

# Sleepy Markets and the Post-Earnings-Announcement Drift

*– A Study on the Nordic Stock Markets during 2014–2022*

BACHELOR'S THESIS IN FINANCIAL ECONOMICS



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## **Abstract**

This study presents results on the phenomenon of post earnings announcement drift (PEAD) in the Nordic countries during January 2014 to December 2022, regarding its existence and the possibility of successfully building a long-short trading strategy. Although the phenomenon has been extensively researched in international markets, the Nordic countries as a whole has interestingly enough not been thoroughly examined. The results indicate that the drift effect is evident in the evaluated sample of the companies listed on the Nordic stock markets through holding periods of 3, 6, and 12 months following the announcement date. Excess return is surprisingly found in both the LONG and SHORT positions throughout all time-periods, however a HEDGE position holding the return spread of the LONG and SHORT positions did not generate abnormal returns. Utilizing the three-factor model of Fama and French (1993) controlling for risk-factors finds that returns are robust to risk-factors on the shorter time frames, but can partly be explained by the value factor on the 12 month time frame.

**JEL Classification: G14, G40, G12**

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# 1 Introduction

## 1.1 *Background*

The pricing of information is among the most well-researched topics in finance, ultimately seeking the answer to whether there are anomalies to exploit in the capital markets. The basis for this large body of research is the hypothesis of efficient markets. In an efficient market, all the available information is always reflected in the prices (Fama, 1970). According to Fama (1970), the efficiency of markets can be classified in three forms: weak, semi-strong and strong. The weak form of efficiency incorporates that market prices reflect old information, whereas semi-strong efficiency implies the incorporation of all publicly available information (Fama, 1970). The strong and most efficient form of markets implies that all information is reflected in prices, including non-public information (Fama, 1970).

New public information in the form of quarterly reports, annual reports or other financial information about a company should, according to the semi-strong form, be reflected immediately in the share price. This phenomenon of how new accounting numbers are reflected in the share price, focusing on reported earnings, has been empirically studied by Ball and Brown (1968), among others. Ball and Brown (1968) reports evidence of positive stock price changes to firms reporting “good” news and negative changes to firms reporting “bad” news, and implies that earnings is an important driver of shareholder value. Setterberg (2011) also notes that under ideal fair value accounting, if reported earnings are positive, they should increase the book value of equity because the profits are retained or distributed as dividends, and in total should equal the shareholder return during the period.

The seeking of excess returns, trying to exploit the fact that not all available information is reflected in prices, is also a common theme in academic finance, questioning the fact of truly efficient markets. One cluster of financial research focuses on the phenomenon of post-earnings announcement drift (PEAD). Originally studied by Ball and Brown (1968), PEAD has been further analyzed by many researchers, including Bernard and Thomas (1989) on US firms, Setterberg (2011) on Swedish firms, among others. In its essence, PEAD involves studying how the share price drifts after a firm announces their quarterly earnings, eventually forming a strategy taking a long (short) position in firms surprising with a higher (lower) than expected earnings (Bernard and Thomas, 1989).

## **1.2 *Problem Description and Problem Analysis***

The body of research on the phenomenon of post-earnings-announcement drift (PEAD) is extensive, at least on international markets, mainly in the US, UK and some European countries. Some of the key questions and takeaways from these studies is whether the effect first and foremost is existent in the respective markets, and whether market capitalization matters in terms of small capitalization stocks outperforming large capitalization stocks in their drift. Also, these studies often incorporate some different factor models, such as Fama and French (1993, 2015) or CAPM to control for risks and explanations.

Similar to the large body of research on PEAD, the research on the value and momentum “effect” is extensive. The value effect is commonly measured as value (book value of equity) in relation to its market value, and momentum effect is measured as the return an asset delivers compared to its historic performance. Following this, PEAD can implicitly be argued to incorporate momentum in its essence as drifting can be perceived as the stock price being driven by momentum, while adding additional layers controlling for value and size.

As the research on both PEAD, the value and size effect have been merged historically, it has not been done in an extensive way on the Nordic equity markets. We are therefore aiming to contribute to this body of research by focusing our study on PEAD in a Nordic context.

## **1.3 *Aim of the Study***

To address the purpose, this thesis will examine the post-earnings-announcement drift (PEAD) on the Nordic stock market, explicitly Danish, Finnish, Norwegian and Swedish. These Nordic countries have similar structures regarding government, legislation and business environment, therefore we have chosen to interpret the countries as one region. The exclusion of the Icelandic market is a consequence of its relatively lower trading volume and market capitalization compared to the other Nordic markets.

To examine this, we will measure how much the reported earnings deviate from their forecasted level, potentially impacting how the share price drifts following this event. From this, we aim to investigate whether it is possible to build a long-short investment strategy based on this anomaly, emphasizing the factors of value and size when evaluating abnormal returns. By long-short we mean buying (selling) the stocks that have the most pronounced positive (negative) deviation from their estimated earnings.

To fulfill the aim of our thesis, our research questions will be:

*(i). Is the post-earnings-announcement drift (PEAD) evident on the Nordic stock markets between 2014 and 2022?*

*(ii). Is it possible to build a successful long-short trading strategy based on PEAD?*

## 2 Literature Review and Theoretical Framework

Previous international studies, both on the European and US markets, have found patterns that abnormal returns could be earned by an investor trading on the post-earnings announcement drift (PEAD). Originally, this drift was examined by Ball and Brown (1968) who studied the effect of earnings announcements on stock prices, spanning between 1946 – 1966. Announcements classified as “bad news” implies that reported earnings are less than expected, and “good news” implies reported earnings that are higher than expected (Ball and Brown, 1968). Empirically, Ball and Brown (1968) discovered companies announcing good (bad) news had, on average, positive (negative) cumulative abnormal returns in the market. Although Ball and Brown (1968) did not study the efficiency of markets explicitly, their results of a drift after announcing earnings could be a contradicting fact to efficient markets.

### 2.1 *Efficient Market Hypothesis*

The Efficient Market Hypothesis (EMH), as formulated by Fama (1970), states that market prices reflect all relevant and available information regarding the asset. As previously mentioned there are three forms of market efficiency, this report focuses on the semi-strong form. Fama (1970) defines semi-strong efficiency as the market incorporating all publicly available information in the price. This implies that when new information becomes available to the public such as quarterly reports, annual reports and other financial information it should immediately be incorporated in the price.

Therefore, by definition there should not be any additional movement in a stock price after an earnings announcement as the earnings should be priced in immediately. However, the phenomenon of PEAD suggests that there is an inefficiency in the market if the price of a stock drifts and does not adjust completely following an earnings announcement, which contradicts the semi-strong market efficiency. Consequently, the semi-strong market efficiency is tested by the speed at which the asset adjusts its price to fully reflect all publicly available information. Fama (1970) concluded in his report that there is evidence supporting the efficient market hypothesis through testing the adjustment time following different types of announcements. The tests measured the average time for market prices to fully reflect new information announced to the public regarding stock splits, annual earnings and new issues of shares. It was found that the market estimated prices from implications of a stock

split, the estimates fully incorporated the information of the split on average at the time of the split. Similar results were concluded from tests with new information pertaining to annual earnings and issuance of shares. Although only certain types of new information is evaluated, the results in future studies are probable to be similar since the tested types of information are important announcements to a company and its stock price (Fama, 1970).

PEAD challenges market efficiency in the sense that there is a delay before earnings announcements are completely reflected in the price, implying the market is not efficient. The inefficiency enables opportunities for investment strategies to exploit the PEAD.

## ***2.2 Post-Earnings-Announcement Drift***

Bernard and Thomas (1989) discoveries in the area of PEAD is one of the first and most comprehensive empirical studies made on the US markets. Between 1974 and 1986, Bernard and Thomas (1989) discovered that a long-short investment strategy, based on the PEAD anomaly in the US, earned an annualized return of 18%, with about equal returns from the long and short positions. The strategy implies going long the good news firms and short the bad news firms, holding the positions for 60 trading days (Bernard and Thomas, 1989). Although the holding period is 60 trading days in this study, Bernard and Thomas (1989) found a longer-term drift, approximately up to 12 months after announcement, with a more pronounced drift during the first months, and a more pronounced drift in small firms compared to large firms.

Setterberg (2011), in her dissertation *The Pricing of Earnings: Essays on the Post-Earnings Announcement Drift and Earnings Quality Risk*, partly studies if the anomaly of PEAD is existent on the Swedish stock market between 1990–2005. Setterberg (2011) found a drift that could be exploited using a similar trading strategy as Bernard and Thomas (1989), combining long and short positions in good and bad news firms, earning an annualized return of 11%. The strategy by Setterberg (2011) implies a holding period of 12 months after announcement and formation of the long-short portfolio. Also, Setterberg (2011) shows that CAPM and the three-factor model hold for this strategy, while the separate long and short positions face similar risks under CAPM. Similar to Bernard and Thomas (1989) and several other studies (Bhushan, 1994; Brav et al., 2009; Fama et al., 1993), Setterberg (2011) found that small stocks answer for higher returns compared to larger capitalization stocks.

### 2.3 *Fama-French Three Factors*

When evaluating PEAD, it is common to control excess returns for risk-factors to assess where the returns are originating from. Fama and French (1993) presents a three-factor model in order to control for certain risk-factors. The model builds on the CAPM and examines the market excess return over the risk-free rate ( $RM - RF$ ), size ( $SMB$ ) and valuation ( $HML$ ). Fama and French (1993) defines the three-factor asset pricing model as:

$$R_{it} - RF_t = \alpha_i + \beta_i(RM_t - RF_t) + \gamma_i(SMB_t) + \delta_i(HML_t) + \epsilon_{it}$$

where:

$R_{it}$  = the return on portfolio/security  $i$  during period  $t$

$RF_t$  = the risk-free return

$RM_t$  = the return on a value-weighted market portfolio

$SMB_t$  = the return spread between a diversified portfolio with small stocks  
and a diversified portfolio with big stocks

$HML_t$  = the return spread between a diversified portfolio with high and low book-to-market  
ratio stocks

$\epsilon_{it}$  = residual with the mean zero

The model is used in regression to control for the effect of the different factors on returns and it was found that the factors explain more than 90% of returns of a diversified stock portfolio. In other words, expected stock returns are mainly driven by sensitivity to the market, size and valuation. Fama and French (1993) found that in the long run, smaller size companies tend to on average generate higher returns, outperforming larger size companies and value companies tend to outform growth companies.

### 2.4 *Value and Growth Stocks*

Porta et al. (1997) examined the difference in stock price response following earnings announcements between value and glamour stocks. The authors hypothesized a superior return from the portfolio of value stocks compared to the portfolio of glamour stocks. To classify their sample of U.S. common stocks in the two portfolios, each firm was ranked based on

its cash-flow-to-price (CP) and a weighted average of sales growth (GS). The value portfolio included the stocks with the highest ranking of the top 30 percent in CP and lowest in the bottom 30 percent in GS. The glamour portfolio included the stocks with the lowest ranking of the bottom 30 percent in CP and highest of the top 30 percent of GS. Porta et al. (1997) found that after a five year period following the formation of the portfolios the returns of the portfolio of value stocks was greater. A significant part of the return spread was explained by earnings surprises having a more positive effect on value stocks compared to glamour stocks. The evidence presented in the article therefore suggests that value stocks have superior returns following earnings announcements compared to glamour stocks.

### 3 Method

To examine the aim of our study, we will base our method on the quantitative process of first measuring the earnings surprise on our selected companies (see 4. Data) using standardized unexpected earnings (SUE). Then, we will form sub-portfolios both based on the surprise difference, valuation (P/B) and size (MC) while assessing the portfolio returns using buy-and-hold returns (BHAR). This is done by a step-by-step process, eventually leading up to a fixed effect regression on our variables: SUE, P/B, MC, measuring BHAR.

#### 3.1 *Standardized Unexpected Earnings (SUE)*

In order to answer our two research questions, we will first need to measure the earnings surprise of each observed company in each quarter between Q1 2014 and Q4 2022. Then, we will need to sort these surprise differences from largest negative deviation to largest positive deviation, enabling us to quantify and identify which stocks to go long or short each quarter.

To measure earnings surprise, we will use the Standardized Unexpected Earnings (SUE). This way of measuring earnings surprise is widely used in empirical research, such as Bernard and Thomas (1989), Setterberg (2011), among others.

SUE measures how much reported earnings deviate from analyst consensus estimates, and standardizes the positive or negative unexpected earnings by how certain the consensus estimate is. Thus, if the estimates are closely aligned, the consensus is said to be more certain (uncertain), meaning a lower (higher) standard deviation, implying a more (less) pronounced surprise signal if the earnings deviates from consensus. SUE can be calculated as:

$$SUE_{i,t} = (Ea_{i,t} - Ef_{i,t})/\sigma_{i,t}$$

where:

$SUE_{i,t}$  = Standardized Unexpected Earnings of share  $i$  at time  $t$

$Ea_{i,t}$  = Quarter  $t$  actual earnings per share (EPS) of firm  $i$

$Ef_{i,t}$  = Quarter  $t$  forecasted earnings per share, measured as consensus mean, of firm  $i$

$\sigma_{i,t}$  = Quarter  $t$  standard deviation of analysts' forecasted earnings per share of firm  $i$

SUE is one of the most commonly used metrics for assessing the announcement deviation, used by Setterberg (2011), Bernard and Thomas (1989) among many others. Alternative measures such as Earnings Announcement Return (EAR) are also used in some studies, including a broader set of inputs besides earnings. Due to the limited time frame, influencing our choice to focus on a more simple variable, we have chosen to only use SUE in this study.

### 3.2 *Buy-and-hold Returns*

In order to measure the return of our trading strategy we will first estimate the individual stock returns, and later compare these returns with the “market” return to estimate the abnormal return. The market return will be measured by the market index OMX Nordic EUR GI, since this index mimics the companies in our study the most, including all shares trading on NASDAQ OMX Stockholm, NASDAQ OMX Helsinki and NASDAQ OMX Copenhagen. This index excludes the Norwegian stock market and due to limited time during this study we will not try to adjust a market index to each respective stock based on country.

By calculating the abnormal return, we can simulate the buy-and-hold return for each individual stock and the overall portfolio, accounting for the compounding effect of returns which can have an increasing effect over long time periods. When using time periods of 12 months, as our study has a partial focus on, or even longer time periods, the compounding effect becomes more pronounced, making BHAR potentially more relevant compared to non-compounding measures such as Cumulative Abnormal Returns (CAR).

The firm specific net return can be calculated as:

$$R_{i,t} = (P_{i,t} + DIV_{i,t})/P_{i,t-1}$$

where:

$R_{i,t}$  = net return of share  $i$  at time  $t$

$Pa_{i,t}$  = price of share  $i$  at time  $t$

$Ef_{i,t}$  = dividend of share  $i$  at time  $t$

The abnormal return can be calculated as:

$$AR_{i,t} = R_{i,t} - Rm_{i,t}$$

where:

$AR_{i,t}$  = abnormal return of share  $i$  at time  $t$

$R_{i,t}$  = net return of share  $i$  at time  $t$

$Rm_{i,t}$  = market return (net return of a market index OMX Nordic EUR GI)

Finally, the buy-and-hold return can be calculated as:

$$BHAR_{i,T} = \prod_{t=1}^T (1 + AR_{i,t}) - 1$$

where:

$BHAR_{i,T}$  = buy-and-hold return of firm  $i$  for the holding period  $T$

$T$  = holding period measured in months  $t$

$AR_{i,t}$  = abnormal return of share  $i$  at time  $t$

This can also be measured on a portfolio level, as we give equal weights to each share in the respective SUE-portfolios, aggregated as portfolio BHAR:

$$BHAR_{p,T} = 1/N \sum_{i=1}^N BHAR_{i,T}$$

where:

$BHAR_{p,T}$  = buy-and-hold return of portfolio  $p$  after  $T$  months

$p$  = portfolio, 10 (LONG), 9, ... , 2, 1 (SHORT)

$N$  = number of firms in portfolio  $p$ ,  $i = 1, 2, \dots, N$

$BHAR_{i,T}$  = buy-and-hold return of firm  $i$  for the holding period  $T$

### 3.3 *Price-to-Book (P/B)*

To categorize groups based on valuation our sample is sorted by Price-to-Book Ratio each quarter. P/B is a valuation metric that is calculated as the market price of a share divided by the book value per share, it is defined as:

$$P/B = \frac{\text{Market price per share}}{\text{Book value per share}}$$

It compares how a company is valued in the market and its book value. The P/B ratio is used to categorize companies to value and growth stocks, where companies with low (high) P/B are considered to be value (growth) stocks. Portfolios are then created based on this variable. Fama and French (1993) and Setterberg (2011) have in their earlier studies used book-to-market as the valuation metric, however as data for P/B was easier obtainable and considering that P/B indicates the same value but only with the ratio being inverted we have chosen P/B as the valuation metric.

### 3.4 *Market Capitalization (MC)*

To categorize groups based on company size our sample is sorted by market capitalization (MC) each quarter. MC is the market value of a company's total shares outstanding and is defined as:

$$MC = \text{Market price per share} \times \text{Total shares outstanding}$$

Higher (lower) MC equals a larger (smaller) company. The MC variable is used to create portfolios based on company size.

### **3.5 *Portfolios***

Since we are aiming to research a potential trading strategy based on PEAD, we will need to form portfolios in order to evaluate whether abnormal returns are evident. For every quarter between 2014 and 2022, we will form sub-portfolios based on the variables described in 3.1 Standardized Unexpected Earnings (SUE), 3.3 Price-to-Book (P/B) and 3.4 Market Capitalization (MC), and rank each company according to their respective value on each variable for every quarter. This ranking will later be the base of forming portfolios from 1-10, ranging from low to high values on the respective variable.

From the portfolios 1–10, we calculate the individual buy-and-hold returns 3, 6 and 12 months subsequent to the next quarter after portfolio formation, with monthly rebalancing, and quantify the equally weighted portfolio return (BHAR) which will be our final estimate of the PEAD for the respective portfolio. For example, the portfolio formed in Q1 2014, our first observed quarter, will have returns calculated from the subsequent quarter, Q2 2014, and 12 months ahead, to ensure that every company has reported their quarterly earnings before calculating returns. As Setterberg (2011) mentions, this can bring some weakness into the calculations, but with this limited timeframe we are not able to calculate the rolling 12 month return following the exact quarterly reporting date since this requires us to manually source reporting data for 76 companies during 32 quarters.

#### **3.5.1 *SUE Portfolios***

For SUE, we will do a quarterly rank of each company based on their respective unexpected earnings, and then sorted into deciles depending on their unexpected earnings. The companies with the lowest SUE will be placed in portfolio 1, all the way up the highest SUE in portfolio 10. This calculation of deciles will also be made on a quarterly basis since the span of SUE changes each quarter. Each share is weighted equally in the portfolio.

### 3.5.2 *HML Portfolios*

The HML portfolios are calculated by quarterly ranking each company based on their P/B from low to high and sorting them into deciles. The companies with the lowest P/B will be placed in portfolio 1, all the way up the highest P/B in portfolio 10. This calculation of deciles will also be made on a quarterly basis since the range of the P/B changes each quarter. Each share is weighted equally in the portfolio.

### 3.5.3 *SMB Portfolios*

The SMB portfolios are calculated by quarterly ranking each company based on their MC from low to high and sorting them into deciles. The companies with the lowest MC will be placed in portfolio 1, all the way up the highest MC in portfolio 10. This calculation of deciles will also be made on a quarterly basis since the range of the MC will differ each quarter. Each share is weighted equally in the portfolio.

### 3.5.4 *HEDGE Portfolios*

When we have calculated the individual portfolio BHAR for 1 and 10, we can measure the HEDGE portfolio since it is based on the spread between portfolio 1 (SHORT) and 10 (LONG). The HEDGE portfolio is included in our study because we want to evaluate a possible trading strategy, consistent with Setterberg (2011), Bernard and Thomas (1989) among others, based on going long (short) the high (low) SUE portfolio, hence implying the spread as the hedge return, calculated as:

$$BHAR_{HEDGE,T} = BHAR_{LONG,T} - BHAR_{SHORT,T}$$

where:

$BHAR_{HEDGE,T}$  = BHAR of a HEDGE portfolio with holding period  $T$

$BHAR_{LONG,T}$  = BHAR of a LONG (10) portfolio with holding period  $T$

$BHAR_{SHORT,T}$  = BHAR of a SHORT (1) portfolio with holding period  $T$

### 3.6 *Fixed Effect Regression*

The regressions are based on monthly net returns calculated on the equally weighted portfolios formed by SUE rankings which are defined as:

$$R_{p,t} = 1/N \sum_{i=1}^N$$

where:

$R_{i,t}$  = net return of share  $i$  at month  $t$

$T$  = net return of portfolio  $p$  at month  $t$

$p$  = portfolio type,  $p = 1$  (SHORT),  $2, \dots, 10$  (LONG)

$t$  = month after date of formation,  $t = 1, 2, \dots, 12$

The focus of the regressions is on the SHORT, LONG and HEDGE positions (portfolios 1, 10 and 101 respectively). As mentioned, the HEDGE position is equivalent to the spread between the LONG and SHORT position. Consequently, the regressions are run on a monthly basis for every one of the three positions. As the portfolios are formed on the first day each quarter and the holding period is up to 12 months, returns will be calculated for 12 months for 32 different portfolios formed in 32 different quarters. This means there are a total of  $12 \times 32 = 384$  observations of monthly returns for the regressions. The reason that we use fixed effect regressions is that we can control for the unobserved firm-specific factor to some extent, isolating the impact of changes in the independent variables on the dependent over time.

The fixed effect regressions are run with the monthly portfolio excess returns being the dependent variable (as in Chan et al., 1996). Monthly portfolio excess returns is defined as the net portfolio return minus the monthly risk-free rate, using STIBOR as a proxy for the risk-free interest rate, similar to Setterberg (2011). The explanatory variables follow the multi-factor model of Fama and French (1993). This regression model is specified as:

$$R_{p,t,f} - RF_t = \alpha_i + \beta_i(RMRF_t) + \gamma_i(SMB_t) + \delta_i(HML_t) + \epsilon_{it}$$

where:

$R_{p,t,f}$  = net return on portfolio  $p$  at month  $t$  and formation date  $f$

$p$  = portfolio type,  $p = 1$  (SHORT),  $2, \dots, 10$  (LONG)

$t$  = month after date of formation,  $t = 1, 2, \dots, 12$

$f$  = the date of formation,  $f = 1$  (Q1 2014),  $\dots, 32$  (Q1 2022)

$RF_t$  = the risk-free rate at month  $t$  measured as monthly average STIBOR

$RMRF_t$  = excess market return:  $R_m - R_f$

$SMB_t$  = the return spread between a diversified portfolio with small stocks  
and a diversified portfolio with big stocks

$HML_t$  = the return spread between a diversified portfolio with high and low book-to-market  
ratio stocks

$\epsilon_{it}$  = residual with the mean zero

The explanatory variables are RMRF (excess market return), SMB and HML. Following Fama and French (1993), the variables SMB and HML are interpreted as follows:

Portfolios SMB are, as mentioned in 3.5.3 SMB, ranked and divided in regards to size. The variable SMB is the spread between the monthly net return of Portfolio 1 (Small) which includes the firms with the lowest market capitalization and the monthly net return of Portfolio 10 (Big) that includes the firms with the highest market capitalization, i.e. the monthly net returns of Small minus Big. Net returns are calculated monthly from the formation date – the first day of every quarter, and 3, 6 and 12 months forward.

Portfolios HML are, as specified in 3.5.2 HML, ranked and divided in regards to valuation. The variable HML is the spread between the monthly net return of portfolio 1 (Value) which includes the firms with the lowest P/B and the monthly net return of portfolio 10 (Growth) that includes the firms with the highest P/B, i.e. the monthly net returns of Value minus Growth. Net returns are calculated monthly from the formation date – the first day of every quarter, and 3, 6 and 12 months forward.

## 4 Data

Our study is based on a large collection of data, both company-specific and market-specific, which requires a process for collecting, structuring, quantifying and analyzing data. Therefore, we will describe how our dataset was selected and collected.

### 4.1 Data Selection

We limited our dataset to the Danish, Finnish, Norwegian and Swedish stock markets, as the aim of our study is to examine the Nordic stock markets. In earlier studies we have seen similar examination of the post-earnings-announcement drift, however not with a dataset covering the Nordics as a whole.

When selecting our companies we first started our screening with the aim of including as many of the companies in the index OMX Nordic EUR GI, as it represents the stock markets of Sweden, Finland and Denmark very well. Since the Norwegian main stock market is owned by Euronext, no Norwegian companies are included in the OMX Nordic EUR GI (owned by NASDAQ) and we therefore had to include the Oslo Børs All-share Index GI. After our broad selection we had to clean the data from mainly missing values since not all stocks have analyst forecasts, at least not for the whole selected time period of all the 36 quarters between 2014–2022. Since all the included indices are of the format all share, they include all the shares trading on these exchanges, meaning that many will not be able to make it through our data cleaning. From the original screen 688 companies were included, with some companies being double counted from having multiple shares listed (A and B class shares), while after our cleaning process only 76 companies remained and had sufficient information, including analyst coverage and being listed through the whole period. We believe that we have a sufficient sample to base our study on with stocks from multiple industries, multiple valuations and market capitalizations, with a mix of companies very similar to the weighting in OMX Nordic EUR GI, with the Swedish market as the largest similar to our dataset (Figure 1). A complete list of companies included in the dataset can be found in *Appendix 1: Companies included in the study*.

As our time period covers 2014 through the end of 2022 (or 32 quarters), we will have sufficient data points to evaluate our data, and ultimately our trading strategy, over time in different economic conditions, both in upturns and downturns for our 76 companies.

Following this relatively long period, we will have 2432 individual company observations, or 64 portfolio observations for each variable SUE, P/B and MC, since we have the same 76 companies to base our portfolio on each quarter.

<b>Country</b>	<b>Total Number of Companies in Sample</b>
Sweden	32
Finland	16
Norway	16
Denmark	12
	<hr/> 76

Figure 1: Geographic representation of companies

## 4.2 *Data Collection*

When collecting the data for our selected companies we focus mainly on our three variables: Standardized Unexpected Earnings, Price-to-Book and Market Capitalization.

For SUE, we gathered company specific data on quarterly earnings per share (EPS), consensus quarterly EPS based on analyst forecasts, and the standard deviation of the analysts' forecasts, from the database Refinitiv Eikon (previously named Datastream). For the P/B and MC variables we collected quarterly data on each individual company, similar to SUE, from Refinitiv Eikon.

We also used Refinitiv Eikon for collecting monthly net returns. In order to calculate the abnormal and buy-and-hold returns, we obtained the closing prices, adjusted for dividends and stock splits, of each individual stock through our selected time period, 1 January 2014 to 31 December 2022. To estimate and simulate the market portfolio, we also collected monthly returns of the OMX Nordic EUR GI for the same time period.

Finally, to measure the monthly portfolio excess return for each portfolio, a risk-free rate is required. We have collected the monthly average of the Stockholm Interbank Offered Rate (STIBOR) from the time period 1 January 2014 to 31 December 2022. The rates were collected from the official database of the Swedish Financial Benchmark Facility (SFBF).

## 5 Results

This chapter presents an overview of our sample with descriptive statistics, followed by a section detailing the regressions aiming to examine PEAD, controlling for risk-factors, and providing the returns of the respective portfolios together with the implied trading strategy. The results are presented both statistically using the regressions and visually using line charts showing the return over time, focusing on the statistical analysis since it provides us with the ability to control for conventional risk-factors explaining parts of the return.

### 5.1 *Sample overview*

Figure 2 gives an overview of the return statistic for our studied portfolios over the 12 month time frame. Our long position portfolio, Portfolio 10, has a median return of about 10% over the studied quarters between 2014 – 2022. The short portfolio, Portfolio 1, has a higher median return of 14 compared to our long portfolio. This contradicts the overall expectation for the phenomenon of post-earnings announcement drift, more in line with efficient markets and Fama's semi-strong form of efficiency (Fama, 1970). Consequently, the hedge portfolio, Portfolio 101, which is calculated as the spread between Portfolio 10 and 1 each quarter, has a negative median return of about -1,3%. The overall excess market return over the risk-free rate has a median return of about 9,5% in our studied time frame, underperforming both Portfolio 10 and 1. Our HML (value factor) portfolio, calculated as the return spread between companies with a low valuation and high valuation, has a slightly negative median return of -1%. The SMB (size factor) portfolio, calculated as the spread between small and big company returns, has a median return of 8,6%. The SMB portfolio has the highest standard deviation of about 30,3% while the market portfolio has the lowest of about 17,3%.

<b>Portfolio</b>	<b>min</b>	<b>max</b>	<b>range</b>	<b>mean</b>	<b>median</b>	<b>std dev</b>	<b>variance</b>
<b>1</b>	-0.26542	1.04568	1.3111	0.14346	0.14465	0.21938	0.04813
<b>10</b>	-0.15629	0.72248	0.87877	0.14002	0.10002	0.19129	0.03659
<b>101</b>	-0.3199	0.5948	0.9147	-0.00231	-0.01289	0.19694	0.03879
<b>RMRF</b>	-0.20759	0.59027	0.79786	0.1108	0.0951	0.1732	0.03
<b>HML</b>	-0.34	0.543	0.883	0.0185	-0.012	0.2226	0.04955
<b>SMB</b>	-0.56292	1.14085	1.70377	0.10438	0.08556	0.30337	0.09204

Figure 2: Descriptive statistics for 12 month return portfolios

Figure 3 gives an overview of the return statistic for the same variables as Figure 2 but on the 6 month time frame. Here, the results are more in line with the overall PEAD phenomenon, with a higher median return for Portfolio 10 (9,6%) compared to Portfolio 1 (7,6%), although with a negative median return of the hedge portfolio (Portfolio 101) of about -3,6%. Still, both Portfolio 1 and 10 outperformed the median market return (4,8%), although with a slightly higher standard deviation of 0,5 and 1,3 percentage points respectively. HML still has a slightly negative return (-2,6%) while SMB has a higher median return (6,9%) than the market but not compared to Portfolio 1 and 10.

<b>Portfolio</b>	<b>min</b>	<b>max</b>	<b>range</b>	<b>mean</b>	<b>median</b>	<b>std dev</b>	<b>variance</b>
<b>1</b>	-0.14312	0.43037	0.57349	0.07475	0.07581	0.11757	0.01382
<b>10</b>	-0.2122	0.28184	0.49404	0.0583	0.09556	0.1246	0.01552
<b>101</b>	-0.15987	0.29714	0.45701	-0.01532	-0.03592	0.10806	0.01168
<b>RMRF</b>	-0.23088	0.32877	0.55965	0.05782	0.04779	0.112	0.01254
<b>HML</b>	-0.193	0.38	0.573	-0.00322	-0.0255	0.13575	0.01843
<b>SMB</b>	-0.35071	0.54807	0.89878	0.06423	0.06924	0.18062	0.03262

Figure 3: Descriptive statistics for 6 month return portfolios

Figure 4 also gives an overview of the return statistics for the same variables as the previous two figures but on the 3 month time frame. Again, Portfolio 1 has a higher median return (5,8%) compared to Portfolio 10 (5,0%), with a lower standard deviation. Also, the hedge portfolio (101) has a slightly negative return (0,04%) similar to the other time periods, although marginally lower standard deviation (7,8%) compared to all other portfolios. Again, both Portfolio 1 and 10 outperform the median market return (3,3%) with a slightly higher standard deviation. HML has through all the time periods a slightly negative median return, including the 3 month period (-0,04%) while SMB, similar to the 6 month period, has a higher median return (3,5%) than the market but not compared to Portfolio 1 and 10.

<b>Portfolio</b>	<b>min</b>	<b>max</b>	<b>range</b>	<b>mean</b>	<b>median</b>	<b>std dev</b>	<b>variance</b>
<b>1</b>	-0.14772	0.21137	0.35909	0.04409	0.05788	0.08882	0.00789
<b>10</b>	-0.25086	0.19491	0.44577	0.03805	0.05022	0.08907	0.00793
<b>101</b>	-0.14873	0.21903	0.36776	-0.00491	-0.0043	0.0775	0.00601
<b>RMRF</b>	-0.1721	0.20058	0.37268	0.03237	0.03246	0.08209	0.00674
<b>HML</b>	-0.175	0.194	0.369	-0.00322	-0.0035	0.09275	0.0086
<b>SMB</b>	-0.19966	0.32369	0.52335	0.02838	0.03466	0.0988	0.00976

Figure 4: Descriptive statistics for 3 month return portfolios

## 5.2 PEAD 12 Month

Figure 5. Panel C shows that the intercept of the HEDGE position is negative of about -3.1% (average 12 month return) when controlling for risk-factors, although with a t-value of -0.7542 proving that the intercept is not significant at a 5%-level. Also, the fairly low R-squared indicates that the Fama and French (1993) multi-factor model fails to explain much of the variability in the average return of the HEDGE portfolio. Consequently, these factor exposures fail to capture the underlying drivers of the 12 month return for the spread between the extreme portfolios LONG (highest SUE) and SHORT (lowest SUE). Setterberg (2011) also found that the 12 month HEDGE return, on the Swedish stock market, is robust to the Fama and French (1993) three factor model, although with a significant (at a 5%-level) intercept of 0.9% monthly return or compounded to about 11% annual return.

*Panel A. SHORT position portfolios (low SUE)*

	Intercept	RMRF	SMB	HML	R2
Coefficient	0.1499*	-0.3091**	0.1842	0.4663*	0.4300
(t-stat)	3.9861	-1.6869	1.6165	3.0336	

*Panel B. LONG position portfolios (high SUE)*

	Intercept	RMRF	SMB	HML	R2
Coefficient	0.1166*	0.0466	0.1148	0.3402*	0.2505
(t-stat)	3.1011	0.2545	1.0078	2.2135	

*Panel C. HEDGE position portfolios (Spread LONG - SHORT)*

	Intercept	RMRF	SMB	HML	R2
Coefficient	-0.0314	0.3493**	-0.0683	-0.1349	0.1337
(t-stat)	-0.7542	1.7220	-0.5417	0.1701	

(i) The symbols \*\* and \* show statistical significance at a 5% and 10%-level, respectively.

(ii) The regression is run with portfolio excess return (portfolio return – STIBOR) as the dependent variable

Figure 5: Multi-Factor Regression on 12 Month Returns of Extreme SUE Portfolios

## 5.3 PEAD 6 Month

Looking at the 6 month time period for Panel C in Figure 6. shows a similar picture as in the 12 month period, with an insignificant negative -0.4% for the HEDGE positions although

more robust to the different risk-factors since their significance level is far more off than their comparative variable on the 12 month period. This can consequently be seen in a low R-squared implying that the model explains a small part of the variability in the dependent variable portfolio excess return. Here, our result is consistent with Setterberg (2011), showing no significant intercept or risk-factor on the 6 month time period.

Panel B in Figure 6. shows a statistically significant (at a 5%-level) intercept of the LONG position, equal to about 6.8% six month return. The alpha of this portfolio is robust to all the risk-factors in the model, hence the overall market development (RMRF), size (SMB) and value factor (HML) do not have a statistically significant effect on the excess portfolio return. Setterberg (2011) shows a significant excess return (8.4% annualized) similar to ours, although with significant loading on RMRF and HML. The low R-squared (0.0612) in our test also indicates that these risk-factors fail to incorporate much of the variability in the portfolio excess return.

The SHORT portfolio (Panel C, Figure 6.) has a significant intercept of about 7.3%. Similar to the LONG portfolio, the SHORT portfolio is robust to the multiple risk-factors in the model, where the excess market return, size and value factors do not have a significant impact on the portfolio excess return. This differs from Setterberg (2011) showing no significant excess returns for the SHORT portfolio on the 6 month time frame. The SHORT portfolio has a lower R-squared (0.0437) compared to the LONG portfolio, hence the multi-factor model explains less of the variability in the portfolio excess returns.

#### **5.4 *PEAD 3 Month***

The 3 month return portfolios in Figure 7. are telling somewhat the same picture as the 6 month return. Panel C showing the HEDGE position portfolio has no significant coefficient (at a 5%-level) with the overall worst model fit out of all regressions in Figure 5., 6. and 7., with an R-squared of 0.0219 implying that the risk-factor model does a bad job of explaining the dependent variable portfolio excess return. Although, the intercept or alpha of the HEDGE portfolio shows no significant excess portfolio returns for the spread between LONG and SHORT portfolios on the 3 month time frame. Setterberg (2011) found no or low returns of this strategy on the 3 month time frame, consistent with our results but different from Bernard and Thomas (1989) finding an abnormal return of 4.2% during approximately 3 months.

Panel A. SHORT position portfolios (low SUE)

	Intercept	RMRF	SMB	HML	R2
Coefficient	0.0733*	0.0403	-0.0047	0.1807	0.0437
(t-stat)	2.9293	0.2051	-0.0372	1.0782	

Panel B. LONG position portfolios (high SUE)

	Intercept	RMRF	SMB	HML	R2
Coefficient	0.0675*	-0.0608	-0.0781	0.2225	0.0612
(t-stat)	2.5707	-0.2948	-0.5849	1.2640	

Panel C. HEDGE position portfolios (Spread LONG - SHORT)

	Intercept	RMRF	SMB	HML	R2
Coefficient	-0.0044	-0.1072	-0.0719	0.0342	0.0297
(t-stat)	-0.1894	-0.5890	-0.6108	0.2202	

- (i) The symbols \*\* and \* show statistical significance at a 5% and 10%-level, respectively.
- (ii) The regression is run with portfolio excess return (portfolio return – STIBOR) as the dependent variable

Figure 6: Multi-Factor Regression on 6 Month Returns of Extreme SUE Portfolios

Again, both the position in the LONG and SHORT portfolio in Panel B and A (Figure 7.) has a significant intercept. The LONG position has a significant excess return of about 3.7% compared to the SHORT position showing a significant excess return of about 4.8%. Following the non-significant risk-factors of excess market return (RMRF), size (SMB) and value (HML), both the excess portfolio returns are robust to these factors explaining the outperformance, although the SHORT portfolio has a marginally less worse model fit of a R-squared equal to 0.0968 compared to the even lower R-squared of 0.0650 for position LONG. Thus, the LONG portfolio has a slightly lower excess return than SHORT, but a return that is explained less by the Fama and French (1993) risk-factors. Following Bernard and Thomas (1989) significant abnormal return of 4,2% during approximately 3 months, they consequently show a positive return for the LONG portfolio of about 1,9% and a negative return for the SHORT portfolio of about 2,3%. Hence, Bernard and Thomas show a lower abnormal return for the LONG portfolio and a negative for the SHORT in contrast to our positive.

Panel A. SHORT position portfolios (low SUE)

	Intercept	RMRF	SMB	HML	R2
Coefficient	0.0479*	-0.0508	-0.0421	0.3073**	0.0968
(t-stat)	2.7536	-0.2563	-0.2469	1.7148	

Panel B. LONG position portfolios (high SUE)

	Intercept	RMRF	SMB	HML	R2
Coefficient	0.0373*	0.0755	-0.0325	0.2376	0.0650
(t-stat)	2.1005	0.3733	-0.0325	0.2376	

Panel C. HEDGE position portfolios (Spread LONG - SHORT)

	Intercept	RMRF	SMB	HML	R2
Coefficient	-0.0094	0.1217	0.0114	-0.0713	0.0219
(t-stat)	-0.5948	0.6761	0.0734	-0.4385	

- (i) The symbols \*\* and \* show statistical significance at a 5% and 10%-level, respectively.
- (ii) The regression is run with portfolio excess return (portfolio return – STIBOR) as the dependent variable

Figure 7: Multi-Factor Regression on 3 Month Returns of Extreme SUE Portfolios

### 5.5 Visual representation of PEAD: 3, 6 and 12 month Buy-And-Hold Returns

Following Bernard et al. (1997) and Setterberg (2011), the effect of abnormal returns can be evaluated visually, reinforcing the results from the regression analysis. The three line charts in Figure 8., 9. and 10. show Buy-And-Hold Returns on the y-axis and time period measured in quarters on the x-axis.

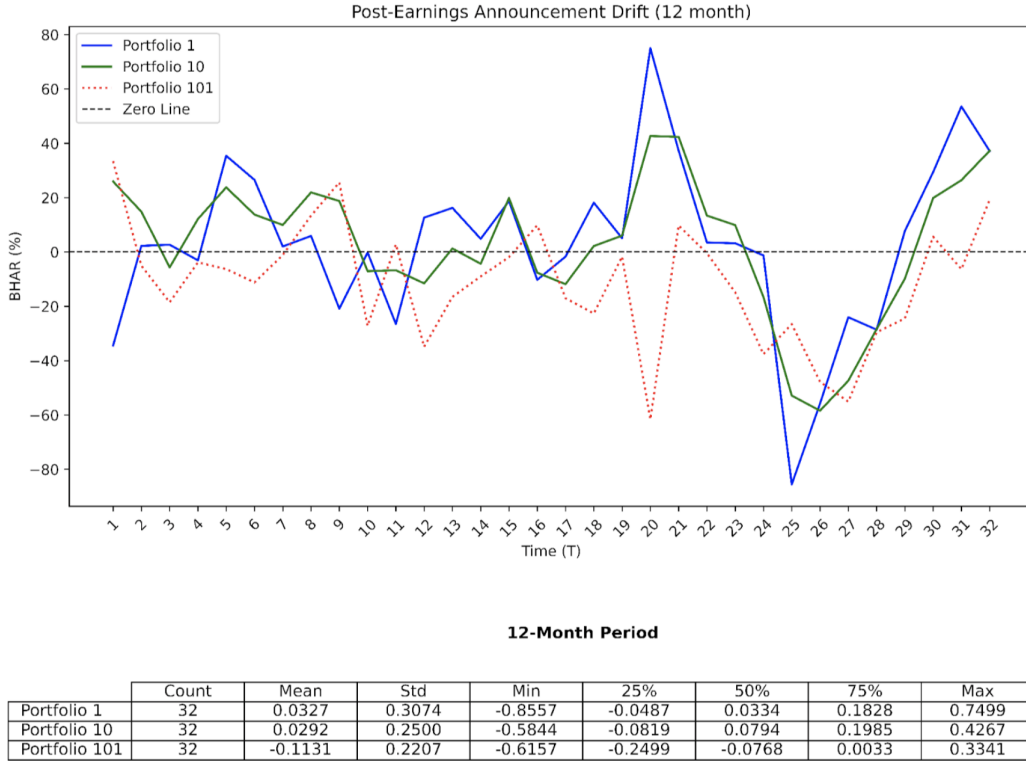


Figure 8: BHAR of portfolios formed every quarter with 12 month rolling returns

Figure 8. shows PEAD for the 32 subsequent quarters, with the returns calculated on a 12 month time frame following the subsequent quarter after portfolio formation. The green line shows the return for the companies with the highest SUE, formed into Portfolio 10, calculated as the mean return of the companies included. Portfolio 10 shows positive returns in many of the quarters pre-covid (before quarter 22). After quarter 22 Portfolio 10 has some large drawdowns in abnormal returns of maximum 58,4%.

We cannot observe any clear trend that Portfolio 10 outperforms Portfolio 1 (blue line, lowest SUE), inline with the regression output in Figure 5., implying a non-evident trend of the spread (Portfolio 101) delivering consistent abnormal returns, although sometimes during individual quarters. Since Portfolio 1 is positive in many quarters, actually outperforming Portfolio 10 in several quarters, the spread will not deliver consistent abnormal returns, consistent with the regression results of insignificant HEDGE intercept in Figure 5.

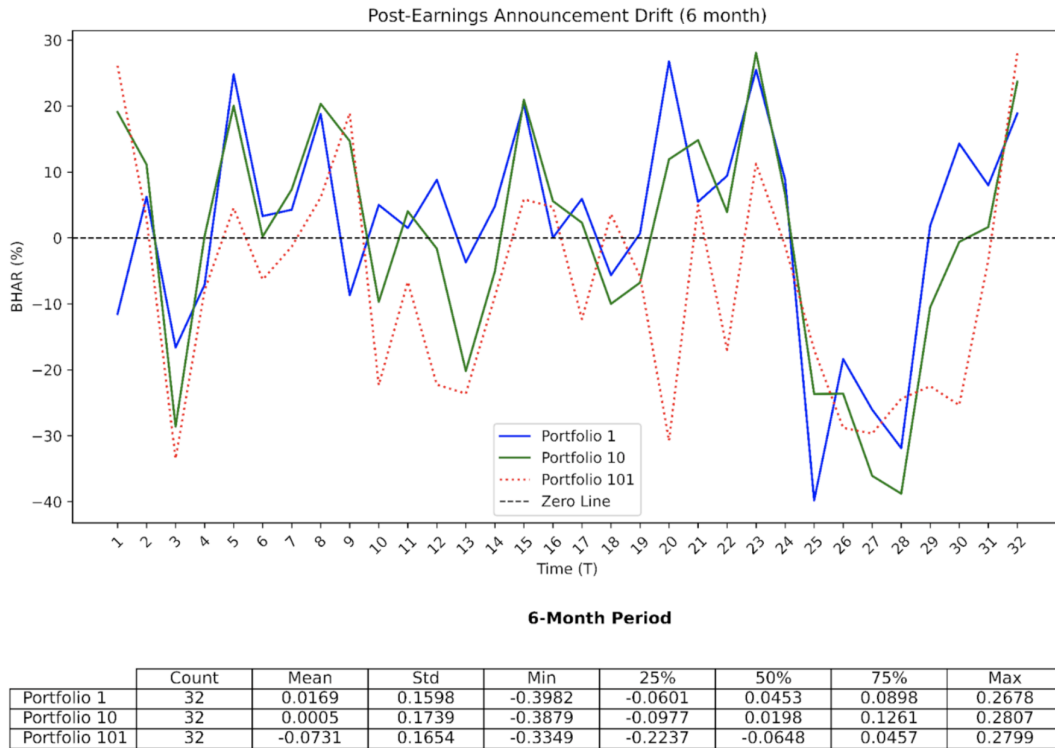


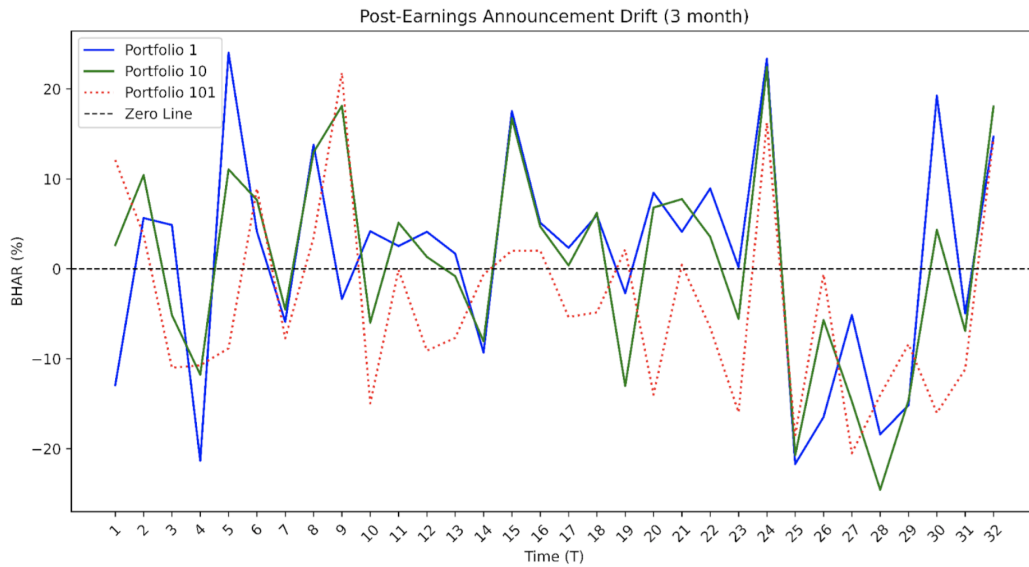
Figure 9: BHAR of portfolios formed every quarter with 6 month rolling returns

Both the 6 and 3 month charts in Figure 9. and 10. describe an overview of the same 32 quarters as in Figure 8., showing an even unclearer trend of the spread (Portfolio 101) and the individual Portfolios 1 and 10. For the 6 month chart, Figure 9., Portfolio 10, the green line, has some consistent positive return between quarters 1 – 24, although Portfolio 1, the blue line, is returning a higher abnormal return in most of the quarters, similar to the result in regressing excess portfolio returns. Following this on average higher abnormal return from Portfolio 1, the spread becomes less effective and proves not to be earning consistently positive abnormal returns with large drawdowns (maximum -33,5%).

The rolling 3 month return shows a similar pattern since Portfolio 1 and 10 follows each other to some degree, although with no clear trend. Portfolio 1 has almost consistently a higher abnormal return on the rolling 3 month return, implying that the spread faces the same problem as during the 12 and 6 month period, with negative abnormal returns, consistent with the regression in Figure 6.

These visual representations of PEAD on the aggregated Nordic stock market show results inconsistent with the result of Setterberg (2011), showing a 11% abnormal return of a hedge

portfolio similar to ours over a 12 month period after portfolio formation, however, limited to the Swedish stock market only.



**3-Month Period**

	Count	Mean	Std	Min	25%	50%	75%	Max
Portfolio 1	32	0.0117	0.1223	-0.2171	-0.0532	0.0332	0.0658	0.2402
Portfolio 10	32	0.0057	0.1157	-0.2456	-0.0622	0.0198	0.0768	0.2244
Portfolio 101	32	-0.0373	0.1057	-0.2051	-0.1105	-0.0595	0.0206	0.2181

Figure 10: BHAR of portfolios formed every quarter with 3 month rolling returns

## 6 Discussion

### 6.1 *General discussion*

This thesis is aiming to examine if PEAD is evident on the Nordic stock markets during the time period 2014–2022, while also examining whether it is possible to build a trading strategy based on the HEDGE portfolio, known as the spread or long-short position. Our overall results are consistent with previous studies on PEAD (Setterberg (2011), Bernard and Thomas (1989), Chan et al. (1996), Chordia et al (2009) among others) in the context of showing excess or abnormal returns for the LONG portfolio. Although in contrast to many of these previous studies, our SHORT portfolio is also showing excess returns through all the time periods, similar to Brandt et al. (2006) who show significant positive abnormal returns for the lowest SUE position (SHORT) through a 6, 9 and 12 month period. Following this excess return in the SHORT portfolio, Brandt et al. (2006) also observes a converging return over time, approaching the 12 months, for the long-short spread, similar to our non-significant HEDGE position.

Thus, it is possible to find similarities and differences between previous studies on PEAD, where different phenomena are presented as causes of the anomaly. There are many behaviorist explanations to PEAD, explaining over- and underreaction to earnings announcements, where De Bondt and Thaler (1985) observes investors overreacting on new information, moving stock prices to excessive levels and potentially contributing to the converging effect of portfolios that theoretically should face a out- or underperformance. So, one explanation to our non-significant observation of a PEAD trading strategy on the Nordic market between 2014–2022, based on the HEDGE position, could possibly have a behaviorist explanation. Rabin (1998) also observes investors having a confirmation bias, confirming existing beliefs and ignoring new contradicting information, which possibly could imply that investors favoring a specific company are ignoring bad earnings announcements and continue to buy the stock, leading to a potential updrift for a theoretically bad company in SUE terms. Also, Lys and Sohn (1990) examines the relationship between analyst revisions and stock prices, showing examples of companies having a bad earnings announcement later can face an upward revision from analyst, implying positive abnormal returns following the new outlook incorporated by the market. Possibly, this effect from analyst revisions could be an answer for the converging, or not significant at all, PEAD in both our study and Setterberg (2011) results on the 6 month data, together with Brandt et al.(2006) observing a converging to negative return after 6 months.

Both Chan et al.(1996) and Brandt et al.(2006) state that earnings announcements contain some noise in addition to information about earnings, such as dividend proposals, information on turnover, margins, investments or intangibles. For example, if a company reports bad earnings in terms of SUE ranking, they can simultaneously communicate an increased dividend or improved investment outlook that potentially can be rewarded by investors. Therefore, from the SUE perspective, such noisy information can possibly affect the drift following earnings announcements, potentially making a low SUE portfolio (SHORT) having abnormal or excess returns similar to our findings. Additionally, similar noise could possibly emerge from the volatile period of COVID-19 included in the time periods studied. We can visually observe some large drawdowns after quarter 24 when the quarters possibly can be impacted by the effects following COVID-19, although out of scope for this study.

## **6.2 *Limitations***

Similar to other studies related to efficient markets this thesis faces the difficulty with joint hypotheses. When studying if the phenom of PEAD is evident using the Fama-French Three-Factor Model we find excess returns in the actual returns compared to the expected returns estimated by the model. The reason for the abnormal returns could be because the model is inaccurate in predicting returns whereas a more correct model would not estimate any abnormal returns, however it could also possibly be due to the market being inefficient which contradicts the EMH making it possible to earn excess returns by exploiting such a strategy with PEAD. For this reason, the study inherently examines two things, market efficiency (EMH) and an asset pricing model (Fama-French Three-Factor Model) explaining the returns. The two possibilities could be difficult to disentangle and thus more caution has to be taken when interpreting our results from our method of studying PEAD.

Another limitation to take into account regarding the method is that only companies with analyst coverage are included in the sample, this excludes many companies, especially smaller ones. This could potentially cause the sample to not properly represent the Nordic countries as many companies are excluded and other methods could be explored to examine more companies. The number of analysts covering each company in the sample is not taken into account which could Furthermore, all the Nordic countries are not equally weighted with Swedish companies being most heavily represented, this could cause a country skew and a more equally representative may be more favorable to examine the Nordic region.

One limitation is the way the Fama-French model with the SMB and HML variables is

being used on the same set of companies (in line with Setterberg, 2011) while Fama and French (1993) utilizes a broadly diversified set of companies. Using a more diversified set of companies would decrease the idiosyncratic factors that companies bring which could make the variables represent the market in a better way.

Another limitation is the returns being calculated in the subsequent quarter and not on the exact day of the earnings announcement. This could be considered a weakness in the calculations of the returns as there is a risk that some of the drift effect that happens between the day of the announcement and when the returns are actually calculated is excluded. The reason for this weakness is due to the limited time frame of the study, as one would be required to manually source reporting data for 76 companies during 32 quarters to be able to calculate the returns on the day of the earnings announcement which is not feasible.

## 7 Conclusion

### 7.1 *Overall conclusion*

The answer, questioning whether PEAD is evident on the Nordic stock markets between 2014–2022, is not straightforward. Studying 76 companies, spread across Sweden, Finland, Norway and Denmark, we show a significant drift in the best performing stocks (high SUE; LONG) and worst performing stocks (low SUE; SHORT) through all our studied periods 3, 6 and 12 months. Adopting a trading strategy to these drifts, using the spread between the LONG and SHORT portfolio as a proxy for the HEDGE portfolio, we observe a non-significant negative excess return through the period 3, 6 and 12 months.

We observe excess returns over the risk-free rate, robust to a 5%-level of significance, for the LONG portfolio of about 11,7% , 6.8% and 3.7% over the period 12, 6 and 3 months respectively. For the SHORT portfolio we observe an excess return of about 14,9%, 7,3% and 4.8% over the period 12, 6 and 3 months respectively. Thus, the SHORT has higher excess returns in all time periods compared to the LONG, consistent with Brandt et al. (2006) who also finds negative spread between the SHORT and LONG portfolios on the 9 to 12 month time frame. Although, this is inconsistent with some of the findings of Setterberg (2011), observing a significant return of 11% on the 12 month time frame for the spread between LONG and SHORT, while observing a non-significant return of the spread on shorter time frames, in line with our findings.

When controlling for risk-factors using the Fama and French (1993) three-factor model, we find that companies with a lower valuation generate some of the drift in the portfolios LONG and SHORT on the 12 month time frame. On the shorter time frames 6 and 3 months, both the LONG and SHORT portfolio are robust to the risk-factors explaining the excess returns. Thus, in line with Fama and French (1993), we can show that the 12 month return can be partly explained by the value factor HML.

To conclude, we find evidence of PEAD on the Nordic stock markets between 2014 and 2022, although positive drifts in both the LONG and SHORT portfolios over the different time periods 3, 6 and 12 months. Additionally, we find one interesting observation that the spread between a LONG and SHORT position, referred to as HEDGE throughout the study, proves to generate non-existent excess returns on all time periods studied.

## 7.2 *Further research*

We have limited our study to only evaluate SUE as the defining variable for portfolio formation. There are numerous other metrics that can be used to sort companies based earnings announcements such as Earnings Announcement Return (EAR), including additional information about the companies sales, margins, investments. Also, several studies include an autoregressive model for estimating the expected earnings in favor of relying on only analyst forecasts. This due to the possibility of including a larger sample of companies, decreasing the problem of limited analytical coverage. Further studies could utilize the power of comparing different measures and observing any differences.

We also choose to limit our time frame to three different time periods 3, 6 and 12 months. Some studies include and test returns on much shorter time frames, explicitly identifying the exact quarterly reporting date and calculating returns from the subsequent trading day. Combining a study with a more detailed time frame together with a comparison between metrics for identifying the extreme earnings announcements could possibly contribute with enhanced insights to the body of research on PEAD. In particular, new studies could be done by comparing the Nordic stock markets, which was not possible due to the limited time frame of this study, and contribute insights on the Nordics as the US, UK and the overall European market are more well studied.

As mentioned in our discussion, COVID-19 could have a possible influence on our dataset since we have parts of our studied quarters during the COVID-19 years. Therefore, a variable controlling for noise such as COVID-19 could possibly enhance the model fit of regressions. Additionally, other variables could be relevant to include such as macro-variables controlling for the volatile interest rate environment following COVID-19.

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# Appendix 1: Companies included in the study

Company Name	Average Market Capitalization (2014 – 2022)	Country	Company Name	Average Market Capitalization (2014 – 2022)	Country
Alfa Laval AB	9 540 484 276	Sweden	Novo Nordisk A/S	160 223 467 543	Denmark
Asa A-bly AB	21 600 126 109	Sweden	Novozymes A/S	11 983 460 644	Denmark
AstraZeneca PLC	118 530 310 569	Sweden	OKla ASA	7 906 302 717	Norway
Atlas Copco AB	19 926 753 039	Sweden	Outokumpu Oyj	1 969 889 872	Finland
Austevoll Seafood ASA	1 705 339 863	Norway	P/F Bakkafrøst	2 653 568 606	Norway
Avanor Bank Holding AB	2 112 593 879	Norway	Royal Unibrew A/S	3 332 557 371	Denmark
Actiod AB	4 090 272 234	Sweden	Salmar ASA	4 683 779 320	Norway
Actoion AB	1 270 146 311	Sweden	Sampo Oyj	23 208 007 438	Finland
Adia AB (publ)	6 510 966 428	Sweden	Schibsted ASA	6 715 427 912	Norway
Boliden AB	786 556 673	Norway	Securitas AB	5 433 609 911	Sweden
BW LPG Ltd	2 214 450 404	Finland	Skandinaviska Enskilda Banken AB	21 100 629 624	Sweden
Cargotec Corp	5 917 655 628	Sweden	Skanska AB	7 245 023 958	Sweden
Castellum AB	29 691 173 796	Norway	SKF AB	7 773 629 078	Sweden
DNB Bank ASA	23 044 230 024	Denmark	Sparabank 1 SR Bank ASA	2 384 369 835	Norway
DSV A/S	5 901 147 702	Sweden	SSAB AB	3 722 899 516	Sweden
Eletrolux AB	71 64 698 854	Finland	Stora Enso Oyj	9 725 347 237	Finland
Equinor ASA	65 213 279 495	Norway	Storebrand ASA	2 948 492 137	Norway
Equinor AB	1 600 612 122	Denmark	Subsea 7 SA	3 071 125 820	Norway
Flint Group & Co A/S	1 988 663 091	Denmark	Svenska Cellulosa Aktiebolaget SCA	6 898 714 380	Sweden
Gemab A/S	14 814 863 015	Denmark	Svenska Handelsbanken AB	18 909 515 637	Sweden
Getinge AB	4 510 331 833	Sweden	Sveabank AB	19 306 595 642	Sweden
Gensidige Forsikring ASA	8 053 371 024	Norway	Telefonaktiebolaget LM Ericsson	24 547 723 098	Sweden
GN Store Nord A/S	4 942 081 113	Norway	Telenor ASA	20 945 065 484	Norway
Grig Seafood ASA	907 127 516	Norway	Tieto Oyj	2 395 293 783	Finland
H&M Hennes & Mauritz AB	27 268 972 066	Sweden	Topdanmark A/S	3 342 487 259	Denmark
Hexagon AB	20 248 535 020	Sweden	Trulieberg AB	4 687 731 989	Sweden
Huayuan AB	2 692 647 773	Sweden	Tyg A/S	8 772 030 384	Denmark
Hyundai A/S	4 695 462 778	Denmark	UPM-Kymmene Oyj	14 183 083 983	Finland
Kentech A/S	1 604 638 318	Finland	Valmet Oyj	3 280 306 049	Finland
Kesko Oyj	6 329 885 335	Finland	Vestas Wind Systems A/S	19 947 644 733	Denmark
Konecranes Abp	2 296 424 292	Finland	Volvo AB	31 096 626 927	Sweden
Kongberg Gruppen ASA	3 417 367 936	Norway	Wihlborgs Fastigheter AB	1 981 060 961	Sweden
Lindab International AB	935 253 592	Sweden	Yara International ASA	9 600 258 201	Norway
Loomis AB	1 993 138 457	Sweden			
Métro Oyj	3 604 579 785	Finland			
Neste Oyj	22 086 898 755	Finland			
Nibe Industrier AB	19 065 334 151	Sweden			
Nickita Oyj	1 717 145 453	Finland			
Norwegian Shiprepairing AS	5 522 119 345	Finland			
Norden Bank Abp	35 333 318 795	Finland			