EARNINGS ANNOUNCEMENTS AND
THE VARIABILITY OF STOCK RETURNS

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Abstract - This paper is concerned with the dissemination process of firm-specific annual earnings information in the Norwegian capital market. We find a significant reduction in stock price volatility in the post-announcement period relative to the pre-announcement period for companies traded on the Oslo Stock Exchange in the period 1990-1995. Potential explanations for this phenomenon are tested by relating the observed return volatility to changes in the volatility of the underlying business, the speed at which information is incorporated into stock prices, and the amount of noise in the price process. The empirical analyses reveal no significant changes in either the underlying business variance or the price adjustment coefficients. However, we find a significant decline in the noise term for the largest companies after the earnings release date, supporting the hypothesis that earnings announcements reduce informational asymmetries among investors.

Key words: Earnings announcements, dissemination of information, stock return volatility, variance decomposition.

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INTRODUCTION

Starting with Ball and Brown (1968) and Beaver (1968), a large body of literature has investigated the information relevance of accounting numbers in capital markets. The majority of studies on stock markets and earnings announcements focus on information content and timeliness - measured by changes in the characteristics of the stock return distribution (e.g. mean, variance, and serial correlation) and trading volume - when corporate earnings are announced to the market. Focusing on the association between earnings releases and the variance of the stock return distribution, empirical studies typically find that the price variance is significantly larger during the announcement period than the average variance in the non-announcement period (see for instance Beaver, 1968; May, 1971; Hagerman, 1973; Morse, 1981; McNichols and Manegold, 1983; and Patell and Wolfson, 1981, 1984 on US data, and Brookfield and Morris, 1992; and Pope and Inyangete, 1992 on UK data). This finding is consistent with the claim that earnings data convey new information to the capital market.

The main hypothesis of this paper is that earnings announcements reduce informational asymmetry among investors. The underlying factors of the stock return variances are identified by utilizing a variance decomposition methodology. The data sample is earnings releases to the Norwegian capital market from 1990 to 1995 for companies listed on the Oslo Stock Exchange. Our research design is motivated by the fact that, as the earnings announcement date approaches, there is usually an intensive flow of earnings-related information to the market, e.g. via firms' communication to analysts, analysts' forecasts to the market, and the earnings announcements of competitors (see Lev, 1989). Based on this flow of earnings related information, investors continuously revise their expectations as the announcement date approaches. These revisions are the result of the endogenous acquisition of information regarding the forthcoming earnings announcement (see Demski and Feltham, 1994). The formal earnings release significantly reduces the information asymmetry among investors as more information becomes public. Consequently, we hypothesise a decrease in stock price volatility in the post-announcement period relative to the pre-announcement period. This reasoning is consistent with, for instance, Holthausen and Verrecchia (1988), who show that ex ante routine

announcements increase the variance of announcement period returns, but reduce the variance of the post-announcement period returns. Further theoretical insights into how public announcements affect price changes and volume due to the varying precision of private information prior to disclosures, are provided by Diamond and Verrecchia (1981, 1991), Grundy and McNichols (1989), Holthausen and Verrecchia (1990), Kim and Verecchia (1991a, b and 1994), Dontoh and Ronen (1993), and McNichols and Trueman (1994).

To analyze the information dissemination process around earnings announcements, we use the price behavior model developed by Amihud and Mendelson (1987). Their model decomposes the observed return variance into three components: i) an intrinsic variance portion that can be attributed to the volatility of the underlying business, ii) a price adjustment component that captures the effect of an imperfect price adjustment process, and iii) a noise term that is the result of noise trading as well as of the impact of the trading mechanism whereby prices are set in the market. This design provides us with a direction for empirically testing the effects of information dissemination in the capital market. Few empirical studies have explicitly addressed the question of changes in the underlying return-generating process around earnings announcements. Brooks (1996), however, uses the model proposed by Hasbrouck (1991), and finds that earnings announcements reduce the level of asymmetric information among traders. Bid-ask spreads have been examined by Lee et al. (1993), for example. But the spread is a function of execution and inventory costs as well as adverse selection costs, and is hence a noisy proxy of information asymmetry.

As expected, our empirical analysis finds a significant reduction in stock price volatility in the post-announcement period relative to the pre-announcement period. To analyze the characteristics of stock returns - as reflected by their time series behavior - under different information conditions, our sample was split into two test categories by company size (market value). The literature agrees on an inverse relationship between the amount of predisclosed information reflected in the stock price and the stock price reaction. Capitalization (Atiase, 1985, 1987; Bamber, 1987), exchange listing (Grant, 1980; Morse, 1981; and Atiase, 1987), and the level of institutional investor ownership (Potter, 1992), have been utilized as proxies for differences in predisclosed information. In our study, the decrease in stock price volatility is significant for both the largest and the smallest companies.

The decomposition procedure reveals no significant changes in either the intrinsic component or the price adjustment coefficients. However, there is evidence of a significant decline in the noise term for the largest companies after disclosures of accounting information. In contrast, there is a tendency for a non-significant increase in the noise term for the smallest companies. There are several possible explanations for these noise effects. Of interest, our findings are consistent with discretionary noise traders timing their trades (see e.g. Admati and Pfleiderer, 1988). In large company stocks, the stock market is efficient due to the high number of analysts following the largest companies. If an efficient market makes the liquidity traders trade as non-discretionary noise traders, their trading would not be affected by disclosures of public information. Nonetheless, the noise traders impact on the market would still be reduced after the disclosure because the bid-ask spread, and thereby price volatility, is reduced due to less private information. In small company stocks, however, the noise traders would benefit significantly by timing their trades to the period of least informational asymmetry, i.e. to the period after public disclosures. Since the amount of noise trading increases in the post-disclosure period, the impact of noise in the stock price would increase, but would be balanced by the simultaneous reduction of the bid-ask spread. This trade-off may explain our insignificant finding of the noise term for the smallest firms. Accordingly, our findings are consistent with the hypothesis that the stock market for smaller companies is less informationally efficient than the stock market for larger companies.

The rest of the paper is organized as follows. In the next section, the data set is presented. In the third section, we examine the effects of earnings announcements on the stock return volatility by estimating the pre- and post-announcement variance of the stocks' daily return distribution. Explanations for return-process shifts are given by estimating the intrinsic, price adjustment, and noise components of the variance. A summary and conclusions are offered in the final section.

DATA

The study utilizes data from the Oslo Stock Exchange (OSE). Compared with other markets, the volatility of Norwegian stock prices has been high. Based on a value-weighted market index, the standard deviation of annual stock returns for the period 1983-1994 is about 24 per

cent in Norway, while corresponding figures in the US and UK are 12 per cent and 13 per cent, respectively. This characteristic of the OSE may be attributed to both economic and market-structure phenomena. First, Norway represents a small, open economy, which is sensitive to the world market prices of its natural resources. The industry structure, characterized by processing intermediate products rather than final goods, increases this price risk sensitivity. In fact, Norwegian securities have been considered an attractive investment due to this commodity price risk sensitivity. Second, since the market is smaller and obviously less mature than the world's largest stock markets, both market structure-related noise and information-related noise, as well as lagged price adjustment to value changes may be present. The methodology used in the paper, i.e. a variance decomposition approach, may provide direct evidence on the underlying price processes in the market, and may represent a potentially interesting approach when explaining the high volatility of OSE stock prices.

The data sample consists of 37 companies listed on the OSE with annual earnings announcements made between 1990 and 1995. In 19 events, stocks with infrequent trading surrounding an annual announcement date were excluded from the analysis, which yields a sample of 203 events. As noted in the introduction, the literature agrees on an inverse relationship between the amount of predisclosure information and the stock price reaction. To analyze the differential impact of earnings announcements accross companies, the sample was split into two categories by size; the smallest (19) versus the largest (18) companies, evaluated by market value. The companies are listed in Table 1.

[Table 1 about here]

Daily prices for the stocks and the value-weighted market index are provided from the Amadeus stock data base at the Norwegian School of Economics and Business Administration. All prices are adjusted for stock splits and dividends. We calculate logarithmic returns, i.e. $r_t = \ln(P_t) - \ln(P_{t-1})$, where P_t is the adjusted stock price at time t. Earnings announcements dates have been collected from the Daily Bulletin of the OSE.

METHODOLOGY AND EMPIRICAL RESULTS

To examine effects of earnings announcements on stock return volatility, we use the model of price behavior initially formulated by Amihud and Mendelson (1987) and developed further by Damodaran and Lim (1991) and Damodaran (1993). In this model, the observed return variance is divided into three components: i) an intrinsic variance portion that can be attributed to the volatility of the underlying business, ii) a price adjustment component that captures the effect of an imperfect price adjustment process, and iii) a remaining noise term. Consequently, this methodology provides us with a tool for empirically testing the effects of information dissemination in the capital market.

Amihud and Mendelson (1987) distinguish between the intrinsic or fundamental value of a security and its observed price. The price behavior is described by both market structure-related noise and information-related noise, as well as imperfect price adjustment to value changes:

$$P_{it} - P_{i(t-1)} = h_i(V_{it} - P_{i(t-1)}) + u_{it} \tag{1}$$

where P_{it} and V_{it} are logarithms of the observed price and the intrinsic value of stock i, respectively, h_i is a price adjustment coefficient, and u_{it} is the noise term. The noise term comes from two main sources: i) information-related factors (noise trading), e.g. trading-related mispricing generated by errors in the investors' analysis and interpretation of information, and ii) market structure-related factors, e.g. bid-ask spreads, discreteness of stock prices (Amihud and Mendelson, 1987: 536).

The observed variance of stock returns can be divided into three parts (Damodaran and Lim, 1991):

$$Var(r_{it}) = v_i^2 + 2\sigma_i^2 + \{[(h_i/(2-h_i)) - 1] \, v_i^2 + [(2/(2-h_i)) - 2] \, \sigma_i^2\} \tag{2}$$

where v_i^2 is the intrinsic variance of returns, σ_i^2 is the variance of the noise term, and the term in brackets is the contribution to variance from an imperfect price adjustment. Thus, the first term in (2) is the variance attributed to the volatility of the underlying business. The second term is

the component attributed to structure- and information-related noise. The third component reflects the adjustment of prices towards the value of the security. In particular, $h_i=0$ represents the extreme case of no price reaction to changes in value, and $0<h_i<1$ represents partial price adjustment. A unit-adjustment coefficient, $h_i=1$, represents full, though noisy, price adjustment. When $h_i>1$, there is overshooting or overreaction to new information, thereby leading to higher observed return variances.

To estimate the price adjustment factor using only the time series of returns, Damodaran and Lim (1991) made the following assumptions:

i)   the intrinsic value follows a random walk process,

ii)   there is no correlation between the noise and the intrinsic value, and

iii)   there exists a constant k such that the price adjustment coefficient becomes equal to one if the length of the interval over which returns are measured is greater than or equal to k.

Although it is difficult to justify stationarity in the process for long-period returns, the first assumption is not unreasonable for short intervals. The second assumption is a simplification in the absence of an explicit model for the covariance between the two processes. With respect to the third assumption, Damodoran and Lim (1991) made the choice that k=10. In their study, the price adjustment coefficient for longer intervals rapidly approached one, even for very low or very high values of h_i.

To derive the measure of h_i, the variances in different return intervals are utilized. The coefficient r_{ijt} is firm i's return in time period t, where each return interval is of length j. The variance in these returns can be written (Damodaran and Lim, 1991):

$$\text{Var}(r_{ijt}) = \{[h_{ij}/(2-h_{ij})]\,jv^2_i + [2/(2-h_{ij})]\,\sigma^2_i\}. \tag{3}$$

Furthermore, $h_{ik} = 1$ implies:

$$\sigma^2_i = -\text{Cov}(r_{ikt}, r_{ik(t-1)}) \tag{4}$$

$$v^2_i = 1/k[\text{Var}(r_{ikt}) + 2\text{Cov}(r_{ikt}, r_{ik(t-1)})], \tag{5}$$

where equation (4) is the noise variance component, measured by the serial covariance in return intervals of length k, and equation (5) is the intrinsic variance factor. Based on equations (3), (4), and (5), the price adjustment factor h_{ijt} for return intervals $j \leq k-1$ can be estimated by the time series of unit-interval return data (Damodaran and Lim, 1991), i.e.:

$$h_{ij} = 2 \{Var(r_{ijt})/j + Var(r_{ikt}/k)(j-1) + Cov(r_{ikt}, r_{ik(t-1)})/j\}$$
$$x \{Var(r_{ijt})/j + Var(r_{ikt}/k)(2j-1) + [2Cov(r_{ikt}, r_{ik(t-1)})]/k\}^{-1}. \qquad (6)$$

For a given series of return data, the value of k has to be estimated to obtain price adjustment factors over different return intervals j. Watt et al. (1992) note that if $h_{ik}=1$, the series covariance, $Cov(r_{ikt}, r_{ik(t-1)})$, should not include any component arising out of an imperfect price adjustment, i.e. the covariance stabilizes to a constant value. For $j<k$, $Cov(r_{ijt}, r_{ij(t-1)})$ may include a component arising from imperfect price adjustment. We calculate the return variance of each stock for an event period of 125 trading days on either side of the earnings announcement date, denoted the pre- and post-announcement period respectively. We then calculate $Cov(r_{ijt}, r_{ij(t-1)})$ for different j. The selected value of k is equal to the value of j at which this covariance stabilizes to a constant value. In our sample, the covariance stabilizes rapidly for return intervals approaching ten days, and, consequently, k is chosen as ten trading days. Hence, we assume full price adjustment by this intervaling frequency.

The components of the return variances are estimated by using the excess return version of the market model. Excess return for stock i on day t is defined as:

$$r_{it} = R_{it} - (\alpha_i + \beta_i R_{mt}) \qquad (7)$$

where R_{it} is the return on security i on day t and R_{mt} is the return on the Oslo Stock Exchange value weighted market index on day t. The market model parameters α_i and β_i are estimated using daily returns from 250 trading days preceding the event window, i.e. from day -375 to day -126 relative to the announcement day.

Total risk

To examine effects of earnings announcements on stock return volatility, we start by calculating the abnormal return variances of each stock. For each event or observation, a variance ratio (VR) is computed by dividing the variance of the post-announcement period by the corresponding variance of the pre-announcement period, i.e. $VR = Var(r)_{(post)}/Var(r)_{(pre)}$. A variance ratio less (greater) than one indicates that the volatility of stock returns is higher (lower) in the pre-announcement period than in the post-announcement period. We apply an F-test to test the significance of each individual variance ratio. A Wilcoxon test is conducted for the hypothesis that the median variance ratio is one for the sample.

An additional approach to test for differences in total risk between the pre- and post-announcement periods is conducted by estimating the volatility version of the market model over the two subperiods. Schwert (1989, 1990) and Schwert and Seguin (1990) account for any time variation in volatility by including lagged stock and market return variances. Their approach is utilized here. In addition, the earnings announcement is included as a dummy variable, D_i, equal to zero in the pre-announcement period and to unity in the post-announcement period, and e_t is the error term:

$$r^2_{it} = a_i + b_i r^2_{i(t-1)} + c_i r^2_{i(t-2)} + d_i r^2_{m(t)} + e_i r^2_{m(t-1)} + f_i r^2_{m(t-2)} + g_i D_i + e_t. \tag{8}$$

This regression model is estimated for each individual stock. The null hypothesis is that the sum of the firm-specific dummy variable coefficients is zero. The test statistic is chi-square distributed.

To analyze the differential impact of earnings announcements across companies, the hypothesis is tested for both the smallest and the largest companies. The results are reported in Table 2. We learn from Panel A that the variance ratio is significantly less than one for 104 observations and significantly greater than one for 37 observations (at the 5 per cent level). The median variance ratio is significantly less than one for both the smallest and the largest companies. Panel B shows a highly significant decrease in the average g_i-value for both the smallest and the largest companies. A significantly lower stock price volatility in the post-announcement period than in

the pre-announcement period, is consistent with the hypothesis that earnings announcements reduce the informational asymmetry among investors.

[Table 2 about here]

A decomposition of the observed variance reduction

In this section, we consider potential explanations for the overall decline in return variances after the earnings release. Price adjustment coefficients are estimated by equation (6), and noise and intrinsic components of the return variances are estimated by equations (4) and (5) respective ly. The results are summarized in Table 3.

[Table 3 about here]

The first component of the observed stock return variance, the intrinsic variance portion, can be attributed to the volatility of the underlying business. Earnings numbers per se are not expected to influence the underlying business risk. However, if an earnings announcement is accompanied by value-relevant information, i.e. information about the firm's future investment opportunities/operating risk, the market's perception about the intrinsic variance would change after the disclosure date. The magnitude depends on the precision of public information with respect to the future underlying value of the firm, and the extent to which disclosed information is already reflected in current market prices. The empirical results document no significant changes in the intrinsic variances for either categories of companies after the earnings announcement date (at the 5 per cent level), suggesting that earnings releases per se are not carrying information which changes the perception of the underlying risk.

The price adjustment coefficient reflects the adjustment of prices towards the underlying value of the security. As pointed out in the Methodology section, a unit-adjustment coefficient, $h_i=1$, represents full, though noisy, price adjustment to new information. However, the majority of the price adjustment coefficients are greater than one both before and after the information release. In general, this is consistent with an overreaction to new information, i.e. the overall observed return variance becomes greater than the underlying variance since value fluctuations

are amplified by traders overreacting to new information. Consequently, the high volatility in the Norwegian stock market relative to larger, and more mature stock markets (see the discussion in the Introduction section), is consistent with traders generally overreacting to information.

More specifically, if markets are accompanied by different reaction patterns before and after earnings releases, one would expect the adjustment coefficients to be different between the two periods. We recognize a difference for the two groups of companies, with a tendency for information to be used more intensively (increasing coefficients) after the information disclosure for the smallest companies and more intensively (decreasing coefficients) before the earnings release for the largest companies. However, the data do not reveal any significant change (at the 5 per cent level) in the price adjustment factors between the pre- and post-announcement periods. Thus, there seems to be little evidence that corporate earnings releases per se increase the likelihood of the Norwegian market inadequately reacting to new information.

The estimation procedure is based on the assumption that there exists a constant k such that the adjustment coefficient becomes equal to one if the length of the interval over which returns are measured is greater than or equal to k. In our analysis, the covariance stabilization tests suggest that a value of k equal to ten is appropriate, and we see that h_i stabilizes rapidly for return intervals approaching ten days. But we learn from the table that h_{10} is greater than one, possibly indicating that the selected value of k is too small. To increase the likelihood of h_{10} converging to unity, the return intervaling frequence must be increased. However, there will be a trade-off between the length of the observation period and the number of return intervals available. Increasing the interval over which returns are measured will dramatically reduce the number of observations available for estimation, or alternatively, we need a higher total number of observations, in which case the event window must be widened. We consider both these alternatives to be unsatisfactory. Therefore, we have estimated the price adjustment coefficients, assuming a return interval of 10 days.

Two points are of importance when analyzing the effects of the return frequency choice. The first concerns statistical significance. The value of h_{10} for the segment of the largest

companies and the companies combined respectively, is not significantly different from one at a 5 per cent level either before or after the earnings release. However, the coefficient for the smallest companies is significantly different from one at the 5 per cent level. The second concerns biased estimates. As pointed out by Damodaran (1993: 391), if h_{10} (in our notation) is greater than one, the estimates we obtain for h_1 through h_9 will be biased upwards. Hence, it follows that our estimates of the pre- and post-price adjustment coefficients may be biased upwards. With respect to these two points as well as the fact that the change in the price adjustment coefficients between the pre- and post-announcement periods is non-significant, we conclude that earnings announcements per se seem to have no influence on the speed of adjustment of prices to new information.

The difference between the underlying value of a security and its observed price is attributable to noise. This component is the result of pure noise trading and the impact of the trading mechanism by which prices are set in the market. Noise has been explained by factors such as errors in investors' analyses and interpretation of information about forthcoming company events, see e.g. Black (1986) and Schleifer and Summers (1990). In our sample, there is evidence suggesting a significant decline in the noise term for the largest companies in the post-disclosure period. On the contrary, there is a non-significant tendency towards increased noise for the smallest companies. These findings are consistent with the extensive literature relying upon Kyle (1985). In Kyle-type models, the noise component in the stock price volatility is:

$$\sigma = \lambda^2 \, s, \tag{9}$$

where λ is the price sensitivity and s is the amount of noise trading (as measured by the variance of noise trading). The price sensitivity λ is a decreasing function of the precision of public information (see e.g. Diamond and Verrecchia, 1991). If s is constant from the pre- to the post-disclosure period, σ would fall from the pre- to the post-disclosure period, because λ is falling due to the increased precision of public information. Accordingly, a reduction of the bid-ask spread, as measured by the price sensitivity λ, could explain our finding of a significant decline in the noise term for the largest companies.

If, as in Admati and Pfleiderer (1988), the noise traders are discretionary noise traders who are able to time their trades, it would be optimal for them to concentrate their trades to the period where the problems of informational asymmetry is minimized. Since the problem of asymmetric information is least in the post-disclosure period, it could be optimal to cluster trades in this period. Accordingly, since s is increasing and λ is decreasing in the post-disclosure period, the net effect upon σ could be both positive and negative. Hence, a small net effect, insignificantly different from zero, may be observed.

In our case, there is an insignificant tendency towards an increased noise term for the smallest firms, which suggests that liquidity traders batch their trades in the post-disclosure period to avoid being exploited by informed traders. For the largest companies there would be less concentration of trades because a more efficient dissemination of information makes it harder for privately informed traders to exploit their informational advantage, e.g. due to a substantial number of analysts following the largest companies. Still, the noise falls from the pre- to the post-disclosure period.

CONCLUSION

There is usually an intensive flow of earnings-related information to the market as the earnings announcement date approaches. Investors' expectations are consequently revised as the announcement date approaches. The formal announcement reduces informational asymmetry, as investors could immediately adjust to public information. Consequently, we expect a decrease in stock price volatility in the post-announcement period relative to the pre-announcement period. Our evidence on Norwegian data clearly supports this hypothesis by reporting a significant decrease in stock price volatility in the post-announcement period relative to the pre-announcement period for both the smallest and the largest companies.

Potential explanations for the change in the stock return processes are tested by decomposing the observed return volatility into three components: the volatility of the underlying business, the volatility caused by the speed at which information is incorporated into stock prices, and the volatility caused by noise in the price process. First, the empirical results document that earnings releases per se seem to have no effect on the intrinsic variance. Second, the price adjustment

coefficients are generally higher than unity, which is consistent with the claim that the Norwegian stock market is generally overreacting to new information. Such overreaction might help to explain the relatively high stock return volatility observed on the Oslo Stock Exchange. However, the change in the price adjustment factors between the pre- and post-announcement periods is not significant for any of the estimated coefficients. Consequently, earnings announcements per se do not seem to increase the likelihood of inadequate reactions to earnings information. Finally, there is evidence of a significant decline in the noise term after earnings announcements for the largest companies. This empirical result is consistent with the hypothesis that reduced noise can be attributed to reduced informational asymmetry among investors.

REFERENCES

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

Amihud, Y. and H. Mendelson (1987) Trading mechanisms and stock returns: An empirical investigation. *Journal of Finance* **42**, 533-553.

Atiase, R.K. (1985) Predisclosure information, firm capitalization, and security price behavior around earnings announcements. *Journal of Accounting Research* **23**, 21-36.

Atiase, R.K. (1987) Market implications of predisclosure information: Size and exchange effects. *Journal of Accounting Research* **25**, 168-176.

Ball, R. and P. Brown (1968) An empirical evaluation of accounting numbers. *Journal of Accounting Research* **6**, 159-178.

Bamber, L.S. (1987) Unexpected earnings, firm size, and trading volume around quarterly earnings announcements. *The Accounting Review* **62**, 510-532.

Beaver, W.H. (1968) The information content of annual earnings announcements. *Journal of Accounting Research* **6**, 67-92.

Black, F. (1986) Noise. *Journal of Finance* **41**, 529-543.

Brookfield, D. and R. Morris (1992) The market impact of UK company news announcements. *Journal of Business Finance & Accounting* **19**, 585-602.

Brooks, R.M. (1996) Changes in asymmetric information at earnings and dividend announcements. *Journal of Business Finance & Accounting* **23**, 359-378.

Damodaran, A. (1993) A simple measure of price adjustment coefficients. *Journal of Finance* **48**, 387-400.

Damodaran, A. and J. Lim (1991) The effect of option listing on the underlying stocks' return process: A study. *Journal of Banking and Finance* **15**, 647-664.

Demski, J.S. and G.A. Feltham (1994) Market response to financial reports. *Journal of Accounting and Economics* **17**, 3-40.

Diamond, D.W. and R.E. Verrecchia (1981) Information aggregation in a noisy expectations economy: *Journal of Financial Economics* **9**, 221-235.

Diamond, D.W. and R.E. Verrecchia (1991) Disclosure, liquidity, and the cost of capital. *Journal of Finance* **46**, 1325-1359.

Dontoh, A. and J. Ronen (1993) Information content of accounting announcements *The Accounting Review* **68**, 857-869.

Grant, E.B. (1980) Market implication of differential amounts of interim information. *Journal of Accounting Research* **18**, 255-268.

Grundy, B.D. and M. McNichols (1989) Trade and revelation of information through prices and direct disclosure. *Review of Financial Studies* **2**, 495-526.

Hagerman, R.L. (1973) The efficiency of the market for bank stocks: An empirical test. *Journal of Money, Credit and Banking* **5**, 846-855.

Hasbrouck, J. (1991) Measuring the information content of stock trades. *Journal of Finance* **46**, 179-207.

Holthausen, R.W. and R.E. Verrecchia (1988) The effect of sequential information releases on the variance of price changes in an intertemporal multi-asset market. *Journal of Accounting Research* **26**, 82-100.

Holthausen, R.W. and R.E. Verrecchia (1990) The effect of informedness and concensus on prices and volume behavior. *The Accounting Review* **65**, 191-208.

Kim, O. and R.E. Verrecchia (1991a) Trading volume and price reactions to public announcements. *Journal of Accounting Reasearch* **29**, 302-321

Kim, O. and R.E. Verrecchia (1991b) Market reaction to anticipated announcements. *Journal of Financial Economics* **30**, 273-309.

Kim, O. and R.E. Verrecchia (1994) Market liquidity and volume around earnings announcements. *Journal of Accounting and Economics* **17**, 41-67.

Kyle, A.S. (1985) Continuous auctions and insider trading. *Econometrica* **53**, 1315-1335.

Lee, C., B. Mucklow and M. Ready (1993) Spreads, depths and the impact of earnings information: An intraday analysis. *Review of Financial Studies* **6**, 345-374.

Lev, B. (1989) On the usefulness of earnings and earnings research: Lessons and directions from two decades of empirical research. *Journal of Accounting Research* **27**, 153-201.

May, R. (1971) The influence of quarterly earnings announcements on investor decisions as reflected in common stock price changes. *Journal of Accounting Research* **9**, 119-163.

McNichols, M. and J.G. Manegold (1983) The effect of the information environment on the relationship between financial disclosure and security price variability. *Journal of Accounting and Economics* **5**, 49-74.

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. (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 (1981) The ex ante and ex post price effects of quarterly earnings announcements reflected in option and stock prices. *Journal of Accounting Research* **19**, 434-458.

Patell, J. M. and M. A. Wolfson (1984) The intraday speed of adjustment of stock prices to earnings and dividend announcements. *Journal of Financial Economics* **13**, 223-252.

Pope, P. and C.G. Inyangete (1992) Differential information, the variability of UK stock returns, and earnings announcements. *Journal of Business Finance & Accounting* **19**, 603-623.

Potter, G. (1992) Accounting earnings announcements, institutional investor concentration, and common stock returns. *Journal of Accounting Research* **30**, 146-155.

Schwert, G. W. (1989) Why does stock market volatility change over time? *Journal of Finance* **44**, 1115-1154.

Schwert, G. W. (1990) Stock volatility and the crash of '87. *Review of Financial Studies* **3**, 77-106.

Schwert, G. W. and P. J. Seguin (1990) Heteroskedasticity in stock returns. *Journal of Finance* **45**, 1129-1155.

Schleifer, A. and L. H. Summers (1990) The noise trader approach to finance *Journal of Economic Perspectives* **4**, 19-33.

Watt, W. H., P. K. Yadav and P. Draper (1992) The impact of option listing on underlying stock returns: The UK evidence. *Journal of Business Finance & Accounting* **19**, 485-503.

TABLE 1

List of Companies Included in the Analyses

Category A: Smallest companies		Category B: Largest companies	
Company name	Market value[*]	Company name	Market value[*]
Bergens Skillingsbank	414	Aker	2167
Bjølvefossen	169	Awilco	839
Blom	116	Bergesen d.y.	6571
Chr. Bjelland & Co.	260	Den norske Bank	7993
Eidsiva	113	Elkem	2860
Grand Hotel	313	Ganger Rolf	924
Gyldendal Norsk Forlag	682	Hafslund Nycomed	5716
Kverneland	672	Havtor	1594
Moelven Industrier	540	Kværner	7231
Nordlandsbanken	459	Norsk Hydro	60993
Porsgrunds Porselænsfabrik	80	Norske Skogindustrier	3354
Simrad	370	Olav Thon Eiendom	1041
Simrad Optronics	82	Orkla	6868
Skiens Aktiemølle	217	Rieber & Søn	2058
Stentofon	5	Saga Petroleum	4949
Tandberg	92	Uni Storebrand	4802
Tomra Systems	509	Unitor	2179
Vard	527	Wilh. Wilhelmsen	1589
Veidekke	658		
Average value	330	Average value incl. Hydro	6874
		Average value ex. Hydro	3690

* Market value in NOK mill.

TABLE 2

Excess Return Variances Before and After Earnings Announcements

Panel A: Variance ratio (VR) of excess returns.

	Smallest companies	Largest companies	All companies
Mean VR	0.8918	1.0060	0.9474
Median VR	0.7336	0.8304	0.7867
No. of VR significantly greater than 1[*]	19	18	37
No. of VR significantly less than 1[*]	55	49	104
Wilcoxon test p-value for the hypothesis that median VR is 1	0.010	0.004	0.000

Panel B: Market model in volatility, with earnings announcements as a dummy variable (Eq. 8).

	Smallest companies	Largest companies	All companies
Mean g_i-value	-0.00137	-0.00023	-0.00078
χ^2 test p-value for the hypothesis that the sum of g_i-values is 0	0.000	0.000	0.000

[*] Significant at the 5 per cent level

TABLE 3

Components of Observed Excess Return Variances

		Smallest companies				Largest companies				All companies			
		Before	After	Change	p-value	Before	After	Change	p-value	Before	After	Change	p-value
a)	Intrinsic variance (Eq.5)	0.0015	0.0025	0.0010	0.45	0.0004	0.0006	0.0002	0.35	0.0009	0.0015	0.0006	0.35
b)	Noise (Eq. 4)	0.0003	0.0026	0.0023	0.13	0.0013	0.0001	-0.0012	0.04*	0.0008	0.0012	0.0004	0.60
c)	Price adjustment coefficients (Eq. 6)												
	1 day	0.01	1.73	1.72	0.61	-7.40	4.08	11.48	0.70	-3.90	2.98	6.88	0.66
	2 days	8.25	12.71	4.46	0.64	17.90	1.02	-16.88	0.22	13.60	6.22	-7.38	0.40
	3 days	1.43	2.40	0.97	0.22	-1.40	7.00	8.40	0.15	-0.14	4.94	5.08	0.12
	4 days	1.39	14.70	13.31	0.32	2.08	1.19	-0.89	0.08	1.77	7.24	5.47	0.36
	5 days	1.82	2.88	1.06	0.46	1.36	1.53	0.17	0.21	1.57	2.14	0.57	0.38
	6 days	1.29	1.50	0.21	0.44	1.26	1.00	-0.26	0.46	1.27	1.23	-0.04	0.83
	7 days	1.69	3.39	1.70	0.22	1.41	1.39	-0.02	0.70	1.54	2.28	0.74	0.23
	8 days	1.39	1.38	-0.01	0.79	1.37	0.83	-0.54	0.33	1.38	1.07	-0.31	0.32
	9 days	1.44	1.40	-0.04	0.32	1.40	1.35	-0.05	0.21	1.42	1.37	-0.05	0.11
	10 days	1.36	1.38	0.02	0.36	1.40	1.29	-0.11	0.05	1.38	1.33	-0.05	0.13

* Significant at the 5 per cent level