Market liquidity around earnings announcements

Pronk, M.

Publication date:
2002

Document Version
Publisher's PDF, also known as Version of record

CentER

Market Liquidity aroun
Earnings Announcement

Maarten Pronk

Market Liquidity
around
Earnings Announcements

Market Liquidity
around
Earnings Announcements

Proefschrift

ter verkrijging van de graad van doctor aan de Universiteit van Tilburg op gezag van de rector magnificus, prof.dr. F.A. van der Duyn Schouten, in het openbaar te verdedigen ten overstaan van een door het college voor promoties aangewezen commissie in de aula van de Universiteit op vrijdag 8 november 2002 om 14.15 uur door

Maarten Pronk

geboren op 29 april 1974 te Ridderkerk

Promotores: Prof.dr. D.V. DeJong

Prof.dr. G.M.H. Mertens

'Unless the LORD builds the house, they labor in vain who build it; unless the LORD guards the city, the watchman stays awake in vain.' (Psalm 127:1)

To my father Maarten Pronk

PREFACE

One of the things I learned as a Ph.D. student is that research is an interactive process. Feedback by fellow academics is necessary to make progress. I benefited from many advices, comments and suggestions. Therefore, I would like to express my gratitude to those who contributed to my dissertation.

First of all, I would like to thank my supervisors Doug DeJong and Gerard Mertens. Doug explained the importance of Ph.D. courses, stimulated me to visit the University of Iowa, stressed the importance of an international academic network and commented quickly and thoroughly on all versions of my papers. In other words, he is largely responsible for my academic education over the last five years. On top of that, I am grateful for all pleasant non-academic meetings and talks we had. Gerard's major contribution lies in the field of motivation. He asked me to become a Ph.D. student, created a pleasant working atmosphere at Tilburg University and stimulated me all the way long. I also enjoyed our participation in the research project of the Limperg Institute into the quality of financial reporting in the Netherlands.

Part of the research was undertaken at the University of Iowa. I am grateful to the accounting faculty and Ph.D. students there for the great time and enriching experience. Our neighbours and friends in Iowa City changed this challenging time into an exciting period. I gratefully acknowledge financial support from The Netherlands Organization for Scientific Research for these visits (NWO R46-404 and R46-435).

My colleagues at Tilburg University contributed to my dissertation too, by their advice and by creating a stimulating research environment. I am also indebted to Peter Easton, Terry Warfield and Mort Pincus for their comments on my research as well as the participants of the seminars at Erasmus University Rotterdam, Lancaster University, London Business School, Nijenrode University, University of Antwerp, University of Iowa, and participants of the PWC 2000 Doctoral Colloquium. Finally, I would like to thank the members of my committee, in addition to those already mentioned: Willem Buijink, Theo Nijman and Arthur van Soest, for the approval of this thesis.

This dissertation closes a period of five years as a Ph.D. student. However, writing this preface also feels like closing a part of my life. A period with ups and

downs. A clear up was my marriage to Karin in July 1999. Every day I enjoy her decision to share her life with me. A big loss was the sudden death of my father in November 1999, as he was an important person in my life. He was companionable and he was always interested in my activities. I have great memories of the time we shared together. As an expression of my gratitude I dedicate this thesis to him.

Maarten Pronk
September 2002

CONTENTS

CHAPTER 1

INTRODUCTION

1.1 Introduction

Market liquidity drops around earnings announcements. Lee, Mucklow and Ready (1993) (hereafter LMR) present evidence that bid-ask spreads are higher and depths are lower during trading hours around earnings announcements than during non-announcement periods. Investors dislike this drop, because market liquidity is one of the most important characteristics that investors look for in an organized financial market. Market liquidity relates to the ability to buy or sell significant quantities of a security quickly, anonymously, and with relatively little price impact. Low market liquidity has a negative impact on the demand for shares and the share price. This reduced share price relates to a higher cost of equity capital. Therefore, it is important to explore the drop in market liquidity around earnings announcements.

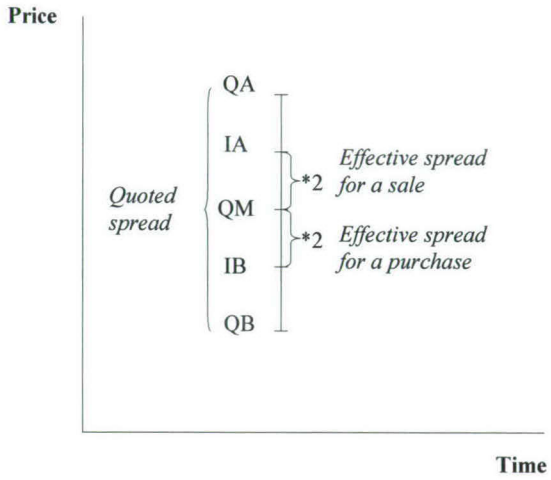
This thesis investigates two important aspects of this drop in market liquidity, namely (a) the ability of management to mitigate the drop in market liquidity around earnings announcements by using their discretion to announce the earnings news during non-trading instead of trading hours and (b) the conjecture that the drop in market liquidity before earnings announcements relates to the richness of the information environment. Before discussing these topics in more detail in section 1.3 and 1.4, I explain the notion of market liquidity and the behavior of the (adverse selection component of the) bid-ask spread and depth around earnings announcements. Section 1.5 positions the thesis within finance and financial accounting research and section 1.6 provides the outline of this thesis.

1.2 Market liquidity around earnings announcements

To maintain liquidity, many organized exchanges use market makers, individuals who stand ready to buy or sell whenever investors wish to sell or buy. In return for providing liquidity, market makers are granted monopoly rights by the exchange to post different prices for purchases and sales: they buy at the bid price and sell at a higher ask price. As figure 1.1 shows, the quoted bid-ask spread is the difference between the quoted bid and ask price. It is possible that traders negotiate with the market maker about the bid or ask price. Therefore, market makers sometimes buy at

a price that is higher than the quoted bid price and sell at a price that is lower than the quoted ask price. The effective bid-ask spread takes this possibility into account and is calculated as two times the absolute value of the difference between the quote midpoint (average of the bid and ask price) and the bid or ask price for a purchase or sale, respectively.

Figure 1.1 Bid-ask spreads

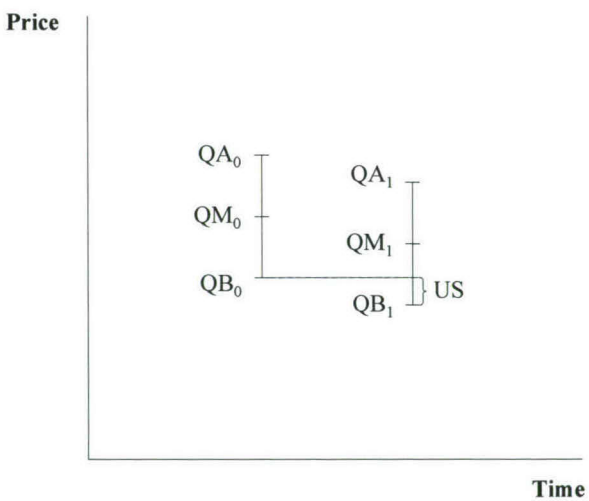


This figure demonstrates the quoted and effective bid-ask spread. QA represents the quoted ask price, IA the inside ask price, QM the quote midpoint, IB the inside bid price and QB the quoted bid price.

Extant market microstructure literature shows that the bid-ask spread consists of three components: order processing costs, inventory holding costs, and adverse selection costs. The order processing cost component represents a fee charged by market makers for standing ready to match buy and sell orders (Tinic 1972). The inventory holding cost component compensates dealers for managing the inventory (Stoll 1978, Ho and Stoll 1981). Finally, the adverse selection component represents a reward to market makers for taking on the risk of dealing with traders who may possess superior information (Copeland and Galai 1983, Glosten and Milgrom 1985). When, for example, an investor knows before an earnings announcement that the earnings are far lower than expected, (s)he will sell shares to the market maker. After the information arrival both the bid and ask price drop. As figure 1.2 indicates, the market maker bought the shares at a high bid price (QB_0) and has to sell the shares at

a low ask price (QA_1). Therefore, the market maker earns only part of the bid-ask spread. Similarly, when an investor knows before the announcement that the earnings are higher than expected (s)he will buy shares. After the information arrival the bid and ask price go up and the market maker misses the return on the shares because (s)he already sold the shares. In other words, when investors possess private information, market makers are missing part of the spread or part of the return because they have the obligation to trade. To compensate themselves for these missed revenues, market makers increase the bid-ask spread. As a result, market makers earn more when they trade with traders without private information. These additional revenues compensate for the missed spreads and missed returns while trading with informed investors. The higher the probability of informed trading is, the higher the adverse selection component and, thus, the bid-ask spread.

Figure 1.2 Adverse selection component



This figure illustrates the unrealized spread due to informed trading. QA represents the quoted ask price, QM the quote midpoint, QB the quoted bid price and US the unrealized spread due to informed trading.

LMR state that the bid-ask spread is only one dimension of market liquidity. The other dimension is the depth: the number of shares market makers are willing to trade at the quoted bid and ask prices, respectively. Market makers may declare the depth strategically to protect themselves against informed trading. When a market

maker quotes a large depth, an informed investor can trade many shares at one time against the quoted bid or ask price. However, when the market maker declares a small depth, the informed investor can only trade small portions at a time. After each trade, the market maker has the opportunity to change the bid and ask prices. Therefore, the market maker may lose less money before discovering the implications of new information for the fundamental share price. Thus, when the probability of informed trading increases, the spread and adverse selection component are expected to increase and the depth is expected to decrease.

Days around earnings announcements constitute a period in which market makers may experience an increased probability of informed trading. LMR mention three reasons why the information asymmetry between market makers and informed investors may increase just *before* an earnings release, namely: (a) a higher probability of leakage of value relevant information when earnings are known to the company, (b) the possibility that the officially filed information reaches investors earlier than market makers, and (c) the expectation of imminent earnings news may stimulate some traders to search for information immediately prior to the announcement. Kim and Verrecchia (1991, 1994) and McNichols and Trueman (1994) provide analytical evidence on this issue. LMR show that market makers indeed increase spreads and decrease depths before daytime earnings announcements. Additionally, Krinsky and Lee (1996) (hereafter KL) present evidence that the adverse selection component of the spread is significantly higher before daytime earnings announcements than during the non-announcement period. This suggests that market makers are facing an increased probability of informed trading.

Market makers may also face an increased probability of informed trading *after* earnings announcements. Kim and Verrecchia (1994) and Livne (2000) model this situation. Their basic idea is that some investors gather private information through their superior capacities to interpret earnings news. Another argument is that earnings news is revealed in pieces and informed trading takes place when this information reaches investors earlier than market makers. For example, the earnings number may hit the news wire first, followed by the income statement and balance sheet, while detailed information is revealed later during the day. LMR and KL present empirical evidence on this issue and show that the spread and adverse selection component are higher during trading hours after daytime earnings announcements than during the non-announcement period.

1.3 The impact of intraday timing of earnings announcements on market liquidity

As discussed in the previous sections, empirical literature indicates that market liquidity drops around earnings announcements. Investors dislike this drop, because market liquidity is one of the most important characteristics that investors look for in an organized financial market. Even though the period around earnings announcements is a short interval, the impact of the market liquidity drop may be severe, because this period is known for its high trading volume (Morse (1981), Bamber (1986)). Therefore, it is important for management of listed firms to be aware of actions that might reduce the decline in market liquidity around earnings announcements.

The first essay investigates intraday timing of earnings releases as a way of mitigating the drop in market liquidity around these announcements. There are several reasons to expect that intraday timing of earnings announcements influences the probability of informed trading and, therefore, the change in bid-ask spreads and depths around these announcements. The probability of informed trading increases *before* earnings announcements during trading hours ('daytime' announcements) because investors are more motivated to search for private information and because the public announcement may reach investors earlier than market makers. This second threat, however, does not exist for announcements during non-trading hours ('overnight' announcements). In addition, Livne (2001) shows analytically that investors with private information trade less aggressively before overnight than daytime announcements. This suggests that the increase in the probability of informed trading is smaller before overnight releases.

The intraday timing may also influence the probability of informed trading *after* earnings announcements. When the earnings are released overnight, investor do not need to react immediately on the news and can research the data before making a trading decision. In addition, when the information is revealed in pieces before opening of the market, investors can also use this additional information in their decision process. On the NYSE and AMEX investors can submit orders before opening of the market. When the submitted orders reflect the earnings news, the opening price will capture the released information and the probability is smaller that market makers will loose money to investors with private information after opening of the market. Even when the order flow does not reflect the earnings news, market

makers can still set the opening price conditional on the release when they check news wires before the opening of the market. Based on these arguments, I hypothesize that the percentage deviation of the spread from the median spread during the non-announcement period is larger and the percentage deviation of the depth is smaller *before* and *after* daytime announcements relative to overnight announcements.

The sample consists of 1000 daytime and 1802 overnight earnings announcements declared between 1993 and 1996 by 336 firms traded at the NYSE or AMEX. The results show that percentage deviations of quoted and effective spreads are significantly larger and percentage deviations of depths are smaller *after* 'daytime' announcements compared to 'overnight' announcements. This suggests that intraday timing is possibly a way to mitigate the drop in market liquidity after earnings announcements.

1.4 The impact of the information environment on the drop in market liquidity before earnings announcements

The second essay investigates the drop in market liquidity *before* earnings announcements. So far, no evidence exists whether market makers adjust spreads and depths for all firms to the same extent or condition the market liquidity drop on firm-specific factors. I investigate the conjecture that this drop in market liquidity relates to the richness of the information environment. A rich information environment means that more information is publicly available and captured in the share price. Therefore, a smaller price reaction is expected at the earnings announcement and this reduces investor's incentives to search for private information. In addition, even when investors search for and find private information, the loss to the market maker might be smaller, because the expected price reaction to new information is smaller. I use three proxies for the information environment, namely disclosure quality, the occurrence of management earnings forecasts and the number of analysts forecasting the earnings news.

The data set contains 2802 earnings announcements made between 1993 and 1996 by 336 firms that are traded at the NYSE or AMEX. The analysis provides some evidence on the impact of the information environment on the market liquidity drop before earnings announcements by showing that the occurrence of management earnings forecasts affects the change in depths. However, I do not find a robust relationship between the information environment variables and the change in (the

adverse selection component of) spreads. One explanation for this lack of results is that market makers do not believe that the information environment affects the probability of informed trading before earnings announcements and, therefore, do not condition on these variables. Another explanation is that the drop in market liquidity is too small to show cross-sectional differences.

1.5 Positioning of the essays within finance and financial accounting research

The essays can be positioned in both finance and financial accounting research. Within finance, my research relates to market microstructure literature. This area of research investigates trading systems and price formation processes on capital markets. My thesis contributes to this literature in two ways. First, I investigate the impact of information releases during trading and non-trading hours and show that announcing news during a non-trading period improves market liquidity. Second, I explore the information set that market makers use to infer the probability of informed trading before earnings announcements.

Alternatively, my thesis can be viewed from a financial accounting perspective, because it contributes to disclosure-related capital market research. This research area uses capital markets to provide evidence on the relevance of supplying information to investors. Overall, two sets of capital market variables are investigated, namely (a) share prices and returns, and (b) bid-ask spreads and depths. An example of the first category is the study by Healy, Hutton and Palepu (1999). They find that firms that expand disclosure experience significant contemporaneous increases in stock prices that are unrelated to current earnings performance. Other papers focus on bid-ask spreads and depths because, as discussed in section 1.2, these variables are related to the information asymmetry on capital markets. While the reduction of information asymmetry is an aim of disclosure, this research design provides direct evidence on the impact of information supply on uncertainty on capital markets. Welker (1995) documents, for example, a significant negative relation between analysts' ratings of firms' disclosures and bid-ask spreads, while Coller and Yohn (1997) provide evidence on the impact of management earnings forecasts on spreads and depths. My thesis contributes to this area by investigating whether disclosure also affects the change in bid-ask spreads and depths before earnings announcements and by documenting that the timing of announcements impacts uncertainty on capital markets.

1.6 Outline of the thesis

Chapter 2 presents the investigation of the impact of intraday timing of earnings announcements on market liquidity, while chapter 3 contains the essay on the impact of the information environment on the drop in market liquidity before earnings announcements. Chapter 4 summarizes the thesis and proposes some themes for future research. Note that the essays in chapter 2 and 3 are self-contained. Therefore, it is unavoidable that some overlap exists between the chapters of this thesis.

CHAPTER 2

THE IMPACT OF INTRADAY TIMING OF EARNINGS ANNOUNCEMENTS ON MARKET LIQUIDITY

2.1 Introduction

Market liquidity drops around earnings announcements. Lee, Mucklow and Ready (1993) (hereafter LMR) present evidence that bid-ask spreads are higher and depths are lower during trading hours around earnings announcements than during non-announcement periods. Investors dislike this drop, because market liquidity is one of the most important characteristics that investors look for in an organized financial market. Market liquidity relates to the ability to buy or sell significant quantities of a security quickly, anonymously, and with relatively little price impact. Low market liquidity impacts the demand for shares and the share price negatively. This reduced share price relates to a higher cost of equity capital. Even though the period around earnings announcements is a short interval, the impact of the market liquidity drop may be severe, because this period is known for its high trading volume (Morse 1981, Bamber 1986). It is of great importance for management of listed firms to understand the relevance of the market liquidity drop and to be aware of actions that might reduce this decline.

This essay investigates the intraday timing of earnings announcements as a way of mitigating the drop in market liquidity around earnings announcements. Several analytical papers show that market liquidity drops before and after earnings announcements because market makers are concerned about an increase in the probability of informed trading (Kim and Verrecchia 1991, 1994, Livne 2000 and McNichols and Trueman 1994). There are several reasons to expect that the intraday timing of earnings announcements influences this probability of informed trading and, therefore, the change in the bid-ask spread and depth. The probability of informed trading increases *before* earnings announcements during trading hours ('daytime' announcements) because investors are more motivated to search for private information and because the public announcement may reach investors earlier than market makers. This second threat, however, does not exist for announcements during non-trading hours ('overnight' announcements). In addition, Livne (2001) shows analytically that investors with private information trade less agressively before

overnight than daytime announcements. This suggests that the increase in the probability of informed trading is smaller before overnight releases.

The intraday timing may also influence the probability of informed trading *after* earnings announcements. When the earnings are released overnight, investors do not need to react immediately on the news and can research the data before making a trading decision. In addition, when the information is revealed in pieces before opening of the market, investors can also use this additional information in their decision process. On the New York Stock Exchange (NYSE) and American Stock Exchange (AMEX) investors can submit orders before opening of the market. When the submitted orders reflect the earnings news, the opening price will capture the released information and the probability is smaller that market makers will loose money to investors with private information after opening of the market. Even when the order flow does not reflect the earnings news, market makers can still set the opening price conditional on the release when they check news wires before the opening of the market. Based on these arguments I hypothesize that the percentage deviation of the spread from the median spread during the non-announcement period is larger and the percentage deviation of the depth is smaller *before* and *after* daytime announcements relative to overnight announcements.

The sample consists of 1000 daytime and 1802 overnight earnings announcements declared between 1993 and 1996 by 336 firms traded at the NYSE or AMEX. Relative to overnight releases, the results show that daytime releases relate, on average, to significantly larger percentage deviations of the quoted and effective spread from the median during the non-announcement period and lower percentage deviations of the depth *after* earnings announcements. This suggests that intraday timing is possibly a way to mitigate the drop in market liquidity *after* earnings announcements. Sensitivity tests reveal that these findings are robust to firm-specific factors and cross-listings, and that there is no difference in the information content of daytime and overnight announcements in the sample. In fact, I find no evidence of a drop in market liquidity after *overnight* earnings announcements at all. LMR state that a valid conjecture about a decrease in market liquidity can only be made when spreads increase and depths do not rise or when depths decrease and spreads do not decline, simultaneously. However, after overnight earnings announcements the quoted spread and depth are both significantly larger than during the non-announcement period. Thus, one dimension of market liquidity (quoted spread) signals a decrease in

liquidity, while the other dimension (depth) shows an increase in market liquidity. In addition, the effective spread is significantly smaller after overnight announcements than during the non-announcement period. Finally, the analysis provides some evidence that intraday timing affects effective spreads *before* earnings announcements. However, sensitivity tests reveal that this result may be driven by firm-specific factors.

The essay shows that the call auction at the opening of the market and/or the opportunity for the market maker to interpret the earnings news before trading starts, reduce the probability of informed trading and improve market liquidity after earnings announcements. In this way the essay shows a benefit of announcing earnings news outside trading hours. However, firms that are cross-listed on a non-US exchange should be aware that the drop in market liquidity may occur on the other exchange when that exchange is open at the announcement. Additionally, the decision to announce earnings during trading or non-trading hours depends on more factors than just the impact on market liquidity.

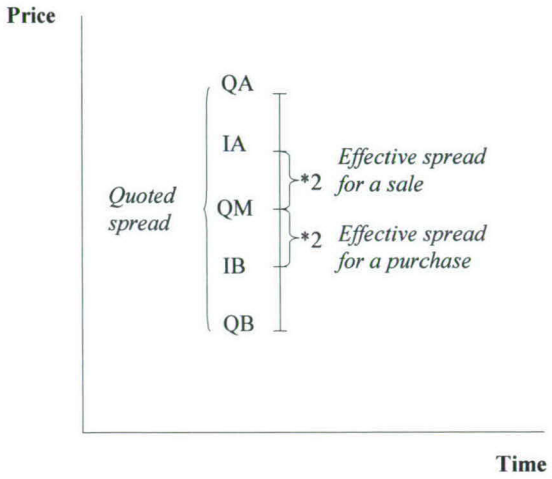
The remainder of this chapter is organized as follows. In section 2.2, I discuss the relevant literature and develop the hypotheses. Section 2.3 discusses the research design, while section 2.4 presents the empirical results. Section 2.5 concludes.

2.2 Literature overview and hypothesis development

2.2.1 Bid-ask spread and depth

To maintain liquidity, many organized exchanges use market makers, individuals who stand ready to buy or sell whenever investors wish to sell or buy. In return for providing liquidity, market makers are granted monopoly rights by the exchange to post different prices for purchases and sales: They buy at the bid price and sell at a higher ask price. As figure 2.1 shows, the quoted bid-ask spread is the difference between the quoted bid and ask price. It is possible that traders negotiate with the market maker about the bid or ask price. Therefore, market makers sometimes buy at a price that is higher than the quoted bid price or sell at a price that is lower than the quoted ask price. The effective bid-ask spread takes this possibility into account and is calculated as two times the absolute value of the difference between the quote midpoint (average of the bid and ask price) and the bid or ask price for a purchase or sale, respectively.

Figure 2.1 Bid-ask spreads

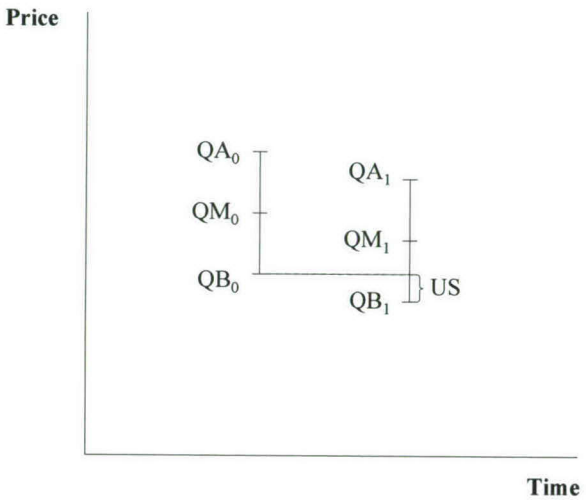


This figure demonstrates the quoted and effective bid-ask spread. QA represents the quoted ask price, IA the inside ask price, QM the quote midpoint, IB the inside bid price and QB the quoted bid price.

Extant market microstructure literature shows that the quoted bid-ask spread consists of three components: order processing costs, inventory holding costs, and adverse selection costs. The order processing cost component represents a fee charged by market makers for standing ready to match buy and sell orders (Tinic 1972). The inventory holding cost component compensates dealers for managing the inventory (Stoll 1978, Ho and Stoll 1981). Finally, the adverse selection component represents a reward to market makers for taking on the risk of dealing with traders who may possess superior information (Copeland and Galai 1983, Glosten and Milgrom 1985). When, for example, an investor knows before an earnings announcement that the earnings are far lower than expected, (s)he will sell shares to the market maker. After the information arrival the bid and ask price drop. As figure 2.2 indicates, the market maker bought the shares at a high bid price (QB_0) and has to sell the shares at a low ask price (QA_1). Therefore, the market maker earns only part of the bid-ask spread. Similarly, when an investor knows before the announcement that the earnings are higher than expected (s)he will buy shares. After the information arrival the bid and ask price go up and the market maker misses the return on the shares because (s)he already sold the shares. In other words, when investors possess private information, market makers are missing part of the spread or part of the return because they have

the obligation to trade. To compensate themselves for these missed revenues, market makers increase the bid-ask spread. As a result, market makers earn more when they trade with traders without private information. These additional revenues compensate them for the missed spreads and missed returns while trading with informed investors. The higher the probability of informed trading is, the higher the adverse selection component and, thus, the bid-ask spread.

Figure 2.2 Adverse selection component



This figure illustrates the unrealized spread due to informed trading. QA represents the quoted ask price, QM the quote midpoint, QB the quoted bid price and US the unrealized spread due to informed trading.

LMR state that the bid-ask spread is only one dimension of market liquidity. The other dimension is the depth: the number of shares market makers are willing to trade at the quoted bid and ask prices, respectively. Market makers may declare the depth strategically to protect against informed trading. When a market maker quotes a large depth, an informed investor can trade many shares at one time against the quoted bid or ask price. However, when the market maker declares a small depth, the informed investor can only trade small portions at a time. After each trade, the market maker has the opportunity to change the bid and ask prices. Therefore, the market maker may lose less money before discovering the implications of new information

for the fundamental share price. Thus, when the probability of informed trading increases, the spread is expected to increase and the depth is expected to decrease.

2.2.2 Increased probability of informed trading around earnings announcements

Days around earnings announcements form a period in which market makers may experience an increased probability of informed trading. LMR mention three reasons why the information asymmetry between market makers and informed investors may increase just *before* an earnings release, namely: (a) a higher probability of leakage of value relevant information when earnings are known to the company, (b) the possibility that the officially filed information reaches investors earlier than market makers, and (c) the expectation of imminent earnings news may stimulate some traders to search for information immediately prior to the announcement. Kim and Verrecchia (1991, 1994) and McNichols and Trueman (1994) provide analytical evidence on this issue. LMR show that market makers indeed increase spreads and decrease depths before daytime earnings announcements. Additionally, Krinsky and Lee (1996) (hereafter KL) present evidence that the adverse selection component of the spread is significantly higher before daytime earnings announcements than during the non-announcement period. This suggests that market makers are facing an increased probability of informed trading.

Market makers may also face an increased probability of informed trading *after* earnings announcements. Kim and Verrecchia (1994) and Livne (2000) model this situation. Their basic idea is that some investors gather private information through their superior capacities to interpret earnings news. Another argument is that earnings news is revealed in pieces and informed trading takes place when this information reaches investors earlier than market makers. For example, the earnings number may hit the news wire first, followed by the income statement and balance sheet, while detailed information is revealed later during the day. LMR and KL present empirical evidence on this issue and show that the spread and adverse selection component are higher during trading hours after daytime earnings announcements than during the non-announcement period.

2.2.3 Impact of the intraday timing of earnings announcements on the increased probability of informed trading

The probability of informed trading increases *before* daytime earnings announcements because investors are more motivated to search for private information and because the public announcement may reach investors earlier than market makers. This last argument does not hold, however, for overnight announcements. In addition, Livne (2001) models the intraday timing of earnings announcements. He shows that investors with private information trade less agressively before overnight than daytime announcements. His argument is that intraday timing determines whether the (post-announcement) unwinding of short-term investors' prior positions takes place before, or at the same time as, long-term investors trade on their supposed superior assessment of firm value. Unwinding at the same time is less advantageous to short term traders, because market makers will interpret their orders as informed trading and adjust the share price quickly. This diminishes short term traders' profits. Overall, these arguments suggest that the probability of informed trading increases less before overnight releases. Therefore, I propose the following hypothesis: *The percentage deviation of the spread from the median spread during the non-announcement period is larger and the percentage deviation of the depth from the median depth during the non-announcement period is smaller* ***before daytime*** *earnings announcements than* ***before overnight*** *announcements.*

The intraday timing of earnings releases may also influence the probability of informed trading *after* earnings announcements. When earnings news is announced during trading hours investors may feel compelled to act quickly on the information they have instead of researching and analyzing the data. When the news is revealed in pieces, investors will continue to react on new information and market makers experience a continuous threat of trading with investor with private information. However, when the earnings are released overnight, investors do not need to react immediately on the news and can research the data before making a trading decision. In addition, when the information is revealed in pieces before opening of the market, investors can also use this additional information in their decision process. On the NYSE and AMEX investors can submit buy and sell orders before opening of the market. At the open, market makers examine this supply and demand for shares and may offset any or all of the imbalance by trading on their own account. In other words, market makers know the order flow at the opening of the market and can set

the opening price conditional on this information. When the submitted orders reflect the earnings news, the opening price will capture the released information and the probability is smaller that market makers will loose money to investors with private information after opening of the market. Even when the order flow does not reflect the earnings news, market makers can still set the opening price conditional on the release when they check news wires before the opening of the market. Two empirical papers investigate whether earnings news is captured in the opening price. Unfortunately, these papers present conflicting evidence. Francis, Pagach and Stephan (1992) (hereafter FPS) find no evidence that the opening price reflects overnight announcement information. However, Greene and Watts (1996) show that the opening trade on the NYSE impounds most of the price response. Therefore, it remains an empirical question whether the intraday timing of earnings announcements affects the probability of informed trading and the bid-ask spread and depth after these releases. The second hypothesis runs: *The percentage deviation of the spread from the median spread during the non-announcement period is larger and the percentage deviation of the depth from the median depth during the non-announcement period is smaller* ***after daytime*** *earnings announcements than* ***after overnight*** *announcements.*

2.3 Research design

2.3.1 Earnings announcement times

The data set consists of firms with a disclosure quality rating in 'An Annual Review of Corporate Reporting Practices' prepared by the Corporate Information Committee of the Association for Investment Management and Research (AIMR) for 1993/94, 1994/95 and 1995/96. While not a direct requirement for this study, this selection criterion should have no impact on the findings.[1] In fact, it may be more difficult to detect the items of interest with such firms. AIMR rated firms tend to be larger and to have higher stock prices (Welker 1995). In the literature, firm size is often used as a proxy for information availability in the market. When more information is available about firms before earnings announcements, the price reaction and probability of informed trading at announcements are expected to be smaller. Therefore, the drop in market liquidity may be smaller and it might be more difficult to detect any

[1] The data set was developed for use in another project, which explains the focus on AIMR firms.

differences between the market liquidity reaction to overnight and daytime announcements.

The Dow Jones Interactive database is used to determine the date and time of the earnings announcements. For firms with an AIMR rating in the 1993/94 volume, I look for quarterly earnings announcements between July 1, 1993 and June 30, 1994. The other two years' reports are matched with earnings announcements in a similar way. I take the time stamp of the first publication of the quarterly earnings announcement by Business Wire, Dow Jones News Service, Dow Jones International News or PR Newswire. Announcements on trading days between 9.30 AM and 4.00 PM EST are considered daytime announcements while all other announcements are regarded as overnight announcements.

2.3.2 Calculation of market liquidity variables

The Trades and Quotes (TAQ) database is used to calculate the variables of interest, namely the percentage deviations of the quoted spread, effective spread, depth and volume before and after earnings announcements from the related medians during the non-announcement period. Following LMR, I exclude all thinly traded stocks (on average less than ten trades a day), and stocks with an average price below $5 or above $100 during the month of January that is closest to the announcement. I focus on firms traded at the NYSE or AMEX, because the NASDAQ has a different trading system. All quotes coded differently from opening or normal trading quotes are deleted. Quotes that are set before 9.30 AM or after 4.00 PM and trades that occurred before a bid and ask price were quoted, are also removed.

In accordance to LMR and KL, each trading day is divided into thirteen half-hour trading intervals. For each half-hour interval, the time weighted quoted bid-ask spread and depth, the average effective bid-ask spread, and the volume are calculated for each firm, separately. In these computations, the effective spread is defined as two times the absolute value of the difference between the trade price and the quote midpoint (average of the bid and ask price).[2] The depth equals the number of shares the market maker is willing to buy plus the shares (s)he is willing to sell, simultaneously.

---

[2] Following Lee and Ready (1991), I delay quotes five seconds relative to transactions to reduce time stamping errors in the data.

Next, the periods before and after earnings announcements are defined. For firms with a *daytime* announcement, the half-hour trading interval containing the earnings announcement is determined according to the time stamp of the news wire. The period *before* the earnings announcement consists of 6.5 trading hours before this half-hour interval. The period *after* the earnings release consists of the half-hour trading interval containing the announcement plus the six trading hours thereafter. For firms with an *overnight* announcement, the period *before* the earnings announcement consists of 6.5 trading hours before the closing of the market (full trading day), while the period *after* the announcement consists of 6.5 trading hours after the opening of the market. For earnings announcements between July 1, 1993 and June 30, 1994, the non-announcement period consists of all trading days between these dates except two trading days before, the day of and two trading days after earnings announcements as well as days with management earnings forecasts or dividend announcements.[3] For announcements between July 1994 and June 1996, comparable periods apply.[4]

The percentage deviation of the quoted spread before an earnings announcement from the median during the non-announcement period is calculated as follows. First, I average the time weighted quoted spreads during the period before the earnings announcement. Next, I divide the non-announcement period into similar periods of 13 half-hour trading intervals. Thus, when the period before the earnings announcement ranges from 11.00 AM the day before the announcement to 11.00 AM the day of the announcement, the non-announcement period is divided in periods from 11.00 AM day 1 to 11.00 AM day 2, 11.00 AM day 2 to 11.00 AM day 3 etcetera. For each period, I average the time weighted quoted spreads during the 13 half-hour trading intervals during that period. This approach results for each announcement in one average quoted spread before the announcement and approximately 220 average quoted spreads during the non-announcement period. I determine for each announcement separately the median of the approximately 220 average quoted spreads during the non-announcement period. Finally, I divide the difference between

---

[3] The Dow Jones Interactive database is used to investigate the Business Wire, Dow Jones News Service, Dow Jones International News and PR Newswire for management earnings forecasts and dividend announcements.

[4] The accuracy of the time stamp is important. The relative precision of these time stamps is difficult to gauge. LMR, who follow a similar approach, show that no significant increase in trading volume occurs until the half-hour interval containing daytime announcements. This finding strongly suggests announcement times are accurate to within a half hour.

the quoted spread before the announcement and the median quoted spread during the non-announcement period by the median quoted spread and multiply it with 100. In these calculations the median is used instead of the mean of the average quoted spreads during the periods of 13 half-hour trading intervals during the non-announcement period because the distribution of these quoted spreads is skewed. The percentage deviations of the effective spread, depth and volume before and after earnings announcements are calculated in a comparable way. However, to compute the percentage deviations of the volume I sum the volume during the 13 half-hour trading intervals instead of taking the average.

The final sample consists of 1000 daytime and 1802 overnight earnings announcements made by 336 firms. Table 2.1 summarizes the sample selection process.

Table 2.1 Sample selection

Quantitative disclosure quality rating AIMR in 1993/94, 1994/95, 1995/96	854
Expected announcements per firm per year	x 4
Expected announcements	3416
Date or time of earnings announcement not available	(54)
No listing at NYSE or AMEX	(320)
Thinly traded or extremely priced stocks	(168)
Data for calculations not available from TAQ for specific announcement	(72)
Earnings announcements	2802
Daytime announcements	1000
Overnight announcements	1802

2.4 Results

2.4.1 After earnings announcements

Table 2.2 shows the cross-sectional medians of percentage deviations of the quoted spread, effective spread, depth and volume during the 6.5 trading hours *after* daytime and overnight earnings announcements from the medians during the non-announcement period, separately. The first observation is that the percentage deviations of the quoted spread, effective spread and volume are significantly larger than zero after *daytime* earnings announcements. These findings are in line with the evidence by LMR. The significance levels are based on the sign test because the

distributions of the percentage deviations are skewed. After *overnight* earnings announcements, the percentage deviations of the quoted spread, volume and the depth are significantly larger than zero, while the percentage deviation of the effective spread is smaller than zero. This observation is interesting because the effective spread (depth) is not expected to be smaller (larger) after earnings announcements. Thus, after overnight releases no conjecture can be made about a decline in market liquidity, because one dimension of market liquidity (quoted spread) signals a decreased liquidity, while the other dimension (depth) signals an increased market liquidity.

Table 2.2 Percentage deviations of quoted spread, effective spread, depth and volume *after* earnings announcements

	Quoted spread	*Effective spread*	*Depth*	*Volume*
Daytime (N=1000)				
Expected sign	+	+	-	
Median	3.85	1.14	-2.46	61.00
Significance level	0.01	0.01	0.07	0.01
Overnight (N=1802)				
Expected sign	+	+	-	
Median	3.04	-1.51	5.31	63.91
Significance level	0.01	0.01	0.01	0.01
Daytime ⇔ Overnight				
Expected sign	+	+	-	
Difference median	0.81	2.65	-7.77	-2.91
Significance level	0.01	0.01	0.01	0.14

This table reports the cross-sectional medians of the percentage deviations of the quoted spread, effective spread, depth and volume during the period after the earnings announcement from the median during the non-announcement period. The one-tailed significance levels for daytime and overnight announcements are based on the sign test, while the one-tailed significance levels for the difference between the median after daytime and overnight announcements are based on the Wilcoxon rank sum test.

With regard to the hypothesis, the differences between medians of the percentage deviations of the quoted spread, effective spread and depth after daytime and overnight announcements are 0.81, 2.65 and –7.77, respectively, and all significant at 0.01 one-tailed significance levels accordance to the Wilcoxon rank sum test. This suggests that intraday timing of earnings announcements impacts market

liquidity after these announcements. The higher spread and lower depth after daytime earnings announcements affect the wealth of investors who trade after the announcement. However, this effect is not that strong that it prevents investors from trading, because the percentage deviation of the trading volume after overnight announcements is not significantly larger than the percentage deviation of the volume after daytime announcements. In other words, despite the higher trading costs due to the relatively high spreads and low depths, traders prefer to trade during the day after daytime announcements instead of postponing their trades.

2.4.2 Before earnings announcements

Table 2.3 shows results for the period *before* earnings announcements.

Table 2.3 Percentage deviations of quoted spread, effective spread, depth and volume *before* earnings announcements

	Quoted spread	*Effective spread*	*Depth*	*Volume*
Daytime (N=1000)				
Expected sign	+	+	-	
Median	0.90	0.47	-2.08	-0.30
Significance level	0.02	0.10	0.09	0.47
Overnight (N=1802)				
Expected sign	+	+	-	
Median	0.67	0.28	-3.37	1.79
Significance level	0.01	0.23	0.01	0.17
Daytime⇔Overnight				
Expected sign	+	+	-	
Difference median	0.23	0.19	1.29	-2.09
Significance level	0.40	0.10	0.42	0.11

This table reports the cross-sectional medians of the percentage deviations of the quoted spread, effective spread, depth and volume during the period before the earnings announcement from the median during the non-announcement period. The one-tailed significance levels for daytime and overnight announcements are based on the sign test, while the one-tailed significance levels for the difference between the median before daytime and overnight announcements are based on the Wilcoxon rank sum test.

The quoted and effective spread are higher and the depth is lower before daytime announcements compared to the non-announcement period. Before overnight announcements the quoted spread is higher and the depth is smaller. This indicates a

drop in market liquidity before earnings announcements. With respect to the impact of intraday timing on this drop in market liquidity the table shows one-tailed significance levels of the difference in the median of 0.40, 0.10 and 0.42 for the percentage deviations of the quoted spread, effective spread and depth, respectively. Thus, the analysis presents only evidence of the impact of intraday timing of earnings announcements on the effective spread.

A possible explanation for the lack of significant findings for the quoted spread and depth is that the period before the earnings announcement is too long. If, for instance, the market maker knows that an announcement will take place on Wednesday the threat of informed trading is higher on Wednesday than on Tuesday. However, I analyze 6.5 trading hours before the announcement. When the announcement takes place at 11.10 AM this period consists of 1.5 trading hours on Wednesday and 5 trading hours on Tuesday. Therefore, focusing on a shorter period before the announcement may improve the power of the tests.

Unfortunately, the investigation of a shorter period before the earnings announcement is problematic for two reasons. First, when I focus on a shorter interval the effect of possible mismeasurement of the time of earnings announcements becomes stronger. When for instance an earnings announcement took place 31 minutes before the time stamp of the news wire and the spread increased strongly after the announcement, this mismeasurement has a stronger effect on the average spread during one trading hour before the announcement than on the average spread during 6.5 trading hours before the announcement.

The second reason is the impact of the intraday pattern of spreads and depths. LMR show that during trading days without earnings announcements the quoted and effective spread have a U-shape pattern with relatively high spreads during the half hour after opening and the half hour before closing of the market. The depth shows an opposite pattern. When I focus on one trading hour before earnings announcements, for overnight announcements this trading hour is always the last trading hour before closing of the market. Spreads during this hour during the non-announcement period are relatively high while depths are relatively low. For daytime announcements the trading hour before the announcement depends on the time of the announcement and also occurs during periods with relatively low spreads and high depths. Therefore, the spread and depth during the non-announcement period differ for daytime and overnight announcements due to the intraday pattern when I focus on one trading hour

before announcements. This effect makes it impossible to compare the percentage deviations of the spread and depth during a short interval before daytime and overnight earnings announcements.

Table 2.4 Percentage deviations of quoted spread, effective spread, depth and volume *before* earnings announcements for firms with *low turnover*

	Quoted spread	*Effective spread*	*Depth*	*Volume*
Daytime (N=567)				
Expected sign	+	+	-	
Median	0.82	0.98	-2.23	2.53
Significance level	0.16	0.05	0.09	0.29
Overnight (N=831)				
Expected sign	+	+	-	
Median	1.44	0.90	-5.16	2.15
Significance level	0.01	0.08	0.03	0.27
Daytime⇔ Overnight				
Expected sign	+	+	-	
Difference median	-0.62	0.08	2.93	0.38
Significance level	0.16	0.11	0.33	0.17

This table reports the cross-sectional medians of the percentage deviations of the quoted spread, effective spread, depth and volume during the period before the earnings announcement from the median during the non-announcement period. The one-tailed significance levels for daytime and overnight announcements are based on the sign test, while the one-tailed significance levels for the difference between the median before daytime and overnight announcements are based on the Wilcoxon rank sum test.

Another possible explanation for the lack of significant findings for the quoted spread and depth is the sample selection. One of the selection criteria is the availability of a disclosure quality rating of the AIMR. As stated before, this criterion may bias the sample against finding results during the period before earnings announcements, because AIMR rated firms tend to be larger. To provide some evidence on the impact of firm size I redo the analysis for announcements of firms with an average daily turnover on the NYSE/AMEX during the month of January, that is closest to the announcement, that is smaller than the median daily turnover of the full sample during that period. Table 2.4 presents the results for this sample consisting of 567 daytime and 831 overnight announcements. Also in this sample differences

between the deviations of the quoted spread and depth before daytime and overnight announcements are not significant at conventional levels.

2.4.3 Sensitivity tests

Prior analysis reveals strong evidence that intraday timing affects market liquidity *after* earnings announcements and some evidence that intraday timing impacts market liquidity *before* announcements. In this section I investigate whether these findings are driven by firm-specific factors, cross-listings or differences in the information content of the announcements.

Firm-specific factors

In the previous analysis I did not control for firm-specific issues. However, firms that consequently announce their earnings overnight are only included in the sample with overnight announcements, while firms that always release their earnings during trading hours are only present in the other sample. Therefore, it is possible that some firm-specific factors are driving the difference between market liquidity around daytime and overnight announcements. To ensure that the results are not due to firm-specific factors I redo the analysis for a matched sample of earnings announcements. This is possible because for each firm several earnings announcements are included in the sample. The announcements are matched as follows. For each firm I determine the number of daytime and overnight announcements. When there are less daytime than overnight announcements, the daytime releases are matched with overnight announcements that are randomly drawn from the available overnight releases for that firm. When there are less overnight announcements, these announcements are matched with randomly picked daytime announcements. The final sample consists of 407 daytime and 407 overnight earnings announcements made by 184 firms. Table 2.5 shows the results for this matched sample with regard to the period *before* earnings announcements. The median percentage deviation of the effective spread before daytime announcements declines from 0.47 to 0.01, while the median percentage deviation before overnight announcements drops from 0.28 to –0.23. The one-tailed significance level of the difference in the median percentage deviation of the effective spread before daytime and overnight announcements drops from 0.10 to

0.28. This may indicate that the previous finding that intraday timing of announcements affects effective spreads is driven by firm-specific factors.

Table 2.5 Percentage deviations of quoted spread, effective spread, depth and volume *before* earnings announcements for *matched* sample

	Quoted spread	*Effective spread*	*Depth*	*Volume*
Daytime (N=407)				
Expected sign	+	+	-	
Median	0.90	0.01	-2.23	0.73
Significance level	0.21	0.40	0.16	0.40
Overnight (N=407)				
Expected sign	+	+	-	
Median	1.16	-0.23	-4.19	-3.86
Significance level	0.08	0.42	0.06	0.08
Daytime ⇔ Overnight				
Expected sign	+	+	-	
Difference median	-0.26	0.24	1.96	4.59
Significance level	0.24	0.28	0.34	0.21

This table reports the cross-sectional medians of the percentage deviations of the quoted spread, effective spread, depth and volume during the period before the earnings announcement from the median during the non-announcement period. The one-tailed significance levels for daytime and overnight announcements are based on the sign test, while the one-tailed significance levels for the difference between the median before daytime and overnight announcements are based on the Wilcoxon rank sum test.

Firm-specific factors and cross-listings

In addition to the impact of firm-specific factors, cross-listings may affect the results for the period *after* earnings announcements. When shares are traded on another exchange during or after the earnings announcement, US market makers may condition the opening price not only on the order flow and earnings news, but also on the share price on the other exchange. This additional information item may impact the probability of informed trading and may drive the difference between market liquidity after daytime and overnight announcements. However, in that case, the reduction in the market liquidity drop after earnings announcements on the NYSE/AMEX takes place when a market liquidity drop may occur on another exchange. Thus, intraday timing may not reduce the market liquidity drop after

earnings announcements, but may just shift the decline in liquidity to another exchange.

Table 2.6 Percentage deviations of quoted spread, effective spread, depth and volume *after* earnings announcements for *matched* sample of firms *without* cross-listings at London Stock Exchange or Tokyo Stock Exchange

	Quoted spread	*Effective spread*	*Depth*	*Volume*
Daytime (N=297)				
Expected sign	+	+	-	
Median	4.09	1.08	-3.59	74.27
Significance level	0.01	0.18	0.32	0.01
Overnight (N=297)				
Expected sign	+	+	-	
Median	2.91	-0.07	5.06	49.66
Significance level	0.01	0.48	0.10	0.01
Daytime⇔ Overnight				
Expected sign	+	+	-	
Difference median	1.18	1.15	-8.65	24.61
Significance level	0.07	0.08	0.01	0.03

This table reports the cross-sectional medians of the percentage deviations of the quoted spread, effective spread, depth and volume during the period after the earnings announcement from the median during the non-announcement period. The one-tailed significance levels for daytime and overnight announcements are based on the sign test, while the one-tailed significance levels for the difference between the median after daytime and overnight announcements are based on the Wilcoxon rank sum test.

To test for this conjecture and the impact of firm-specific factors I redo the analysis for the period *after* earnings announcements for the matched sample after excluding firms with cross-listings at the London Stock Exchange or Tokyo Stock Exchange during 1993 to 1996.[5] Table 2.6 reveals that differences in the percentage deviations in the quoted spread, effective spread and depth after daytime and overnight announcements are still significant at 0.07, 0.08 and 0.01 one-tailed levels.

[5] According to Roberts, Weetman and Gordon (1998) these two exchanges were the major non-US stock exchanges during 1996. Listing at the London Stock Exchange is based on Timbrell and Tweedie (1994, 1995 and 1996), while listing at the Tokyo Stock Exchange is determined with an overview on listing and delisting of foreign companies from 1973 up to 1996 provided by the Tokyo Stock Exchange.

This indicates that the findings for the period after earnings announcements are robust to cross-listings and firm-specific factors.

Differences in information content announcements

A last concern is the possible difference in the information content of daytime and overnight announcements. Firms probably do not announce earnings news randomly during trading or non-trading hours, but may condition the intraday timing of the announcement on the earnings news. In other words, results may be affected by a self-selection bias. Patell and Wolfson (1982) (hereafter PW) and FPS show that overnight releases contain more bad news. Additionally, overnight announcements may contain bigger surprises than daytime disclosures, because the American Stock Exchange explicitly sanctions after-trading-hour disclosures of big news events to provide a longer period of information dissemination (FPS). These findings suggest that differences in the information content result in higher spreads and lower depths around overnight announcements compared to daytime announcements because overnight announcements reveal more surprising news. My aim is to show an opposite relationship and therefore differences in the information content of announcements are biasing against finding results when the findings of PW and FPS hold for my sample. Nevertheless, to rule out the possibility that these findings do not hold for my sample and differences in the content of announcements are biasing in favor of finding results, I investigate differences between overnight and daytime releases in the sign and magnitude of the (absolute) price reaction. I focus on the price reaction rather than the forecast error, because the price reaction captures both the effect of earnings surprises and the revelation of other surprising information.

For overnight announcements, the price reaction equals the quote midpoint at the closing of the market after the release minus the quote midpoint at the closing of the market before the release divided by this last quote midpoint. For daytime announcements, I calculate the relative change between the quote midpoint at the beginning of the half-hour containing the announcement and the quote midpoint at the same time one trading day later.

Table 2.7 shows the mean and median price change, mean and median absolute price change and the percentage of positive price reactions. There are no significant differences between the price changes around daytime and overnight announcements. Thus, the results of PW and FPS do not hold for this sample, but

there is also no evidence that differences in the content of daytime and overnight earnings announcements are biasing in favor of finding results.[6]

Table 2.7 Price changes at daytime and overnight announcements for *matched* sample of firms *without* cross-listings at London Stock Exchange or Tokyo Stock Exchange

	Daytime (N=297)		Overnight (N=297)		Difference		Significance level
	Mean	Median	Mean	Median	Mean	Median	
Price change	0.37	0.00	0.10	0.14	0.27	-0.14	0.65
Absolute price change	1.99	1.27	2.00	1.43	-0.01	-0.16	0.74
Price changes > 0 (%)	49.8%		50.5%		-0.7%		0.87

The (absolute) price change is defined as the (absolute value of the) percentage price change between the quote midpoint before the earnings announcement and the quote midpoint one trading day later. 'Price changes > 0 (%)' is defined as the percentage of positive price changes between the quote midpoint before the earnings announcement and the quote midpoint one trading day later. The two-tailed significance level is based on the Wilcoxon rank sum test.

2.5 Summary and conclusions

This essay investigates whether management can mitigate the increase in bid-ask spreads and decrease in depths around earnings announcements by using their discretion to announce the earnings news during non-trading instead of trading hours. The results show that daytime releases relate, on average, to significantly larger percentage deviations of the quoted and effective spread and smaller percentage deviation of the depth *after* earnings announcements than overnight releases. Sensitivity tests reveal that these findings are robust to firm-specific factors and cross-listings, and that there are no differences in the information content of daytime and overnight releases in this sample. In addition, the analysis presents some evidence that intraday timing of earnings announcements affects effective spreads *before* earnings announcements. However, sensitivity tests reveal that this result may be driven by firm-specific factors.

The findings suggest that from a market liquidity perspective it is beneficial to announce earnings news during non-trading instead of trading hours. However, cross-

[6] The same results occur when the price change is calculated from one day before the announcement to one day thereafter.

listings may erode the advantage of announcing outside US-trading hours because the drop in market liquidity may occur on other exchanges. Additionally, the decision to announce earnings news during trading or non-trading hours depends on more factors than just the impact on market liquidity. Future research may address other costs and benefits of intraday timing of earnings announcements to provide a more complete picture of factors that affect this important decision. Additionally, future research may focus on the impact of intraday timing of announcements on market liquidity on stock markets with a different trading system. Greene and Watts (1996), for example, present evidence on differences in price discovery on the NYSE and NASDAQ. Therefore, different trading systems may affect the influence of intraday timing of earnings announcements on market liquidity. Another interesting avenue for research is the investigation of the impact of intraday timing of other announcements, like mergers or replacements of management, on market liquidity after those events. While the price impact of these announcements is likely larger, on average, than the impact of earnings announcements, a larger difference may exist between market liquidity after daytime and overnight announcements.

CHAPTER 3

THE IMPACT OF THE INFORMATION ENVIRONMENT ON THE DROP IN MARKET LIQUIDITY BEFORE EARNINGS ANNOUNCEMENTS

3.1 Introduction

Lee, Mucklow and Ready (1993) and Krinsky and Lee (1995) (hereafter LMR and KL, respectively) present empirical evidence that the (adverse selection component of the) bid-ask spread is higher and the depth is lower before earnings announcements than during a non-announcement period. Several analytical papers argue that this drop in market liquidity occurs because market makers face a higher probability of informed trading before earnings announcements (Verrecchia 1991, 1994 and McNichols and Trueman 1994). So far, no evidence exists whether market makers adjust spreads and depths for all firms to the same extent or condition the market liquidity drop on firm-specific factors.

This essay investigates the conjecture that this drop in market liquidity relates to the richness of the information environment. A rich information environment means that more information is publicly available and captured in the share price. Therefore, a smaller price reaction is expected at the earnings announcement and this reduces investor's incentives to search for private information. In addition, even when investors search for and find private information, the loss to the market maker might be smaller, because the expected price reaction to the new information is smaller. I use three proxies for the information environment, namely disclosure quality, the occurrence of management earnings forecasts and the number of analysts forecasting the earnings news.

The data set contains 2802 earnings announcements made between 1993 and 1996 by 336 firms that are traded at the New York Stock Exchange (NYSE) or American Stock Exchange (AMEX). The analysis provides some evidence on the impact of the information environment on the market liquidity drop before earnings announcements by showing that the occurrence of management earnings forecasts affects the change in depths. However, I do not find a robust relationship between the information environment variables and the change in (the adverse selection component of) spreads. One explanation for this lack of results is that market makers do not believe that the information environment affects the probability of informed

trading before earnings announcements and, therefore, do not condition on these variables. Another explanation is that the drop in market liquidity is too small to show cross-sectional differences.

The aim of this essay is to provide evidence on the influence of the information environment on the change in market liquidity before earnings announcements. Such a relationship would indicate that the information environment also affects the change in market liquidity when the probability of informed trading increases. This additional evidence on the impact of the information environment on market liquidity would stress the importance of creating a rich information environment by providing information to investors. However, the essay does not reveal strong evidence on this relationship. The small drop in market liquidity even casts doubt on the conjecture that market liquidity drops before earnings announcements because market makers anticipate informed trading. When market makers drop market liquidity in anticipation of announcements a drop in market liquidity for all firms would be expected. Given the small size of the drop, it is questionable whether that occurs. In fact, prior evidence that, in aggregate, spreads increase and depths decrease before earnings announcements does not imply that market makers anticipate informed trading. Another explanation for this effect is that market makers react to information arrival and more information enters the market the day before earnings announcements than on average during the non-announcement period. Future research may investigate whether the drop in market liquidity occurs because market makers react to increased information arrival or because they really anticipate earnings announcements.

The remainder of this chapter is organized as follows. In section 3.2, I discuss the relevant literature and develop the hypotheses, while section 3.3 discusses the sample selection and variable definitions. Section 3.4 presents and section 3.5 discusses the empirical results. Section 3.6 concludes.

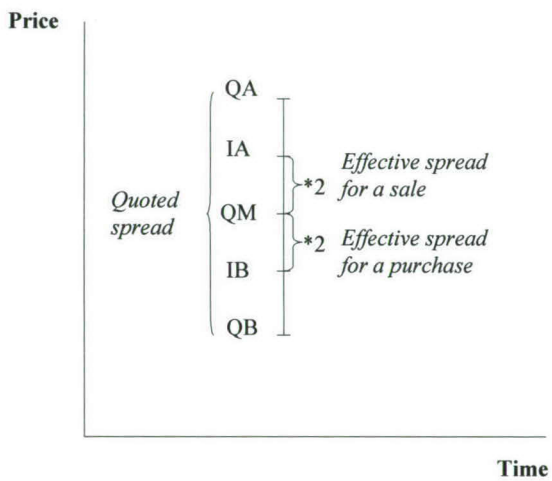
3.2 Literature overview and hypothesis development

3.2.1 Bid-ask spread, adverse selection component and depth

To maintain liquidity, many organized exchanges use market makers, individuals who stand ready to buy or sell whenever investors wish to sell or buy. In return for providing liquidity, market makers are granted monopoly rights by the exchange to post different prices for purchases and sales: They buy at the bid price and sell at a

higher ask price. As figure 3.1 shows, the quoted bid-ask spread is the difference between the quoted bid and ask price. It is possible that traders negotiate with the market maker about the bid or ask price. Therefore, market makers sometimes buy at a price that is higher than the quoted bid price and sell at a price that is lower than the quoted ask price. The effective bid-ask spread takes this possibility into account and is calculated as two times the absolute value of the difference between the quote midpoint (average of the bid and ask price) and the bid or ask price for a purchase or sale, respectively.

Figure 3.1 Bid-ask spreads

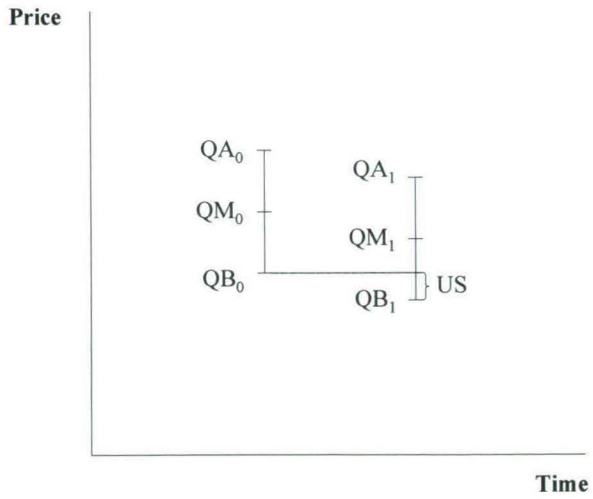


This figure demonstrates the quoted and effective bid-ask spread. QA represents the quoted ask price, IA the inside ask price, QM the quote midpoint, IB the inside bid price and QB the quoted bid price.

Extant market microstructure literature shows that the bid-ask spread consists of three components: order processing costs, inventory holding costs, and adverse selection costs. The order processing cost component represents a fee charged by market makers for standing ready to match buy and sell orders (Tinic 1972). The inventory holding cost component compensates dealers for managing the inventory (Stoll 1978, Ho and Stoll 1981). Finally, the adverse selection component represents a reward to market makers for taking on the risk of dealing with traders who may possess superior information (Copeland and Galai 1983, Glosten and Milgrom 1985). When, for example, an investor knows before an earnings announcement that the

earnings are far lower than expected, (s)he will sell shares to the market maker. After the information arrival the bid and ask price drop. As figure 3.2 indicates, the market maker bought the shares at a high bid price (QB_0) and has to sell the shares at a low ask price (QA_1). Therefore, the market maker earns only part of the bid-ask spread. Similarly, when an investor knows before the announcement that the earnings are higher than expected (s)he will buy shares. After the information arrival the bid and ask price go up and the market maker misses the return on the shares because (s)he already sold the shares. In other words, when investors possess private information, market makers are missing part of the spread or part of the return because they have the obligation to trade. To compensate themselves for these missed revenues, market makers increase the bid-ask spread. As a result, market makers earn more when they trade with traders without private information. These additional revenues compensate them for the missed spreads and missed returns while trading with informed investors. The higher the probability of informed trading is, the higher the adverse selection component and, thus, the bid-ask spread.

Figure 3.2 Adverse selection component



This figure illustrates the unrealized spread due to informed trading. QA represents the quoted ask price, QM the quote midpoint, QB the quoted bid price and US the unrealized spread due to informed trading.

LMR state that the bid-ask spread is only one dimension of market liquidity. The other dimension is the depth: the number of shares market makers are willing to trade at the quoted bid and ask prices, respectively. Market makers may declare the depth strategically to protect themselves against informed trading. When a market maker quotes a large depth, an informed investor can trade many shares at one time against the quoted bid or ask price. However, when the market maker declares a small depth, the informed investor can only trade small portions at a time. After each trade, the market maker has the opportunity to change the bid and ask prices. Therefore, the market maker may lose less money before discovering the implications of new information for the fundamental share price. Thus, when the probability of informed trading increases, the spread and adverse selection component are expected to increase and the depth is expected to decrease.

3.2.2 Increased probability of informed trading before earnings announcements

The days before an earnings announcement constitute a period in which market makers may experience an increased probability of informed trading. LMR mention three reasons why the information asymmetry between market makers and informed investors may increase at this time, namely: (a) a higher probability of leakage of value relevant information when earnings are known to the company, (b) the possibility that the officially filed information reaches investors earlier than market makers, and (c) the expectation of imminent earnings news may stimulate some traders to search for information immediately prior to the announcement. Kim and Verrecchia (1991, 1994) and McNichols and Trueman (1994) provide analytical evidence on this issue. In addition, LMR show that market makers increase spreads and decrease depths before daytime earnings announcements, while KL present evidence that the adverse selection component of the spread is significantly higher before daytime earnings announcements than during the non-announcement period.

3.2.3 The impact of the information environment on the drop in market liquidity

Empirical research shows that market liquidity drops before earnings announcements. So far, no evidence exists whether market makers adjust spreads and depths for all firms to the same extent or whether they condition the market liquidity drop on firm-specific factors. Given the suggestion by the analytical literature that this drop is related to a higher probability of informed trading, a straightforward conjecture is that

the drop in market liquidity relates to the information environment before the earnings announcement. When more information is publicly available, more information will be captured in the share price and the price reaction at the earnings announcement is expected to be smaller. A smaller expected price reaction reduces investors' incentives to search for private information. Additionally, even when investors search for and find private information, the loss to the market maker might be smaller, because the expected price reaction to the new information is smaller. Welker (1995) and Coller and Yohn (1997) provide empirical evidence that the information environment, proxied by disclosure quality and occurrence of management earnings forecasts, respectively, affects bid-ask spreads during non-announcement periods. These results indicate that a rich information environment relates to a lower probability of informed trading during non-announcement periods. I conjecture that the information environment also affects the change in market liquidity before earnings announcements when the probability of informed trading increases.

I use three proxies for the information environment, namely disclosure quality, occurrence of management earnings forecasts and the number of analysts forecasting the earnings news. When the disclosure quality is high, management launched a forecast of the upcoming earnings news or when many analysts reveal information about the company, more information is available at the market before the earnings announcement. Therefore, I propose the following hypotheses:

1. *The difference between the spread (depth) before the earnings announcement and the median spread (depth) during the non-announcement period is negatively (positively) related to disclosure quality, occurrence of management earnings forecasts and the number of analysts forecasting the earnings news;*
2. *The abnormal adverse selection component before the earnings announcement is negatively related to disclosure quality, occurrence of management earnings forecasts and the number of analysts forecasting the earnings news.*

The abnormal adverse selection component before earnings announcements and the differences between the spread and depth before the earnings announcement and the corresponding medians during the non-announcement period are presumably also affected by other factors. LMR, for example, show an autoregressive pattern of spreads and depths during the non-announcement period. In other words, the relative size of the spread at a certain day relates to the relative size of the spread one day

earlier. Market makers may also condition the change in the (adverse selection component of the) spread and depth on the share price variance before earnings announcements. An increase in share price variance may indicate the arrival of information at the market and market makers likely react to information arrival by increasing spreads and decreasing depths to protect themselves against additional informed trading. Finally, trading volume may affect the change in the market liquidity variables. However, it is not straightforward whether high or low volume relates to high spreads and low depths. On the one hand, high trading volume may indicate the arrival of information at the market and market makers presumably adjust spreads and depths to protect themselves against informed trading. On the other hand, high (low) trading volume may result from the presence (absence) of liquidity traders. Liquidity traders are traders who buy or sell shares for other reasons than exploiting private information. When more (less) liquidity trading occurs, the probability of informed trading is lower (higher) and market makers may set lower (higher) spreads and higher (lower) depths. Based on these arguments, I also include the relative size of the market liquidity variables two days before the earnings announcement and the deviations of the trading volume and share price variance as control variables in the analysis.

3.3 Research design

The data set contains 2802 earnings announcements declared between 1993 and 1996 by 336 firms with the following characteristics: (a) quantitative AIMR disclosure quality rating, (b) listing on NYSE or AMEX, (c) stock market data available from the TAQ database, and (d) no thinly traded or extremely priced.

Table 3.1 Sample selection

Quantitative disclosure quality rating AIMR 1993/94, 1994/95, 1995/96	854
Expected announcements per firm per year	x 4
Expected announcements	3416
Date or time earnings announcement not available	(54)
No listing at NYSE or AMEX	(320)
Thinly traded or extremely priced stocks	(168)
Data for calculations not available from TAQ for specific announcement	(72)
Investigated announcements	2802

Quarterly earnings announcements of these firms are included in the analysis when the announcement was published by Business Wire, Dow Jones News Service, Dow Jones International News or PR Newswire. In this section, I discuss the sample selection in detail and define the variables of interest. Table 3.1 summarizes the sample selection process.

3.3.1 Earnings announcement times

The Dow Jones Interactive database is used to determine the date and time of earnings announcements. For firms with a disclosure quality rating in the 1993/94 volume of 'An Annual Review of Corporate Reporting Practices' of the AIMR, I look for quarterly earnings announcements between July 1, 1993 and June 30, 1994. The other two years' reports are matched with earnings announcements in a similar way. I take the time stamp of the first publication of the quarterly earnings announcement by Business Wire, Dow Jones News Service, Dow Jones International News or PR Newswire.

3.3.2 Variable definitions

Quoted spread, effective spread and depth

The Trades and Quotes (TAQ) database is used to calculate the difference between the quoted spread, effective spread and depth before the earnings announcement and the related medians during the non-announcement period. Following LMR, I exclude all thinly traded stocks (on average less than ten trades a day), and stocks with an average price below $5 or above $100 during the month of January that is closest to the announcement. I focus on firms traded at the NYSE or AMEX, because the NASDAQ has a different trading system. All quotes coded differently from opening or normal trading quotes are deleted. Quotes that are set before 9.30 AM or after 4.00 PM and trades that occurred before a bid and ask price were quoted, are also removed.

In accordance to LMR and KL, each trading day is divided into thirteen half-hour trading intervals. For each half-hour interval, the time weighted quoted bid-ask spread and depth, and the average effective bid-ask spread are calculated for each firm, separately. In these computations, the effective spread is defined as two times the absolute value of the difference between the trade price and the quote midpoint

(average of the bid and ask price).[7] The depth equals the number of shares the market maker is willing to buy plus the shares (s)he is willing to sell, simultaneously.

Next, the period before earnings announcements is defined. For firms with an announcement during trading hours, the half-hour trading interval containing the earnings announcement is determined according to the time stamp of the news wire. The period before the earnings announcement consists of 6.5 trading hours before this half-hour interval. For firms with an announcement during non-trading hours, the period before the earnings announcement consists of 6.5 trading hours before the closing of the market (full trading day).[8] For earnings announcements between July 1, 1993 and June 30, 1994, the non-announcement period consists of all trading days between these dates except two trading days before, the day of and two trading days after earnings announcements as well as days with management earnings forecasts or dividend announcements.[9] For announcements between July 1994 and June 1996, comparable non-announcement periods apply.

The non-announcement period is divided in periods of 6.5 trading hours similar to the period before the earnings announcement. Thus, when the period before the earnings announcement ranges from 11.00 AM the day before the announcement to 11.00 AM the day of the announcement, the non-announcement period is divided in periods from 11.00 AM day 1 to 11.00 AM day 2, 11.00 AM day 2 to 11.00 AM day 3 etcetera. For each period, I average the time weighted quoted spreads during the 13 half-hour trading intervals during that period. This approach results for each announcement in one average quoted spread before the announcement and approximately 220 average quoted spreads during the non-announcement period. To calculate the difference between the quoted spread before the earnings announcement and the median spread during the non-announcement period, I determine for each announcement separately the median of the approximately 220 average quoted spreads during the non-announcement period. Finally, I substract the median spread

---

[7] Following Lee and Ready (1991), I delay quotes five seconds relative to transactions to reduce time stamping errors in the data.

[8] The accuracy of the time stamp is important. The relative precision of these time stamps is difficult to gauge. LMR, who follow a similar approach, show that no significant increase in trading volume occurs until the half-hour interval containing daytime announcements. This finding strongly suggests announcement times are accurate to within a half hour.

[9] The Dow Jones Interactive database is used to investigate the Business Wire, Dow Jones News Service, Dow Jones International News and PR Newswire for management earnings forecasts and dividend announcements.

during the non-announcement period from the quoted spread during the period before the earnings announcement. In these calculations the median is used instead of the mean of the average quoted spreads during the non-announcement period because the distribution of the spread is skewed. The changes in the effective spread and depth are calculated in a comparable way. The changes in the quoted spread, effective spread and depth two days before the earnings announcement are also computed with a similar approach. In these computations the average spread and depth between 13 and 6.5 trading hours before the earnings announcement are used.

I use the difference between the market liquidity variables before the announcement and the related medians during the non-announcement period rather than the percentage deviations of the market liquidity variables before the announcement from the related medians. For cross-sectional comparison, it would be better to divide the difference between the quoted spread before the announcement and the median spread during the non-announcement period by this median spread. However, research by Welker (1995) and Coller and Yohn (1997) suggests that the information environment affects spreads during the non-announcement period. Therefore, I expect that firms with a richer information environment have a lower median spread and higher median depth during the non-announcement period. When deviations are used, the differences between the market liquidity variables before the announcement and the related medians during the non-announcement period are divided by lower spreads or higher depths for firms with a rich information environment. This will affect the results, because it is more difficult (easier) to show a small deviation of the spread (depth) when the median spread (depth) during the non-announcement period is lower (higher). Thus, the use of deviations of the market liquidity variables before the announcement from the related medians during the non-announcement period would bias the results.

Adverse selection component

To calculate the abnormal adverse selection component before the earnings announcement, I adjust the approach by Lin et al. (1995) (hereafter LSB). They show that the adverse selection component as a fraction of the effective spread equals λ in the following firm-specific regression:

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

where ΔQ_{t+1} equals the log quote midpoint at the following trade minus the log quote midpoint at this trade and Z_t equals the log trade price minus the log quote midpoint. Appendix 3.A discusses this model in more detail.

A dummy variable is added to calculate the abnormal adverse selection component before the earnings announcement. Thus, the following regression equation is estimated:

$$\Delta Q_{t+1} = \lambda Z_t + \lambda_b (Z_t * BEFORE_t) + \varepsilon_{t+1}$$

where $BEFORE_t$ has value one during the 6.5 trading hours before the earnings announcement and zero otherwise, and all other variables are defined as above. These firm-specific regressions are estimated with all trades between 9.30 AM and 4.00 PM during the period before the earnings announcement or the non-announcement period. λ_b represents the abnormal adverse selection component as a fraction of the effective spread during 6.5 trading hours before the earnings announcement. The abnormal adverse selection component during two days before the earnings announcement is computed in a comparable way.

Disclosure quality

I obtain a measure for firm's overall disclosure quality from 'An Annual Review of Corporate Reporting Practices' prepared by the Corporate Information Committee of the Association for Investment Management and Research (AIMR) for 1993/94, 1994/95 and 1995/96. 1996 is the final year, because the AIMR stopped the evaluation process at that time. Each annual volume provides scores on disclosure practices for a sample of firms, based on their aggregate disclosure efforts over a fiscal year. Firms are evaluated on their disclosures through annual reports, quarterly reports, 10Ks, press releases, other public announcements, and discussions with financial analysts. The evaluations are performed by subcommittees consisting of leading analysts with specific knowledge of a particular industry. Each subcommittee decides first on the firms to be examined and the scoring process. Subsequently, each committee member evaluates all the firms selected in that industry. Finally, the committee meets to summarize and report the scores. To ensure comparability of the scores across industries, the AIMR provides a checklist of criteria to be used for scoring firms and guidelines for the weights to be used for different disclosure categories.

Each year approximately 300 firms are evaluated by the AIMR. Recent studies using these disclosure scores generally indicate that they are reasonable proxies for information availability in the market (Farragher et al. 1994, Lang and Lundholm 1993, 1996, Sengupta 1998 and Welker 1995). One complication with the AIMR database is that different industries are possibly rated on different scales because of industry-specific evaluation committees. To address this problem, I divide the raw disclosure scores by the industry mean. Industries without quantitative disclosure quality scores are excluded.

Management earnings forecasts

The Dow Jones Interactive database is used to investigate the Business Wire, Dow Jones News Service, Dow Jones International News and PR Newswire for the existence of management earnings forecasts. The analysis focuses on management earnings forecasts between the previous and current earnings announcement. Several studies indicate that the occurrence of management earnings forecasts relates to a rich information environment. Coller and Yohn (1997), for instance, provide evidence that these forecasts improve market liquidity, while Lang and Lundholm (1996) show a relationship between management earnings forecasts and analyst forecast dispersion and forecast errors.

Number of analysts forecasting the earnings announcement

The First Call Historical Database is used to determine the number of individual analysts that forecast an earnings announcement. I focus on quarterly earnings forecasts made during the 180 day period before the corresponding earnings announcement to reduce the impact of stale forecasts. Academic research indicates that financial analysts improve the information environment. Givoly and Lakonishok (1979), Lys and Sohn (1990) and Francis and Soffer (1997), for example, show that analysts' earnings forecasts and recommendations reveal information and affect stock prices.

Trading volume

As discussed above, the drop in market liquidity is expected to relate to the change in trading volume. A correlation between the change in trading volume and the change in spreads and depths does not imply, however, that market makers condition the drop

in market liquidity on the change in volume. It is also possible that trading volume is affected by the spread and depth. When spreads increase, trading costs become higher and investors may be less willing to trade. This results in a lower trading volume. Similarly, high depths facilitate trading of large quantities and may cause larger trading volumes. Thus, due to this endogeneity problem a correlation between the change in the spread or depth and the percentage deviation of trading volume during the day before the earnings announcement cannot be interpreted as a causal relationship. Technically, the ordinary least squares (OLS) estimate is inconsistent because the deviation of trading volume is correlated with model's error term.

One approach to deal with this endogeneity problem is to use two-stage least squares (2SLS). Under this approach the deviation in trading volume the day before the earnings announcement is estimated with instrumental variables. An instrumental variable is a variable that can be assumed to be uncorrelated with the model's error term but correlated with the endogenous independent variable. Therefore, the instrumental variable should be exogenous and should not have a direct effect on the dependent variable itself. The *estimated* trading volume the day before the earnings announcement is likely uncorrelated with the model's error term and the coefficient of this variable in the regression on spreads or depths represents a causal relationship.

Unfortunately, there is no instrumental variable available to estimate the deviation of trading volume the day before the earnings announcement from the median volume during the non-announcement period. The seemingly most suitable instrumental variable is the deviation of trading volume two days before the earnings announcement. This variable is presumably correlated with the deviation of volume one day before the announcement, while it is impossible that the spread or depth on the day before the announcement influences trading volume one day earlier. However, the deviation of trading volume two days before the announcement may have a direct effect on the change in the spread and depth one day before the announcement. Market makers may condition their spreads and depths during that period on the trading volume one trading day earlier. This disqualifies the deviation of volume two days before the announcement as an instrumental variable. Therefore, I do not apply 2SLS and only investigate the impact of the deviation of the trading volume two days before earnings announcement on the change in the spread and depth one day before the announcement.

I compute the percentage deviation of trading volume two days before the earnings announcement from the median volume during the non-announcement period in the following way. First, I divide the trading volume from 13 to 6.5 trading hours before the earnings announcement by the median volume during the 6.5 trading hour periods during the non-announcement period. Next, I subtract 1 and multiply the outcome with 100. The percentage deviation of trading volume during the 6.5 trading hours before the earnings announcement from the median volume during the non-announcement period is also calculated for descriptive purposes.

Share price variance

An increase in share price variance may indicate the arrival of new information at the market. Nevertheless, a relationship between the change in share price variance and the drop in market liquidity does not imply that market makers condition the increase in spreads and decline in depths on share price variance. The change in share price variance is a result from market makers' price setting process rather than an input for that process. When market makers infer that information arrives at the market they will adjust the bid and ask prices to reflect that information and at the same time they may increase the (adverse selection component of the) spread and reduce the depth because they are afraid of informed trading. In that case, the increase in share price variance and decline in market liquidity result both from the information arrival and a correlation between changes in these two variables does not imply causality.

Also in this case, 2SLS can solve the endogeneity problem but again there is no suitable instrumental variable available. The deviation of share price variance two days before earnings announcements has the same shortcoming that a direct relationship between this variable and the change in the spread and depth may exist. Therefore, only the relationship between the deviation of the share price variance two days before earnings announcement and the change in the spread and depth one day before the announcement is explored.

I calculate the share price variance from 13 to 6.5 trading hours before the earnings announcement and divide this variance by the median share price variance during the 6.5 trading hour periods during the non-announcement period. Additionally, the percentage deviation of share price variance during the 6.5 trading hours before the earnings announcement from the median variance during the non-announcement period is computed. The deviation of the share price variance is based

on the variance of the quote midpoint rather than the share price to avoid the effect of the bid-ask bounce.

Control variables

As discussed above, I use the difference between the market liquidity variables before the earnings announcement and the related medians during the non-announcement period, rather than the percentage deviations of the market liquidity variables. This mitigates the bias due to the impact of the information environment on the median spread and depth during the non-announcement period. However, the change in spreads and depths before earnings announcements may relate to the size of spreads and depths during the non-announcement period. Therefore, I include the share price and turnover as control variables in the analysis, because several studies document a correlation between these variables and bid-ask spreads (Demsetz 1968, Tinic 1972, Tinic and West 1972, Benston and Hagerman 1974 and Hamilton 1976, 1978 among others). The variable turnover also controls for the impact of firm size or liquidity of the shares on the results. The price is the median of the average share prices during the 6.5 hour periods during the non-announcement period, while the turnover is the average daily turnover during the month of January that is closest to the earnings announcement.

3.4 Results

3.4.1 Descriptive statistics

Table 3.2 presents summary statistics. The median of the difference between the quoted spread, effective spread and depth during the day before the earnings announcement and the related medians during the non-announcement period are 0.001 cents, 0.0004 cents and -277 shares, respectively, while the abnormal adverse selection component during that day is 0.015. The corresponding one-tailed significance levels based on the Sign test are 0.01, 0.08, 0.01 and 0.01. This evidence confirms the findings by LMR and KL that the (adverse selection component of the) spread is higher and the depth is lower before earnings announcements. The table also reveals that the distributions of these differences are skewed. This occurs because spreads and depths are always positive and, thus, declines are bounded. Therefore, the median is a better measure of location than the mean and the Sign test is more appropriate than the t-test.

Table 3.2 Summary statistics

N=2802	*Mean*	*Median*	*Sign.*	*St Dev*	*Min*	*Q1*	*Q3*	*Max*
ΔBASb	0.003	0.001	0.01	0.034	-0.13	-0.011	0.016	0.72
ΔEBASb	0.001	0.0004	0.08	0.026	-0.13	-0.010	0.010	0.47
ΔDEPTHb	1375	-277	0.01	13502	-139811	-3219	3972	142148
ΔASCb	0.030	0.015	0.01	0.18	-1.03	-0.057	0.12	0.89
ΔBASb2	0.002	0.001	0.06	0.036	-0.16	-0.012	0.015	0.89
ΔEBASb2	0.001	0.0004	0.08	0.026	-0.20	-0.011	0.010	0.34
ΔDEPTHb2	1465	-257	0.01	13140	-147609	-3203	4095	133737
ΔASCb2	0.027	0.011	0.01	0.19	-1.75	-0.060	0.11	2.53
ΔVARb	122	15.4	0.01	390	-100	-45.7	147	9560
ΔVARb2	109	2.28	0.23	560	-100	-51.8	120	20142
ΔVOLb	32.2	1.06	0.24	169	-98.9	-33.3	56.8	6047
ΔVOLb2	24.7	-2.76	0.03	129	-96.9	-38.4	49.6	4062
DQ	1.01	1.02		0.14	0.34	0.94	1.08	1.41
MEF	0.18	0.00		0.38	0.00	0.00	0.00	1.00
ANALYST	9.24	9.00		6.23	0.00	4.00	14.0	30.00
TURNOVER	1.53E7	7.87E6		2.01E7	1.28E5	2.76E6	1.92E7	1.47E8
PRICE	38.6	35.1		19.19	5.43	24.2	51.5	98.0

ΔBASb(2) (ΔEBASb(2), ΔDEPTHb(2)) represents the difference between the quoted spread (effective spread, depth) one (two) day(s) before the earnings announcement and the corresponding median during the non-announcement period; ΔASCb (ΔASCb2) the abnormal adverse selection component one (two) day(s) before the announcement; ΔVARb(2) (ΔVOLb(2)) the deviation of the share price variance (trading volume) one (two) day(s) before the earnings announcement from the corresponding median during the non-announcement period; DQ the disclosure quality; MEF a dummy variable indicating the occurrence of management earnings forecasts; ANALYST the number of analysts forecasting the announcement; PRICE the share price and TURNOVER the turnover. The one-sided significance levels are based on the Sign test.

During the day before the earnings announcement the deviation of the share price variance is also significantly larger than zero suggesting that share prices fluctuate more before announcements than during the non-announcement period. This suggests that more information enters the market the day before the earnings announcement than on average during the non-announcement period. At first glance, the fact that the deviation of the trading volume one day before the earnings announcement is not significantly larger than zero contradicts this suggestion. However, note that the deviation of the trading volume two days before the announcement is significantly smaller than zero. An explanation is that some traders

are reluctant to trade before an announcement and postpone trading until the announcement. In that situation, it is possible that trading volume during the day before the earnings announcement is not larger than during the non-announcement period while more informed trading takes place. In addition, the (not presented) deviation of the absolute price change before the announcement from the median absolute price change during the non-announcement period is also significantly larger than zero.

With regard to the information environment variables, the disclosure quality measure varies from 0.14 to 1.41, and 18 percent of the earnings announcements are forecasted by management. The number of analysts forecasting the earnings news ranges from 0 to 30 with a median of 9 analysts.

Table 3.3 shows the Pearson and Spearman correlation coefficients. To mitigate the impact of outliers values larger (smaller) than the mean plus (minus) three times the standard deviation are removed. As expected, the changes in the quoted spread, depth and adverse selection component before earnings announcements are all significantly correlated. However, the change in the effective spread is not significantly correlated with the changes in the other market liquidity variables. The information environment variables disclosure quality, occurrence of management earnings forecasts and the number of analysts forecasting the earnings news are significantly correlated.

3.4.2 Regression results

To test the hypothesis I estimate the following regression equations separately:

$$(1)\ \Delta BASb_i = \alpha + \beta_1 DQ_i + \beta_2 MEF_i + \beta_3 ANALYST_i + \beta_4 \Delta VARb2_i + \beta_5 \Delta VOLb2_i + \beta_6 PRICE_i + \beta_7 TURNOVER_i + \beta_8 \Delta BASb2_i + \varepsilon_i$$

$$(2)\ \Delta EBASb_i = \alpha + \beta_1 DQ_i + \beta_2 MEF_i + \beta_3 ANALYST_i + \beta_4 \Delta VARb2_i + \beta_5 \Delta VOLb2_i + \beta_6 PRICE_i + \beta_7 TURNOVER_i + \beta_8 \Delta EBASb2_i + \varepsilon_i$$

$$(3)\ \Delta ASCb_i = \alpha + \beta_1 DQ_i + \beta_2 MEF_i + \beta_3 ANALYST_i + \beta_4 \Delta VARb2_i + \beta_5 \Delta VOLb2_i + \beta_6 PRICE_i + \beta_7 TURNOVER_i + \beta_8 \Delta ASCb2_i + \varepsilon_i$$

$$(4)\ \Delta DEPTHb_i = \alpha + \beta_1 DQ_i + \beta_2 MEF_i + \beta_3 ANALYST_i + \beta_4 \Delta VARb2_i + \beta_5 \Delta VOLb2_i + \beta_6 PRICE_i + \beta_7 TURNOVER_i + \beta_8 \Delta DEPTHb2_i + \varepsilon_i$$

where, $\Delta BASb_i$ ($\Delta EBASb_i$, $\Delta DEPTHb_i$) represents the difference between the quoted spread (effective spread, depth) the day before the earnings announcement and the

Table 3.3 Correlation coefficients

N= 2671-2802	ΔBASb	ΔEBASb	ΔDEPTHb	ΔASCb	ΔBASb2	ΔEBASb2	ΔDEPTHb2	ΔASCb2
ΔBASb	1.00	0.14**	-0.25**	0.28**	0.29**	0.12**	-0.15**	0.13**
ΔEBASb	0.02	1.00	-0.02	-0.02	0.06**	0.15**	-0.01	0.06**
ΔDEPTHb	-0.37**	-0.03	1.00	-0.18**	-0.13**	-0.02	0.40**	-0.10**
ΔASCb	0.31**	-0.02	-0.26**	1.00	0.09**	0.09**	-0.08**	0.39**
ΔBASb2	0.29**	0.03	-0.17**	0.11**	1.00	0.11**	-0.24**	0.23**
ΔEBASb2	0.08**	0.18**	-0.03	0.07**	-0.01	1.00	-0.03	0.01
ΔDEPTHb2	-0.22**	-0.02	0.43**	-0.14**	-0.35**	-0.04*	1.00	-0.16**
ΔASCb2	0.12**	0.05**	-0.11**	0.36**	0.28**	-0.04*	-0.22**	1.00
ΔVARb	0.33**	0.06**	-0.22**	0.30**	0.14**	0.02	-0.14**	0.08**
ΔVARb2	0.19**	0.01	-0.13**	0.10**	0.33**	0.04*	-0.23**	0.29**
ΔVOLb	0.01	-0.09**	0.26**	0.05**	-0.01	-0.07**	0.15**	0.00
ΔVOLb2	-0.04*	-0.08**	0.18**	-0.05**	0.04*	-0.13**	0.27**	0.09**
DQ	-0.01	-0.02	-0.01	0.03	-0.01	-0.03	0.00	0.02
MEF	-0.02	-0.03*	0.03*	-0.02	-0.01	-0.03*	0.03	0.01
ANALYST	-0.02	0.00	0.00	0.02	-0.02	-0.02	0.00	0.05**
TURNOVER	-0.05**	-0.04*	-0.04**	0.07**	-0.01	-0.05**	-0.05**	0.08**
PRICE	0.01	0.02	0.02	0.10**	-0.03*	0.03*	0.04*	0.08**

	ΔVARb	ΔVARb2	ΔVOLb	ΔVOLb2	DQ	MEF	ANALYST	TURN-OVER	PRICE
ΔBASb	0.22**	0.13**	0.01	-0.04*	-0.01	-0.02	-0.03	-0.03	0.00
ΔEBASb	0.08**	0.03*	-0.07**	-0.05**	0.01	-0.03	0.00	0.00	0.05**
ΔDEPTHb	-0.14**	-0.09**	0.18**	0.14**	-0.02	0.03	0.00	-0.01	0.01
ΔASCb	0.20**	0.07**	0.02	-0.05**	0.02	0.00	0.03*	0.06**	0.10**
ΔBASb2	0.10**	0.23**	-0.01	0.00	-0.01	-0.01	-0.02	0.00	-0.05**
ΔEBASb2	0.03	0.07**	-0.03	-0.11**	-0.01	-0.03	-0.03	-0.04*	0.02
ΔDEPTHb2	-0.08**	-0.12**	0.12**	0.18**	-0.02	0.04*	0.01	-0.02	0.03
ΔASCb2	0.08**	0.20**	0.00	0.08**	0.01	0.00	0.03	0.07**	0.07**
ΔVARb	1.00	0.21**	0.30**	0.07**	0.01	-0.01	0.02	-0.01	0.01
ΔVARb2	0.22**	1.00	0.15**	0.33**	0.01	0.03	0.01	0.00	-0.01
ΔVOLb	0.37**	0.14**	1.00	0.31**	-0.01	0.00	-0.04*	-0.05**	-0.08**
ΔVOLb2	0.06**	0.36**	0.37**	1.00	0.02	0.02	-0.02	-0.02	-0.03*
DQ	0.02	-0.01	0.00	0.02	1.00	0.03*	0.18**	0.17**	0.12**
MEF	-0.02	0.02	0.02	0.04*	0.04*	1.00	0.07**	0.07**	0.02
ANALYST	0.02	0.01	-0.01	0.03	0.19**	0.08**	1.00	0.53**	0.38**
TURNOVER	0.01	0.02	0.00	0.05**	0.23**	0.10**	0.61**	1.00	0.46**
PRICE	0.01	-0.02	-0.05**	-0.01	0.16**	0.02	0.38**	0.50**	1.00

This table contains the Pearson (top right) and Spearman (bottom left) correlation coefficients. The variables are defined as in table 3.2. ** and * indicate significance at 1% and 5% levels, respectively (one-tailed tests).

median quoted spread (effective spread, depth) during the non-announcement period; $\Delta ASCb_i$ ($\Delta ASCb2_i$) the abnormal adverse selection component one (two) day(s) before the announcement; DQ_i the disclosure quality; MEF_i a dummy variable indicating the occurrence of management earnings forecasts; $ANALYST_i$ the number of analysts forecasting the announcement; $\Delta VARb2_i$ ($\Delta VOLb2_i$) the deviation of the share price variance (trading volume) two days before the earnings announcement from the corresponding median during the non-announcement period; $PRICE_i$ the share price, $TURNOVER_i$ the turnover, and $\Delta BASb2_i$ ($\Delta EBASb2_i$, $\Delta DEPTHb2_i$) represents the difference between the quoted spread (effective spread, depth) two days before the earnings announcement and the related median during the non-announcement period. Observations are removed when at least one variable is larger (smaller) than the mean plus (minus) three times the standard deviation.

While the data set contains repeated observations over the same firms, it is not appropriate to assume that different observations are independent. Therefore, I estimate all models with the fixed effects approach and apply the F-test to determine whether the fixed effects are significantly different from zero. These effects are different from zero in the regressions on the quoted spread, effective spread and adverse selection component. This indicates that it is not appropriate to estimate these three models with OLS. I estimate the regressions on the quoted and effective spread with the random effect approach (Feasible Generalized Least Squares). However, in case of the abnormal adverse selection component the fixed effects model is applied because the Hausman test indicates that the individual effects are correlated with the other variables in the model. Applying the random effects model in this situation would lead to inconsistent estimators.

First, a reduced model is estimated with only disclosure quality, occurrence of management earnings forecasts, analyst following, share price and turnover as independent variables. Table 3.4 reveals that the occurrence of management earnings forecasts influences the change in the depth. This result indicates that the information environment has some impact on the drop in market liquidity before earnings announcements. The adjusted R-squared for the depth and the Buse (1973) R-squared for the quoted and effective spread are around zero but that is not surprising.[10] The

[10] No R-squared is presented for the abnormal adverse selection component because the fixed effects inflate the R-squared and hinder interpretation.

abnormal adverse selection component and the differences between the spread and the depth before earnings announcements and the corresponding medians during the non-announcement period do not only represent the anticipation of earnings announcements by market makers. Market liquidity variables also fluctuate for other reasons. The anticipatory effect is, therefore, only that part of the change in the market liquidity variables that is different from what would occur under the same circumstances during a non-announcement period. In other words, the major differences between the observations of the dependent variables are not due to a difference in anticipation of the announcement but due to other factors that affect (adverse selection components of) spreads and depths. Therefore, I also include the relative size of the market liquidity variables, and the deviations of the share price variance and volume two days before the earnings announcement in the regression equations.

Table 3.4 Regressions results information environment variables

	Exp sign	ΔBASb	ΔEBASb	ΔASCb	Exp sign	ΔDEPTHb
Intercept		0.006	-0.004	0.027		1458
		(1.28)	(-1.05)	(0.30)		(0.99)
DQ	-	-0.002	0.001	0.024	+	-1612
		(-0.46)	(0.44)	(0.38)		(-1.12)
MEF	-	-0.001	-0.001	-0.002	+	1078**
		(-0.99)	(-1.39)	(-0.18)		(2.34)
ANALYST	-	-0.00008	5.0E-6	-0.0009	+	44.0
		(-0.74)	(0.06)	(-0.61)		(1.27)
PRICE		1.7E-7	0.00007**	0.0006		17.0
		(0.00)	(2.76)	(1.09)		(1.58)
TURNOVER		-2.6E-11	-3.44E-11	-6.5E-10		-0.00003*
		(-0.57)	(-1.06)	(-1.01)		(-1.91)
R^2		0.00	0.00			0.00
F value						2.37
N		2593	2559	2561		2544

This table reports results from OLS (ΔDEPTHb), EGLS (ΔBASb, ΔEBASb) and fixed effects model (ΔASCb). The variables are defined as in table 3.2 and t-statistics are within parentheses. R^2 represents the adjusted R-squared in case of ΔDEPTHb and the Buse (1973) R-squared in case of ΔBASb and ΔEBASb. ** and * indicate significance at the 1% and 5% levels, respectively (one-tailed tests).

Table 3.5 Regressions results full model

	Exp sign	ΔBASb	ΔEBASb	ΔASCb	Exp sign	ΔDEPTHb
Intercept		0.004	-0.004	0.028		1192
		(0.85)	(-1.08)	(0.32)		(0.88)
DQ	-	-0.001	0.002	0.046	+	-1253
		(-0.33)	(0.49)	(0.77)		(-0.95)
MEF	-	-0.001	-0.001	-0.0003	+	732*
		(-0.80)	(-1.24)	(-0.04)		(1.73)
ANALYST	-	-0.00007	0.00001	0.00003	+	37.1
		(-0.61)	(0.16)	(0.02)		(1.17)
ΔVARb2	+	0.00001**	3.9E-6*	0.00003*	-	-2.81**
		(4.37)	(2.13)	(1.76)		(-3.59)
ΔVOLb2	?	-0.00002**	-0.00001**	-0.0002**	?	10.5**
		(-3.69)	(-2.49)	(-5.52)		(4.79)
ΔBASb2	+	0.26**				
		(13.15)				
ΔEBASb2	+		0.13**			
			(6.61)			
ΔASCb2	+			0.32**		
				(15.36)		
ΔDEPTHb2					+	0.36**
						(18.99)
PRICE		0.00002	0.00006**	0.0008**		6.61
		(0.60)	(2.29)	(1.49)		(0.67)
TURNOVER		-4.5E-11	-2.4E-11	-6.0E-10		-9.6E-6
		(-1.00)	(-0.75)	(-0.98)		(-0.72)
R^2		0.09	0.03			0.16
F value						61.99
N		2593	2559	2561		2544

This table reports results from OLS (ΔDEPTHb), EGLS (ΔBASb, ΔEBASb) and fixed effects model (ΔASCb). The variables are defined as in table 3.2 and t-statistics are within parentheses. R^2 represents the adjusted R-squared in case of ΔDEPTHb and the Buse (1973) R-squared in case of ΔBASb and ΔEBASb. ** and * indicate significance at the 1% and 5% levels, respectively (one-tailed tests).

Table 3.5 indeed shows a higher R-squared for the full model, namely 0.09, 0.03 and 0.16 for the change in the quoted spread, effective spread and depth, respectively. The relative size of the market liquidity variables two days before the announcement is significant in all regressions. This result confirms the finding by

LMR of a positive autoregressive pattern for spreads and depths. Large differences of spreads and depths from the median during the non-announcement period are followed by large differences. The deviation of the share price variance two days before the earnings announcement is also significant in all regressions. The sign of this relationship indicates that market liquidity is lower when the share price variance two days before the announcement is high. Market makers seemingly interpret the relative high variance as a signal of a high probability of informed trading and therefore offer lower market liquidity. The sign of the significant relationship between the deviation of volume and the change in the market liquidity variables suggest that market makers set lower spreads and higher depths after a period with relatively high trading volume. This finding is consistent with the argument that low trading volume two days before earnings announcements results from the absence of trading by liquidity traders. When less (more) liquidity trading goes on, the probability of informed trading is higher (lower) and market makers may set higher (lower) spreads and lower (higher) depths.

The full model also presents evidence that the change in depths is affected by the occurrence of management earnings forecasts. However, the analysis does not reveal any impact of the information environment variables on the change in the quoted and effective bid-ask spread and the adverse selection component. The next section discusses several explanations for this lack of evidence.

3.5 Discussion

The analysis shows that the information environment variables disclosure quality, occurrence of management earnings forecasts and number of analysts forecasting the earnings news have only a small impact on the change in market liquidity variables before earnings announcements. One explanation for this lack of significant findings is that market makers do not believe that these information environment variables relate to the probability of informed trading before earnings announcements. When they think that these variables are not relevant for predicting informed trading before announcements, they will not condition the (adverse selection component of the) spread and depth before announcements on disclosure quality, occurrence of management earnings forecasts or analyst following.

Another explanation is that the increase in the (adverse selection component of the) spread is too small to show cross-sectional differences. Table 3.2 reveals that the

medians of changes in the quoted and effective spread are 0.001 and 0.0004 cents. In percentages, the medians of the changes in the quoted and effective spread are 0.77 and 0.35 percent, respectively. Also the increase in the adverse selection component is small, because the median abnormal adverse selection component as a fraction of the effective spread is 0.015 while the median adverse selection component during the non-announcement period is 0.29 of the effective spread. These numbers suggest that the increase in the (adverse selection component of the) spread before earnings announcement is only a minor effect. This effect may be too small to provide evidence on the impact of information environment variables on the changes in spreads before earnings announcements.

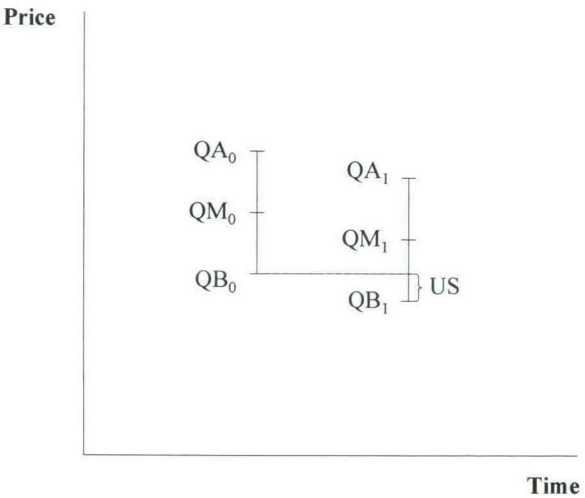
The small drop in market liquidity casts doubt on the conjecture that market liquidity drops before earnings announcements because market makers anticipate earnings announcements. When market makers drop market liquidity in anticipation of announcements a drop in market liquidity for all firms would be expected. Given the small drop in market liquidity, it is questionable whether that occurs. In fact, prior evidence that, in aggregate, spreads increase and depths decrease before earnings announcements does not imply that market makers anticipate informed trading. Another explanation for this effect is that market makers react to information arrival and more information enters the market before earnings announcements than on average during the non-announcement period. When the drop in market liquidity occurs because market makers react to increased information arrival rather than anticipating announcements, the detection of a relationship between the information environment variables and the changes in spreads and depths before earnings announcements will be difficult. Firms that do not experience any informed trading will not show a relationship between the information environment and the change in the spread and depth before the earnings announcement, because market makers do not adjust market liquidity for these firms.

3.6 Summary and conclusions

The aim of this study is to provide evidence on the conjecture that the drop in market liquidity before earnings announcements is related to the information environment. This relationship is expected because analytical literature suggests that the increase in spreads and decrease in depths before earnings announcements are related to an increased probability of informed trading. When the information environment is rich,

trade price at a purchase will be lower than the quote midpoint. Given that a drop in bid prices is expected after a purchase, λ is positive. Recall that the quote midpoint is the average of the quoted bid and ask price. Under the assumption that the market maker adjusts the bid and ask prices to the same extent after a purchase the adverse selection component can also be calculated as the difference between the quote midpoint at time t+1 minus the quote midpoint at time t ($QM_1 - QM_0$ in figure 3.3).

Figure 3.3 Adverse selection component (Approach LSB)



This figure illustrates the unrealized spread due to the possibility of informed trading. QA represents the quoted ask price, QM the quote midpoint, QB the quoted bid price and US the unrealized spread due to the possibility of informed trading.

After a sale the market maker will increase the ask price when the probability of informed trading is larger than zero. When the trade reveals private information and (s)he does not adjust the ask price, the market maker will sell more shares for a price that is far too low and will miss revenue. The higher the probability of informed trading is, the larger the adjustment of ask prices after a sale and the higher the adverse selection component. Under the same assumptions as above, the portion of the spread due to adverse information after a sale as a fraction of one-half the signed effective spread equals λ in

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

where Q_t (Q_{t+1}) is the quote midpoint at t (t+1) and Z_t represents the trade price at time t minus the quote midpoint at time t. Also in this case, λ is positive because after a sale the quote midpoint is expected to increase and the difference between the trading price and the quote midpoint is positive. Therefore, the equation is identical for purchases and sales.

In the empirical estimation LSB use the logarithms of the transaction price and the quote midpoint. They state that this transformation yields a (continuously compounded) rate of return for the dependent variable and a relative spread for the independent variable. The transformation produces estimates of the adverse selection cost components of the spread as a percent of the effective spread for easy cross-sectional comparisons, and may also reduce the problem of price discreteness.

A shortcoming of this method is that the approach does not separate the adverse selection component and the inventory holding component. LSB, however, state that Madhavan and Smidt (1991) use specialist inventory data and show that inventory has a very weak effect on intraday dealer pricing. Similarly, Hasbrouck (1988) uses a sophisticated VAR model and finds the inventory effect to be insignificant. Finally, Hasbrouck and Sofianos (1993) use NYSE specialist inventory data and find 'little support for the classical inventory control mechanism.' Hence, like LSB, I focus on adverse information in the interpretation of the results.

CHAPTER 4

SUMMARY AND CONCLUSIONS

4.1 Introduction

Prior research indicates that bid-ask spreads are higher and depths are lower during trading hours around earnings announcements than during non-announcement periods (LMR). Literature suggests that this drop in market liquidity occurs because market makers are confronted with a higher probability of informed trading before and after these announcements. Before earnings announcements, this occurs because investors may search for and find private information or because the public announcement reaches investors earlier than market makers. After earnings announcements, some investors may gather private information through their superior capacities to interpret earnings news or the earnings news is revealed in pieces and this information reaches investors earlier than market makers.

It is relevant to explore this drop in market liquidity around earnings announcements, because investors view market liquidity as an important characteristic of organized financial markets. In this thesis I investigated two aspects of this drop, namely (a) the impact of intraday timing of earnings announcements on the drop in market liquidity around these announcements and (b) the influence of the richness of the information environment on the drop in market liquidity before earnings announcements. Sections 4.2 and 4.3 summarize this research and propose several themes for future research.

4.2 The impact of intraday timing of earnings announcements on market liquidity

In general, investors dislike drops in market liquidity. Therefore, it is important to know whether management can mitigate the drop in market liquidity around earnings announcements. I investigated one possible action, namely intraday timing of announcements. When firms release the earnings news overnight it is not possible that investors start trading on the public announcement before market makers are aware of the news. In addition, Livne (2001) shows analytically that short term investors trade less aggressively before overnight than daytime announcements. This reduces the probability that market makers trade with investors with private information before

earnings announcements. Intraday timing may also influence the probability of informed trading after earnings announcements, because market makers have more information after overnight than daytime announcements. When market makers check news wires before opening of the market, they are aware of the earnings news. In addition, after overnight releases they know the order flow because the opening prices are set by a process that resembles a call auction market, whereas during the day the process resembles a dealer market.

The sample consists of 1000 daytime and 1802 overnight announcements declared between 1993 and 1996 by 336 firms traded at the NYSE or AMEX. Relative to overnight releases, results show that daytime releases relate, on average, to significantly larger percentage deviations of the quoted and effective spread from the median during the non-announcement period and lower percentage deviations of the depth after earnings announcements. Sensitivity tests reveal that these findings are robust to firm-specific factors and cross-listings, and that there is no difference in the information content of daytime and overnight announcements in the sample. In fact, there is no evidence of a drop in market liquidity after overnight earnings announcements at all.

The findings suggest that from a market liquidity perspective it is beneficial to announce earnings news during non-trading instead of trading hours. However, cross-listings may erode the advantage of announcing outside US-trading hours because the drop in market liquidity may occur on other exchanges. Additionally, the decision to announce earnings news during trading or non-trading hours depends on more factors than just the impact on market liquidity. Future research may address other costs and benefits of intraday timing of earnings announcements to provide a more complete picture of factors that affect this important decision. Additionally, future research may focus on stock markets with a different trading system. Greene and Watts (1996), for example, present evidence on differences in price discovery on the NYSE and NASDAQ. Therefore, differences in trading systems may affect the influence of intraday timing of earnings announcements on market liquidity. Another interesting avenue for research is the investigation of the impact of intraday timing of other announcements, like mergers or replacements of management, on market liquidity after those events. While the price impact of these announcements is likely to be larger, on average, than the impact of earnings announcements, a larger difference may exist between market liquidity after daytime and overnight announcements.

4.3 The impact of the information environment on the drop in market liquidity before earnings announcements

The study presented in chapter 3 aims at providing evidence on the conjecture that the drop in market liquidity before earnings announcements is related to the information environment. This relationship is expected because analytical literature suggests that the increase in spreads and decrease in depths before earnings releases are related to an increased probability of informed trading. When the information environment is rich, more information will be captured in the share price and the probability of informed trading before announcements may be lower. Three proxies are used for the information environment, namely disclosure quality, occurrence of management earnings forecasts and the number of analysts forecasting the earnings news.

The analysis of 2802 earnings announcements shows that the occurrence of management earnings forecasts affects the change in depths. In that way, it provides some evidence on the impact of the information environment on the market liquidity drop before earnings announcements. However, the relationship between the information environment variables and the change in the quoted spread, effective spread and the adverse selection component is never significant. One explanation for this lack of results is that market makers do not condition on the information environment because they do believe that these variables affect the probability of informed trading before earnings announcements. Alternatively, the drop in market liquidity before earnings announcements might be too small to provide evidence on cross-sectional differences in this drop.

The small drop in market liquidity casts doubt on the conjecture that market liquidity drops before earnings announcements because market makers anticipate earnings releases. When market makers drop market liquidity in anticipation of announcements a drop in market liquidity for all firms would be expected. Given the small drop in market liquidity, it is questionable whether that occurs. In fact, prior evidence that, in aggregate, spreads increase and depths decrease before earnings announcements does not imply that market makers anticipate informed trading. Another explanation for this effect is that market makers react to information arrival and more information enters the market before earnings announcements than on average during the non-announcement period. The question whether the drop in market liquidity before earnings announcements is driven by

increased information arrival or a real anticipation of earnings releases is an interesting topic for future research.

References

Amihud, Y., and H. Mendelson, 1987, "Trading Mechanisms and Stock Returns: An Empirical Investigation," *Journal of Finance*, 42, 533-553.

Association for Investment Management and Research, 1994, *Corporate Information Committee Report 1993-94.*

Association for Investment Management and Research, 1995, *An Annual Review of Corporate Reporting Practices 1994-95.*

Association for Investment Management and Research, 1996, *An Annual Review of Corporate Reporting Practices 1995-96.*

Bamber, L.S., 1986, "The Information Content of Annual Earnings Releases: A Trading Volume Approach," *Journal of Accounting Research,* 24, 40-56.

Benston, G., and R. Hagerman, 1974, "Determinants of bid-ask spreads in the over-the–counter market", *Journal of Financial Economics*, 1, 353-364.

Buse, A., 1973, "Goodness of fit in generalized least squares estimation", *American Statistician*, 27, 106-108.

Coller, M., and T.L. Yohn, 1997, "Management Forecasts and Information Asymmetry: An Examination of Bid-Ask Spreads," *Journal of Accounting Research*, 35, 181-192.

Copeland, T., and D. Galai, 1983, "Information Effects on the Bid-ask Spread," *Journal of Finance*, 38, 1457-1469.

Demsetz, H., 1968, "The cost of transacting, " *Quarterly Journal of Economics*, 82, 33-53.

Farragher, E., R. Kleiman, and M. Bazaz, 1994, "Do investor relations make a difference?," *Quarterly Review of Economics and Finance*, 34, 403-412.

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, 165-184.

Francis, J., and L. Soffer, 1997, "The Relative Informativeness of Analysts' Stock Recommendations and Earnings Forecast Revisions," *Journal of Accounting Research*, 35, 193-212.

Givoly, D., and Lakonishok, J., 1979, "The Information Content of Financial Analysts Forecasts of Earnings: some evidence of semi-strong efficiency," *Journal of Accounting and Economics*, 2, 165-186.

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, 71-100.

Greene, J.T., and S.G. Watts, 1996, "Price Discovery on the NYSE and the NASDAQ: The Case of Overnight and Daytime News Releases," *Financial Management*, 25, 19-42.

Hamilton, J., 1976, "Competition, scale economics and transaction cost in the stock market," *Journal of Financial and Quantitative Analysis*, 11, 779-802.

Healy, P., A. Hutton and K. Palepu, 1999, "Stock performance and intermediation changes surrounding sustained increases in disclosure," *Contemporary Accounting Research*, 16, 485-520.

Ho, T., and H. Stoll, 1981, "Optimal Dealer Pricing under Transaction and Return Uncertainty," *Journal of Financial Economics*, 9, 47-74.

Kim, O., and R. Verrecchia, 1991, "Market Reactions to Anticipated

Announcements," *Journal of Financial Economics,* 30, 273-309.

Kim, O., and R. Verrecchia, 1994, "Market Liquidity and Volume around Earnings Announcements," *Journal of Accounting and Economics*, 17, 41-67.

Krinsky, I., and J. Lee, 1996, "Earnings Announcements and the Components of the Bid-ask Spread," *Journal of Finance*, 51, 1523-1535.

Lang, M.H., and R.J. Lundholm, 1993, "Cross-sectional determinants of analysts ratings of corporate disclosure," *Journal of Accounting Research*, 31, 246-271.

Lang, M.H., and R.J. Lundholm, 1996, "Corporate disclosure policy and analyst behavior," *The Accounting Review*, 71, 467-492.

Lee, C.M.C., B. Mucklow, and M.J. Ready, 1993, "Spreads, Depths, and the Impact of Earnings Information: An Intraday Analysis," *Review of Financial Studies*, 6, 345-374.

Lee, C.M.C., and M.J. Ready, 1991, "Inferring Trade Direction from Intraday Data," *Journal of Finance,* 46, 733-746.

Lin, J., G.C. Sanger and G.G. Booth, 1995, Trade size and components of the bid-ask spread, *The Review of Financial Studies,* 1153-1183.

Livne, G., 2000, "Information Asymmetry, Investment Horizons, and the Dual Role of Public Announcements," *Review of Accounting Studies*, 5, 127-153.

Livne, G., 2001, "Market Equilibrium and the Intraday Timing of Public Announcements," working paper, London Business School.

Lys, T.,and S. Sohn, 1990, "The Association between Revisions of Financial Analysts' Earnings Forecasts and Security Price Changes," *Journal of Accounting and Economics*, 13, 341-364.

McNichols, M., and B. Trueman, 1994, "Public Disclosure, Private Information Collection, and Short Term Trading," *Journal of Accounting and Economics*, 17, 69-94.

Morse, D.C., 1981, "Price and Trading Volume Reaction surrounding Earnings Announcements: A Closer Examination," *Journal of Accounting Research,* 19, 374-383.

Patell, J.M., and M.A. Wolfson, 1982, "Good News, Bad News, and Intraday Timing of Corporate Disclosures," *The Accounting Review,* 57, 509-527.

Roberts, C., P. Weetman, and P. Gordon, 1998, *International Financial Accounting; A Comparative Approach*, Pitman Publising , London.

Sengupta, P., 1998, "Corporate disclosure quality and the cost of debt," *The Accounting Review*, 73, 459-474.

Stoll, H.R., 1978, "The Supply of Dealer Services in Securities Markets," *Journal of Finance*, 33, 1133-1151.

Timbrell, M.C., and D.L. Tweedie, 1994, *Stock Exchange Official Yearbook 1993-1994,* Macmillan Press Ltd., London.

Timbrell, M.C. and D.L. Tweedie, 1995, *The Macmillan Stock Exchange Yearbook 1994-1995,* Macmillan Press Ltd., London.

Timbrell, M.C. and D.L. Tweedie, 1996, *The Macmillan Stock Exchange Yearbook 1996: The In-depth Guide to all Quoted Companies and Securities,* Macmillan Press Ltd., London.

Tinic, S., 1972, "The Economics of Liquidity Services," *Quarterly Journal of Economics*, 86, 79-93.

Tinic, S., and R. West, 1972, "Competition and the pricing of dealer services in the

over-the-counter market," *Journal of Financial and Quantitative Analysis*, 7, 1707-1728.

Welker, M., 1995, "Disclosure Policy, Information Asymmetry, and Liquidity in Equity Markets," *Contemporary Accounting Research*, 11, 801-827.

SAMENVATTING IN HET NEDERLANDS
(SUMMARY IN DUTCH)

S.1 Introductie

De marktliquiditeit neemt af rond winstaankondigingen. Lee, Mucklow en Ready (1993) (hierna LMR) tonen aan dat het verschil tussen de bied- en laatkoers ('bied-laat wijdte') groter is en de diepte kleiner is rond winstaankondigingen dan gedurende een periode zonder deze aankondigingen. Beleggers stellen deze afname niet op prijs, omdat marktliquiditeit één van de belangrijkste karakteristieken is van georganiseerde financiële markten. Een hoge marktliquiditeit betekent dat grote hoeveelheden aandelen snel en anoniem gekocht of verkocht kunnen worden zonder sterke prijsreacties. Een lage marktliquiditeit heeft een negatieve invloed op de vraag naar aandelen en de aandelenprijs. Deze lagere aandelenprijs is gerelateerd aan hogere kosten van eigen vermogen. Daarom is het belangrijk om de afname in marktliquiditeit rond winstaankondigingen te onderzoeken.

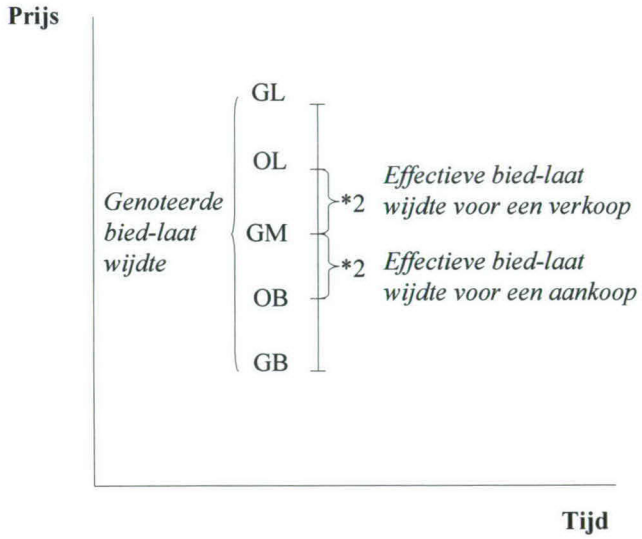
Dit proefschrift onderzoekt twee belangrijke aspecten van de afname in marktliquiditeit, namelijk (a) de mogelijkheid voor het management om de afname in marktliquiditeit te beperken door de winstaankondiging buiten in plaats van tijdens handelsuren te doen en (b) de veronderstelling dat de afname in marktliquiditeit voor winstaankondigingen gerelateerd is aan de informatieomgeving. Voordat ik deze onderzoeken samenvat, introduceer ik eerst de notie van marktliquiditeit en het gedrag van de (nadelige selectiekostencomponent van de) bied-laat wijdte en de diepte rond winstaankondigingen.

S.2 Marktliquiditeit rond winstaankondigingen

Om de liquiditeit van aandelen te bevorderen gebruiken veel georganiseerde financiële markten specialisten. Dit zijn individuen die aandelen kopen of verkopen als beleggers deze aanbieden of vragen. Als beloning voor het bevorderen van de liquiditeit hebben deze specialisten het recht om verschillende prijzen te hanteren voor het aan- en verkopen: ze kopen tegen de biedprijs en verkopen tegen een hogere laatprijs. Zoals figuur S.1 aangeeft, is de genoteerde bied-laat wijdte het verschil tussen de genoteerde bied- en laatprijs. Het is mogelijk dat beleggers met de specialist onderhandelen over de bied- of laatprijs. Daarom kopen specialisten soms tegen een

prijs die hoger is dan de biedprijs en verkopen tegen een prijs die lager is dan de laatprijs. De effectieve bied-laat wijdte houdt hiermee rekening en wordt berekend als tweemaal het absolute verschil tussen het genoteerde middelpunt (gemiddelde van de bied- en laatprijs) en de onderhandelde bied- of laatprijs voor respectievelijk een aan- of verkoop.

Figuur S.1 Bied-laat wijdtes

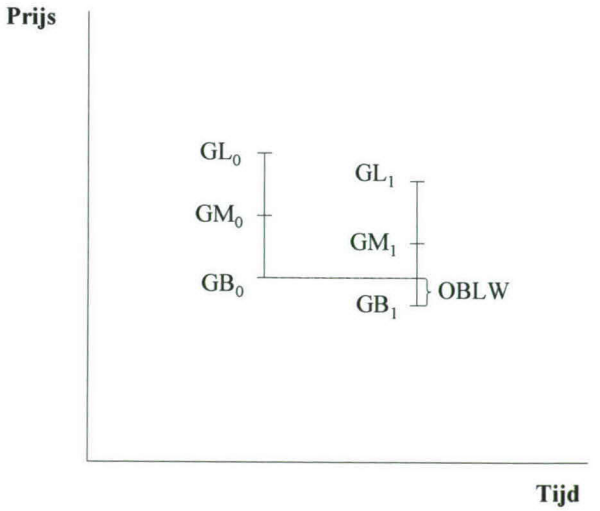


Deze figuur toont de genoteerde en effectieve bied-laat wijdte. GL is de genoteerde laatprijs, OL de onderhandelde laatprijs, GM het genoteerde middelpunt, OB de onderhandelde biedprijs en GB de genoteerde biedprijs.

De literatuur laat zien dat de bied-laat wijdte bestaat uit drie componenten, namelijk verhandelingskosten, voorraadkosten en nadelige-selectiekosten. De verhandelingskostencomponent is een beloning voor de specialist voor de werkzaamheden die hij (zij) moet verrichten voor het aan- en verkopen van de aandelen (Tinic 1972). De voorraadkostencomponent compenseert de specialisten voor het beheersen van de voorraad (Stoll 1978, Ho en Stoll 1981). De nadelige-selectiekostencomponent is een beloning voor de specialisten voor het aanvaarden van het risico om met beleggers met privé-informatie te handelen (Copeland en Galai 1983, Glosten en Milgrom 1985). Indien een belegger bijvoorbeeld voor een winstaankondiging weet dat de winst veel lager is dan verwacht, dan zal hij (zij)

aandelen verkopen aan de specialist. Na het bekend worden van het winstcijfer zal de aandelenprijs dalen. Zoals figuur S.2 laat zien, kocht de specialist de aandelen tegen een hoge biedprijs (GB_0) en moet hij (zij) de aandelen verkopen tegen een lage laatprijs (GL_1). De specialist verdient daarom maar een gedeelte van de bied-laat wijdte. Wanneer de belegger weet voor de aankondiging dat de winst hoger is dan verwacht, zal hij (zij) aandelen kopen. Na het bekend worden van het winstcijfer stijgen de bied- en laatprijs en de specialist mist het rendement op de aandelen, omdat hij (zij) de aandelen reeds verkocht heeft. Met andere woorden, indien beleggers privé-informatie bezitten, missen de specialisten een deel van de bied-laat wijdte of het rendement. Ter compensatie voor deze misgelopen verdiensten verhogen specialisten de bied-laat wijdte. Specialisten verdienen daardoor meer als zij handelen met beleggers zonder privé-informatie. De additionele verdiensten compenseren de gemiste delen van de bied-laat wijdte en het gemiste rendement wanneer gehandeld wordt met beleggers met privé-informatie. Des te hoger de kans op geïnformeerde handel, des te hoger de nadelige-selectiekostencomponent en dus de bied-laat wijdte.

Figuur S.2 Nadelige-selectiekostencomponent



Deze figuur illustreert de ongerealiseerde bied-laat wijdte vanwege geïnformeerde handel. GL is de genoteerde laatprijs, GM het genoteerde middelpunt, GB de genoteerde biedprijs en OBLW de ongerealiseerde bied-laat wijdte vanwege geïnformeerde handel.

LMR stellen dat de bied-laat wijdte slechts één dimensie is van marktliquiditeit. De andere dimensie is de diepte: het aantal aandelen dat een specialist bereid is om tegen de genoteerde bied- en laatprijs te verhandelen. Specialisten kunnen de diepte gebruiken om zichzelf tegen geïnformeerd handelen te beschermen. Als een specialist een grote diepte noteert, kan een belegger met privé-informatie op één moment veel aandelen verhandelen tegen de genoteerde bied- of laatprijs. Echter, wanneer de specialist een kleine diepte noteert, kan de geïnformeerde belegger slechts kleine hoeveelheden aandelen per keer verhandelen. Na elk handelsmoment heeft de specialist de mogelijkheid om de bied- en laatprijs aan te passen. Daardoor verliest de specialist minder voordat de implicaties van de nieuwe informatie voor de aandelenprijs duidelijk geworden zijn. Het is daarom de verwachting dat de bied-laat wijdte en de nadelige-selectiekostencomponent stijgen en de diepte daalt, wanneer de kans op handelen met privé-informatie toeneemt.

Een periode met mogelijk een toegenomen kans op geïnformeerd handelen, bestaat uit de dagen rond de winstaankondiging. LMR noemen drie redenen waarom de informatieasymmetrie tussen specialisten en geïnformeerde beleggers kan toenemen voor een winstaankondiging, namelijk (a) een grotere kans op het lekken van relevante informatie wanneer de winst bekend is bij de onderneming, (b) de mogelijkheid dat bij publicatie de informatie beleggers eerder bereikt dan de specialist en (c) de verwachting van belangrijke winstcijfers kan sommige beleggers stimuleren om informatie te zoeken voor de winstaankondiging. Kim en Verrecchia (1991, 1994) en McNichols en Trueman (1994) tonen analytisch bewijs hiervoor. LMR laten zien dat specialisten inderdaad bied-laat wijdtes vergroten en dieptes verlagen voor winstaankondigingen tijdens handelsuren. Krinsky en Lee (1996) (hierna KL) presenteren daarnaast bewijs dat de nadelige-selectiekostencomponent van de bied-laat wijdte significant hoger is voor winstaankondigingen tijdens handelsuren dan gedurende een periode zonder deze aankondigingen. Dit suggereert dat specialisten geconfronteerd worden met een toegenomen kans op geïnformeerde handel.

De kans op handel op basis van privé-informatie kan ook hoger zijn na winstaankondigingen. Kim en Verrecchia (1994) en Livne (2000) modelleren deze situatie. De idee is dat sommige beleggers privé-informatie verzamelen met hun superieure capaciteiten om financieel nieuws te interpreteren. Een andere redenering is dat financieel nieuws in gedeelten gepubliceerd wordt en dat geïnformeerde handel plaatsvindt indien de informatie de beleggers eerder bereikt dan de specialisten. Het

winstcijfer wordt bijvoorbeeld als eerste gepubliceerd en daarna pas de volledige balans en winst- en verliesrekening. LMR en KL tonen empirisch aan dat de bied-laat wijdte en de nadelige-selectiekostencomponent inderdaad hoger zijn tijdens handelsuren na een winstaankondiging dan gedurende een periode zonder aankondigingen.

S.3 De invloed van het tijdstip van de winstaankondiging op de marktliquiditeit

Zoals hiervoor besproken is, toont de empirische literatuur aan dat de marktliquiditeit afneemt rond winstaankondigingen. Beleggers stellen deze afname niet op prijs, omdat marktliquiditeit een belangrijke karakteristiek is van een georganiseerde financiële markt. Ondanks dat de periode rond een winstaankondiging kort is, kan de afname in de marktliquiditeit belangrijke gevolgen hebben, omdat deze periode bekend staat om een groot handelsvolume (Morse 1981, Bamber 1986). Daarom is het voor het management van beursgenoteerde ondernemingen van belang om kennis te hebben van de mogelijkheden om de afname in de marktliquiditeit rond winstaankondigingen te beperken.

Het eerste essay onderzoekt de invloed van het tijdstip van de winstaankondiging op de afname in de marktliquiditeit rond deze aankondigingen. Er zijn verschillende redenen om te veronderstellen dat het tijdstip van de aankondiging invloed heeft op de kans op geïnformeerde handel en daarom op de verandering in de bied-laat wijdte en diepte rond deze aankondigingen. De kans op handel met geïnformeerde beleggers stijgt voor winstaankondigingen tijdens handelsuren, omdat beleggers meer gemotiveerd zijn om privé-informatie te verzamelen of omdat de winstaankondiging de beleggers eerder bereikt dan de specialisten. Dit tweede risico bestaat niet bij aankondigingen buiten handelsuren. Daarnaast toont Livne (2001) in een analytische studie aan dat beleggers met privé-informatie minder agressief handelen voor een aankondiging buiten handelsuren dan tijdens handelsuren. Dit suggereert dat de stijging van de kans op geïnformeerde handel kleiner is voor aankondigingen buiten handelsuren.

Het tijdstip van de winstaankondiging kan ook invloed hebben op de kans op geïnformeerde handel na deze aankondigingen. Indien het winstcijfer buiten handelsuren bekend gemaakt wordt, hoeft de belegger niet onmiddellijk te reageren op het nieuws en kan hij (zij) de informatie analyseren voor het maken van een

handelsbeslissing. Wanneer het financiële nieuws in gedeelten gepubliceerd wordt, kunnen beleggers deze extra informatie ook gebruiken in het beslissingsproces. Op de New York Stock Exchange (NYSE) en American Stock Exchange (AMEX) kunnen beleggers orders verstrekken voordat de markt opent. Wanneer de verstrekte orders het winstnieuws reflecteren, wordt het nieuws in de aandelenprijs verdisconteerd en is de kans op geïnformeerde handel na het openen van de markt kleiner. Zelfs als de verstrekte orders het winstnieuws niet reflecteren, kunnen de specialisten de openingsprijs nog steeds op het winstnieuws baseren indien zij de financiële berichtgeving nagaan voor het openen van de markt. Op basis van deze argumenten verwacht ik dat de percentuele verandering van de bied-laat wijdte groter is en de percentuele verandering van de diepte kleiner is voor en na aankondigingen tijdens handelsuren in vergelijking tot aankondigingen buiten handelsuren.

Ik onderzoek 1000 aankondigingen tijdens en 1802 aankondigingen buiten handelsuren. De winstaankondigingen zijn gemaakt tussen 1993 en 1996 door 336 ondernemingen die verhandeld worden op de NYSE of AMEX. De analyse toont dat de percentuele veranderingen van de genoteerde en effectieve bied-laat wijdte significant groter zijn en de percentuele veranderingen van de diepte kleiner zijn na winstaankondigingen tijdens handelsuren dan na aankondigingen buiten handelsuren. Het onderzoek toont ook aan dat deze resultaten niet veroorzaakt worden door ondernemingsspecifieke factoren, notering aan buitenlandse aandelenbeurzen of verschillen in de inhoud van winstaankondigingen tijdens en buiten handelsuren.

De resultaten suggereren dat het kiezen van het tijdstip een mogelijkheid is om de afname in de marktliquiditeit rond winstaankondigingen te voorkomen. Echter notering aan buitenlandse aandelenbeurzen kan het voordeel van aankondigingen buiten handelsuren verminderen, omdat de afname in de marktliquiditeit zich voor kan doen op een andere beurs. Daarnaast hebben ook andere factoren invloed op de keuze om tijdens of buiten handelsuren het winstcijfer bekend te maken. Toekomstig onderzoek zou andere kosten en baten van het tijdstip van de winstaankondiging kunnen onderzoeken om een completer beeld te geven van de factoren die deze beslissing beïnvloeden. Een ander interessant onderwerp voor toekomstig onderzoek is de invloed van het tijdstip van andere bekendmakingen op de marktliquiditeit, zoals fusies en overnames. Omdat de prijsreacties op deze aankondigingen waarschijnlijk groter zijn dan op winstaankondigingen, kan een groter verschil bestaan tussen de marktliquiditeit na bekendmakingen tijdens en buiten handelsuren.

S.4 De invloed van de informatieomgeving op de afname van de marktliquiditeit voor winstaankondigingen

Het tweede essay onderzoekt de afname van de marktliquiditeit voor winstaankondigingen. Tot op heden is er geen bewijs of specialisten de bied-laat wijdtes en dieptes voor alle ondernemingen in dezelfde mate aanpassen of dat de afname afhankelijk is van ondernemingsspecifieke factoren. Ik onderzoek de veronderstelling dat de afname in de marktliquiditeit gerelateerd is aan de informatieomgeving. Een rijke informatieomgeving betekent dat meer informatie publiekelijk beschikbaar is en opgenomen is in de aandelenprijs. Daarom wordt een kleinere prijsreactie verwacht bij een winstaankondiging en reduceert dit de prikkel voor beleggers om privé-informatie te verzamelen. Zelfs indien de beleggers privé-informatie zoeken en vinden, kan het verlies voor de specialist kleiner zijn, omdat de verwachte prijsreactie op de nieuwe informatie kleiner is. Ik gebruik drie variabelen voor de informatieomgeving, namelijk de kwaliteit van de informatieverstrekking, het plaatsvinden van winstvoorspellingen door het management en het aantal analisten dat een winstcijfer voorspelt.

Het onderzoek omvat 2802 winstaankondigingen gemaakt tussen 1993 en 1996 door 336 ondernemingen die op de NYSE of AMEX verhandeld worden. De analyse toont aan dat het plaatsvinden van winstvoorspellingen door het management de verandering in de diepte beïnvloedt. Ik vind echter geen robuuste relatie tussen de variabelen van de informatieomgeving en de verandering in de (nadelige-selectiekostencomponent van de) bied-laat wijdte. Een mogelijke verklaring voor het ontbreken van significante resultaten is dat specialisten niet geloven dat de informatieomgeving invloed heeft op de kans van geïnformeerde handel voor winstaankondigingen. Een andere verklaring is dat de afname in de marktliquiditeit te klein is om verschillen tussen ondernemingen te tonen.

Het is de vraag of de kleine afname van de marktliquiditeit in lijn is met de veronderstelling dat de marktliquiditeit daalt omdat specialisten op winstaankondigingen anticiperen. Indien specialisten de marktliquiditeit laten dalen in anticipatie op de aankondigingen zou een afname in de marktliquiditeit voor alle ondernemingen verwacht worden. Gegeven de kleine afname is het de vraag of dit gebeurt. Het bewijs in voorgaand onderzoek dat gemiddeld genomen de bied-laat wijdte stijgt en de diepte daalt, hoeft niet te betekenen dat specialisten anticiperen op de aankondigingen. Een andere verklaring voor dit effect is dat specialisten reageren

op het beschikbaar komen van informatie en meer informatie beschikbaar komt voor een winstaankondiging dan gemiddeld genomen gedurende een periode zonder winstaankondigingen. De vraag of de afname in de marktliquiditeit voor winstaankondigingen veroorzaakt wordt door een toename in het beschikbaar komen van informatie of door een echte anticipatie van de aankondiging, is een interessant onderwerp voor toekomstig onderzoek.

Center for Economic Research, Tilburg University, The Netherlands
Dissertation Series

No.	*Author*	*Title*	*Published*
1	P.J.J. Herings	Static and Dynamic Aspects of General Disequilibrium Theory; ISBN 90 5668 001 3	June 1995
2[i]	Erwin van der Krabben	Urban Dynamics: A Real Estate Perspective - An institutional analysis of the production of the built environment; ISBN 90 5170 390 2	August 1995
3	Arjan Lejour	Integrating or Desintegrating Welfare States? - a qualitative study to the consequences of economic integration on social insurance; ISBN 90 5668 003 X	September 1995
4	Bas J.M. Werker	Statistical Methods in Financial Econometrics; ISBN 90 5668 002 1	September 1995
5	Rudy Douven	Policy Coordination and Convergence in the EU; ISBN 90 5668 004 8	September 1995
6	Arie J.T.M. Weeren	Coordination in Hierarchical Control; ISBN 90 5668 006 4	September 1995
7	Herbert Hamers	Sequencing and Delivery Situations: a Game Theoretic Approach; ISBN 90 5668 005 6	September 1995
8	Annemarie ter Veer	Strategic Decision Making in Politics; ISBN 90 5668 007 2	October 1995
9	Zaifu Yang	Simplicial Fixed Point Algorithms and Applications; ISBN 90 5668 008 0	January 1996
10	William Verkooijen	Neural Networks in Economic Modelling - An Empirical Study; ISBN 90 5668 010 2	February 1996
11	Henny Romijn	Acquisition of Technological Capability in Small Firms in Developing Countries; ISBN 90 5668 009 9	March 1996
12	W.B. van den Hout	The Power-Series Algorithm - A Numerical Approach to Markov Processes; ISBN 90 5668 011 0	March 1996
13	Paul W.J. de Bijl	Essays in Industrial Organization and Management Strategy; ISBN 90 5668 012 9	April 1996

No.	*Author*	*Title*	*Published*
14	Martijn van de Ven	Intergenerational Redistribution in Representative Democracies; ISBN 90 5668 013 7	May 1996
15	Eline van der Heijden	Altruism, Fairness and Public Pensions: An Investigation of Survey and Experimental Data; ISBN 90 5668 014 5	May 1996
16	H.M. Webers	Competition in Spatial Location Models; ISBN 90 5668 015 3	June 1996
17	Jan Bouckaert	Essays in Competition with Product Differentiation and Bargaining in Markets; ISBN 90 5668 016 1	June 1996
18	Zafar Iqbal	Three-Gap Analysis of Structural Adjustment in Pakistan; ISBN 90 5668 017 X	September 1996
19	Jimmy Miller	A Treatise on Labour: A Matching-Model Analysis of Labour-Market Programmes; ISBN 90 5668 018 8	September 1996
20	Edwin van Dam	Graphs with Few Eigenvalues - An interplay between combinatorics and algebra; ISBN 90 5668 019 6	October 1996
21	Henk Oosterhout	Takeover Barriers: the good, the bad, and the ugly; ISBN 90 5668 020 X	November 1996
22	Jan Lemmen	Financial Integration in the European Union: Measurement and Determination; ISBN 90 5668 021 8	December 1996
23	Chris van Raalte	Market Formation and Market Selection; ISBN 90 5668 022 6	December 1996
24	Bas van Aarle	Essays on Monetary and Fiscal Policy Interaction: Applications to EMU and Eastern Europe; ISBN 90 5668 023 4	December 1996
25	Francis Y. Kumah	Common Stochastic Trends and Policy Shocks in the Open Economy: Empirical Essays in International Finance and Monetary Policy; ISBN 90 5668 024 2	May 1997
26	Erik Canton	Economic Growth and Business Cycles; ISBN 90 5668 025 0	September 1997

No.	*Author*	*Title*	*Published*
27	Jeroen Hoppenbrouwers	Conceptual Modeling and the Lexicon; ISBN 90 5668 027 7	October 1997
28	Paul Smit	Numerical Analysis of Eigenvalue Algorithms Based on Subspace Iterations; ISBN 90 5668 026 9	October 1997
29	Uri Gneezy	Essays in Behavioral Economics; ISBN 90 5668 028 5	October 1997
30	Erwin Charlier	Limited Dependent Variable Models for Panel Data; ISBN 90 5668 029 3	November 1997
31	Rob Euwals	Empirical Studies on Individual Labour Market Behaviour; ISBN 90 5668 030 7	December 1997
32	Anurag N. Banerjee	The Sensitivity of Estimates, Inferences, and Forecasts of Linear Models; ISBN 90 5668 031 5	December 1997
33	Frans A. de Roon	Essays on Testing for Spanning and on Modeling Futures Risk Premia; ISBN 90 5668 032 3	December 1997
34	Xiangzhu Han	Product Differentiation, Collusion and Standardization; ISBN 90 5668 033 1	January 1998
35	Marcel Das	On Income Expectations and Other Subjective Data: A Micro-Econometric Analysis; ISBN 90 5668 034 X	January 1998
36	Jeroen Suijs	Cooperative Decision Making in a Stochastic Environment; ISBN 90 5668 035 8	March 1998
37	Talitha Feenstra	Environmental Policy Instruments and International Rivalry: A Dynamic Analysis; ISBN 90 5668 036 6	May 1998
38	Jan Bouwens	The Use of Management Accounting Systems in Functionally Differentiated Organizations; ISBN 90 5668 037 4	June 1998
39	Stefan Hochguertel	Households' Portfolio Choices; ISBN 90 5668 038 2	June 1998
40	Henk van Houtum	The Development of Cross-Border Economic Relations; ISBN 90 5668 039 0	July 1998
41	Jorg Jansen	Service and Inventory Models subject to a Delay-Limit; ISBN 90 5668 040 4	September 1998

No.	*Author*	*Title*	*Published*
42	F.B.S.L.P. Janssen	Inventory Management Systems: control and information issues; ISBN 90 5668 041 2	September 1998
43	Henri L.F. de Groot	Economic Growth, Sectoral Structure and Unemployment; ISBN 90 5668 042 0	October 1998
44	Jenke R. ter Horst	Longitudinal Analysis of Mutual Fund Performance; ISBN 90 5668 043 9	November 1998
45	Marco Hoeberichts	The Design of Monetary Institutions; ISBN 90 5668 044 7	December 1998
46	Adriaan Kalwij	Household Consumption, Female Employment and Fertility Decisions: A microeconometric analysis; ISBN 90 5668 045 5	February 1999
47	Ursula Glunk	Realizing High Performance on Multiple Stakeholder Domains: A Resource-based Analysis of Professional Service Firms in the Netherlands and Germany; ISBN 90 5668 046 3	April 1999
48	Freek Vermeulen	Shifting Ground: Studies on the Intersection of Organizational Expansion, Internationalization, and Learning; ISBN 90 5668 047 1	February 1999
49	Haoran Pan	Competitive Pressures on Income Distribution in China; ISBN 90 5668 048 X	March 1999
50	Laurence van Lent	Incomplete Contracting Theory in Empirical Accounting Research; ISBN 90 5668 049 8	April 1999
51	Rob Aalbers	On the Implications of Thresholds for Economic Science and Environmental Policy; ISBN 90 5668 050 1	May 1999
52	Abe de Jong	An Empirical Analysis of Capital Structure Decisions in Dutch Firms; ISBN 90 5668 051 X	June 1999
53	Trea Aldershof	Female Labor Supply and Housing Decisions; ISBN 90 5668 052 8	June 1999
54	Jan Fidrmuc	The Political Economy of Reforms in Central and Eastern Europe; ISBN 90 5668 053 6	June 1999
55	Michael Kosfeld	Individual Decision-Making and Social Interaction; ISBN 90 5668 054 4	June 1999

No.	*Author*	*Title*	*Published*
56	Aldo de Moor	Empowering Communities - A method for the legitimate user-driven specification of network information systems; ISBN 90 5668 055 2	October 1999
57	Yohane A. Khamfula	Essays on Exchange Rate Policy in Developing Countries; ISBN 90 5668 056 0	September 1999
58	Maurice Koster	Cost Sharing in Production Situations and Network Exploitation; ISBN 90 5668 057 9	December 1999
59	Miguel Rosellón Cifuentes	Essays on Financial Policy, Liquidation Values and Product Markets; ISBN 90 5668 058 7	December 1999
60	Sharon Schalk	Equilibrium Theory: A salient approach; ISBN 90 5668 059 5	December 1999
61	Mark Voorneveld	Potential Games and Interactive Decisions with Multiple Criteria; ISBN 90 5668 060 9	December 1999
62	Edward Droste	Adaptive Behavior in Economic and Social Environments; ISBN 90 5668 061 7	December 1999
63	Jos Jansen	Essays on Incentives in Regulation and Innovation; ISBN 90 5668 062 5	January 2000
64	Franc J.G.M. Klaassen	Exchange Rates and their Effects on International Trade; ISBN 90 5668 063 3	January 2000
65	Radislav Semenov	Cross-country Differences in Economic Governance: Culture as a major explanatory factor; ISBN 90 5668 065 X	February 2000
66	Alexandre Possajennikov	Learning and Evolution in Games and Oligopoly Models; ISBN 90 5668 064 1	March 2000
67	Eric Gaury	Designing Pull Production Control Systems: Customization and Robustness; ISBN 90 5668 066 8	March 2000
68	Marco Slikker	Decision Making and Cooperation Restrictions; ISBN 90 5668 067 6	April 2000
69	Ruud Brekelmans	Stochastic Models in Risk Theory and Management Accounting; ISBN 90 5668 068 4	June 2000
70	Flip Klijn	A Game Theoretic Approach to Assignment Problems; ISBN 90 5668 069 2	June 2000

No.	*Author*	*Title*	*Published*
71	Maria Montero	Endogenous Coalition Formation and Bargaining; ISBN 90 5668 070 6	June 2000
72	Bas Donkers	Subjective Information in Economic Decision Making; ISBN 90 5668 071 4	June 2000
73	Richard Nahuis	Knowledge and Economic Growth; ISBN 90 5668 072 2	October 2000
74	Kuno Huisman	Technology Investment: A Game Theoretic Real Options Approach; ISBN 90 5668 073 0	October 2000
75	Gijsbert van Lomwel	Essays on Labour Economics; ISBN 90 5668 074 9	November 2000
76	Tina Girndt	Cultural Diversity and Work-Group Performance: Detecting the Rules; ISBN 90 5668 075 7	December 2000
77	Teye A. Marra	The Influence of Proprietary Disclosure Costs on the Decision to Go Public: Theory and Evidence; ISBN 90 5668 076 5	January 2001
78	Xiaodong Gong	Empirical Studies on the Labour Market and on Consumer Demand; ISBN 90 5668 078 1	February 2001
79	Kanat Çamlibel	Complementarity Methods in the Analysis of Piecewise Linear Dynamical Systems; ISBN 90 5668 079 X	May 2001
80	Joost Driessen	Empirical Studies on the Pricing of Bonds and Interest Rate Derivatives; ISBN 90 5668 080 3	June 2001
81	Bram van den Broek	Uncertainty in Differential Games; ISBN 90 5668 081 1	June 2001
82	Ricardo Recht	Organisational Culture and Privatisation: A Case Study of the Argentinean Railway Sector; ISBN 90 5668 082 X	June 2001
83	Willem Verhagen	Inflation Targeting and Interest Rate Policy; ISBN 90 5668 083 8	June 2001
84	Vincent Verouden	Essays in Antitrust Economics; ISBN: 90 5668 086 2	June 2001
85	Rosalia Vazquez Alvarez	A Nonparametric Approach to the Sample Selection Problem in Survey Data; ISBN 90 5668 087 0	June 2001

No.	*Author*	*Title*	*Published*
86	Theo Leers	Public Pensions and Population Ageing: An Economic Analysis of Fertility, Migration, and Social-Security Policy; ISBN 90 5668 084 6	June 2001
87	Bernard Conlon	Consumer Rationality in Choice; ISBN 90 5668 085 4	June 2001
88	Judith Timmer	Cooperative behaviour, uncertainty and operations research; ISBN 90 5668 088 9	September 2001
89	Enrico Diecidue	Nonexpected Utility and Coherence; ISBN 90 5668 089 7	November 2001
90	Alexander Konovalov	Essays in General Equilibrium Theory; ISBN 90 5668 091 9	November 2001
91	Stefan Stremersch	Essays on Marketing Strategy in Technology-Intensive Markets; ISBN 90 5668 090 0	December 2001
92	Rian Drogendijk	Expansion Patterns of Dutch Firms in Central and Eastern Europe: Learning to Internationalize; ISBN 90 5668 092 7	December 2001
93	Han Donker	Takeovers. An Empirical Study of Ownership Structure and the Wealth to Shareholders in Dutch Takeovers; ISBN 90 5668 093 5	December 2001
94	Erica van Herpen	Perceptions and Evaluations of Assortment Variety; ISBN 90 5668 094 3	December 2001
95	Jana Vyrastekova	Cheap Talk and Spiteful Preferences in Ultimatum Games: Experiments and Evolutionary Rationale; ISBN 90 5668 095 1	March 2002
96	Tao Lin	Statistics of Extremes in the Space of Continuous Functions; ISBN 90 5668 096 X	May 2002
97	Sander Onderstal	Papers in Auction Theory; ISBN 90 5668 097 8	May 2002
98	Wolf Wagner	Risk Sharing under Incentive Constraints; ISBN 90 5668 098 6	June 2002
99	Willem-Jan van den Heuvel	Integrating Modern Business Applications with Objectified Legacy Systems; ISBN 90 5668 099 4	June 2002
100	Jacco Wielhouwer	Optimal Tax Depreciation and its Effects on Optimal Firm Investments; ISBN 90 5668 100 1	June 2002
101	Peter Roosenboom	Corporate Governance Mechanisms in IPO Firms; ISBN 90 5668 101 X	September 2002

No.	*Author*	*Title*	*Published*
102	Victoria Shestalova	Essays in Productivity and Efficiency; ISBN 90 5668 103 6	September 2002
103	Paula van Veen-Dirks	Flexibility and Control: An Empirical Study Relating Production Flexibility to the Design of Performance Management Systems; ISBN 90 5668 102 8	September 2002
104	Michal Matějka	Management Accounting in Organizational Design: Three Essays; ISBN 90 5668 105 2	November 2002
105	Maarten Pronk	Market Liquidity around Earnings Announcements; ISBN 90 5668 106 0	November 2002

---

[i] Copies can be ordered from Thela Thesis, Prinseneiland 305, 1013 LP Amsterdam, The Netherlands, phone: + 31 20 6255429; fax: +31 20 6203395; e-mail: office@thelathesis.nl

PROPOSITIONS

belonging to the dissertation

Market Liquidity around Earnings Announcements

Maarten Pronk

1

If stock exchanges switch to a 24 hour trading system, firms cannot reveal information when the exchange is closed. Because the revelation of information during trading hours reduces the market liquidity, stock exchange authorities should consider introducing trading halts around announcements. *(Chapter 2)*

2

The finding that bid-ask spreads increase and depths decrease before earnings announcements is not sufficient to conclude that market makers anticipate these announcements. *(Chapter 3)*

3

Users of annual report information in HTML most often view financial highlights followed by the income statement and the message from the president. These users are looking for a limited number of specific information items. *(Pronk, M., The Use of Annual Report Information on the Internet, working paper Tilburg University)*

4

The use of annual report information is different on the day of publication than later during the year. *(Pronk, M., The Use of Annual Report Information on the Internet, working paper Tilburg University)*

5

The high number of financial analysts that visit a quarterly report site on the day of publication indicates that Internet is an important medium for the dissemination of accounting information to sophisticated users. *(Pronk, M., The Use of Quarterly Report Information on the Internet, working paper Tilburg University)*

6

Quarterly reports are so important to financial analysts and institutional investors that they get up early on the day of a quarterly earnings announcement. *(Pronk, M., The Use of Quarterly Report Information on the Internet, working paper Tilburg University)*

7

The majority of users that view the quarterly report on the Internet to evaluate current or new investments, view the report after the day of publication. This finding indicates that quarterly reports are also relevant after that day. *(Pronk, M., The Use of Quarterly Report Information on the Internet, working paper Tilburg University)*

8

The high rejection rate of European accounting papers by US journals is because of the quality of the papers rather than a bias against European research.

9

The best way to compete with US accounting researchers is to create your own dataset.

10

Financial accounting researchers and financial statements are both backward looking. Therefore, researchers underestimate the value of the electronic dissemination of financial accounting information for financial accounting research.

11

Because cycling is an excellent activity to generate research ideas, academics who cycle to a university should be allowed to travel during working-hours.

MAARTEN PRONK (1974) graduated in Business Administration from Erasmus University Rotterdam in 1997. Between September 1997 and December 2001, he was a Ph.D. student at CentER for Economic Research (Tilburg University). Part of his research was undertaken at the University of Iowa. As of January 2002, he is an Assistant Professor at Tilburg University. His main areas of interest are disclosure-related capital market research and the use of financial accounting information on the Internet.

Prior literature indicates that bid-ask spreads are higher and depths are lower around earnings announcements than during non-announcement periods. This Ph.D. thesis investigates two important aspects of this drop in market liquidity, namely (a) the ability of management to mitigate the drop in market liquidity around earnings announcements by using their discretion to announce the earnings news during non-trading instead of trading hours, and (b) the conjecture that the drop in market liquidity before earnings announcements relates to the richness of the information environment. The study confirms the idea that the intraday timing of earnings announcements affects the drop in market liquidity. A robust relationship between the information environment and the drop in market liquidity before earnings announcements cannot be documented however.

ISBN: 90 5668 106 0