock returns

SHARES = number of shares outstanding (in millions) at the end of the second / third quarter

VOLUME = natural logarithm of trading volume on each event day

DVQ = indicator variable that equals one for the third quarter, and zero otherwise.

Hypothesis 1a posits that the bid-ask spread change around earnings announcements is negatively related to corporate governance quality. Accordingly, we expect the coefficients β_1 , β_2 , β_3 , and β_4 to be negative. Information asymmetry is lower for larger firms and higher-priced stocks because they have more publicly available information. Therefore, the coefficients on *SIZE* (β_5) and *PRICE* (β_6) should be negative. Market makers may quote higher spreads when faced with higher market risk. Thus we predict a positive association between *VOLATILITY* (β_7) and *CSPREAD*. We add an

indicator variable (*DVQ*) to control for differences in market conditions between the second and the third quarter that may lead to differences in spread changes.

Hypothesis 1b posits that the depth change around earnings announcements is positively related to corporate governance quality. Therefore, we expect the coefficients γ_1 , γ_2 , γ_3 , and γ_4 to be positive. As discussed above, large firms have lower information asymmetry; therefore, we expect the coefficient on *SIZE* (γ_5) to be positive. Market makers may also reduce the number of shares offered at a given price when faced with higher market risk. Thus we predict a negative association between *VOLATILITY* (γ_6) and *CDEPTH*. Firms with a larger number of shares outstanding have a broader investment base, which contributes to more trading volume and more liquidity trading. Therefore, we expect the coefficient on *SHARES* (γ_7) to be positively associated with market depth. A larger trading volume is likely to be associated with more shares being available at the bid and ask prices. Therefore, we expect a positive association between *VOLUME* (γ_9) and *CDEPTH*. Again, we add an indicator variable (*DVQ*) to control for any differences in depth changes between the second and third quarter.

Table 3 reports the OLS estimation results for equations [1] and [2]. As hypothesized, there is a statistically significant negative relationship between *CSPREAD* and *F1*, *F3*, and *DOHOLDINGS*, indicating that firms with higher board independence, board activity, and directors' and officers' stock holdings have lower changes in bid-ask spreads around quarterly earnings announcements. The control variable, *PRICE*, exhibits a statistically significant negative relationship with *CSPREAD*, as expected; however, *CSPREAD* is not reliably related to *SIZE* or *VOLATILITY*. Interestingly, the coefficient

on DVQ (β_9) is significantly greater than zero, indicating that changes in spread are higher for earnings announcements made in the third quarter.

Estimation results for equation [2] demonstrate that, as hypothesized, there is a statistically significant positive relationship between $CDEPTH$ and $F2$, $F3$, and $DOHOLDINGS$. These results suggest that higher levels of board effectiveness, board activity, and directors' and officers' stock holdings are associated with increased market liquidity around quarterly earnings releases. As expected, the relationship between $CDEPTH$ and the control variable $VOLATILITY$ is significantly negative and its relationship with the control variable $VOLUME$ is significantly positive. However, the coefficients on the control variables $SHARES$ and $SIZE$ do not have the expected signs.

Simultaneous Equations Estimation

The OLS estimations discussed in the previous section do not control for the contemporaneous relation between $CSPREAD$ and $CDEPTH$. Lee et al. (1993) argue that specialists revise quoted spreads and depths simultaneously to protect against the risk of loss to better-informed traders. Dupont (2000) and Kavajecz (1999) demonstrate that specialists may use spreads and depths as substitutes when dealing with information risk. To reflect the simultaneity in the specialist's decision process, we add $CDEPTH$ as an explanatory variable in equation [1] and $CSPREAD$ as an explanatory variable in equation [2], and test our hypotheses after re-estimating equations [1] and [2] as a system of simultaneous equations using two-stage least squares estimation (hereafter, 2SLS). We use all observations from the four-day event-period centered on the earnings announcement. We use $PRICE$, $SHARES$ and $VOLUME$ as instruments in our system of equations.

Results using the 2SLS models are presented in Table 4. These results are generally consistent with the OLS results. *CSPREAD* is significantly negatively related to board independence (*F1*), board activity (*F3*), and percentage of directors' and officers' stock holdings (*DOHOLDINGS*); and *CDEPTH* is significantly positively related to board effectiveness (*F2*), board activity (*F3*) and percentage of directors' and officers' stock holdings (*DOHOLDINGS*). Thus, we are able to support hypotheses H1a and H1b that market liquidity around earnings announcements is positively related to corporate governance quality.

5. Conclusions

This study examines the relationship between corporate governance quality and market liquidity around quarterly earnings announcements. Diamond (1985) and Verrecchia (2001) demonstrate that voluntary information disclosures lower information asymmetry for investors. Subsequent research finds that the effectiveness of board monitoring has a significant impact on both the quantity and quality of these disclosures; companies with higher levels of corporate governance issue more frequent and more accurate earnings forecasts (Ajinka, Bhojraj, and Sengupta, 2005) and more credible earnings (Dey, 2005). Yohn (1998) finds that more accurate earnings forecasts lower information asymmetry around earnings announcements. Higher quality corporate governance should, therefore, increase market liquidity around these announcements.

Our univariate results indicate that spread changes are significantly lower around earnings announcements for firms that have greater board independence and greater board activity. Depth changes are significantly higher for firms that have greater board

effectiveness and greater board activity. Also, depth changes are significantly higher for firms whose officers and directors own a greater percentage of company stock.

The multivariate results demonstrate that spread changes are significantly negatively related to board independence, board activity, and the percentage stock holdings of officers and directors. We also find that depth changes are significantly positively related to board effectiveness, board activity and the percentage stock holdings of officers and directors. Our results are consistent with our hypotheses and suggest that market liquidity around quarterly earnings announcements is positively related to the quality of corporate governance.

Our findings have important implications for regulators, investors, and the companies themselves. They also suggest that the recent enhancements in corporate governance required by the Sarbanes-Oxley Act of 2002, and the SEC and New York Stock Exchange, are likely to positively impact companies by increasing the market liquidity of their stocks and reducing their cost of capital.

References

- Affleck-Graves, J., C. Callahan and N. Chipalkatti. 2002. Earnings predictability, information asymmetry, and market liquidity. *Journal of Accounting Research* 40 (3): 561-583
- Ajinkya, B., S. Bhojraj and P. Sengupta. 2005. The governance role of institutional investors and outside directors on the properties of management earnings forecasts. *Journal of Accounting Research* 43 (3): 343 – 376
- Ashbaugh-Skaife, H., D.W. Collins and R. LaFond. 2005. Corporate Governance and the Cost of Equity Capital, Working Paper, University of Wisconsin.
- Atiase, R.K. 1985. Pre-disclosure information, firm capitalization, and security price behavior around earnings announcements. *Journal of Accounting Research* 23: 21-36
- Barry, C., and R. Jennings. 1992. Information and diversity of analyst opinion. *The Journal of Financial and Quantitative Analysis* 27 (2): 169-183
- Beasley, M. 1996. An empirical analysis of the relation between the board of director composition and financial statement fraud. *Accounting Review* 71: 443-465
- Coller, M. and T. Yohn. 1997. Management forecasts and information asymmetry: An examination of bid-ask spreads. *Journal of Accounting Research* 35: 181-191
- Conger, J., D. Finegold, and E. Lawler III. 1998. Appraising boardroom performance. *Harvard Business Review* 76: 136-148.
- Copeland, T. and D. Galai. 1983. Information effects on the bid-ask spread. *Journal of Finance* 38: 1457-1469
- Dey, A. 2005. Corporate governance and financial reporting credibility. Northwestern University Unpublished Working Paper
- Diamond, D. 1985. Optimal release of information by firms. *The Journal of Finance* 40: 1071-1094
- Dupont, D. 2000. Market making, prices, and quantity limits. *Review of Financial Studies* 13: 1129-1151
- Eisenberg, T., S. Sundgren, and M. Wells. 1998. Larger board size and decreasing firm value in small firms. *Journal of Financial Economics* 48: 35-54
- Fama, E. and M. Jensen. 1983. Separation of ownership and control. *Journal of Law and Economics* 26: 301-326

- Francis, J., D. Pagach, and J. Stephan. 1992. The stock market response to earnings announcements released during trading versus nontrading periods. *Journal of Accounting Research* 30 (2): 165-84
- Freeman, R. 1987. The association between accounting earnings and security returns for large and small firms. *Journal of Accounting and Economics* 9: 195-228
- Genotte, B., and B. Trueman. 1996. The strategic timing of corporate disclosures. *Review of Financial Studies* 9 (2): 665-90
- Glosten, L. and P. Milgrom. 1985. Bid, ask, and transaction prices in a specialist market with heterogeneously informed traders. *Journal of Financial Economics* 14: 71-100
- Gompers, P., J. Ishii and A. Metrick. 2003. Corporate Governance and Equity Prices. *Quarterly Journal of Economics* 118(1): 107-155
- Hermalin, B. and M. Weisbach, 1991. The effects of board composition and direct incentives on firm performance. *Financial Management* 20: 101-112
- Hermalin, B. and M. Weisbach, 2003. Boards of directors as an endogenously determined institution: A survey of the economic literature. *Federal Reserve Bank of New York Economic Policy Review* (April): 7-26
- Huang, H., G.J. Lobo and J. Zhou, 2005, To Form or Not to Form a Governance Committee. Working Paper, University of Houston.
- Herman, E. 1981 Corporate Control. Corporate Power. New York: Cambridge University Press.
- Kanagaretnam, K., G.J. Lobo and D. Whalen. 2005. Relationship between Analyst Forecast Properties and Equity Bid-Ask Spreads and Depths around Quarterly Earnings Announcements. *Journal of Business, Finance and Accounting* Volume 32, (9 & 10): 1773-1799
- Karamanou, I., and N. Vafeas. 2005. The association between corporate boards, audit committees, and management earnings forecasts: An empirical analysis. *Journal of Accounting Research* 43: 453-486
- Kavajecz, K. 1999. A specialist's quoted depth and the limit order book. *The Journal of Finance* 54 (2): 747-771
- Kim, O., and R. Verrecchia. 1994. Market liquidity and volume around earnings announcements. *Journal of Accounting and Economics* 17 (1/2): 41-67

- King, R., G. Pownall, and G. Waymire. 1992. Corporate disclosure and price discovery associated with NYSE temporary trading halts. *Contemporary Accounting Research* 8 (2): 509-531
- Klein, A. 1998. Firm performance and board committee structure. *Journal of Law and Economics* 41: 275-299
- Klien, A. 2002a. Audit committee, board of director characteristics, and earnings management. *Journal of Accounting and Economics* 33: 375-400
- Klein, A. 2002b. Economic determinants of audit committee independence. *The Accounting Review* 435-452
- Krinsky, I., and J. Lee. 1996. Earnings announcements and components of the bid-ask spread. *Journal of Finance* 51 (4): 1523-35
- Kyle, A. 1985. Continuous auctions and insider trading. *Econometrica* 53: 1315-1335
- Lang, M., and R. Lundholm. 1993. Cross-sectional determinants of analyst ratings of corporate disclosures. *Journal of Accounting Research* 31: 246-271
- 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): 345-74
- Libby, T., R. Mathieu, S. Robb. 2002. Earnings announcements and information asymmetry: An intra-day analysis. *Contemporary Accounting Research* 19 (3):449-472
- Libby, T., R. Mathieu, S. Robb. 2003. Information risk and earnings announcements: The effect of director monitoring. Wilfred Laurier University Unpublished Working Paper
- Lobo, G., and J. Zhou. 2001. Disclosure quality and earnings management. *Asia-Pacific Journal of Accounting & Economics* 8 (1): 1-20
- Mann, S., and P. Ramanlal. 1996. The dealers' price/size quote and market liquidity. *The Journal of Financial Research* 19 (2) 243-271
- McConnell, J. and H. Servaes. 1990. Additional evidence on equity ownership and corporate value. *Journal of Financial Economics* 27: 595-612
- Morck, R., A. Shleifer, and R. Vishny. 1988. Management ownership and market valuation: An empirical analysis. *Journal of Financial Economics* (20): 293-315
- Morse, D. and N. Ushman. 1983. The effect of information announcements on the market microstructure. *The Accounting Review* 71 (4): 467-492

Richardson, V. 2000. Information asymmetry and earnings management: Some evidence. *Review of Quantitative Finance and Accounting* 15 (4): 325-347

Roulstone, D. 2003. Analyst following and market liquidity. *Contemporary Accounting Research* 20 (3) 551-578

Shleifer, A. and R. Vishny. 1997. A survey of corporate governance. *Journal of Finance* 52: 737-783

Vafeas, N. 2000. Board structure and the informativeness of earnings. *Journal of Accounting and Public Policy* 19 (2):139-160

Venkatesh, P. and R. Chiang. 1986. Information asymmetry and the dealer's bid-ask spread: A case study of earnings and dividend announcements. *The Journal of Finance* 41 (5): 1089-1102

Verrecchia, R. 2001. Essays on disclosure. *Journal of Accounting and Economics* 32: 97-180

Warfield, T.D, J.J. Wild and K.L. Wild. 1995. Managerial ownership, accounting choices, and informativeness of earnings. *Journal of Accounting and Economics* 20: 61-91

Welker, M. 1995. Disclosure policy, information asymmetry, and liquidity in equity markets. *Contemporary Accounting Research* 11 (2): 801-827

Xie, B., W. Davidson and P. DaDalt. 2003. Earnings management and corporate governance: The role of the board and the audit committee. *Journal of Corporate Finance* 9: 295-316

Yermack, D. 1996. Higher market valuation of companies with a small board of directors. *Journal of Financial Economics* 40: 185-212

Yohn, T.L. 1998. Information asymmetry around earnings announcements. *Review of Quantitative Finance and Accounting* 11 (2): 165-82

TABLE 1
Descriptive Statistics and Correlations

Panel A: Descriptive Statistics (2,027 observations)

<i>Variable</i>	<i>Mean</i>	<i>Median</i>	<i>Standard Deviation</i>	<i>25%</i>	<i>75%</i>
<i>CSPREAD</i>	0.02473	0.0124	0.1238	-0.0349	0.0758
<i>CDEPTH</i>	-5.2083	-4.1960	59.9133	-29.5127	17.293
<u>Board Independence Factor (F1)</u>					
<i>PCTONBD</i>	65.0545	66.7000	17.3901	54.5000	77.8000
<i>PCTONAUD</i>	83.8449	100.000	20.5118	66.7000	100.000
<i>REL</i>	0.33004	0.00000	0.47034	0.0000	1.0000
<i>F1</i>	122.5177	129.0924	28.2737	103.937	146.563
<u>Board Effectiveness Factor (F2)</u>					
<i>BDSIZE</i>	10.3453	10.0000	2.4586	9.0000	12.0000
<i>COMM</i>	1.7454	2.00000	0.96295	1.0000	2.0000
<i>RETAGE</i>	0.12827	0.00000	0.33447	0.0000	1.0000
<i>F2</i>	8.8194	8.66200	2.2135	7.247	10.120
<u>Board Activity Factor (F3)</u>					
<i>NUMBDMTG</i>	7.4376	7.0000	2.6183	6.0000	7.0000
<i>NCMTGAUDIT</i>	3.5841	3.0000	1.6973	2.0000	4.0000
<i>F3</i>	8.3387	8.2580	2.5690	6.646	9.718
<i>DOHOLDINGS</i>	6.2480	2.90000	8.0543	1.4000	7.4000
<i>PRICE</i>	35.4868	30.0313	23.4483	20.1298	45.4917
<i>SIZE</i>	8.2099	8.0633	1.4928	7.0935	9.1016
<i>SHARES</i>	317.7777	103.6220	823.884	51.040	249.508
<i>VOLUME</i>	13.0803	13.0425	1.4550	12.1270	14.0486
<i>VOLATILITY</i>	0.1286	0.1216	0.0446	0.0969	0.1461

Variable Definitions:

- CSPREAD* = difference between the average percentage spread for each of the four days in the announcement period and the benchmark period average
- CDEPTH* = difference between the average depth for each of the four days in the announcement period and the benchmark period average
- PCTONBD* = the percentage of independent directors on the board
- PCTONAUD* = the percentage of independent directors on the audit committee
- REL* = Outside directors with personal or business relationship. This variable takes the value of “+1”, if outside directors outside have any business relationship/ family relationship/ other financial relations.

BDSIZE = Board size
COMM= Existence of independent nominating, corporate governance and executive committees. This variable takes the value of “+3”, if the board has separate nominating, corporate governance, executive committees; takes the value of “+2” if the board has two of them; “+1” if the board has one of them; “0” if the board has none of them.
RETAGE= retirement age of board of directors. This variable takes the value of “+1” if the retire age of the directors is over 72 years
NUMBDMTG= the number of board meetings held during the fiscal year
NCMTGAUDIT= the number of audit committee meetings held during the fiscal year
DOHOLDINGS= percentage holdings of directors and officers,
PRICE = daily average stock price
SIZE = natural logarithm of firm’s total assets at the end of the second / third quarter
SHARES = number of shares outstanding (in millions) at the end of the second / third quarter
VOLUME= natural logarithm of trading volume on each event day
VOLATILITY= stock returns volatility based on standard deviation of past 12 months stock returns.

TABLE 1 (Continued)

Panel B: Correlations between Market Liquidity Measures and Governance Variables (2,027 Observations)

	<i>CSPREAD</i>	<i>CDEPTH</i>	<i>F1</i>	<i>F2</i>	<i>F3</i>	<i>DOHOLDINGS</i>	<i>SIZE</i>	<i>PRICE</i>	<i>SHARES</i>	<i>VOLUNE</i>	<i>VOLATILITY</i>
<i>CSPREAD</i>	1.000	-0.182 (<0.001)	-0.049 (0.027)	-0.036 (0.110)	-0.116 (<0.001)	-0.011 (<0.614)	-0.093 (<0.001)	-0.121 (<0.001)	-0.027 (0.222)	-0.006 (0.800)	0.016 (0.479)
<i>CDEPTH</i>		1.000	-0.014 (0.542)	0.012 (0.582)	0.075 (0.001)	0.047 (0.034)	0.065 (0.003)	0.086 (<0.001)	-0.019 (0.400)	0.131 (<0.001)	0.002 (0.937)
<i>F1</i>			1.000	0.263 (<0.001)	0.157 (<0.001)	-0.410 (<0.001)	0.046 (0.038)	0.091 (<0.001)	-0.047 (0.0333)	-0.005 (0.820)	-0.195 (<0.001)
<i>F2</i>				1.000	0.197 (<0.001)	-0.315 (<0.001)	0.410 (<0.001)	0.145 (<0.001)	0.290 (<0.001)	0.290 (<0.001)	-0.234 (<0.001)
<i>F3</i>					1.000	-0.172 (<0.001)	0.134 (<0.001)	0.009 (0.682)	0.144 (<0.001)	0.145 (<0.001)	0.041 (0.068)
<i>DOHOLDINGS</i>						1.000	-0.238 (<0.001)	-0.151 (<0.001)	-0.145 (<0.001)	-0.224 (<0.001)	0.166 (<0.001)
<i>SIZE</i>							1.0000	0.599 (<0.001)	0.614 (<0.001)	0.802 (<0.001)	-0.179 (<0.001)
<i>PRICES</i>								1.000	0.240 (<0.001)	0.373 (<0.001)	-0.2002 (<0.001)
<i>SHARES</i>									1.0000	0.467 (<0.001)	-0.090 (<0.001)
<i>VOLUME</i>										1.0000	0.0706 (0.002)
<i>VOLATILITY</i>											1.0000

Notes to Table 1, Panel B:

1. All variables are defined in Table 1, Panel A.
2. p-values denoting significance of correlation coefficients are in parentheses.

Table 2
Mean Differences in Spreads and Depths between Firms with High and Low
Board Quality Measures

Panel A: Mean differences in spreads and depths based on Board Independence factor (F1)

	<i>High F1</i>	<i>Low F1</i>	<i>Difference</i>
<i>CSPREAD</i>	0.0228 (0.1129)	0.0342 (0.1487)	-0.0114**
N	671	673	
<i>CDEPTH</i>	-8.3534 (59.53)	-4.2166 (66.38)	-4.1368
N	671	673	

Panel B: Mean differences in spreads and depths based on percentage Board effectiveness factor (F2)

	<i>High F2</i>	<i>Low F2</i>	<i>Difference</i>
<i>CSPREAD</i>	0.0202 (0.0895)	0.0296 (0.1503)	-0.0094
N	676	690	
<i>CDEPTH</i>	-1.3264 (64.24)	-6.4697 (67.49)	5.1433**
N	676	690	

Panel C: Mean differences in spreads and depths based on Board Activity factor (F3)

	<i>High F3</i>	<i>Low F3</i>	<i>Difference</i>
<i>CSPREAD</i>	0.0082 (0.1247)	0.0369 (0.1289)	-0.0287***
N	700	679	
<i>CDEPTH</i>	-0.0172 (66.29)	-5.5730 (51.45)	5.5558***
N	700	679	

Panel D: Mean differences in spreads and depths based on Directors' and Officers' Holdings (DOHOLDINGS)

	<i>High DOHOLDINGS</i>	<i>Low DOHOLDINGS</i>	<i>Difference</i>
<i>CSPREAD</i>	0.0275 (0.1520)	0.0228 (0.0910)	0.0047
N	674	673	
<i>CDEPTH</i>	-1.3890 (56.94)	-6.8283 (63.05)	5.4393***
N	674	673	

Notes:

1. Sample size equals 2,027 firm-day observations.

2. Variable Definitions:

CSPREAD = difference between the average percentage spread for each of the four days in the announcement period and the benchmark period average
CDEPTH = difference between the average depth for each of the four days in the announcement period and the benchmark period average

3. Standard errors are shown in parentheses.

4. The High (Low) classification represents values of top (bottom) third of value for the variable in each quarter.

4. *** significant at 0.01 level, ** significant at 0.05 level. Significance levels are based on one-tailed tests when the coefficient sign is predicted and on two-tailed tests otherwise.

TABLE 3
Ordinary Least Squares Regressions of Changes in Spreads and Depths
On Measures of Board Quality (n= 2,027)

<i>Dependent Variable</i>	<i>Spread (CSPREAD)</i>			<i>Depth (CDEPTH)</i>		
	<i>Sign</i>	<i>Coefficient</i>	<i>t value</i>	<i>Sign</i>	<i>Coefficient</i>	<i>t value</i>
<i>INTERCEPT</i>	?	0.11590	4.46***	?	-104.56	-6.46***
<i>F1</i>	-	-0.00020	-1.90**	+	-0.0143	-0.27
<i>F2</i>	-	-0.00026	-0.17	+	1.8195	2.47***
<i>F3</i>	-	-0.00568	-5.15***	+	2.4484	4.62***
<i>DOHOLDINGS</i>	-	-0.00106	-2.74***	+	0.5879	3.16***
<i>SIZE</i>	-	-0.00035	-0.13	+	-10.7572	-7.09***
<i>VOLATILITY</i>	+	-0.02319	-0.37	-	-84.9818	-2.73***
<i>DVQ</i>	?	0.03399	6.32***	?	-3.7706	-1.46
<i>PRICE</i>	-	-0.00064	-5.13***			
<i>SHARES</i>				+	-0.0052	-2.76***
<i>VOLUME</i>				+	12.5162	10.28***
F-Value		13.59			14.92	
Adjusted R ²		4.74%			5.83%	

Notes:

1. Variable Definitions:

- CSPREAD* = difference between the average percentage spread for each of the four days in the announcement period and the benchmark period average
- CDEPTH* = difference between the average depth for each of the four days in the announcement period and the benchmark period average
- F1*= board independence factor
- F2*= board effectiveness factor
- F3*= board activity factor
- DOHOLDINGS*= percentage holdings of directors and officers
- PRICE* = daily average stock price
- SIZE* = natural logarithm of firm's total assets at the end of the second / third quarter
- SHARES* = number of shares outstanding (in millions) at the end of the second / third quarter
- VOLUME*= natural logarithm of trading volume on each event day
- VOLATILITY*= stock returns volatility based on standard deviation of past 12 months stock returns
- DVQ*= an indicator variable that equals one for the third quarter

2. *** significant at 0.01 level, ** significant at 0.05 level, * significant at 0.10 level. Significance levels are based on one-tailed tests when the coefficient sign is predicted and on two-tailed tests otherwise.

TABLE 4
Two-Stage Least Squares Regressions of Changes in Spreads and Depths on
Measures of Board Quality (n= 2027)

<i>Dependent Variable</i>	<i>Spread (CSPREAD)</i>			<i>Depth (CDEPTH)</i>		
	<i>Sign</i>	<i>Coefficient</i>	<i>t value</i>	<i>Sign</i>	<i>Coefficient</i>	<i>t value</i>
<i>INTERCEPT</i>	?	0.11419	4.11***	?	-85.628	-4.59***
<i>F1</i>	-	-0.00020	-1.84**	+	-0.0250	-0.45
<i>F2</i>	-	-0.00030	-0.19	+	1.9889	2.52***
<i>F3</i>	-	0.00570	-5.21***	+	2.5540	4.49***
<i>DOHOLDINGS</i>	-	-0.00105	-2.75***	+	0.5930	2.98***
<i>RDEP</i>	-	-0.00050	-0.41			
<i>RSPR</i>				-	-282.36	-2.74***
<i>SIZE</i>	-	0.00075	-0.27	+	-11.182	-6.85***
<i>VOLATILITY</i>	+	-0.02580	-0.41	-	-66.019	-1.94**
<i>DVQ</i>	?	-0.03397	6.37***	?	-3.3304	-1.20
<i>PRICE</i>	-	-0.00052	-1.63*			
<i>SHARES</i>				+	-0.0053	-2.65**
<i>VOLUME</i>				+	11.5864	8.60***
<hr/>						
F-Value		12.32			6.23	
Adjusted R ²		4.80%			3.00%	

Notes:

1. Variable Definitions:

- CSPREAD* = difference between the average percentage spread for each of the four days in the announcement period and the benchmark period average
- CDEPTH* = difference between the average depth for each of the four days in the announcement period and the benchmark period average
- F1*= board independence factor
- F2*= board effectiveness factor
- F3*= board activity factor
- DOHOLDINGS*= percentage holdings of directors and officers
- PRICE* = daily average stock price
- SIZE* = natural logarithm of firm's total assets at the end of the second / third quarter
- SHARES* = number of shares outstanding (in millions) at the end of the second / third quarter
- VOLUME*= natural logarithm of trading volume on each event day.
- VOLATILITY*= stock returns volatility based on standard deviation of past 12 months stock returns
- DVQ*= an indicator variable that equals one for the third quarter

2. *** significant at 0.01 level, ** significant at 0.05 level, * significant at 0.10 level. Significance levels are based on one-tailed tests when the coefficient sign is predicted and on two-tailed tests otherwise.

Appendix 1: Description of Factor Analysis

Descriptive Statistics of variables used in Factor Analysis

	N	Minimum	Maximum	Mean	Std. Deviation
BDSIZE	2280	5.00	17.00	10.3246	2.49790
PCTONBD	2280	10.00	91.70	65.0265	17.57159
PCTONAUD	2280	.00	100.00	84.1163	20.45882
relation	2280	.00	1.00	.3351	.47212
committee	2280	.00	3.00	1.7491	.96914
retage	2280	.00	1.00	.1351	.34189
NUMBDMTG	2280	3.00	19.00	7.4684	2.64299
NCMTGAUDIT	2280	.00	16.00	3.5789	1.73595
Valid N (listwise)	2280				

Kaiser-Meyer-Olkin measure of sampling adequacy

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.662
Bartlett's Test of Sphericity	Approx. Chi-Square	3149.221
	df	28
	Sig.	.000

The KMO measure is 0.662, indicating that it's reasonable to go ahead with the factor analysis.

Percentage of variance explained and screen plot

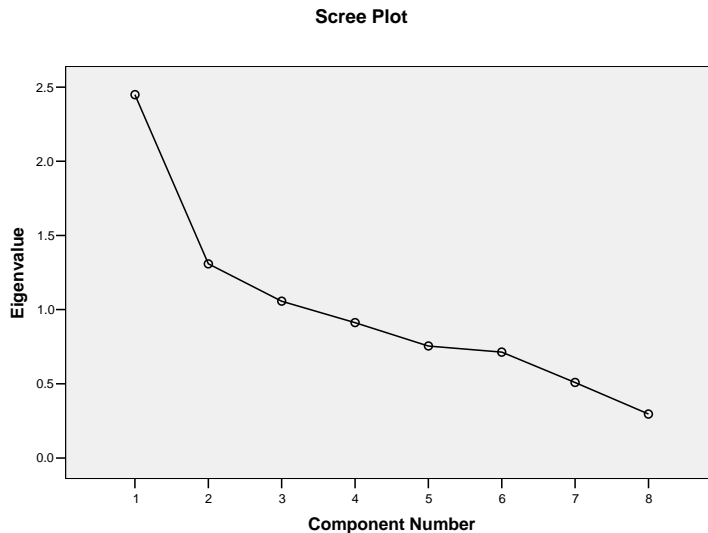
Total Variance Explained

Component	Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.449	30.611	30.611	1.978	24.724	24.724
2	1.309	16.357	46.968	1.599	19.985	44.708
3	1.057	13.211	60.179	1.238	15.471	60.179

Extraction Method: Principal Component Analysis.

We use **Principle Components Analysis**. In the Total column, you will see the variance explained by each factor. The factors are arranged in decreasing order of variance explained. The column labeled “ % of variance” is the percentage of the total variance attributable to each factor.

Eigenvalue-greater-than one criteria:



This is a plot of the total variance associated with each factor. The plot shows a distinct break between the steep slope of the large factors and the gradual trailing off of the rest of the factors, the scree that forms at the foot of a mountain. We use only the factors before the scree begins. In our case, it appears that three factors may be adequate.

Variables and factors

Component Matrix (a)

	Component		
	1	2	3
BDSIZE	.475	.582	-.172
PCTONBD	.819	-.340	-.041
PCTONAUD	.659	-.467	.102
NCMTGAUDIT	.392	.495	.379
relation	-.490	.447	.000
committee	.753	.263	-.181
retage	.305	.294	-.509
NUMBDMTG	.251	.189	.762

The coefficients are called factor loadings because they tell you how much weight is assigned to each factor for each variable.

Rotation: Making factors easier to interpret.

We use Varimax orthogonal rotation method to minimize the number of variables that have high loadings on a factor so that the factors can be interpreted more easily.

Rotated Component Matrix(a)

	Component		
	1	2	3
BDSIZE	-.015	.729	.248
PCTONBD	.844	.264	.078
PCTONAUD	.809	.017	.096
NCMTGAUDIT	-.003	.339	.654
relation	-.663	.011	.036
committee	.392	.686	.192
retage	.026	.626	-.213
NUMBDMTG	.099	-.137	.806

Rotated component matrix with small coefficients suppressed

	Component		
	1	2	3
BDSIZE		.729	
PCTONBD	.844		
PCTONAUD	.809		
NCMTGAUDIT			.654
relation	-.663		
committee		.686	
retge		.626	
NUMBDMTG			.806

For each factor, individual variables with absolute values of the loadings exceeding 0.60 are retained.