

Annual earnings announcements and market reaction: The case of a small capital market

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ABSTRACT

A rich body of evidence exists on the relationship between security returns and corporate annual earnings announcements for countries with highly active capital markets. This paper presents some recent findings for a capital market at the other end of the scale: the small Danish stock market. Our results are based on the events study methodology, using the market model to calculate abnormal returns. In the first part of the paper we find that the Danish stock market extracts most of the information content of the earnings release on the announcement date and the day after. Significant average abnormal price changes can be found, however, two and three days after the announcement day. In the second part of the paper we identify the market's expectations of earnings. This is done by comparing actual price changes with predictions of price changes based on various expectation models. Our findings suggest that only a model based on reported IBES-estimates of earnings per share shortly before earnings release is descriptive of the market's expectations. Some of these findings contradict the results in the only published 17 year old Danish event study on annual earnings announcements and they indicate that the Danish capital market has become more efficient and sophisticated during the last two decades.

INTRODUCTION

This paper presents some recent findings on the relationship between security returns and corporate annual earnings announcements for one of Europe's smaller equity markets: the Danish capital market. With only approximately 250 listed companies, a market capitalisation of 85 billion ECU, and a value of equity trading of less than 3% of the trading on the London Stock Exchange and Paris bourse SBF respectively and less than 5% of the trading on Deutsche Börse¹ the Copenhagen Stock Exchange represents a type of equity market that is usually not given much attention in accounting research. The question is whether the results obtained from the large capital markets are similar to the results obtained from a small market such as the Danish one? Some researchers have argued that the degree of information dissemination and the openness of the market are the keys to market efficiency rather than size (Reeb et al. 1998: 2). The market may be small but the institutional setup surrounding the Copenhagen stock exchange is however quite modern both in terms of electronic trading systems and the regulations and restrictions concerning market participation. Accordingly we try to answer the following questions: Do stock prices respond quickly to earnings announcements? Do annual reports have information content?

Further, we try to specify a model for the market's earnings expectations. We examine whether the improved possibilities for obtaining and analysing data about the companies have made the capital market more sophisticated than before. Sophisticated in the sense that the market bases its earnings expectations on more information than before and that the expectations are more complex – with the consequence, for example, that earnings figures that would have surprised the market two decades ago are no surprises today.

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The motivation for this study is to analyse the use and impact of annual reports on a small capital market. This provides a contrast to studies of more sophisticated capital markets. The study also gives an opportunity to see how a small capital market has developed during the last 25 years or so and how far such a market has come today. The context for this paper is a previous Danish event study which contained a few rather puzzling results.

This paper is divided into six sections. The introductory section is followed by section two which reviews the only previous Danish event study of earnings announcements. Section three presents the statistical method used for analysis. Section four describes the population and sample utilised. Section five presents the empirical results of the paper. And, finally, section six concludes the paper.

THE PREVIOUS DANISH EVENT STUDY

There has only been one published event study of earnings announcements on the Danish stock market (Sørensen 1982: 223 – 241). This 17 year old study was based on weekly return data from the period 1971 – 1981. The study concluded that the annual reports contained new information for the stock prices – the stock prices responded quickly (i.e., within a few weeks) to the earnings announcement. Sørensen also found high correlation between positive stock returns and "good" (better than expected) earnings figures and between negative stock returns and "bad" (worse than expected) earnings figures.

However, Sørensen's study also contained a few puzzling results. First of all, Sørensen did not only find significant squared abnormal (residual) returns at the earnings announcement, but also significantly negative *average* abnormal returns. This finding – using a large sample and conducted over a long time period – indicates that mechanical trading strategies that were timed to the earnings announcement dates would have been profitable. In other words, this means that the Danish stock market was not semi-strong efficient at that time.

Secondly the predictions of the extremely simple expectation model did in fact correspond very nicely with the actual market reactions. Sørensen used a model where the stock market was expected to compare actual results with last year's return on equity (ROE). If the actual return on equity was higher (lower) than last year's ROE, Sørensen classified earnings as "good" ("bad"). In other words, the expectation model assumed that the stock market expected the same ROE as last year. Surprisingly this simple expectation model worked very well in 1982. Companies that announced lower earnings than expected by the model experienced negative average abnormal returns in the announcement week. But – and this is the final puzzling result – companies that announced higher earnings than expected by the model experienced significantly positive average abnormal returns in the weeks just *before* the announcement week. Sørensen suggested that the explanation for this was insider trading – good results were leaked by the companies before formal announcement to the stock exchange.

In sum: some of Sørensen's results indicate a non-sophisticated capital market. It is, therefore, relevant to see whether these results are still valid.

THE CALCULATION OF ABNORMAL RETURNS AND THE TEST STATISTICS

This section develops the definitions and test statistics used in the study conducted on the Danish stock market.

This study uses the event study methodology to estimate the effects of annual earnings announcements on stock prices. The crucial measure when examining the reaction of stock prices to the earnings announcements is abnormal return – AR. For any security j , the abnormal return $AR_{j,t}$ for event day t is defined as:

$$(1) \quad AR_{j,t} = R_{j,t} - CR_{j,t} \quad \text{for } t = [-5 ; 5]$$

and for the estimation period in which the abnormal returns are estimated retroactively the estimated abnormal return for security j on day t is symbolized by $ARE_{j,t}$:

$$(2) \quad ARE_{j,t} = R_{j,t} - CR_{j,t} \quad \text{for } t = [-186 ; -6]$$

where:

$$(3) \quad R_{j,t} = \ln \left[\frac{P_{j,t}}{P_{j,t-k}} \right]^{1/k}$$

and

t : the number of trading days on the Copenhagen Stock Exchange relative to the announcement day ($t = 0$)

$CR_{j,t}$: the control return for security j on day t (that is, an estimate of the security's rate of return assuming the absence of the earnings announcement).

$P_{j,t}$: the price of security j on day t , corrected for dividend and new issues.

$P_{j,t-k}$: the price of security j on day $t-k$ corrected for dividend and new issues.

k : the number of trading days between two quotes.

The stock prices are drawn from the database "Børsdatabasen" which is available at The Aarhus School of Business. The first stock price used is from August 18, 1993 and the last stock price used is from June 30, 1997.

This study uses the market model to calculate the control return which defines that:

$$(4) \quad CR_{j,t} = \hat{\alpha}_j - \hat{\beta}_j \cdot R_{m,t}$$

where:

$R_{m,t}$: the return on the market portfolio for day t

$\hat{\mathbf{a}}_j, \hat{\mathbf{b}}_j$: parameters estimated when regressing the individual security's return $R_{j,t}$ on the market return $R_{m,t}$, for the estimation period: $t = [-186 ; -6]$.

In event studies like this a tradition has developed to test for significant price changes in the event period by looking at mean squared abnormal returns. Squaring means that the sign of the abnormal returns is ignored. Another feature is that the test statistic is very suitable for visual presentation. We have followed this tradition. However, we have supplemented it with a more direct test of significantly high variance in the abnormal returns (an F-test for equality of variance in the abnormal returns between the event period and the estimation period) – but we only present the first test because the conclusions from the two tests turned out to be practically identical.

Assuming that the individual abnormal returns are independent observations of normally distributed variables the following testor \bar{U}_t is approximately normally distributed with a mean value of 1 and a variance close to $2/N$:

$$(5) \quad \bar{U}_t = \frac{1}{N} \cdot \sum_{j=1}^N \frac{AR_{j,t}^2}{s^2(ARE_j)} \cdot \frac{T_j - 4}{T_j - 2} \quad \cong \quad N\left(1, \frac{2}{N}\right)$$

for $t = [-5 ; 5]$

where:

N : the number of earnings announcements (observations) on day t in the *event* period (= 112)

T_j : the number of days for which the stock j has been quoted in the *estimation* period

$AR_{j,t}^2$: the squared abnormal return for company j on day t in the *event* period

$s^2(ARE_j)$: the estimated variance of the abnormal returns for company j in the *estimation* period:

$$(6) \quad s^2(ARE_j) = \frac{\sum_{t=-186}^{-6} ARE_{j,t}^2}{T_j - 2}$$

As mentioned in section two, Sørensen's 17 year old event study of the Danish stock market revealed that the market on average had too optimistic expectations of the companies' earnings announcements, resulting in significantly negative average abnormal returns at the announcement dates. In order to test whether this finding is still valid and to test the different expectation models, a test of the average abnormal returns in the event period was performed. Assuming that the individual abnormal returns are normally and independently distributed across securities, and that there is identical variance in the abnormal returns in the estimation period and the event period the test statistic t_t , under the null hypothesis that the average abnormal return on day t , (\overline{AR}_t), is equal to zero, is:

$$(7) \quad t_t = \frac{\overline{AR}_t}{s(\overline{ARE}_t)} \simeq t \left(\sum_{j=1}^N (T_j - 2) \right)$$

for $t = [-5 ; 5]$

where:

$$(8) \quad \overline{AR}_t = \frac{1}{N} \cdot \sum_{j=1}^N AR_{j,t}$$

$$(9) \quad s(\overline{ARE}_t) = \frac{1}{\sqrt{N}} \cdot \sqrt{\frac{\sum_{j=1}^N s^2(ARE_j) \cdot (T_j - 2)}{\sum_{j=1}^N (T_j - 2)}}$$

We acknowledge that the test statistic t_t will be too prone to reject the null hypothesis (that the expected value of the abnormal returns is zero) because the variance of the abnormal returns are in fact higher in the event period than in the estimation period. If the test does in fact point to rejections of the null hypothesis it should consequently be supplemented by a less sensitive test statistic. In the alternative situation, with no rejections of the null hypothesis, it will in contrast be very safe to conclude that the expected value of the abnormal returns is zero.

When we study the different expectation models it is relevant to test the possible differences in the ARs of the subsamples generated by the expectation models. A good expectation model is one that splits the ARs in two groups – the higher-than-expected earnings group and the lower-than-expected earnings group – in such a way that ARs of the higher-than-expected group are significantly higher than the ARs of the lower-than-expected group. The difference between the average abnormal returns of sample x and y , respectively, at day t is defined as:

$$(10) \quad \overline{DAR}_t = \overline{AR}_t^x - \overline{AR}_t^y$$

and the testor D_t :

$$(11) \quad D_t = \frac{\overline{DAR}_t}{\hat{s}_j \cdot \sqrt{\frac{1}{N_x} + \frac{1}{N_y}}} \simeq t(N_x + N_y - 2)$$

$$(12) \hat{\sigma}_j = \sqrt{\frac{\hat{\sigma}^2({}_x \text{AR}_{j,t}) \cdot (N_x - 1) + \hat{\sigma}^2({}_y \text{AR}_{j,t}) \cdot (N_y - 1)}{(N_x + N_y - 2)}}$$

where:

N_x : the number of earnings announcements in sample x

N_y : the number of earnings announcements in sample y.

and:

$$(13) \hat{\sigma}^2({}_x \text{AR}_t) = \frac{\sum_{j=1}^{N_x} ({}_x \text{AR}_{j,t} - \overline{{}_x \text{AR}_t})^2}{N_x - 1} \quad \text{for } t = [-5 ; 5]$$

Formula 13 is applicable for subsample y as well.

The D_t testor has been supplemented by stronger testors (stronger in the sense that it results in higher degrees of freedom when estimating the variance) in cases where F-tests of variance homogeneity point to variance homogeneity with abnormal returns in the test period and the estimation period.

POPULATION AND SAMPLE

The main population for the empirical analysis consists of all earnings announcements to the Copenhagen Stock Exchange, covering the financial statement years from 1993 to 1996(/97). In order to have a uniform basis for the financial statements we narrowed the population to include only domestic companies whose financial statements were based on the Danish Annual Accounts Act.² This included all trading-, service-, shipping-, and industrial companies but excluded, for instance, all insurance companies and banks. Thus the population consists of 558 earnings announcements.

Certain shares are traded infrequently on the Copenhagen Stock Exchanges. Thin trading may cause misspecification of the parameters of the market model (See, for instance, van Huffel et al. 1996: 697). Therefore, we applied two criteria on an earnings announcement in order for it to qualify for further analysis. First of all, we required the share to be traded on at least one third of the days in the last six month period before the announcement of annual earnings (the estimation period). This criterion was applied in order to be able to make a reasonable estimation of the parameters in the control return formula. Secondly, we required the share to be traded on each of the 11 days in the event period ($t = -5 ; 5$) and on the day before the beginning of the event period ($t = -6$). This criterion was applied in order to be able to calculate an authentic abnormal return for the share on every day of the event window.

The final sample contains 112 earnings announcements (cfr. Table 1). Thus approximately four in ten announcements were screened out because the shares were traded on less than one third of the

days in the last six month period before the announcement of annual earnings. This indicates how thin trading is on the Danish stock market. There is a little overweight of announcements in the last two years of the selected period in the final sample, nevertheless each year is fairly represented. Approximately three out of four announcements were made in the months of march and april.

Please insert table 1 here

EMPIRICAL RESULTS

This section presents the empirical results of our event study of the Danish stock market. The first subsection answers the fundamental question: How fast does the Danish stock market react to earnings announcements? Subsection two analyses whether the Danish stock market has realistic expectations to the companies' earnings or whether the puzzling results which were found in the previous analysis are still valid. Subsection three, four and five examine the ability of competing models to represent unobservable investor beliefs. This is done by an analysis of the correlation between price reactions and unexpected earnings as classified by different expectation models.

Information content

The overall conclusions from the test of the mean squared abnormal returns (formula 5) and the F-test for equality of variance in the abnormal returns between the event period and the estimation period were alike. We, therefore, choose to present the more visually appealing testor \bar{U}_t from formula 5 in figure 1. A value of \bar{U}_t above 1 means that larger than normal price changes, ignoring sign, take place on that day (i.e., larger variance). A value of \bar{U}_t below 1 means that smaller than normal price changes, ignoring sign, take place on that day (i.e., smaller variance). The two horizontal lines in figure 1 marks a 95% confidence interval.

Please insert figure 1 here

There is clearly a large spike at event day 0 (the announcement day) and at day 1. This means that significantly larger price changes take place on these two days than during other days of the year. This clearly indicates that the announcement of earnings influences the investors' expectations of the companies. In other words, financial statements have information content – they are still news to the market. However, the incorporation of the news is perhaps incomplete within these two days. Significant price changes appear to be present on event day 2 and 3 as well. The values are, however, barely significant and our supplemental F-test was only able to detect a significant value on event day 3. Without overreaching oneself, it seems fair to conclude that the significant values after day 1 indicates a more slow reaction to the announcement of earnings on the Danish stock market compared to the larger capital markets. A study by Morse (1981: 374 – 383) of the US stock market from 1973 – 1976 demonstrated that already at this time significant price reactions could only be found on two days around the announcement day. A later study from 1984 by Patell and Wolfson (See reference in Beaver, 1998: 103) based on intraday price data form the US market demonstrated that a major portion of the market reaction occurred within two hours of the announcement, with detectable traces for an additional two hours. Some price effects continued into the next day. These and other studies indicate a more quick reaction to earnings announcements than we found.

Realistic expectations – on average

As will be remembered from section two, the only previous Danish event study of earnings announcements by Sørensen (1982) included a result that wasn't consistent with a semi-strong efficient stock market. Sørensen found significantly negative *average* abnormal returns in the event period, thus demonstrating that the stock market on average had too optimistic expectations of the companies' earnings. Table 2 and Figure 2 presents the results of our study. The table shows the average abnormal returns and figure 2 illustrates the corresponding statistical testor t_t . The two horizontal lines in figure 2 marks a 95% confidence interval for the t-testor. An average close to 0 indicates that positive and negative surprises were approximately of the same size or, in other words, that the market on average had realistic expectations of the companies' earnings.

Please insert table 2 here

Please insert figure 2 here

It is apparent that the T-testor fluctuates a lot during the event period, but on none of the days was it possible to find average abnormal returns significantly higher or lower than zero. Considering that our T-testor is prone to report significance, it suggests that the Danish stock market on average has realistic expectations of the companies' earnings. In contrast to the findings of the former Danish event study, these findings indicate that no mechanical trading strategies based on the release of the annual earnings figures would result in above normal profits. This is a prerequisite for a stock market to be semi-strong efficient. Thus our findings indicate that the sophistication of the Danish market has grown since the first analyses.

Expectation models

Having established that the stock market reacts to the release of annual earnings and that the market on average has realistic expectations of the companies' earnings, we designed a number of competing models of investor expectations of earnings based on readily available information before the announcement of earnings. Investor beliefs are of course unobservable, but by evaluating the congruence between different models of expectations with abnormal returns we are able to identify a superior model and thus are closer to understanding how these expectations were formed. As mentioned in section three, a good expectation model is one that splits the ARs in two groups – the higher-than-expected earnings group and the lower-than-expected earnings group – in such a way that ARs of the higher than expected group are significantly higher than the ARs of the lower-than-expected group.

The naï ve expectation model

One of the models we examined was the so-called naï ve expectation model which surprisingly worked very well in Denmark in 1982. This model simply assumes that investors expect the same return on equity (ROE) as in the year before. The model thus classified annual reports as signaling unexpected good earnings if the annual reports' ROEs were higher than last year and vice versa. There was a fine correlation between price reactions and unexpected earnings as classified by the model in 1982. Figure 3 and figure 4 presents the results of our study.

Please insert figure 3 here

Please insert figure 4 here

The two figures illustrate that the naïve expectation model is not suitable to describe the actual price reactions that took place on the market after the earnings announcements. Figure 3 shows that none of the average abnormal returns are significantly different from zero for any conventional level of confidence. Note that a confidence band is not illustrated in the figure because the number of companies in each subgroup is different (63 in the better than expected group and 49 in the lower than expected group). Figure 4 illustrates the statistical testor D_t from formula 14. The average abnormal returns for the better-than-expected group exceeds the average abnormal returns for the lower-than-expected group whenever the line is above zero and vice versa. A statistically significant difference between the two groups was found on 9 out of 11 days in the event period, but on 5 of these days the lower-than-expected group had a higher average abnormal return than the better-than-expected group. This indicates that the naïve expectation model doesn't represent the unobservable investor beliefs very satisfactorily. There might be several explanations why the naïve model was able to sort earnings in better and lower-than-expected groups in a way that correlated with price reactions in 1982 based on data from the 1970's and not in 1999. One – and perhaps the most obvious - is that the market's level of sophistication has grown.

Other simple expectation models

The hypothesis that the Danish stock market has grown in sophistication is supported by the results of other analyses. None of the other simple expectation models we developed was able to produce results that demonstrated a convincing congruence between price reactions and unexpected earnings as classified by the expectation models. By a simple expectation model is meant a model that merely is based on one piece of information from the companies themselves. For instance we tested a model where we classified earnings as better (lower)-than-expected if they were higher (lower) than the annual earnings amount announced in the mandatory semi-annual report to the stock exchange. Another model classified earnings in the two groups according to what the companies had announced in their latest revision of annual earnings. Yet another model classified earnings according to the comments or self assessment management gave their annual earnings at the announcement date. None of these models worked very well.

The IBES expectation model

The most convincing sign of market sophistication growth is perhaps the fact that a model based on "IBES" estimates of earnings shortly before earnings release did produce results that demonstrated a quite nice correlation between price reactions and unexpected earnings. IBES estimates are averages of forecasted earnings per share from a number of leading market participants. If a company announces higher earnings than the corresponding IBES estimate, the model predicts a positive abnormal price reaction following the announcement and vice versa. This expectation model may at first seem simple. However, the information used by the financial analysts before compressing it into one single EPS number is expected to be very broad. In addition we know from experience that due to diversification in the errors committed by individual analysts the use of an average enhances the precision of a forecast. Therefore, an IBES model can be characterised as a more complex model. If price reactions correlate with the model's prediction then this can be seen as indicating that a complex processing of information takes place on the market. Figure 5 and figure 6 presents the results.

Please insert figure 5 here

Please insert figure 6 here

Figure 5 is based on formula 7. Three significant values are found. For the lower-than-expected group, average abnormal returns significantly lower than zero are found on event day 0 and 1 and for the better-than-expected group, average abnormal returns significantly higher than zero are found on event day 0. The values and the directions of the average abnormal returns are thus consistent with the prediction of the model. In contrast to the former Danish event study, our findings do not indicate leak of information on “good” earnings figures before the formal earnings announcements. Figure 6 illustrates the statistical testor D_t from formula 13. The average abnormal returns for the better-than-expected group exceeds the average abnormal returns for the lower-than-expected group whenever the line is above zero and vice versa. A statistically significant difference between the two groups was found on 8 out of 11 days in the event period. On four of these days the better-than-expected group had a higher average abnormal return than the lower-than-expected group, three of which were found after the announcement of earnings. Especially the values on the announcement day and the following day are remarkable. In short, the market reacts as predicted by the model which indicates that the IBES expectation model seems to describe the unobservable investor beliefs quite satisfactorily.

CONCLUSION

This paper examines the behavior of a very small capital market - the Danish stock market - on the days around the release of annual earnings. We have examined whether the swift reactions to earnings announcements on the large capital markets could be found on the Danish stock market as well. Further, we have tried to get a better understanding of how the investors’ earnings expectations are formed by specifying and testing a number of expectation models. The context for this study is a previous study of the Danish stock market that indicated that the market was non-sophisticated. Our results indicate that the announcement of earnings influences the investors’ expectations of the companies. Significant abnormal price changes take place on the announcement day and the following day. However, the incorporation of the information may be incomplete within these two days. This suggests a slower reaction on the Danish stock market than on, for instance, the US market.

On the other hand, other results indicate that a growth in the market’s level of sophistication has taken place over approximately the last twenty years. In contrast to the previous Danish event study of earnings announcements, we were able to demonstrate that the market on average had realistic expectations of the companies’ earnings. Further, we did not find any signs of good earnings figures being leaked to the market before their formal release to the stock market. And, finally, we did not find that any of the very simple expectation models we tested were able to predict the actual price reactions that took place on the market after the earnings announcements. This is also contrary to previous results found on the Danish stock market. The expectation model which we found had the best correlation with market reactions was a model based on IBES estimates. The IBES model can be characterised as a more complex model and the result thus contributes to the overall picture of a market that has become more sophisticated.

Table 1: Overview of selected events	
Available earnings announcements from domestic trading-, service-, shipping-, and industrial companies covering the financial statement years 1993 – 1996(/97):	558
Screened out due to infrequent trading in the estimation period (< 60 days):	(229)
	329
Sorted out due to infrequent trading in the event period (< 12 days):	(215)
Abnormal return outliers sorted out	(2)
The final sample	112

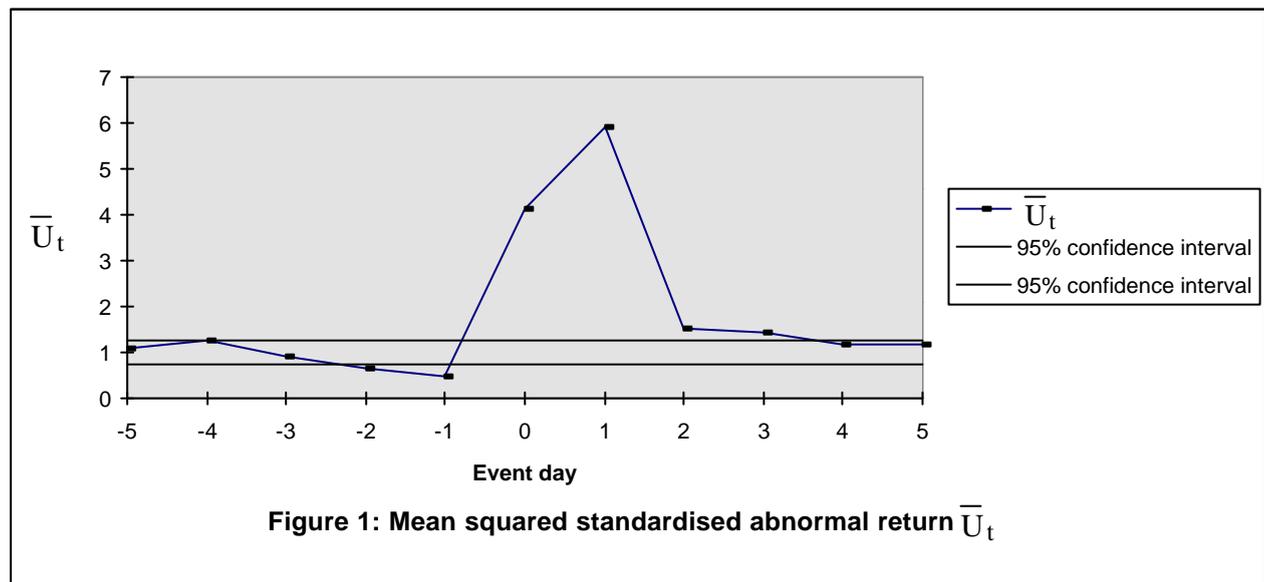
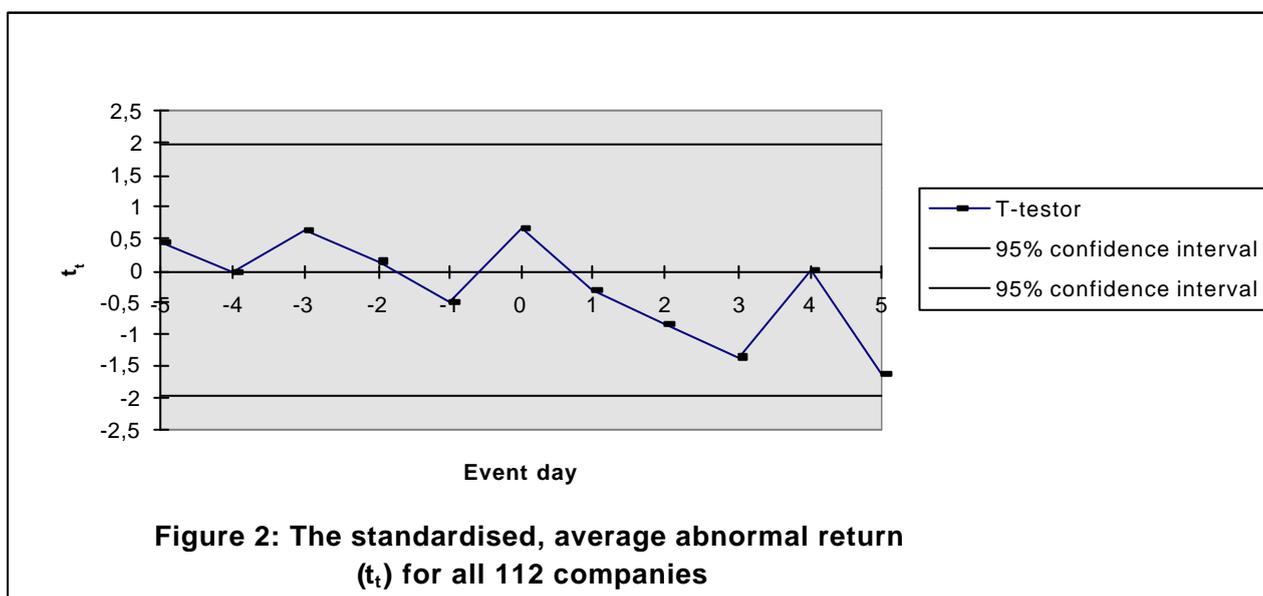


Table 2: Overview of the average abnormal returns (AAR) on every event day, std.deviation and T-testor

Eventday	AAR	Std.dev.	T-testor
-5	0,000751	0,001690266	0,444557
-4	-0,00002	0,001690266	-0,01284
-3	0,001075	0,001690266	0,636016
-2	0,000266	0,001690266	0,157258
-1	-0,00085	0,001690266	-0,50128
0	0,001109	0,001690266	0,656202
+1	-0,00054	0,001690266	-0,31973
+2	-0,0014	0,001690266	-0,82915
+3	-0,0023	0,001690266	-1,35934
+4	0,000012	0,001690266	0,007279
+5	-0,00274	0,001690266	-1,62129



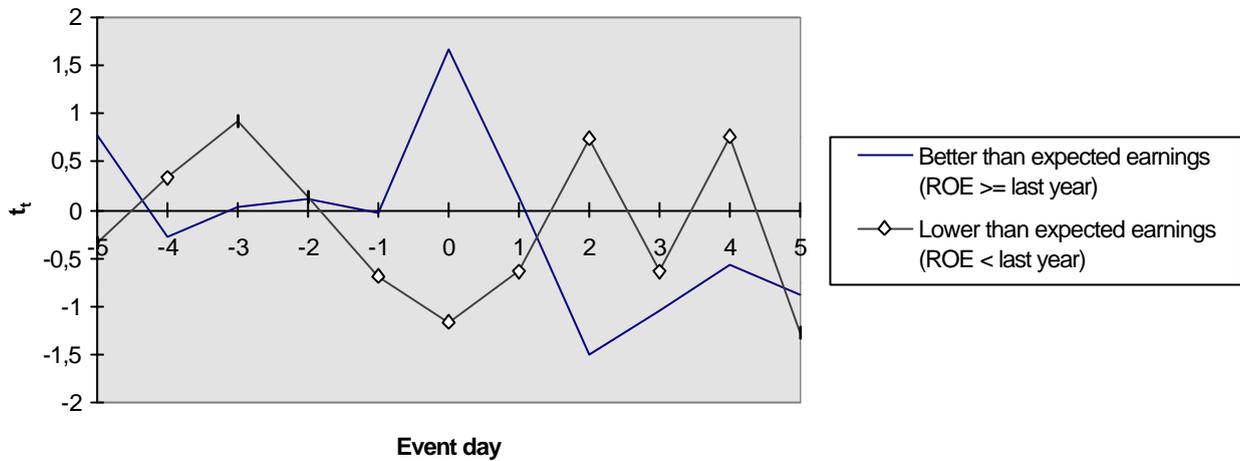


Figure 3: The standardised, average abnormal return (t_t) for the two information groups sorted by the naïve expectation model

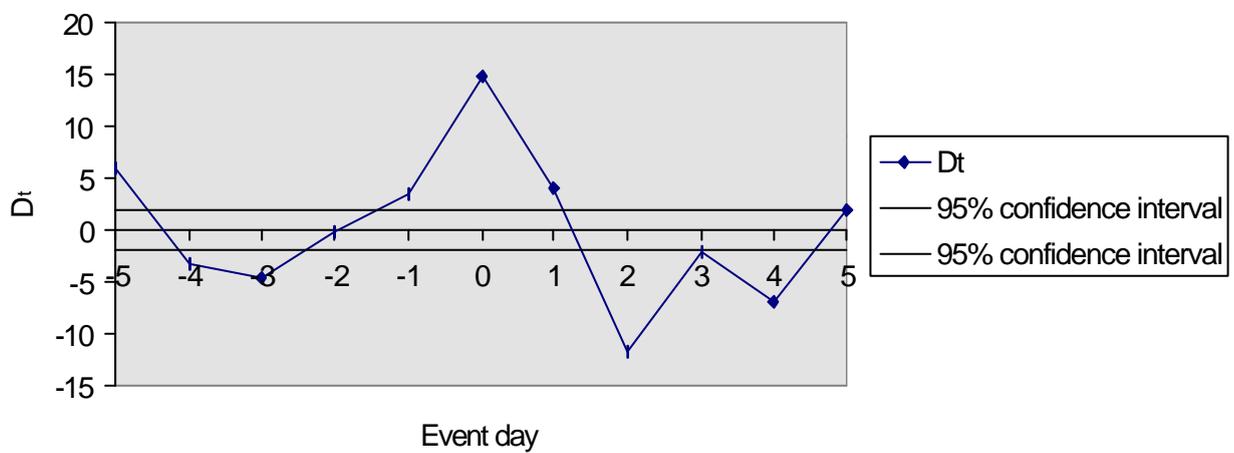


Figure 4: The standardised difference between the average abnormal returns of the two information groups sorted by the naïve expectation model

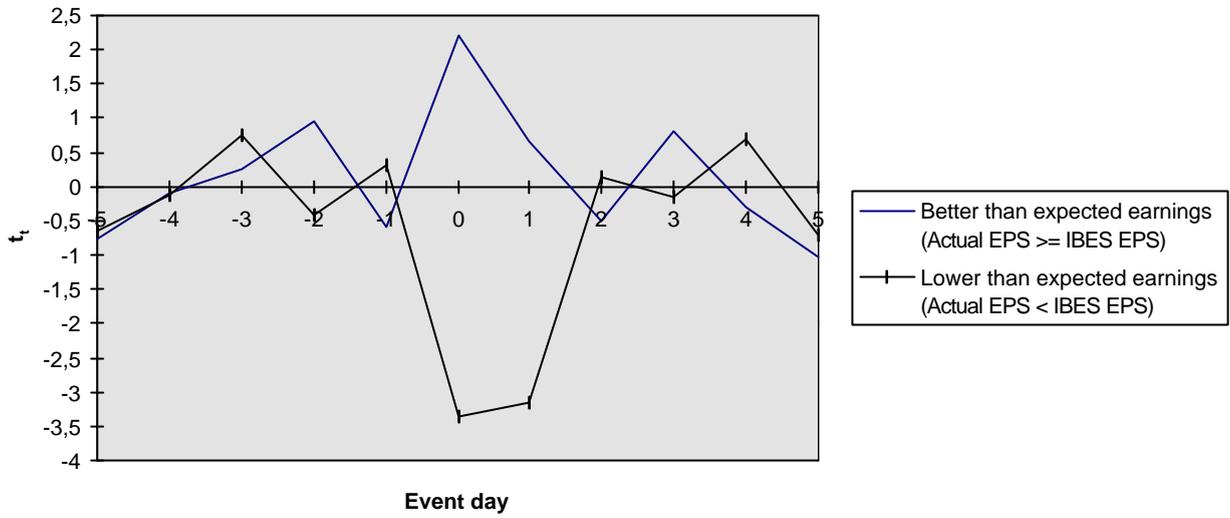


Figure 5: The standardized, average abnormal return t_t for the two information groups sorted by the IBES expectation model

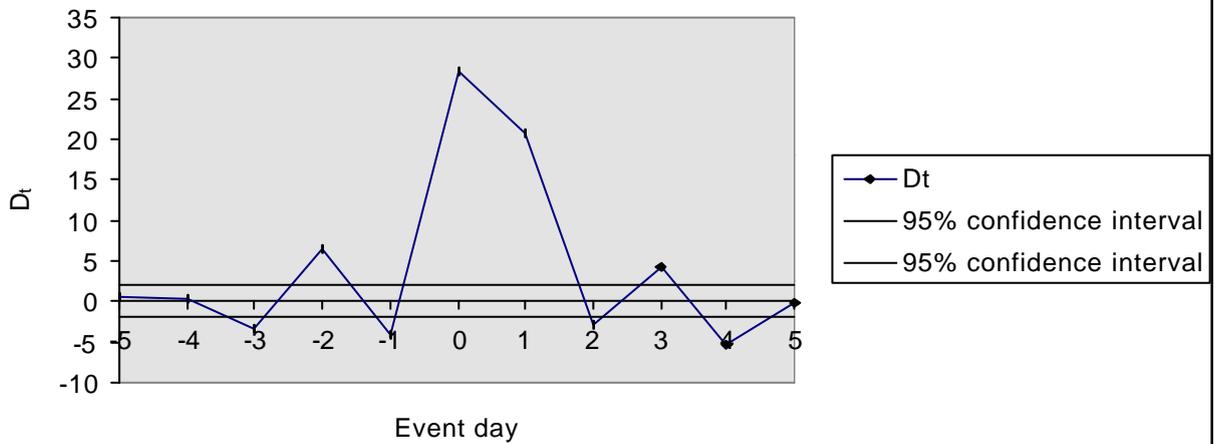


Figure 6: The standardized difference between the average abnormal returns of the two information groups sorted by the IBES expectation model

Litterature

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¹ Source: European Stock Exchange Statistics, Annual Reports, FESE

² As Denmark is a member of the EU, The Danish Annual Accounts Act is based on the EU's fourth and seventh directives.