NEW EVIDENCE ON PREDICTABILITY OF MARKET RESPONSES TO EARNINGS ANNOUNCEMENTS IN FINLAND

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Abstract: In the efficient markets, new information should be impounded into prices correctly and instantaneously. Empirical evidence shows several deviations from this theoretical axiom. In this paper we study how information released via earnings announcements is impounded into prices. Specifically, we test whether market responses to subsequent earnings announcements are related using a dataset from Finland. In order to capture a broad picture of the potential return predictability, both interim and annual earnings announcements for the years 1997-2002 are used. Our results show that subsequent market responses to earnings announcements are positively related. In other words, markets do not fully digest the implications of current earnings to future stock prices. Consistent with this we find that an investment strategy based on the response to earnings announcement buying (selling) firms with positive (negative) market response to earnings is slightly profitable.

EFM Classification: 200, 350, 620, 710, 720

Keywords: investor behaviour, event study, accounting disclosure

This paper is prepared to be presented at the European Financial Management Association 2005 Meetings, June 29-July 2, 2005, Milan, Italy

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1. INTRODUCTION

Practioners as well as researchers have been puzzled by the anomalous market responses to accounting disclosures. In an efficient market, accounting information at time *t* should not be systematically related to security returns at *t+1*, unless that accounting information serves as a proxy for differences in cross-sectional risk. However, long ago it was discovered that stock prices seem to underreact to earnings news (e.g., Ball and Brown, 1968; Foster, Ohlson and Shevlin, 1984). This underreaction means that stock prices drift upwards after positive earnings surprises and downwards after negative earnings surprises. Attempts to explain this phenomenon has also failed to provide a totally satisfactory explanation for the post-earnings-announcement drift, PEAD (e.g., Bernard and Thomas, 1989; Ball, Kothari and Watts, 1988; Shleifer, 2003).

Despite the incomplete explanation for the PEAD, recent studies have documented several interesting insights and partial explanations related to the drift. For example, the magnitude of the drift has been found to be negatively related to the investors sophistication (Bhushan, 1994), institutional ownership (Bartov and Radhakrishnan and Krinsky, 2000), firm size (Foster, Ohlson and Shevlin, 1984), trading volume (Bhushan, 1994), proportion of transitority of earnings surprises (Burgstahler, Jiambalvo and Shevlin, 2002), level of multi-nationality (Riahi-Belkaoui, 2002), reliability to earnings information. A positive relation between the PEAD and the heterogeneous information among analysts has been reported (Liang, 2003). Furthermore, Ball and Bartov (1996) provide evidence that the drift is related to the market's failure to recognize serial autocorrelation patterns in quarterly earnings. In addition, the drift patterns are shown to be sensitive to earnings time-series processes (Brown and Han, 2000) and to which fiscal quarter the earnings announcement belongs (Rangan and Sloan, 1998).

The drift was recognised in the US, and the empirical studies in other countries have been relative scarce. However, a greater understanding of the (non)existence of market-based accounting anomalies in various countries with different investing cultures, accounting settings and market microstructures can help us to understand deviations, like the PEAD, from market efficiency more fully. Hew, Skerratt, Strong and Walker (1996) find some preliminary evidence of PEAD in the UK with the sample of 206 companies, seven half-years from 1989 to 1992 resulting 1442 earnings announcements. Liu, Strong and Xu (2003) test the PEAD in the UK using alternative earnings surprise measures and 13, 848 semi-annual earnings figures covering the years from 1988 to 1998 and find evidence of significant drift in each of the measures. Herrmann, Inoue and Thomas (2001) find in Japan consistent with the PEAD that current subsidiary earnings are significantly positively related to subsequent stock returns. Kallunki (1996) finds using Finland data for 1990-93 and 92 annual earnings announcements that there is drift especially after negative annual earnings news. Schadewitz and Kanto (2002), using 573 Finnish interim earnings announcements covering years 1985-93, find that the drift is related not only earnings figures but also degree of disclosure.

In this paper we study whether current price responses to accounting disclosures are related to subsequent price responses to accounting disclosures using a comprehensive data set from Finland. In addition we investigate whether there are certain firm-related attributes which are related to the drift in subsequent accounting disclosures. Finally, we evaluate whether it is possible to execute a profitable investment strategy based on current price responses. The paper extends the current PEAD literature in the following ways. First, the data, covering the years 1997-2003, is from Finland, representing a thinly traded emerging stock market. The selection of the stock market and time period studied provide possibilities to extent our knowledge of the robustness to the PEAD. Second, the paper uses price-based approach studied e.g. by Foster, Olsen and Shevlin (1984) and Liu, Strong and Xu (2003) to evaluate the information content of the earnings news. In previous studies the magnitude of earnings surprise (especially in US) is mainly evaluated by computing standardised unexpected earnings (SUE). This method requests relative long quarterly earnings time series. However, in many countries firms have been allowed to report also longer earnings intervals during their fiscal year resulting possibilities for firms to change their reporting intervals. This causes difficulties to compute the SUEs reliably, especially if earnings time series are relative short. In the price-based approach market participants themselves determine whether information content of the released news is positive or negative. This interpretation by the market can be observed from the prices. In addition, firms frequently release not only earnings numbers related to previous reporting period but also other information simultaneously, for example R&D-expenditures, investments, future outlooks, revenues and forecasts for the future earnings which all could have value relevance (Lev, 1999; Kelm, Narayanan and Pinches, 1995; Felthan and Ohlson, 1995; Liu and Ohlson, 2000). This can mean that a share price can respond seemingly inconsistently to an earnings surprise when conflicting information is released (see e.g. Livnat 2003). Thus the method applied here provides, by leaning on the market reaction at the event, a simple and more comprehensive picture not only for the past earnings but also information and expectations for the future earnings. Also Liu, Strong and Xu (2003:114) recognised this arguing that price-based earnings surprise model captures all news not just earnings news released at the time of the earnings announcement.

The reminder of this paper is organized as follows. In Section 2 the Finnish stock market data and earnings announcement environment are presented. The research design is presented in Section 3. In Section 4 empirical results are presented. The final section offers concluding remarks.

2. FINNISH DATA ENVIRONMENT

This section interprets the institutional regime and the sources as well as characteristics of the data used in the study. Subsection 2.1 deals with the institutional regime by representing trading on the Helsinki Stock Exchange (HSE). Event data (earnings announcements) is detailed in subsection 2.2.

2.1 Trading on the Helsinki Stock Exchange and Return Data

Compared to major world stock market, the HSE is small but technically advanced. The HSE's trading system, HETI (Helsinki Stock Exchange Automated Trading and Information System), is a distributed, fully automated order-driven system. The market structure is a continuous open limit order book (see Hedvall, 1994; and Hedvall, Niemeyer, and Rosenquist, 1997). The system is a strict market-by-order type, in which the individual orders are ranked and displayed by price and time priority. The identity of the broker/dealer behind each limit order is displayed to members of the exchange. Since the order size and the submitter of an order are visible on the trading screen, the HETI system provides a high degree of ex ante transparency. Broker/dealer and customer orders are treated similarly and cannot be distinguished from each other. The trade can be executed within five different trading modes: pre-trading, round-lot trading, odd-lot trading, prearranged trading, and after-market trading. During the pre-trading phase brokers key their opening buy and sell orders into the system, which are then matched resulting in the opening quotations for the day. During the sample period, rules on free trading on the HSE were amended a couple of times. The free trading period has been lengthened and nowadays the period starts later compared to earlier years. The changes were launched to bring the free trading period more into line with trading in the European and US markets.

Daily return data used in this study were calculated as differences in logarithmic price indices, including splits, stock dividends, and new issues computed by the HSE. Cash dividends are converted and cumulatively added to the price index data of the stock on the ex-dividend day. An estimate of the market return is based on the difference in the logarithmic HEX-portfolio index and is computed by the HSE too. In addition, this index includes cash dividends paid to stockholders. The index reflects the general price movements of HSE-listed firms. The portfolio-index is a value-weighted index, where the maximum weight for one company is 10 per cent. A special feature of the HSE-list is the heavy concentration of trading for Nokia shares. Nokia alone accounted for 56.5 per cent of the share turnover and 48.8 per cent of the total market capitalization in 1998 (Helsinki Stock Exchange, 1998). The return calculations in HSE are originally based on Hernesniemi (1990)[1].

2.2 Earnings Announcement Sample

The rules of the Helsinki Stock Exchange require firms to announce to the public the date(s) on which their earnings reports, both annual and interim reports, will be released. Those dates are available to all interested parties. Market monitoring of the HSE also verifies that firms are publishing their earnings reports according to their pre-announced time-table. Only a few listed firms did not publish their reports in line with the regulations during 1996-2000. Often the reason for non-publishing was mergers, acquisitions or other reconstruction operations.[2] In addition of the regular disclosure requirements applied to listed companies (consisting e.g. pre-scheduled earnings announcements) firms are required to release on an ongoing basis e.g. future prospects and changes in performance, balance sheet or financial condition if they differ substantially from the informed

[1] For more information how the index is calculated see also Helsinki Stock Exchange (2000).
[2] However, no cases that have been brought up for discussion regarding interim report publishing and no cases have been made public by the Disciplinary Board of the HSE. Further, according to the Legal Advisor of the HEX Securities Exchange there is no published court cases regarding the interim report announcements.

assessments of the investor consisting of e.g. positive of negative profit warning (Helsinki Stock Exchange, 2004). Also some firms provide preliminary financial statement data a couple of weeks before the pre-determined full disclosure of annual reports.-Interim earnings announcements are normally not audited, but they are more current than annual reports. In addition, firms do not typically provide preliminary interim earnings reports in Finland. Thus information about a forthcoming announcement has the potential to create interest and anticipation before the actual event. Furthermore, it is important in our study that the information impulse to the market is well and widely known. Published time schedule of financial reporting and their availability support these data requirements. In addition to that, HSE officials monitor overall investor communication of listed companies. All these facts and actions support the accuracy of released information.

During the sample period the annual number of interim reports released by HSE-listed firms has significantly increased. For example, in 1997, only about 20 per cent of HSE-listed firms released three interim reports when the corresponding number for the year 2000 is about 70 per cent. Nowadays the requirement is quarterly reporting. The increased frequency of interim reports characterises their importance. During the research period the content of interim reports was regulated by the recommendations concerning interim reports (Helsinki Stock Exchange, 1996) and by the Securities Markets Act. The current legislation and regulation of interim reports in Finland conform to EU practices (for more details, see Schadewitz, 1997; www.hex.com).

The rules relating to insider trading stipulated by the Securities Market Act have changed during the research period. Before July 26, 1996, short-term trading by insiders was prohibited. Short-term trading was defined as six months. An amendment to the Securities Market Act abolished the six-month trading rule and the public insider register was introduced. According to the Act, an individual who is considered an insider is obliged to publicly announce all changes in his/her stock holdings. In addition, the HSE has issued rules on the trading of insiders in listed companies that restrict, for example, short-term trading and trading during a pre-announcement period.

In Finland, several firms have more than one share-series listed on the HSE. These series typically differ in their voting power and/or the dividends. This makes the series imperfect substitutes for each other and may result in different owner clienteles. Therefore, the different share series of an underlying firm are considered separate stocks. The data cover the period from January 1, 1996 to November 30, 2003. Releases by newly listed firms were omitted in order to eliminate announcements released shortly after their listing. Especially during the first half of the sample period, there were numerous IPOs for high-tech firms. Despite its subsequent rapid development, the Finnish stock market was still rather small and relatively illiquid during the research period. For example in 1997 the value of trading was 36 billion USD and the number of listed companies was 126. The value of trading relative to market capitalization in 1997 was 49.4 per cent[3].

The initial number of annual and interim earnings announcements during the sample period is 3842. Since we are investigating whether the price responses to subsequent earnings announcements are related to each other, it is requested that the data consist not only one earnings announcement but several announcements during the same fiscal year of the firm. In other words, announcements were excluded if the data do not cover interim earnings announcements and annual earnings announcement from the underlying firm’s fiscal year. In order to compute beta-adjusted returns reliably is it requested that there are at least 260 returns observations during pre-announcement period. Also in some cases trading volume and market value are missing in the data set. When the data requirements are taken into account, there are 2496 earnings announcements. When these are

[3] According to Hasan and Malkamäki (2001), the corresponding figure for Nasdaq was 258 per cent, and for the Stockholm Stock Exchange 66.4 per cent in 1997.

presented on a firm-year basis, the data consist of 699 firm-year observations having two to five earnings announcements per year. In Table 1 the final sample is presented.

[insert Table 1 about here]

3. METHODOLOGY

3.1 Market response measures

In line with several prior studies we use price-based approach to approximate announcements information direction to the market (Foster, Olsen and Shevlin, 1984; Liu, Strong and Xu, 2003). In order to determine information content of the announcement, we calculate an abnormal daily return in the vicinity of the event days. Abnormal daily returns are computed using Sharpe's well known market model regressing stock returns on HEX portfolio index returns from the period -260 to -11 days relative to the announcement day. The parameters of the estimated simple OLS regression model (days -260 to -11 for estimation) are employed to compute daily abnormal returns for the stock at and after the announcements (days 0 to 3).

Stock returns related to subsequent earnings announcements are studied using several measures. First, market responses are computed. $CAR(0,3)_t^0$ denotes buy-and hold beta-adjusted abnormal returns over a four-day window ending three days after the first interim earnings announcement for reports on the underlying fiscal year *t*. The return response to the second and third interim earnings announcements, $CAR(0,3)_t^1$ and $CAR(0,3)_t^2$ are measured in the same way, respectively. Finally, the market response to the annual earnings announcement, $CAR(0,3)_t^3$, is measured. If a firm pre-announces before disclosure of a full annual announcement date, the market response to this pre-announcement is used instead of the market response of the full annual earnings disclosure date. The sum of these returns, $CCAR(0,3)$, are computed as shown in Eq. (1) below:

$$CCAR(0,3)_t = CAR(0,3)_t^1 + CAR(0,3)_t^2 + CAR(0,3)_t^3 \qquad (1)$$

Thus, the total short-term market response of the subsequent firm's announcements is the sum of four-day market responses based on the second and the third interim earnings announcement and annual earnings announcement on underlying fiscal year. Since all firms do not follow a quarterly earnings reporting interval during the whole research period, this results in a missing $CAR(0,3)_t^1$ and/or $CAR(0,3)_t^2$. Due this $CCAR(0,3)_t$ is computed only over those interim earnings announcements that fulfil the data requirements in Eq. (1).

The above computed short-term market response to earnings announcements assumes quite long-lasting delay in market responses. Thus also a more timely measure is provided. It takes the following form:

$$CAR(0,3)_t^* = \begin{cases} CAR(0,3)_t^1 & \text{, if more than one interim earnings announcement on year } t \\ CAR(0,3)_t^3 & \text{, if only one interim earnings announcement on year } t \end{cases} \qquad (2)$$

In order to evaluate whether the results are sensitive to the selection of the benchmark portfolio, also market-adjusted returns are computed, in addition to the risk-adjusted returns. $MAR(0,3)_t^j$ measures buy-and hold market-adjusted abnormal returns over a four-day window ending three days after *j*'s (*j=1*, if the second interim earnings announcement, *j=2*, if the third interim earnings announcement and *j=3*, if the annual earnings announcement) earnings announcement on underlying fiscal year *t*. In addition sum of these returns, $CMAR(0,3)$, is computed in line with the $CCAR(0,3)$.

3.2 Predicting the market response to subsequent earnings announcements

The relation between current market responses to subsequent earnings announcements is analyzed using regression analysis with $CCAR(0,3)$ and $CMAR(0,3)$ as the dependent variables.

For the beta-adjusted returns the employed relation takes the following form (explanatory variables and their motivation are discussed after Eqs (3)-(6)):

$$\begin{aligned} CCAR(0,3)_t &= b_0 + b_1 CAR(0,3)_t^0 + b_2 CAR(0,3)_t^0 * MV_t^0 + b_3 CAR(0,3)_t^0 * LIQV_t^0 + \\ & b_4 CAR(0,3)_t^0 * FREQ_t^0 + \varepsilon_t \end{aligned} \quad (3)$$

$$\begin{aligned} CAR(0,3)_t^* &= b_0 + b_1 CAR(0,3)_t^0 + b_2 CAR(0,3)_t^0 * MV_t^0 + b_3 CAR(0,3)_t^0 * LIQV_t^0 + \\ & b_4 CAR(0,3)_t^0 * FREQ_t^0 + \varepsilon_t \end{aligned} \quad (4)$$

Correspondingly for market-adjusted returns relation takes the following form:

$$\begin{aligned} CMAR(0,3)_t &= b_0 + b_1 MAR(0,3)_t^0 + b_2 MAR(0,3)_t^0 * MV_t^0 + b_3 MAR(0,3)_t^0 * LIQV_t^0 + \\ & b_4 MAR(0,3)_t^0 * FREQ_t^0 + \varepsilon_t \end{aligned} \quad (5)$$

$$\begin{aligned} MAR(0,3)_t^* &= b_0 + b_1 MAR(0,3)_t^0 + b_2 MAR(0,3)_t^0 * MV_t^0 + b_3 MAR(0,3)_t^0 * LIQV_t^0 + \\ & b_4 MAR(0,3)_t^0 * FREQ_t^0 + \varepsilon_t \end{aligned} \quad (6)$$

Four independent variables are used in all regression models above. In addition of the price response variables, also three other variables, firm size (*MV*), trading volume (*LIQV*), and number of earnings announcements releases (*FREQ*), are employed based on previous research. The firm size, MV_i^0 is introduced in the model since Foster, Ohlson and Shevlin (1984) find that the drift is larger for small-sized firms than for large-sized firms. Size is measured by market value of the firm stocks. If a firm have multiple stocks series, these are added together. Trading volume, $LIQV_i^0$, is also introduced in the model since high trading volume (indicating high liquidity) can reduce the cost of arbitrage and is therefore expected to be negatively associated with *CAR*. $LIQV_i^0$ is measured by the dividing trading volume during the period -260 to -11 days relative to the first interim earnings announcement day by the number of stocks outstanding. Bhushan (1994) and Livnat (2003), among others, find empirical evidence that the magnitude of the drift is negatively related to the trading volume. The third independent variable, $FREQ_i^0$, measures the number of earnings announcements releases during the fiscal year of the firm. It is hypothesised that an increase in reporting frequency decreases the drift thus having negative expected sign in parameter b_4. This is based on Butler, Kraft and Weiss (2003), who report that earnings are incorporated into price more rapidly for firms reporting quarterly than for those reporting on semiannual or annual basis.

To minimise problems related with outliers in explanatory variables, as in Liang (2003) and others, the decile numbers of *CAR* and *MAR* are used instead of the actual returns. Observations for each of the independent variables, except for $FREQ_i^0$, are also divided into deciles from 0 to 1. Since $FREQ_i^0$ varies only from 2 to 5 the variable is scaled so that its values range from 0 to 1 having 0.25 intervals. This kind of transformation has also certain other benefits mentioned e.g. by Bernard and Thomas (1990), Bhushan (1994) and Liang (2003). Namely, the coefficients of the price response imply the abnormal returns on a zero-investment portfolio when *CAR* and *MAR* are measured as deciles from 0 to 1. Under this procedure slope coefficient, b_1 represents the return on a zero-investment portfolio, consisting of stocks with smallest values of the MV_i^0, $LIQV_i^0$ and

$FREQ_i^0$. A positive and significant b_1-value suggests that the first interim earning announcement is related with the responses to subsequent responses to announcements. Correspondingly, b_2 measures the incremental change in these returns if MV_i^0 is the highest instead of the lowest, all else equal (see e.g. Liang 2003). Also b_3 and b_4 can be interpreted in a similar way.

The basic perception is that if investors underreact to earnings announcements this would provide arbitrage opportunities for savvy investors. An investment strategy can be deemed profitable if excess returns from trading the securities based on publicly available information substantially exceed transaction costs (Foster, Olsen and Shevlin, 1984).

In order to prevent the use of hindsight information in the experiment, one must be careful not to use information for classifying stock that was not available in the market at the time of classification (see e.g. Foster, Olsen and Shevlin, 1984, 579). Since firms are allowed to release one to three interim earnings report per fiscal year during the research period, earnings announcements are released during relative long time periods. In order to minimize the use of hindsight information, all firms are allowed to release their first interim earnings of their fiscal year first and then the stocks are classified into three equally sized portfolios with equal stock weights. The classification is based on the firm’s buy-and hold beta-adjusted abnormal returns over a four-day window ending three days after the first interim earnings announcement for reports on the underlying fiscal year $t, CAR(0,3)_t^0$. Stocks classified into the portfolio of poor-performers have exhibited the most unfavourable response to the first earnings announcement consisting one-third of all firms during the calendar year. Stocks classified into the portfolio of neutral-performers have exhibited the smallest response to the first earnings announcement consisting one-third of all firms during the calendar year. Finally, stocks classified into the portfolio of well-performers have exhibited the most favourable response to the first earnings announcement consisting one-third of all firms during the calendar year.

Previous studies have provided evidence that post-earnings-announcement drift is more evident with extreme portfolio (see e.g. Bernard and Thomas 1989, 1990; Hirshleifer, Myers, Myers and Teoh, 2003). Therefore the analysis in this study is carried out by focusing only stocks which have exhibited either the most favourable or the most unfavourable response to the first earnings announcement during the calendar year. An arbitrage portfolio is constructed by buying (selling) stocks with the most favourable (unfavourable) performers to the first interim earnings announcement during the fiscal year. The possibility to sell stocks with unfavourable interim earnings news is based on the liquid and competitively priced short-selling opportunities. The option to short-sell is constructed in Finland by using stock-lending financial vehicle since May 1995. However, the stock-lending volumes have been quite low in the HSE.

4. EMPIRICAL RESULTS

4.1 Descriptive statistics

Table 2 provides descriptive statistics for the returns used in the study. Panel A (Panel B) shows beta-adjusted (market-adjusted) returns during earnings announcements. In Panel C descriptive statistics for other variables are presented. There are several points to notice. On average the mean abnormal returns at and after the earnings announcement are slightly negative over a four-day window ending three days after earnings announcement. The minimum and maximum values of *CAR* shows that a price response can be very large usually ranging from about -50 per cent to about 50 per cent. The range for *MAR* is somewhat narrower due to the lacking of beta leverage. The number of observations is lower for rows where statistics are based on second ($CAR(0,3)^1$) and third ($CAR(0,3)^2$) announcements of interim reports. This demonstrated the fact that all firms do not follow a quarterly earnings reporting frequency.

[insert Table 2 about here]

The first insight to the relation between current market responses to subsequent earnings announcements is shown in Table 3. The Table exhibits Pearson product-moment and Spearman rank-order correlation coefficients between risk-adjusted returns (Panel A) and market-adjusted returns (Panel B). Both of these coefficients suggest that the price response to the first interim earnings announcement $CAR(0,3)^0$ and $MAR(0,3)^0$ are somewhat related to the first subsequent price responses, $CAR(0,3)^1$ and $MAR(0,3)^1$, as well as the total responses, $CCAR(0,3)$ and $MCAR(0,3)$, respectively. The only exception to this is in Panel A $CAR(0,3)^1$ with the Pearson product-moment correlation. Statistically significant correlations for the second subsequent price response are somewhat higher compared to the first subsequent price response. Further, the third subsequent price responses are about equal or lower compared to the first subsequent price responses. Overall the results support the view that markets are somewhat overlooking the information content of current accounting disclosures to subsequent accounting disclosures.

[insert Table 3 about here]

4.2 Relation between current market responses to subsequent earnings announcements

The relation between current market responses to subsequent earnings announcements is studied using four pooled regression analysis with $CCAR(0,3)$ and $CMAR(0,3)$ as the dependent variables. Since both $CCAR(0,3)$ and $CMAR(0,3)$ assumes quite long-lasting delays in market response to earnings announcements, we also used $CAR(0,3)^*$ and $MAR(0,3)^*$ as the dependent variables (see

Eq. (2) above). There are the same independent variables in the pair of regressions (3) and (4) as well as in the pair of regressions (5) and (6).

Panel A in Table 4 replicates the evidence for drift in an OLS regression using only univariate models. As expected, the results show that the coefficient estimates on the price response to the first interim report is positive and significant. The coefficients of b_1 represents returns on a zero-investment portfolio with long (short) position in stocks within the highest (lowest) decile of price response to the first interim report of the fiscal year. In Table 4 b_1 varies from 2.5% to 4.3%. Magnitudes are about the same as Bernard and Thomas (1989) and somewhat lower when compared to Liang (2003). However, one must keep in mind the differences in research design, the market and return generating periods between studies. The adjusted R^2s range from 0.008 to 0.017 being relative low but consistent with prior PEAD studies (see e.g. Liang 2003).

[insert Table 4 about here]

In Table 5 results based on four models (Eqs. (3) - (6)) are presented. The employed OLS regression models provide quite similar results for the relation between the total subsequent price responses and the price response of first interim earnings announcement. The coefficient b_1 is positive and statistically significantly related to the subsequent price responses $CCAR(0,3)$ and $CMAR(0,3)$ as well as more timely measures $CAR(0,3)^*$ and $MAR(0,3)^*$. This suggests that firm size, trading volume and reporting frequency, the subsequent price responses are related to the price response of the firm’s first interim earnings of the year. In previous research the magnitude of the drift has been found to be negatively related to the firm size (Foster, Ohlson and Shevlin, 1984) the trading volume (Bhushan, 1994; Livnat 2003). In this study these variables do not provide a compelling explanatory power to the drift. Although the estimated parameters are usually in line with the expected sign, they are rather frequently insignificantly related with the post-earnings-announcement drift.

[insert Table 5 about here]

The coefficient estimate b_1 varies from 5.8 % to 11.5% being significantly different from zero at 1 per cent level. For example, in Table 5 column (c) the parameter estimates of $MAR(0,3)_t^0 * MV_t^0$, $MAR(0,3)_t^0 * LIQV_t^0$ and $MAR(0,3)_t^0 * FREQ_t^0$ in Model (5) are –0.045 (significant at 1 per cent level), –0.042 (significant at 10 per cent level) and –0.044 (significant at 5 per cent level). These results implies that the return on a zero-investment portfolio consisting stocks in the lowest MV^0 decile, $LIQV^0$ decile $FREQ$ decile, with a long position $MAR(0,3)^0$ decile 10 and a short position in the $MAR(0,3)^0$ decile 1, is 11.5 per cent. The incremental change in the above return is –4.5 per cent if positions are taken in the highest as opposed to the lowest MV^0 decile. The same analogy applies also for other estimated parameters for b_3 and b_4. For rest of the models the returns of the zero-investment portfolio are somewhat lower. Adjusted R^2s range from 0.016 to 0.033 being somewhat higher than adjusted $R^{2'}$s in Table 5 where univariate OLS regressions are employed.

However, one must keep in mind that in each decile there are only about 70 stocks. This cause serious problems when the above mentioned investment strategy is implemented in practice. To concrete the problem it is hard to form a zero-investment portfolio consisting stock in the lowest value of MV^0, $LIQV^0$, and $FREQ$ and the highest value of $MAR(0,3)^0$ since there are not many stocks available. For example, number of stocks ranked per year in the lowest MV^0 decile is larger than if these stocks also be classified simultaneously in the lowest MV^0 decile and in the lowest

$LIQV^0$ decile. If it is further requested that the stock also belongs to the lowest $FREQ$ class it is even harder to form the investment portfolio. In order to control the above-mentioned problem, the number of classes is reduced. Instead of having decile ranks we ranks stocks to five classes based on their *CAR, MAR*, MV^0, $LIQV^0$, and $FREQ$ values. The same kind of OLS regression analyses are run as presented above. The results seem to be materially about the same. This suggests that it is a profitable investment strategy to buy (sell) stocks with a favourable (unfavourable) market response to the first interim earnings announcement during the fiscal year.

5. SUMMARY

In this paper we have studied whether and to what extent market responses to successive announcements are related. We employed a comprehensive dataset from Finland covering the years 1997-2002. Results indicate that investors with a negatively market response to the first interim earnings announcements during fiscal year tend to response negatively to the subsequent earnings announcements as well. This is consistent with the post-earnings announcement drift phenomena. The drift is less evident if positively market response is observed. This result is consistent with the previous findings from Finland (e.g. Kallunki, 1996 and Vieru, Perttunen and Schadewitz, 2004) suggesting that investors' response to favourable news is more efficient that the response to unfavourable news.

In addition, we studied whether firm size, liquidity, and reporting frequency of the company explains the extent to which the forthcoming returns are associated with the subsequent responses to earnings announcements. Negative estimates found support the hypothesized positive association, but discovered the association is rather weak. Finally we studied the profitability of an investment strategy based on market responses to the first interim earnings announcement during the fiscal year. The basic perception is that investors' underreaction to earnings announcements would provide arbitrage opportunities for savvy investors. An arbitrage portfolio is constructed by buying (selling) stocks with the most favourable (unfavourable) market response to the first interim earnings announcement. Depending on the investment horizon it is found that this strategy would provide 2 to 4 per cent gross returns. When information based on firm size, liquidity and reporting frequency is taken into account, the investment strategy would provide 5 to 11 per cent gross returns. Further research could focus for example to various investor types, such as sophisticated and sophisticated investors, and examine whether trading of investor type is related to the PEAD.

REFERENCES

Ball, R.J. and E. Bartov, E. (1996) ‘How naïve is the stock market’s use of earnings information?’ Journal of Accounting and Economics 21, pp.319-337.

Ball, R.J. and P. Brown (1968), ‘An empirical evaluation of accounting income numbers’, Journal of Accounting Research 6, pp. 159-178.

Ball, R., S.P. Kothari, and Watts (1993). ‘Economic determinants of the relation between earnings changes and stock returns,’ The Accounting Review 68, pp. 622-639.

Ball, R. (2003). ‘The theory of stock market efficiency: accomplishments and limitations’. In *The revolution in corporate finance* (4th ed.), (Eds Joel M. Stern and Donald H. Chew, Junior). Malden: Blackwell.

Bartov, E., S. Radhakrishnan and I. Krinsky (2000), ’Investor sophistication and patterns in stock returns after earnings announcements’, Accounting Review, Vol. 75, pp. 43-63.

Bernard, V. and J. Thomas (1989), ‘Post-earnings-announcement drift: delayed price response or risk premium?’, Journal of Accounting Research, Vol. 27, pp. 1-48.

Bernard, V. and J. Thomas (1990), ‘Evidence that stock prices do not fully reflect the implications of current earnings for future earnings’, Journal of Accounting and Economics, Vol. 13, pp. 305-340.

Bhushan, R. (1994). ‘An informational efficiency perspective on the post-earnings-announcement drift’, Journal of Accounting and Economics 18 pp. 45-65.

Brown, L.D., J.C.Y. Han (2000). Do stock prices reflect the implications of current earnings for future earnings for AR1 firms? Journal of Accounting Research pp.149-164.

Bugstahler, D., J. Jiambalvo, and T. Shevlin, (2002). Do stock prices fully reflect the implications of specific items for future earnings. Journal of Accounting Research 40, pp. 585-612.

Butler, M., A.G. Kraft and I.S. Weiss (2003). ‘The effect of reporting frequency on the timeliness of earnings: The cases of voluntary and mandatory interim reports, ‘ Working paper available on http://www.ssrn.com.

Feltham, G. A. and J. A. Ohlson (1995), ‘Valuation and Clean Surplus Accounting for Operating and Financial Activities,’ Contemporary Accounting Research 11, pp. 689-732.

Foster, G., C. Olsen and T. Shevlin (1984). ‘Earnings releases, anomalies, and the behavior of security returns,’ The Accounting Research 31, pp. 216-230.

Hakansson, N.H. (1977), ’Interim disclosure and public forecasts: An econometric analysis and a framework for choice’, Accounting Review, Vol. 52, pp. 396-416.

Hasan, I. and M. Malkamäki (2001), 'Are expansions cost effective for stock exchanges. A global perspective', Journal of Banking and Finance, Vol. 25, pp. 2339-2366.

Hedvall, K. (1994), 'Essays on the market microstructure of the Helsinki Stock Exchange', Publications of the Swedish School of Economics and Business Administration, No. 56. Helsinki.

Hedvall, K., J. Niemeyer and G. Rosenqvist (1997), 'Do buyers and sellers behave similarly in a limit order book? A high-frequency data examination of the Finnish stock exchange', Journal of Empirical Finance, Vol. 4, pp. 279-293.

Helsinki Stock Exchange (1996), 'Fact book 1996', Helsinki: Helsinki Exchanges Plc.

Helsinki Stock Exchange (1998), 'Fact book 1998', Helsinki: Helsinki Exchanges Plc.

Helsinki Stock Exchange (2000), 'Calculation of HEX indices', Helsinki: Helsinki Exchanges Plc., Available from http://www.hex.fi/.

Helsinki Stock Exchange (2004). 'Rules of the stock exchange. Listing procedures and disclosure and other requirements applicable to the issuers of listed securities,' http://www.hex.com/files/51Fu8V3bh/liite/Rules_of_the_stock_exchange_27092004.pdf

Herrmann, D., T. Inoue and W. Thomas (2001). 'The relation between incremental subsidiary earnings and future stock returns in Japan,' Journal of Business Finance and Accounting 28, pp. 1115-1140.

Hernesniemi, H. (1990), 'Hex- indeksi (HEX-index),' ETLA, B 68, Helsinki.

Hew, D., L. Skerratt, N. Strong and M. Walker (1996). 'Post-earnings-announcement drift: some preliminary evidence for the UK,' Accounting and Business Research 26, pp. 283-293.

Hirshleifer, D., J.N. Myers, L.A., Myers and S.H. Teoh (2003), 'Do individual investors drive post-earnings announcement drift? Direct evidence from personal trades', Working Paper, (Ohio State University).

Jiang, W. (2003) 'A nonparametric test of market timing', Journal of Empirical Finance, Vol. 10, pp. 399-425.

Kahra, H.A., A.J. Kanto, H.J. Schadewitz and D.R. Blevins, (Forthcoming), 'Anatomy of interim disclosures during bimodal return distributions', European Journal of Finance.

Kallunki, J-P. (1996), 'Earnings related anomalies in a thin security market: an accounting-based risk estimation approach', Acta Wasaensia, No. 48, Vaasa.

Kelm K.M., V.K Narayanan and G.E. Pinches (1995), 'The response of capital markets to the R&D process'. Technological Forecasting and Social Change 49, pp. 75-88.

Kothari, S.P. (2001), 'Capital markets research in accounting', Journal of Accounting and Economics, Vol. 31, pp. 105-231.

Lev, B., (1999), 'R&D and capital markets, Journal of Applied Corporate Finance 11, pp. 21-35.

Liang, L. (2003), 'Post-earnings announcement drift and market participants' information processing biases', Review of Accounting Studies, Vol. 8, pp. 321-345.

Liu, J. and J. A. Ohlson. (2000), 'The Feltham-Ohlson (1995) Model: Empirical Implications', Journal of Accounting, Auditing and Finance 15, 321-331.

Liu, W., N. Strong and X. Xu (2003). 'Post-earnings-announcement drift in the UK', European Financial Management 9, 89-116.

Livnat, J. (2003). 'Post-earnings-announcement drift: The role of revenue surprise,' Working paper, Stern School of Business Administration. New York.

Rangan, S. and R.G. Sloan (1998). 'Implications of the integral approach to quarterly reporting for the post-earnings-announcement drift,' The Accounting Review 71, 353.371.

Riahi-Belkaoui A. (2002). 'Level of multinationality as an explanation for post-announcement drift,' The International Journal of Accounting 37, 413-419.

Schadewitz, H. and A. Kanto (2002). 'The impact of disclosure on the market response to reported earnings,' Scandinavian Journal of Management 18, 521-542.

Schadewitz, H. J. (1997), 'Financial and nonfinancial information in interim reports', Determinants and implications. Acta Universitatis Oeconomicae Helsingiensis, A-124, Helsinki.

Shleifer, A. (2003). '*Inefficient markets: an introduction to behavioral finance'*. Oxford: Oxford University Press.

Topi, J. (2002), 'Suomen Rahoitusmarkkinat 2002' [Finnish financial markets 2002], ed. Heikki Koskenkylä. Tutkimuksia A:102. Suomen Pankki. Helsinki.

Vieru, M., J. Perttunen & H. Schadewitz (2004). How investors trade around interim earnings announcements. Working paper, University of Oulu, Turku School of economics and Business Administration.

White, H. (1980), 'A heteroscedasticity-consistent covariance matrix estimator and a direct test for heteroscedasticity', Econometrica, Vol. 48, pp. 817-838.

Table 1. Number of firm-year earnings announcements by fiscal year.

year	Number of firm-year earnings announcements
1997	82
1998	85
1999	87
2000	130
2001	150
2002	165
Total	699

Table 2. Descriptive statistics for variables.

Variable	N	Mean	Std	Min	First Quartile	Median	Third Quartile	Max
Panel A. Risk-adjusted returns								
$CAR(0,3)^0$	699	–0.005	0.072	–0.578	–0.035	–0.004	0.021	0.582
$CAR(0,3)^1$	633	–0.011	0.085	–0.686	–0.040	–0.003	0.027	0.500
$CAR(0,3)^2$	465	–0.002	0.072	–0.334	–0.030	–0.001	0.024	0.415
$CAR(0,3)^3$	699	0.000	0.088	–1.11	–0.029	–0.000	0.034	0.369
$CAR(0,3)^*$	699	–0.011	0.087	–0.686	–0.038	–0.002	0.027	0.500
$CCAR(0,3)$	699	–0.011	0.139	–1.13	–0.067	–0.004	0.051	0.571
Panel B. Market-adjusted returns								
$MAR(0,3)^0$	699	–0.004	0.058	–0.427	–0.025	–0.001	0.017	0.569
$MAR(0,3)^1$	633	–0.006	0.064	–0.478	–0.025	–0.006	0.021	0.294
$MAR(0,3)^2$	465	–0.002	0.049	–0.366	–0.023	–0.001	0.022	0.184
$MAR(0,3)^3$	699	–0.001	0.064	–0.629	–0.022	–0.001	0.024	0.330
$MAR(0,3)^*$	699	–0.006	0.066	–0.478	–0.025	–0.001	0.022	0.330
$CMAR(0,3)$	699	–0.008	0.102	–0.740	–0.050	–0.001	0.039	0.360
Panel C. Other variables								
MV^0	699	3 340	18 436	0.9	51	301	1 272	279 450
$LIQV^0$	699	0.001	0.001	0.000	0.000	0.001	0.002	0.010
$FREQ$	699	3.594	0.661	2	3	4	4	5

Notes: In Panel A $CAR(0,3)^0$ depicts beta-adjusted abnormal returns over a four-day window ending three days after the first interim earnings announcement for report on underlying fiscal year *t*. The return response on the second and the third interim earnings announcements, $CAR(0,3)^1$ and $CAR(0,3)^2$ are measured in the same way, respectively. $CAR(0,3)^3$ depicts the market response to annual earnings announcement. $CAR(0,3)^*$ depicts the market response to subsequent earnings announcement. $CCAR(0,3)$ depicts the sum of returns responses for subsequent earnings announcement in each stock series of the fiscal year. The corresponding market-adjusted returns are presented in Panel B. In Panel C MV^0 depicts firm size (in 100 000 euros) that is measured at the announcement event of the first interim earnings. $LIQV^0$ depicts the arbitrage opportunity of the stock series measured by the dividing trading volume during the period -260 to -11 days relative to the first interim earnings announcement day by the number of stocks outstanding. $FREQ$ depicts number of earnings announcements releases during the fiscal year.

Table 3. Correlations

Panel A. Correlations between risk-adjusted returns

	$CAR(0,3)^1$	$CAR(0,3)^2$	$CAR(0,3)^3$	$CAR(0,3)^*$	$CCAR(0,3)$
	Pearson product-moment correlation				
$CAR(0,3)^0$	0.065	0.058	0.138	0.086	0.140
	(0.101)	(0.214)	(0.001)	(0.023)	(0.000)
	Spearman rank-order correlation				
$CAR(0,3)^0$	0.153	0.059	0.020	0.167	0.121
	(0.000)	(0.205)	(0.603)	(0.000)	(0.000)

Panel B. Correlations between market-adjusted returns

	$MAR(0,3)^1$	$MAR(0,3)^2$	$MAR(0,3)^3$	$MAR(0,3)^*$	$MCAR(0,3)$
	Pearson product-moment correlation				
$MAR(0,3)^0$	0.075	0.143	0.086	0.087	0.146
	(0.060)	(0.002)	(0.023)	(0.022)	(0.000)
	Spearman rank-order correlation				
$MAR(0,3)^0$	0.135	0.138	0.069	0.140	0.137
	(0.000)	(0.003)	(0.069)	(0.000)	(0.000)

Notes: Variables are defined in Table 2. Two-sided *p*-values in parentheses.

Table 4. Relation between market responses to subsequent earnings announcements in univariate OLS regressions.

Coefficient	Expected sign	Model (a)	(b)	(c)	(b)
b_0		–0.032	–0.027	–0.029	–0.018
		(0.007)	(0.000)	(0.001)	(0.001)
b_1	+	0.043	0.034	0.043	0.025
		(0.030)	(0.005)	(0.004)	(0.007)
$Adj.R^2$		0.008	0.014	0.017	0.014
F-value		6.86	11.09	12.72	10.79
		(0.009)	(0.001)	(0.000)	(0.001)

Notes: The estimated univariate OLS regressions are as follows:

$$CCAR(0,3) = b_0 + b_1 CAR(0,3)_t^0 + \varepsilon_t \quad \text{(a)}$$

$$CAR(0,3)^* = b_0 + b_1 CAR(0,3)_t^0 + \varepsilon_t \quad \text{(b)}$$

$$CMAR(0,3) = b_0 + b_1 MAR(0,3)_t^0 + \varepsilon_t \quad \text{(c)}$$

$$MAR(0,3)^* = b_0 + b_1 MAR(0,3)_t^0 + \varepsilon_t \quad \text{(d)}$$

Variables are defined in Table 2. Statistical significance is tested by a *t*-statistic adjusted for an unknown type of heteroscedasticity using White’s (1980) estimate of parameter standard error, two-sided *p*-value in parentheses.

Table 5. Relation between market responses to subsequent earnings announcements in multivariate OLS regressions.

		(Model)			
Coefficient	Expected sign	(a) (3)	(b) (4)	(c) (5)	(d) (6)
b_0	.	–0.035 (0.004)	–0.028 (0.000)	–0.031 (0.000)	–0.019 (0.000)
b_1	+	0.109 (0.000)	0.058 (0.005)	0.115 (0.000)	0.060 (0.000)
b_2	–	0.003 (0.931)	0.013 (0.495)	–0.045 (0.002)	–0.022 (0.107)
b_3	–	–0.080 (0.005)	–0.031 (0.114)	–0.042 (0.072)	–0.021 (0.204)
b_4	–	–0.041 (0.234)	–0.025 (0.291)	–0.044 (0.045)	–0.020 (0.233)
$Adj.R^2$		0.019	0.016	0.033	0.021
F-value		4.32 (0.002)	3.89 (0.004)	6.94 (0.000)	4.76 (0.001)

Notes: Variables are defined in Table 2.. The estimated OLS regressions are as follows (Eqs (3)-(6) in the text):

$$CCAR(0,3)_t = b_0 + b_1 CAR(0,3)_t^0 + b_2 CAR(0,3)_t^0 * MV_t^0 + b_3 CAR(0,3)_t^0 * LIQV_t^0 + b_4 CAR(0,3)_t^0 * FREQ_t^0 + \varepsilon_t \quad \text{(a)}$$

$$CAR(0,3)_t^* = b_0 + b_1 CAR(0,3)_t^0 + b_2 CAR(0,3)_t^0 * MV_t^0 + b_3 CAR(0,3)_t^0 * LIQV_t^0 + b_4 CAR(0,3)_t^0 * FREQ_t^0 + \varepsilon_t \quad \text{(b)}$$

$$CMAR(0,3)_t = b_0 + b_1 MAR(0,3)_t^0 + b_2 MAR(0,3)_t^0 * MV_t^0 + b_3 MAR(0,3)_t^0 * LIQV_t^0 + b_4 MAR(0,3)_t^0 * FREQ_t^0 + \varepsilon_t \quad \text{(c)}$$

$$MAR(0,3)_t^* = b_0 + b_1 MAR(0,3)_t^0 + b_2 MAR(0,3)_t^0 * MV_t^0 + b_3 MAR(0,3)_t^0 * LIQV_t^0 + b_4 MAR(0,3)_t^0 * FREQ_t^0 + \varepsilon_t \quad \text{(d)}$$

Statistical significance is tested by a t-statistic adjusted for an unknown type of heteroscedasticity using White's (1980) estimate of parameter standard error, two-sided p-values in parentheses