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Are Pre-Scheduled Macroeconomic News Days Different From Other Days? – A Cross-Sectional Analysis of the Swedish Stock Market

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Abstract

This thesis has examined if there is any difference in the relationship between different risk factors and the cross-section of assets excess returns on the Swedish stock market between days when macroeconomic news is scheduled to be announced (announcement days) and other days (normal days). The Fama and Macbeth two-pass regression method have been used for investigating the hypothesis that announcement days are different from normal days. The main results illustrate that there is no difference between announcement days and normal days in general, but for the time period 2010-2013 there is a clear difference between the two kinds of days. On announcement days, some of the implications of the CAPM hold, which is no intercept and a positive risk premium for market risk, but on normal days the CAPM does not holds.

Keywords: the Fama-Macbeth regression, cross-sectional regression, two-pass procedure, announcement days, normal days, CAPM, macroeconomic news, Swedish stock market

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Table of Contents

1 Introduction

Classical theory such as the Sharpe-Linter capital asset pricing theory (CAPM) (Sharpe 1964, Linter 1965) states that there should be a trade-off between risk and reward, and this trade-off is one of the most fundamental topics in financial economics. This risk is illustrated as the covariance (beta value) between the return of an asset and the return on the market portfolio and this covariance should be an important determinant of risk premium. But most studies, such as Black, Jensen, and Scholes (1972), Fama and French (1992), and Black (1972), find no direct relation between the beta and average excess return across stocks.

Another important topic of finance is macroeconomic risk and its relationship to the return of securities. Although, much of the relevant information, about the economy, which represents macroeconomic risk, is announced randomly over time, there is some macroeconomic news that has its announcement dates pre-scheduled for weeks in advanced. An investor may not know if the pre-scheduled news will be good or bad, but the investor does know when there will be news. Furthermore, if the prices of assets react to the news, the rational investor will expect a higher risk associated with holding assets around these announcements (Savor and Wilson, 2013b). If the rational investor also is risk-averse and is aware of the exposure to higher risk, he should demand and receive a higher return for this risk during these times (Savor and Wilson, 2013b).

A reasonable question is if there is any empirical findings on a relationship between the return of an asset and the pre-announced macroeconomic news. A number of papers have previously investigated the sensitivity of realised returns to the news component of scheduled macroeconomic announcements. For example, Boyd, Hu, and Jagannathan (2005) found that the stock market reacts negatively to news of rising unemployment during contractions and reacts positive during expansions. Another example is the impact of FOMC interest rate announcement surprises on the stock market returns, which have been analysed by Bernanke and Kutter (2005). They found that an unexpected cut in in the interest rate is related with an increase in broad stock indices.

Perhaps an even more interesting question is if there is a difference between these announcement days and normal days. Savor and Wilson (2013a) show that the trade-off between risk and reward on days when important macroeconomic news is scheduled to be announced gives a higher reward, which is a higher risk premium, compared to other days. The main purpose of this thesis is to investigate if there exists a difference on the Swedish market between days on which important macroeconomic data is scheduled to be announced and other days. The relevant macroeconomic data is the pre-scheduled news about the unemployment, inflation, and the prime lending rate. The days on which this data is released are called announcement days and the other days are called normal days. The hypothesis of this thesis is that announcement days are statistically different from normal days. This hypothesised difference has been examined by searching for a relationship between different risk factors and the cross-section of asset excess returns on the Swedish stock market, and illustrating this relationship separately for announcement days and normal days.

The two-pass regression procedure, by Fama and Macbeth (1973), has been used to find any relationship between different risk factors and the cross-section of assets returns, separately for announcement days and normal days. The Fama-Macbeth approach has had as explanatory variables betas estimated from a single factor model and two multifactor models. The single factor model has had the market risk, as the assumptions of the CAPM states, as its one factor. The multifactor models have included the two additional factors suggested by Fama and French (1992) to better explain the return on assets. These two factors are the book-to-market ratio and the market value of a firm. One last factor has also been included and it is the past one-year return, which has been suggested to explain the return on assets by (Jegadeesh and Titman, 1993), and in addition, Savor and Wilson (2013a) have also used this factor in their research.

The assets that have been used are ten constructed beta-sorted portfolios and individual firms listed throughout the period 01/01/2001 to 17/06/2014 on NASDAQ OMX Nordic Stockholm All Share. The analyses have been limited to focus on the time period 2002-2014 and the following four-year periods: 2002-2005, 2006-2009, and 2010-2013.

The main results that we have found are that there is no clear difference between announcement days and normal days during the whole time period 2002-2014. But however, for the time period 2010-2013 there is a clear difference between announcement days and normal days. Figure 1 can be used for illustrating the main findings. The difference is that two of the implications of the CAPM hold on announcement days for individual firms and the portfolios, which mean that there is no intercept and the market risk premium is positive. This result does not hold on normal days. Meaning that on announcement days a risk premium is rewarded and no risk premium is rewarded on normal days. These results are reoccurring and show the robustness of the results.

The thesis has the following disposition. Chapter 2 will introduce the theoretical framework that lay the ground for this thesis. The data is described in Chapter 3. In Chapter 4 will the method be described that have been used in the creation of the empirical findings. Chapter 5 will present and analyse the empirical findings. Finally, the conclusion will be given in Chapter 6. A reference list and an appendix can be found in the last pages.

2 Theoretical Framework

This chapter will introduce some relevant theory and previous studies. First the general Capital Asset Pricing Model, as developed by Sharpe (1964) and Lintner (1965), is described. Then the theory of the cross-sectional regression method by Fama and Macbeth (1973) will be explained. One of the assumptions of the Fama-Macbeth approach is that the CAPM market betas is known and therefore the method of estimating the CAPM market betas will be mentioned. Several studies show that other factors than the CAPM market betas explain stock returns and Fama and French (1992) show that factors for size and a book-ratio is reasonable to include while Jegadeesh and Titman (1993) suggest that the past-one year return is a good factor to include. Finally, will some previous studies regarding announcement days and normal days be mentioned.

2.1 CAPM – the Capital Asset Pricing Model

The reader is probably familiar with the Capital Asset Pricing Model (CAPM) and for that reason will only its main implications and properties be mentioned. The theory of the CAPM was developed by Sharpe (1964) and Linter (1965) separately during the 1960's by expanding the mean-variance theory previous developed by Markowitz (1959). Sharpe and Linter illustrated that if investors have homogenous expectations and optimally hold mean-variance efficient portfolios, then the market portfolio itself will be a mean-variance efficient portfolio, assuming there is no market frictions (Campbell, Lo and Mackinlay, 1997).

The CAPM also assumes the existence of a riskless interest rate and that agents are free to lend or borrow at this riskless interest rate. According to the CAPM, the expected return of asset i is:

$$E[r_i] = r_f + \beta_{im}(E[r_m] - r_f) \tag{1}$$

$$\beta_{im} = \frac{Cov[r_i,\ r_m]}{Var[r_m]} \tag{2}$$

Where r_f is the return on the risk free asset and r_m the return on the market portfolio. β_{im} is the CAPM market beta. Cov is the covariance between the two values inside the corresponding bracket and Var is the variance of the value inside the bracket. (Campbell, Lo and Mackinlay, 1997)

In this thesis the term excess returns are more commonly used than returns. That is, R_i will be the return on asset i in excess of the risk free interest rate, $R_i = r_i - r_f$. Then the CAPM will be:

$$E[R_i] = \beta_{im} E[R_m] \tag{3}$$

$$\beta_{im} = \frac{Cov[R_i,\ R_m]}{Var[R_m]} \tag{4}$$

Where R_m is the excess return on the market portfolio. For equation (3), empirical tests of the CAPM have focused on three main implications: (1) the market risk premium $E[R_m]$ should be positive; (2) the intercept should be zero; and (3) the beta should completely capture the cross-sectional variation of expected returns. (Campbell, Lo and Mackinlay, 1997)

2.2 The Fama-Macbeth Approach

There is an additional view of the CAPM that implies a linear relation between expected returns and market betas which explain the cross-sectional variation of expected returns. A cross-sectional regression methodology can be used for testing these implications. Fama and Macbeth were the first to suggest a method for running the cross-sectional regression approach, and for generating its test statistics and standard errors. The Fama-Macbeth approach is easy to compute and the basic idea is this: if the CAPM betas are assumed to be known, a general version of the cross sectional regression model is this equation:

$$R_t = \gamma_{0t} \iota + \gamma_{1t} \beta_m + \eta_t \tag{5}$$

Where η_t is a $(N * 1)$ vector of error terms for time period t, β_m is a $(N * 1)$ vector of CAPM betas, ι is an $(N * 1)$ vector of ones, and R_t is a $(N * 1)$ vector of excess asset returns for time period t. It is important to note that the CAPM betas are the explanatory variables in this regression. (Campbell, Lo and Mackinlay, 1997)

The application of the Fama-Macbeth approach can be divided into two steps. In the first step, equation (5) is regressed by OLS at each time period, that is, for given T periods of data, a cross-sectional OLS regression is estimated for each t. These regressions will generate a time-series of T estimates of γ_{0t} and γ_{1t}. In the second step the time-series of γ_{0t} and γ_{1t} are analysed by performing t-tests. This is possible because the returns in this approach are normally distributed as well as independent and identically distributed (IID), and for that reason the estimates of γ_0 and γ_1 will also be normally distributed and IID. For the t-tests, $\omega(\hat{\gamma}_i)$ where i represent 0 or 1, will be defined as the t-statistics for γ_i:

$$\omega(\hat{\gamma}_i) = \frac{\hat{\gamma}_i}{\hat{\sigma}_{\gamma_i}} \tag{6}$$

where

$$\hat{\gamma}_i = \frac{1}{T}\sum_{t=1}^{T}\hat{\gamma}_{it} \tag{7}$$

and

$$\hat{\sigma}^2_{\gamma i} = \frac{1}{T(T-1)}\sum_{t=1}^{T}(\hat{\gamma}_{it} - \hat{\gamma}_i)^2 \tag{8}$$

The estimates of γ_0 and γ_1 will simply be the average of the coefficients received from the regressions (see equation (7)). By placing circumflexes on the coefficients they are denoted as estimates. The distributions of the t-statistics are student-t distributions with $t - 1$ degrees of freedom. The t-tests have the null hypothesis that the estimate of γ_i is equal to zero and the alternative hypothesis is that the estimate of γ_i is different from zero. (Campbell, Lo and Mackinlay, 1997)

According to the implications of the Sharpe-Lintner CAPM, γ_0 should be equal to zero (zero intercept) and γ_1 should be greater than zero (positive market risk premium) (Campbell, Lo and Mackinlay, 1997). The Fama-Macbeth approach is quite useful because it can easily be modified to add additional risk measures beyond the CAPM (Campbell, Lo and Mackinlay, 1997). Such risk measures could for example be firm-size and a book-to-market ratio. The Fama-Macbeth approach has also been vital in a historical context because it allows the betas to be changing (in equation (5) $\beta_m \Rightarrow \beta_{mt}$), which other methods cannot handle as easily (Cochrane, 2005). Potential cross-sectional correlation and heteroskedasticity in the error terms are allowed when calculating the standard errors in this way (Verbeek, 2012). However, the potential problem with autocorrelation in the error terms is not corrected by the standard errors in the method (Fama and French, 1988). But, autocorrelation is usually not a problem for stocks, since stocks have weak autocorrelation for daily and weekly holding periods, although it is stronger for long-horizon returns (Fama and French, 1988).

Though useful, the Fama-Macbeth approach is not flawless. It does have some problems. One issue is that it cannot be directly applied because the CAPM betas are not known. Therefore there is a need for these betas to be estimated which may cause something known as the errors-in-variables problem. Fama and Macbeth dealt with this problem by grouping stocks into portfolios. This improves the precision of the beta estimates and minimises the errors-in-variables problem. However, when assets are combined into portfolios, some data about the relationship between risk and expected return is lost (Campbell, Lo and Mackinlay, 1997).

Furthermore, according to Asgharian and Hansson (2000), the method of grouping stocks into portfolios does not entirely eliminate the error-in-variables problem, although it does decrease the errors-in-variables problem. They deal with this issue by correcting both the conditional and unconditional beta estimations. Another method to deal with the problem is suggested by Shanken (1992). He proposes to adjust the standard errors to correct for the biases created by the errors-in-variables problem. Another issue with the Fama-Macbeth approach is that the true market portfolio is not known and a suitable proxy for the market portfolio is needed to be chosen (Campbell, Lo and Mackinlay, 1997). Fama and Macbeth (1973) used a different equation than the one (equation (5)) suggested by Campbell, Lo and Mackinlay in 1997. The equation used by Fama and Macbeth is the following:

$$\tilde{R}_{it} = \tilde{\gamma}_{0t} + \tilde{\gamma}_{1t}\beta_i + \tilde{\gamma}_{2t}\beta_i^2 + \tilde{\gamma}_{3t}s_i + \tilde{\eta}_{it} \qquad (9)$$

The indices i in equation (9) denote constructed portfolios and not individual stocks (Cochrane, 2005). The equation is nothing more than a CAPM equation that uses a stochastic model for the returns. The equation is used for testing if there is linearity. That is tested by checking if the coefficient $\tilde{\gamma}_{2t}$ is equal to zero; $\mathrm{E}(\tilde{\gamma}_{2t}) = 0$. Second, one of the implications of the CAPM is that a high risk should be rewarded with a high expected return. This is tested by the coefficient $\tilde{\gamma}_{1t}$, which is the risk premium for the market exposure and it should have a positive expected value according to the CAPM. Third, the coefficient $\tilde{\gamma}_{3t}$ can be used to test if there is some other variable s_i that represent other sources of risk that is not captured by the market beta. If the market beta captures all the risk, then the expected value of $\tilde{\gamma}_{3t}$ should be equal to zero. The disturbance term $\tilde{\eta}_{it}$ is assumed to have a zero mean and to be independent. (Fama and Macbeth, 1973)

2.3 Estimation of the CAPM Market Betas

As mentioned before, the true market betas are not known in the real world and therefore they need to be estimated. There are many different methods to estimate the market betas, one of them is used by Asgharian and Hansson (2000). They used an unconditional single index model on historical returns available for asset i before the time period t, for estimating the rolling unconditional market betas. This allows the estimated betas to vary over time, which is preferred, because it is probable that the real betas may change over time due to change in the economic conditions or in other non-fixed variables. By applying OLS, the time-varying betas are estimated from the following model:

$$R_{is} = \alpha_{it} + \beta_{it} R_{ms} + \varepsilon_{is} \qquad s = t-36, \dots, t-1 \tag{10}$$

$$cov(e_{is}, e_{js}) = 0 \qquad for\ i \neq j \tag{11}$$

$$cov(e_{is}, e_{js}) = s_{it}^2 \qquad for\ i = j \tag{12}$$

In this model Asgharian and Hansson (2000) use monthly data on excess returns over an estimation window of 36 rolling months, where R_{ms} is the excess return on the market portfolio and ε_{is} is the error term. Equation (11) indicates that the assumed covariance between the error terms is zero while equation (12) indicates that the variance for the error term is assumed to be constant.

The article by Agharian and Hansson (2000) was based on the Fama and French method from 1992 and tested whether the return on Swedish stocks can be explained by the Fama-French factors. Asgharian and Hansson allowed the betas to change, whereas Fama and French assumed that the betas where constant during the whole period. The Fama-French factors will be mentioned in the next section.

2.4 Additional Risk Measures for the Fama-Macbeth Approach

Fama and French (1992) try to improve the previously mentioned CAPM model by including other variables not included in the CAPM model. They find that both the variable size, measured as the market value, and the variable book-to-market ratio can explain some of the cross-section of average stock returns, and because of that they are relevant. Fama and French find that smaller firms have higher average returns. This means that the coefficient associated with the market value should be negatively related to the average stock return. Their estimations also suggest that the book-to-market ratio is even more important in explaining the cross-section of average stock returns. There seems to be a positive relationship between the book-to-market ratio and the average returns. When including both size and the book-to-market ratio at the same time, these results are still persistent. They find no evidence that the CAPM market betas explain stock returns. (Fama and French, 1992)

Jegadeesh and Titman (1993) suggests that stocks which have performed well during the previous year continue to perform well, while bad performing stocks continue to perform badly. The past-one year return, also known as the momentum, could be used for explaining the stock return (Wermers and Fischer, 2012). Savor and Wilson (2013a) included the past-one year return, together with the two variables suggested by Fama and French (2012), when explaining the returns of assets.

2.5 Previous Studies Regarding Announcement Days and Normal Days

In the paper “Asset Pricing: A Tale of Two Days”, Savor and Wilson (2013a) show that asset prices behave differently on days when important macroeconomic news is scheduled to be announced (announcement days) relative to other normal trading days (normal days). Much of earlier studies, such as Black, Jensen, and Scholes (1972), Fama and French (1992), and Black (1972), find no direct relation between the market beta and the average excess returns across stocks. But Savor and Wilson (2013a) show that for announcement days, the market beta is strongly related to returns. Furthermore, they examine if a different risk premium can be observed on announcement days compared to normal days. Savor and Wilson (2013a) have used data from the American market for the time period 1964-2011. They define announcement days as days when news about inflation, unemployment and Federal Open Markets Committee (FOMC) interest rate decisions is scheduled to be announced. They use the Fama-Macbeth approach and compute coefficients separately for announcement days and normal days in order to look for differences between the different days. That is, for each period, they have estimated the following cross-sectional regressions:

$$R_{j,t+1}^N - R_{f,t+1}^N = \gamma_0^N + \gamma_1^N \hat{\beta}_{j,t} \tag{13}$$

and

$$R_{j,t+1}^A - R_{f,t+1}^A = \gamma_0^A + \gamma_1^A \hat{\beta}_{j,t} \tag{14}$$

Where $\hat{\beta}_{j,t}$ is asset $j's$ stock market beta for period t, which has been estimated using daily data from the previous year. Note that $\hat{\beta}_{j,t}$ is the explanatory variable in this cross-sectional regression. The left hand sides of the equations are the explained variable, which is the excess returns for normal days and announcement days. (Savor and Wilson, 2013a)

In addition to the Fama-Macbeth approach Savor and Wilson (2013a) also used another way of testing whether the beta coefficients, representing the risk premium, are different on announcement days and normal days by estimating the following panel regression:

$$R_{j,t+1} - R_{f,t+1} = \gamma_0 + \gamma_1 \hat{\beta}_{j,t} + \gamma_2 A_{t+1} + \gamma_3 \hat{\beta}_{j,t} A_{t+1} \tag{15}$$

Where A_{t+1} is a dummy variable that equals one if the day is an announcement day and equals zero if it is a normal day. $\hat{\beta}_{j,t}$ is the pre-estimated market beta-coefficient for period t.

Savor and Wilson (2013a) examine their data in various ways. They look at various assets, such as individual stocks and different portfolios. For these assets they also look at various explanatory variables such as stock market beta, firm characteristics, and factor betas as controls. The firm characteristics are the two variables firm size and the book-to-market ratio that Fama and French identified as useful for explaining the cross-section of average stock returns. The two variables the past one-year return and the stock market betas are also used as firm characteristics. (Savor and Wilson, 2013a) Their most relevant result is that they find evidence that the stock market beta is related to the average excess returns during the announcement days. Contrary to the announcement days, the stock market beta, during the normal trading days, were unrelated or even negatively related to the average excess returns. That implies a rejection of the CAPM theory for normal days. Furthermore, Savor and Wilson show that some assets, such as small stocks, high-beta stocks and the stock market itself earn most of their annual excess return on announcement days (which constitutes of a small fraction of the total number of days during a year). These findings goes in line with earlier research that announcement days represent periods of much higher excess returns and Sharpe ratios for the stock market and long-term Treasury bonds (Savor and Wilson, 2013a). For example, Savor and Wilson (2013b) themselves found evidence that during days when important macroeconomic data is scheduled to be released, average returns on the stock market as well as Sharpe ratios are significantly higher than on other days. Savor and Wilson (2013b) also discover that the risk free interest rate (the 30-day Treasury Bills in their case) is significantly lower during announcements days. Savor and Wilson's (2013a) findings imply that beta indeed is an important measure of systematic risk, at least on days when investors expect to learn important new information about the economy. Investors subsequently demand a higher return (a higher risk premium) for holding assets with higher market betas on such days.

3 Data

The characteristics of the data that have been used in this thesis will be presented in this section. The data can be summarised to consist of firm data, data for the proxy for the risk free interest rate, data for the proxy for the market portfolio, and the macroeconomic data for announcement days. The data of the stocks, the risk free interest rate and the market portfolio have all been extracted from Thomson Reuters DataStream and have also been manually corrected for holidays and days when the market have been closed.

3.1 Firm Data

Data over the daily historical prices, market values and price-to-book data from the time period 31/12/1999 to 17/06/2014 on the 284 listed firms on NASDAQ OMX Nordic Stockholm All Share have been obtained from Thomson Reuters DataStream. In order to be confident that the data are a good representation of the Swedish stock market, the ambition is to include as many firms as possible in the data. But the firm sample has been limited to only include firms listed on NASDAQ OMX Nordic Stockholm All Share. This means that firms listed on smaller stock exchanges, such as NASDAQ OMX First North, are not included in the data material used in this thesis. Not all the 284 firms were listed on the exchange from the beginning of the desired time period 01/01/2001, and because of that, those firms were removed from the sample. After the adjustment, 177 firms remained out of the original 284 firms. The data of these 177 firms have also manually been corrected for holidays and other days when the market have been closed. This leaves 3128 days of observations in the sample. The data of the 177 firms have been used during the first part of the estimations and calculations. In order to remove potential bias caused by a high frequency of days when non-trading occurs, the 177 firms have also been reduced to 100 firms. This have been done by sorting out the firms with the highest amount of days with non-trading. Estimations have been done for the 100 firms and these firms have also been used in the creation of the 10-beta sorted portfolios, which consists of ten firms in each portfolio. In the estimations of the multifactor models, only 93 firms of the intended 100 firms were included in the sample. DataStream was not able to provide all of the required data for all the 100 firms. DataStream could also not provide data for the whole period for the 93 firms, and because of that, the time period for the sample had to be shortened. The time period for the multifactor models have been limited to be between the date 01/01/2003 and the date 17/06/2014. More details of which firms that have been used in which estimation can be found in the appendix, where there are tables over the 177 firms, the 100 firms, the 10-beta portfolios used in the one-factor model and the 93 firms used in the multifactor models.

3.2 Proxy for the Risk Free Interest Rate - STIBOR

The Stockholm Interbank Offered Rate (the STIBOR) with the duration "Tomorrow Next" has been chosen as the proxy for the risk free interest rate. This interest rate is the overnight reference interbank rate in Sweden and it illustrates an average of the interest rates at which a number of the biggest banks in Sweden are willing to lend to each other at. The Tomorrow Next STIBOR interest rate is written in terms of a yearly interest rate when it is extracted from DataStream. For the STIBOR interest rate to be of use in this thesis, it was therefore a necessity to recalculate the yearly interest rate into a daily overnight interest rate. This was done by dividing the yearly interest rate by 360 and by doing so the daily interest rate was obtained. The number 360 was selected because it is usually what is considered to be the number of calendar days during a year (Asgharian and Nordén, 2007).

3.3 Proxy for the Market Portfolio – OMXSPI

The OMXSPI All Share index (OMXSPI) has been selected as the proxy for the market portfolio. This index consists of all the original 284 firms previously mentioned and is the most talked about when it comes to Swedish indices. It is a capital weighted index including all of the Swedish shares listed on OMXS All Share.

3.4 Macroeconomic Announcement Days

As mentioned earlier the intention of this thesis is to explore if there is a difference between days when macroeconomic data are scheduled to be released compared to days when they are not. An announcement day is defined as a day on which macroeconomic data is pre-scheduled to be released. The macroeconomic data is represented by the Swedish equivalents of the macroeconomic variables that have been used by Savor and Wilson (2013a). The first variable is the interest rate and the representation for that are days when the Swedish Central Bank (Riksbanken) presents the new prime lending interest rate. The second variable is the inflation and the representation for that are days when new statistics from the official Swedish consumer price index (CPI) are published. The third variable is unemployment and the representation for that are days when statistics from the official statistics about unemployment in Sweden are published. The empirical definition of an announcement day is a day when new information is released for at least one of these three variables. The definition of a normal day is a day when none of the three variables releases any new information. It is important to state that the released data itself is irrelevant. This thesis does not discriminate between data that is considered to be good or bad because that is not of interest. What is of importance is to examine if there is differences between announcement days and normal days.

3.4.1 Prime Lending Rate

The specific dates of press releases regarding the prime lending rate have been extracted from the Swedish central bank's website.[1] The Swedish central bank, Riksbanken, was given independence in 1999, so it is natural to include data from 1999 and forward. The Swedish central bank usually have six pre-announced meetings (all with a following press release) a year excluding potential unannounced extra meetings.

3.4.2 CPI - Inflation

The official Consumer Price Index has been used as the indication for the Swedish inflation. The CPI is released by Statistiska Centralbyrån (SCB) and is recognised as a part of the Swedish official statistics. Furthermore CPI matters because other important indices, such as the net price index (NPI), the Harmonised Index of Consumer Prices (HICP), and the underlying inflation, can be calculated from it. The CPI data can be found at SCB's website from the beginning of 2002 and forward. On the website can also information about future CPI release dates be found. The dates are usually pre-announced a couple of months in advance.[2]

3.4.3 AKU – Workforce Surveys

As an indication of the current unemployment situation in Sweden, the Swedish official workforce surveys (Arbetskraftsundersökning, AKU) have been selected. The AKU is also like the CPI calculated by the SCB. The past announced monthly AKU press release days

[1] http://www.riksbank.se/sv/Penningpolitik/Prognoser-och-rantebeslut/Historiska-reporantebeslut/ and http://www.riksbank.se/sv/Penningpolitik/Prognoser-och-rantebeslut/Reporantebeslut/?all=1 [Accessed 06/30 2014]

[2] http://www.scb.se/sv_/Hitta-statistik/Statistik-efter-amne/Priser-och-konsumtion/Konsumentprisindex/Konsumentprisindex-KPI/ [Accessed 06/30 2014]

have been included as macroeconomic days. The dates, starting from 2002, for these days can be found on SCB's website.[3]

3.5 Time period of the Data

The ambition is to use the longest possible period of data in order to be able to draw conclusions from the material. Given the data that have been found, the lowest common denominator in terms of time is 01/01/2002 and therefore this date is used as the starting point. Whereas data over stocks have been easy to find, it was the data for announcement days that have proven to be the most difficult to find further back in time and therefore limited this thesis to the start date 01/01/2002. Analyses have been done using the whole time period, 2002-2014, as the data source, but the data have also been divided into four-year periods: 2002-2005, 2006-2009, and 2010-2013. This has been done because our main sample includes the period of the great recession, and because it enabled differences in the full sample period to be highlighted. The year 2014 includes all the trading days of the year up to the 17th of June (17/06/2014).

3.6 Potential Problem with the Data

Sweden's economy is small and open and it would be possible to argue that also macroeconomic data released in other countries would be of interest but this fact has been neglected mainly for practical reasons. It is hard to tell which data and from which countries that would be relevant to include. Another issue is that DataStream could not provide all the necessary market size and price-to-book data for all the firms. Many of these firms were smaller firms and maybe this has caused a bias towards the larger firms. An additional potential problem with the data is that there might be some kind of "survivor bias" since only firms, which have survived during whole the time period, are included in the sample. This also means that new firms that have been quoted after 2001 have not been included in the sample and maybe the sample is not a perfect representation of the Swedish stock market.

[3] http://www.scb.se/sv_/Hitta-statistik/Pressmeddelanden/Arkiv-for-pressmeddelanden/?Amne=AM&Year=9999&SortOrder=product [Accessed 06/30 2014]

4 Method

The Fama-Macbeth approach will be described in this chapter. That is the cross-sectional regression method that have been used to obtain the empirical findings in chapter 5, for different assets and time periods and separated for announcements days and normal days. First, the cross-sectional regression with the one-factor betas as explanatory variables will be described and then the cross-sectional regression with the multifactor betas will be described. The one-factor is of course the CAPM beta on the market portfolio, which is represented by OMXSPI, and the additional factors are the logarithmic market value, the book-to-market ratio, and the past one-year return. The data treatment, calculations, and the regressions have been done in Microsoft Excel.

4.1 The Cross-Sectional Regressions with CAPM Market Betas as Explanatory Variables

In this section a description of the general cross-sectional method with estimated CAPM market betas as explanatory variables that has been used in this thesis will be given. A general description is necessary because this cross-sectional regression have been computed for various time periods, time-varying betas and full-sample betas, and for the 177 firms, the 100 firms and the 10-beta portfolios. The Fama-Macbeth approach, illustrated in the theoretical framework by equation (5), has been adopted as the cross-sectional regression method since it is straightforward to use. Similar to Savor and Wilson (2013b) equation (16) has been used. Equation (16) is an extended version of equation (5) where the estimates of beta are allowed to be time-varying. The explanatory variable is the estimated value of the CAPM market betas for the excess return on the 177 firms, 100 firms and on the 10-beta portfolios. The explained variables are the excess return on the 177 firms, the 100 firms and the 10-beta portfolios. Please note that these cross-sectional regressions have been conducted separately for the 177 firms, the 100 firms, and the 10-beta portfolios. The cross-sectional regression model has the following appearance:

$$R_t = \gamma_{0t}\iota + \gamma_{1t}\hat{\beta}_{m,t} + \eta_t \quad (16)$$

Where R_t is a vector of daily excess returns at time period t, ι is a vector of ones and $\hat{\beta}_{m,t}$ is a vector of the daily estimated CAPM market betas (estimated either through the time-varying or the full-sample technique, both later being described) at time period t. The coefficients has been estimated by the OLS regression method for each day $(t, t = 1, ..., T)$, in the sample, separately for the 177 firms, the 100 firms and the 10-beta portfolios. Again, it is important to stress that the beta estimates are the explanatory variables. From these regressions, T estimates of γ_0 and γ_1 are received. The coefficient γ_{0t} is the intercept at time t and the coefficient γ_{1t} is the slope and the risk premium for the factor at time t.

In the second part of the Fama-Macbeth approach, the interest lay in the time series of T estimates of γ_0 and γ_1. By calculating the arithmetic average of these T estimates of γ_0 and γ_1 and putting a circumflex on them, $\hat{\gamma}_0$ and $\hat{\gamma}_1$, they are defined as estimates of γ_0 and γ_1. This is done accordingly to equation (7) as proposed by Fama and Macbeth (1973). In order to test if the two estimates $\hat{\gamma}_0$ and $\hat{\gamma}_1$ are statistical significant, the standard errors will be needed. The standard errors are calculated by taking the square root of the variance which is calculated as in equation (8). The standard errors from this procedure allow cross-sectional correlation and heteroskedasticity in the error terms (Verbeek, 2012). Although there might be a problem with autocorrelation, but autocorrelation is usually weak for stocks with daily holding periods (Fama and French, 1988). This is why no tests for heteroskedasticity and autocorrelation have been conducted on the data. After calculating estimates and standard errors all the variables needed to calculate the t-statistics $\omega(\hat{\gamma}_i)$ as in equation (6) exist. The index i represents 0 and 1. This is the general description on how the cross-sectional regression have been used for first estimating T estimates of γ_0 and γ_1 and then for calculating the estimates $\hat{\gamma}_0$ and $\hat{\gamma}_1$ and performing t-tests on them.

By doing these estimations through the same method but looking for differences between announcement days and normal days some minor changes to the method is needed. The intention is to make the estimates $\hat{\gamma}_i$ accordingly to equation (7) but separately for announcement days and normal days. These new estimates will for announcement days be defined as $\hat{\gamma}_i^A$ and for normal days will they be defined as $\hat{\gamma}_i^N$. It is then easy to perform t-tests for the coefficients $\hat{\gamma}_i^A$ and $\hat{\gamma}_i^N$ by following equation (6). The calculations for the estimates, $\hat{\gamma}_i^A$ and $\hat{\gamma}_i^N$, are computed by using a dummy variable. This is done in practice by coding the days that are defined to be announcement days, in the data section 3.4, as ones (1) and the remaining days, normal days, as zeroes (0). By coding the days like this it is possible to look at announcement days only and at normal days only and a comparison between these two kinds of days can therefore easily be done. All of what is mentioned above is then computed for the 177 firms, the 100 firms and the 10-beta portfolios, with both the estimates of the time-varying betas and the full sample betas, and for the time periods in Table i. As can be seen in the table the total number of days is 3128 for the full time period from 2002 to 2014. When dividing in four-year periods the number of days is 1005 for 2002-2005, 1004 days for 2006-2009 and 1006 days for 2010-2013. Similarly the number of days for announcement days and normal days can be seen in the table.

Table i: Number of days in the One-Factor Model

	All Days	A-Days	N-Days
2002-2014*	3128	354	2774
2002-2005	1005	113	892
2006-2009	1004	116	888
2010-2013	1006	112	894

The table show the number of all days, announcement days (A-Days) and normal days (N-Days) for the different time periods for the one-factor model. *2014 go through 17/06/2014

In order to make the cross-sectional regressions just mentioned some additional components is needed, such as the explained and the explanatory variables. As can be seen in equation (16) both the daily excess returns on assets and the estimated beta values are needed. The following subsections will describe these components and the way of calculating them.

4.1.1 The Asset's Excess Return and the Excess Return of the Market Portfolio

The daily historical returns without dividends have been calculated from the historical price data from DataStream by using the following formula:

$$r_t = \frac{(P_t - P_{t-1})}{P_{t-1}} \quad (17)$$

Where r_t is the return at day t for an asset, P_t is the closing price for a firm at day t and P_{t-1} is the closing price at day $t-1$ (Byström, 2010). In order to obtain the daily excess returns, the daily risk free interest rate is subtracted from the daily returns, in this thesis the daily overnight interbank interest rate STIBOR is used as the risk free interest rate.

$$R_t = r_t - rf_t \qquad (18)$$

Where R_t is the excess return at day t for an asset, r_t is the return at day t and rf_t is the risk free interest rate at day t (Bodie, Kane and Marcus, 2011). The excess returns for the market portfolio proxy OMXSPI is obtained by using the same two equations (17) and (18).

4.1.2 Characteristics of the Explained Variables

In this subsection the characteristics of the explained variables in the cross-sectional regression will be described. The explained variables are the excess returns for the individual firms and the portfolios. The data over the 177 firms, as mentioned in the data section 3.1, have been extracted from DataStream. The reason why these 177 firms are used is that these 177 firms were listed during the whole period 01/01/2001-17/06/2014. The excess returns for these 177 firms are calculated as in equation (18). From the 177 firms, the 100 firms were obtained by removing the 77 firms with the highest amount of days with non-trading (days when the daily return observed is zero). The excess returns for these 100 firms were also calculated as in equation (18). In order to be able to notice any potential change in the result when using only the 100 most frequently traded firms instead of all the 177 firms the cross-sectional regression is made on the 100 firms as well. Furthermore, by removing the 77 firms with a lot non-trading days, maybe a potentially bias from the non-trading have been removed from the sample. The 100 firms were then later sorted into ten equally weighted beta portfolios with ten firms in each portfolio. The construction of the portfolios has been done for removing any potential errors-in-variables problems. This was done by first estimating full-sample beta values for the 100 firms with data from the period 02/01/2001-17/06/2014. Then the firms were sorted after their beta values from the lowest to the highest and then ten firms were grouped into each portfolio until there were ten portfolios in total. The return for a portfolio were calculated as in equation (17) but for the portfolios, P_t is the sum of the prices for ten firms at time t, and P_{t-1} is the sum of the prices for the ten firms at time $t-1$. The excess return is then calculated as in equation (18).

4.1.3 Time-Varying and Full-Sample Estimations of the CAPM Market Beta

The time-varying betas have been estimated by the method described in section 2.3 in the theoretical framework chapter. But instead of using monthly data and an estimation window of 36 month, daily data and an estimation window of one year (250 days) has been used.

Time-varying betas for the 177 firms, the 100 firms and the 10-beta portfolios have been estimated for all days in our sample. The one-year rolling time-varying betas have been estimated by using data from the 250 previous days, the estimated beta value for 01/01/2002 has been estimated from the excess returns from 01/01/2001 to 31/12/2001. This method is used for all the following days in the sample. That means that one beta-value per firm and portfolio have been calculated for each day, from the first trading day of 2002 (02/01/2002) to the last day of the sample, which is 17/06/2014. By applying OLS on equation (19) once per day per firm and portfolio, one beta value is estimated for each asset at each t:

$$\begin{gathered} R_{is} = \alpha_{it} + \beta_{it} R_{ms} + \varepsilon_{is} \\ s = t - 251, \dots, t - 1 \end{gathered} \tag{19}$$

Where R_{is} is the excess return for asset i and the time subscript s goes from $t - 251$ to $t - 1$ and R_{ms} is the excess return on the market proxy OMXS. ε_{is} is the error term which is assumed to be uncorrelated and have a constant variance. The amount of 250 days has been used since it was the number of trading days during the first year. All years does not have 250 trading days but a rolling estimation window of 250 days has been used in this thesis for estimating the time-varying betas. Tests for whether or not the estimated time-varying betas are significant have also been done for the 177 firms. This was done by conducting t-tests on the estimated betas for all days.

When calculating the full-sample betas, one beta value per asset for the given time period is received. Similar to the estimation of the time-varying beta, the full sample beta is estimated from a model with an asset's excess return as the explained and the excess return on the market portfolio as the explanatory variable. The model is the following:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_i \tag{20}$$

However, the full sample beta estimation of the whole period 2002-2014 have an estimation window that start 250 days before 2002, meaning that the estimation window for the whole period will be from 01/01/2001 to 17/06/2014. The estimated full sample beta value will then be the same on every day for the period 2002-2014. Tests for whether or not the estimated full sample betas are significant have also been done for the 177 firms. This was done by conducting one t-test per firm on the estimated full sample betas for all days.

4.2 The Cross-Sectional Model with Multifactor Betas as Explanatory Variables

For the two multifactor models, 93 firms have been used because the necessary data could only be found for 93 firms out of the 100 firms. The first multifactor model includes three factors (hereafter called the 3-factor model). The second multifactor model includes four factors (called the 4-factor model). Estimations for both the 3-factor model and 4-factor model have been made. The 3-factor model has the following factors: the logarithmic market value, the book-to-market ratio and the excess return on the market portfolio. The 4-factor model has the same factors as the 3-factor model and the additional factor the past one-year return. The cross-sectional regressions, with the estimated beta values for these three or four factors as the explanatory variables, and the excess returns on the 93 firms as the explained variables, are performed by the method described in the following sections.

4.2.1 Initial Calculations for the Four Factors

As mentioned earlier the 100 most traded firms were reduced to 93 due to lack of necessary data from DataStream for the multifactor models. The daily data from DataStream were then calculated into the variables that represented the four factors: the logarithmic market value, the book-to-market ratio, the past one-year return, and the excess return on the market portfolio. Savor and Wilson's (2013a) approach on constructing these four factors have been followed. Also due to lack of data, the time periods for the cross-sectional regression were pushed to begin in 2003. The variable for the market value have easily been calculated by taking the natural logarithm of the daily market value data from DataStream. The variable for the book-to-market ratio was calculated by taking the inverse of the daily price-to-book ratio received from DataStream. The variable for the daily excess return on the market portfolio have already been calculated in subsection 4.1.3. The variable for the daily past one-year returns were calculated through this formula:

$$r_t = \frac{(P_t - P_{t-250})}{P_{t-250}} \tag{21}$$

Where r_t is the return at day t for an asset, P_t is the closing price at day t and P_{t-250} is the closing price at day $t - 250$. The estimation window begins on the first trading day in 2002 because that is necessary for calculating the daily past one year return on each day during 2003-2014.

4.2.2 The Beta Estimations for the Multi-Factor Betas

The betas associated with each explanatory factor need to be estimated. These betas are needed in the coming cross-sectional regression. From each excess return of the 93 firms, the three or four betas for each day, in the time period 2003-2014, have been estimated by using a one-year rolling regression. The regressions for each firm were made by the following model for the 3-factor model:

$$R_{is} = \alpha_{it} + \beta_{1,it}R_{ms} + \beta_{2,it}MV_{is} + \beta_{3,it}BtM_{is} + \varepsilon_{is} \\ s = t - 251, \dots, t - 1 \tag{22}$$

and by the following model for the 4-factor model:

$$R_{is} = \alpha_{it} + \beta_{1,it}R_{ms} + \beta_{2,it}MV_{is} + \beta_{3,it}BtM_{is} + \beta_{4,it}1YR_{is} + \varepsilon_{is} \\ s = t - 251, \dots, t - 1 \tag{23}$$

Where R_{is} is the excess return for firm i at time s, α_{it} is the intercept for firm i at time s, R_{ms} is the excess return on the market proxy OMXSPI at time s, BtM_{is} is the book-to-market ratio for firm i at time s, MV_{is} is the logarithmic market value of firm i at time s, $1YR_{is}$ is the past one-year return for firm i at time s, and ε_{is} is the error term for firm i at time s.

4.2.3 The Cross-Sectional Regressions with Multifactor Betas as the Explanatory Variables

With the beta values for each factor for the 93 firms being estimated, the first part of the Fama-Macbeth cross-sectional regression approach can be run. The estimated beta values are the explanatory variables in the cross-sectional regression which has the following appearance for the 3-factor model:

$$R_t = \gamma_0 + \gamma_1\hat{\beta}_{1,t} + \gamma_2\hat{\beta}_{2,t} + \gamma_3\hat{\beta}_{3,t} + \varepsilon_t \tag{24}$$

and the following appearance for the 4-factor model:

$$R_t = \gamma_0 + \gamma_1\hat{\beta}_{1,t} + \gamma_2\hat{\beta}_{2,t} + \gamma_3\hat{\beta}_{3,t} + \gamma_4\hat{\beta}_{4,t} + \varepsilon_t \tag{25}$$

Where R_t is a vector of the excess returns of the 93 firms at time t, $\hat{\beta}_{1,t}$ is a vector of estimated beta values for excess returns on the market portfolio for the 93 firms at time t, $\hat{\beta}_{2,t}$ is a vector of estimated beta values for the logarithmic market values for the 93 firms at time t, $\hat{\beta}_{3,t}$ is a vector of estimated beta values for the book-to-market ratios for the 93 firms at time t, $\hat{\beta}_{4,t}$ is a vector of estimated beta values for the past one-year returns for the 93 firms at time t, and ε_t is the error term at time t.

The familiar second part of the Fama-Macbeth approach are the analyses of the time series of T estimates of γ_0, γ_1, γ_2, γ_3, and γ_4, which have been estimated from the cross-sectional regressions. This is done by calculating the arithmetic average of these T estimates of γ_0, γ_1, γ_2, γ_3, and γ_4 and putting a circumflex on them, $\hat{\gamma}_0$, $\hat{\gamma}_1$, $\hat{\gamma}_2$, $\hat{\gamma}_3$, and $\hat{\gamma}_4$, in order to mark them as the estimates for γ_0, γ_1, γ_2, γ_3, and γ_4. By following the same principles as in section 4.1, tests for statistical significance for the estimates $\hat{\gamma}_i$, where i goes from 0 to 4, are performed through equation (6), equation (7), and equation (8).

By calculating the estimates separately for announcement days and normal days differences between the days can be noticed. By coding the days that are defined as in section 3.4 to be announcement days with ones (1) and the remaining normal days with zeroes (0) in Excel. T-tests can then easily be performed for announcement days $\hat{\gamma}_i^A$ and for normal days $\hat{\gamma}_i^N$ by following equation (6), equation (7), and equation (8) but with the day specific estimates instead of $\hat{\gamma}_i$. All of what is mentioned above is then computed for the 93 firms, for the time periods in Table ii.

Table ii: Number of days in the Multi-Factor Model

	All Days	A-Days	N-Days
2003-2014*	2878	327	2551
2003-2005	755	86	669
2006-2009	1004	116	888
2010-2013	1006	112	894

The table show the number of all days, announcement days (A-Days) and normal days (N-Days) for the different time periods for the multi-factor models. Note that the starting point is during 2003 instead of as in the one-factor model in 2002. *2014 go through 17/06/2014

5 Empirical Analysis

This thesis have examined if the CAPM market beta and the additional factors: the logarithmic market value, the book-to-market ratio, and the past one-year return, can explain the cross-section of asset returns, with the hypothesis that on days when news about employment, inflation, and interest rate is scheduled to be announced (announcement days) are different from the other days (normal days). This has been tested for individual firms and portfolios and for different time periods and this chapter will present the analysis of the main empirical findings, related to the other chapters of the thesis. The first section of this chapter will include the findings and the analyses of the cross-sectional model with the CAPM market betas as the explanatory variables, the second section will include the findings and the analyses of the cross-sectional model with multi-factor betas as explanatory variables. The estimates of the different coefficients can be found in the following tables with the corresponding t-statistics value in the bracket below each estimate. The star (*) indicate that the estimate is statistically significant different from zero at the 95 per cent level while the double-star (**) indicates a statistically significant difference from zero at the 99 per cent level. The symbol (¤) indicates a statistically significant difference from zero at the 90 per cent level. The significance level at 90 per cent is included because many estimates are close to being significant on the 95 per cent level. The critical t-statistics for the t-tests are dependent on both the degrees of freedom and on the chosen confidence level. This dependency means that the critical t-values not are the same for all of the tests. The critical t-value for a significance level of 95 per cent is around 1.96, the value for a significance level of 99 per cent is around 2.58, and the value for a significance level of 90 per cent is around 1.64.

5.1 The Cross-Sectional Model with CAPM Market Beta as Explanatory Variable

The two first subsections will analyse the main empirical findings for the individual firms and the constructed portfolios, and the last subsection contains the main conclusions for the cross-sectional model with CAPM market beta as the explanatory variable. Similar results have been found for individual firms and portfolios using both estimation methods of beta, this is an indication of the robustness of the results. Only tables with time-varying estimated betas are shown in this chapter, since they are regarded as the most reliable estimates, all the tables concerning cross-sectional regressions with the full-sample betas can be found in the appendix.

5.1.1 Individual Firms

The 77 firms with a high frequency of non-trading have been removed from the 177 firms in pursue of better results and removing potential bias caused by non-trading. What is meant with better results are significant results for the coefficient $\hat{\gamma}_1$, insignificant results for the coefficient $\hat{\gamma}_0$, and differences in the estimates between announcement days and normal days. The 100 firms with more frequently traded firms show a similar pattern in the results as the 177 firms, although some slightly different results can be found. This small difference is that the $\hat{\gamma}_0's$ have a tendency of being even less often significant and that the $\hat{\gamma}_1's$ are significant on a higher significance level, on announcement days for the 100 firms. This indicates that the 100 firms have better results than the 177 firms. For that reason have the tables containing the estimates of the 177 firms been placed in the appendix while the table for the 100 firms can be seen in Table iii.

Table iii: 100 Firms (Time-Varying Betas)

	$\hat{\gamma}_0^{All}$	$\hat{\gamma}_1^{All}$	$\hat{\gamma}_0^{A}$	$\hat{\gamma}_1^{A}$	$\hat{\gamma}_0^{N}$	$\hat{\gamma}_1^{N}$
2002-2014	0.00082**	-0.00039	-0.00004	0.00039	0.00092**	-0.00048
	[4.906]	[-1.365]	[-0.082]	[0.477]	[5.264]	[-1.606]
2002-2005	0.00122**	-0.00063	0.00155*	0.00007	0.00117**	-0.00072
	[5.359]	[-1.484]	[2.152]	[0.056]	[4.913]	[-1.595]
2006-2009	0.00029	-0.00008	-0.00083	-0.00165	0.00044	0.00013
	[0.813]	[-0.123]	[-0.700]	[-1.015]	[1.164]	[0.191]
2010-2013	0.00068**	-0.00020	-0.00088	0.00309*	0.00087**	-0.00061
	[2.583]	[-0.469]	[-1.206]	[2.234]	[3.119]	[-1.369]

The table reports estimates and t-statistics from the cross-sectional regression of daily excess returns for 100 individual firms on their stock market betas. The stock market betas have been estimated by the method of time-varying betas previously mentioned. The superscripts denote if we look at all days (All), announcement days (A) or normal days (N) while the subscript denotes the intercept (0) or the factor risk premium (1).

The $\hat{\gamma}_0's$ are in general significantly different from zero but never during the time period 2006-2009. The $\hat{\gamma}_0's$ are also, when significant, always positive. One noticeable difference between normal days and announcement days is that the coefficient $\hat{\gamma}_0$ is frequently significantly positive on normal days and frequently insignificant on announcement days. No significant estimates can be found during the period 2006-2009, no matter the number of firms used, and the reason for this could be that this period represents a time of high financial distress (the great recession began in 2007), and that the model that is used might estimate poorly on extraordinary time periods. Two of the implications of the CAPM, which have previous been mentioned in section 2.1, are that the market risk premium should be greater than zero and that the intercept should be zero. One interesting observation is the one for the period 2010-2013, where the coefficient $\hat{\gamma}_1^A$ is significantly positive for announcement days only, while at the same time period the null hypothesis of that the coefficient $\hat{\gamma}_0^A$ is different from zero cannot be rejected. This indicates that two of the implications of the CAPM, which is no intercept and a positive risk premium, hold on announcement days for the time period 2010-2013. For normal days, the results can be interpreted as if there is an intercept and that there is no risk premium. Because $\hat{\gamma}_0^N$ is significantly different from zero and we cannot reject the null hypothesis (insignificant) that $\hat{\gamma}_1^N$ is zero.

5.1.2 Portfolios

The portfolios were constructed for making more precise beta estimations and decrease the potential errors-in-variables-problem that may cause an underestimation of the coefficient for beta. Although, when stocks are grouped into portfolios some information about the relationship between risk and expected return is lost, and this seems indeed to be the case since the results is poor and rarely significant. The only estimate that is significantly different from zero on the 95 per cent significance level is $\hat{\gamma}_0^N$ for the time period 2010-2013 for normal days (see Table iv). The lack of significant findings indicate that there is not much difference between announcement days and normal days and that the two implications for the CAPM does not hold for the 10-beta portfolios on the 95 per cent confidence level. However, if the confidence level were to be reduced to the 90 per cent level the estimates indicate some interesting results, similar as for the individual firms, for the time period 2010-2013. A clear difference between announcement days and normal days illustrates itself. On announcement days, at this confidence level and time period, the interpretation of the results is that no intercept exists (the coefficient $\hat{\gamma}_0^A$ is insignificant) and there is a positive risk premium (the coefficient $\hat{\gamma}_1^A$ is significant and positive). This illustrates that the two implications for the CAPM hold on announcement days at the time period 2010-2013 also for the constructed portfolios. For normal days and the same time period the results are interpreted as if an intercept exist ($\hat{\gamma}_0^N$ is significantly different from zero) and no risk premium can be proven to exist ($\hat{\gamma}_1^N$ is insignificant).

Table iv: Beta-Sorted Portfolios (Time-Varying Betas)

	$\hat{\gamma}_0^{All}$	$\hat{\gamma}_1^{All}$	$\hat{\gamma}_0^{A}$	$\hat{\gamma}_1^{A}$	$\hat{\gamma}_0^{N}$	$\hat{\gamma}_1^{N}$
2002-2014	0.00028	-0.00006	-0.00050	0.00079	0.00038¤	-0.00016
	[1.410]	[-0.178]	[-0.810]	[0.828]	[1.809]	[-0.486]
2002-2005	0.00033	-0.00006	0.00128	0.00013	0.00020	-0.00008
	[1.137]	[-0.120]	[1.373]	[0.088]	[0.680]	[-0.161]
2006-2009	-0.00019	0.00016	-0.00190	-0.00063	0.00003	0.00027
	[-0.444]	[0.229]	[-1.510]	[-0.330]	[0.066]	[0.347]
2010-2013	0.00052¤	-0.00013	-0.00090	0.00322¤	0.00070*	-0.00055
	[1.680]	[-0.275]	[-0.909]	[1.977]	[2.148]	[-1.103]

The table reports estimates and t-statistics from the Cross-Sectional regression of daily excess returns for 10 constructed beta-sorted portfolios on their stock market betas. The stock market betas have been estimated by the method of time-varying betas previously mentioned. The superscripts denote if we look at all days (All), announcement days (A) or normal days (N) while the subscript denotes the intercept (0) or the factor risk premium (1).

The difference between announcement days and normal days for the 10-beta sorted portfolios for the period 2010-2013 is illustrated in Figure 1. The average return is positively related to a higher beta exposure on announcement days, that is, the portfolio with higher beta have a higher average return during the period 2010-2013. An interesting difference between the two kinds of days is that the averages return, on normal days, has a negative relation with the beta exposure, meaning that for normal days there is no reward for taking risk (beta) instead a higher beta exposure is associated with lower return. How the relationship between average excess return and beta value looks like for announcement days and normal days during the whole time period, 2002-2014, can be found in the appendix.

Figure 1: Announcement Days and Normal Days 2010-2013

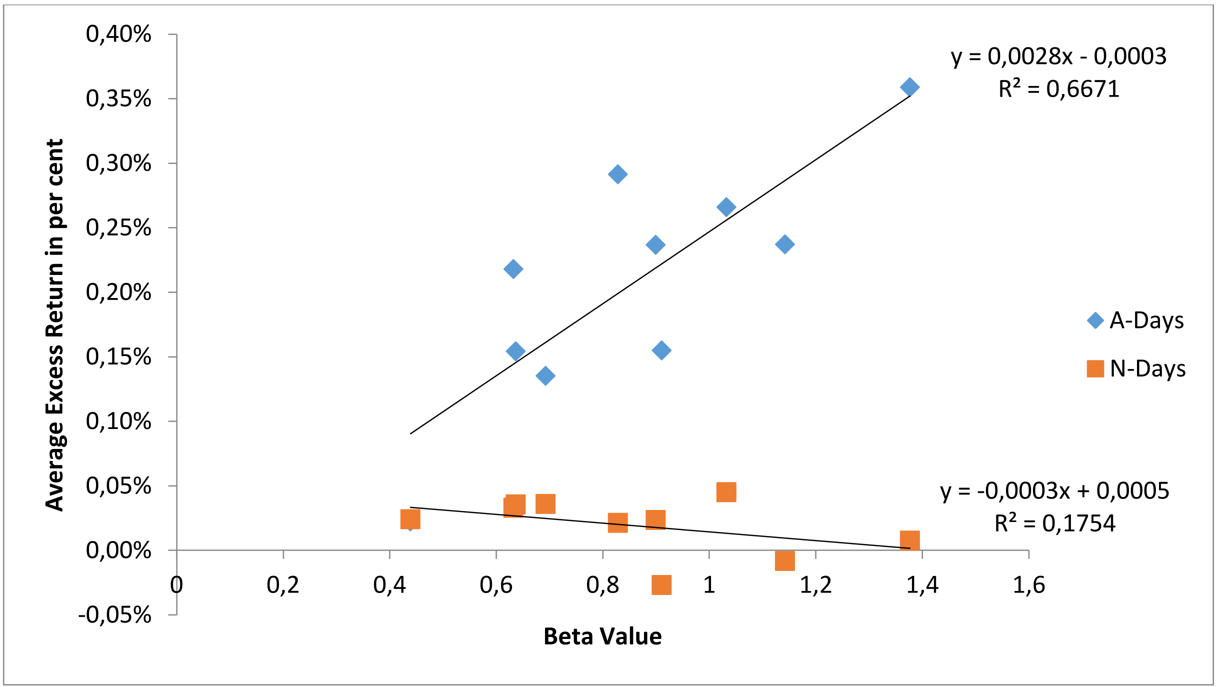

Figure 1 show the average excess returns for the 10-beta sorted portfolios on the y-axis and their beta value on the x-axis. The blue dots represent the values for all the announcement days (A-Days) during 2010 to 2013 while the orange dots represent the values for all the normal days (N-Days) during 2010 to 2013. The R-Squared value is 0.6671 during announcement days and 0.1754 during normal days.

5.1.3 Discussion on the Cross-Sectional Regressions with CAPM as Explanatory Variables

As mentioned in the introduction earlier studies by Black, Jensen and Scholes (1972), Fama and French (1992), and Black (1992) found that the CAPM is an insufficient model in explaining the direct relation between the market beta risk factor and average excess returns across stocks. Similar to those earlier studies, the empirical findings in this thesis show that in general the market beta cannot explain much of the excess returns. However in this thesis, on announcement days during the time period 2010-2013, clear significant results indicate that the market beta values can explain the cross-section excess return on stocks. A positive risk premium is found to exist during this time period on announcement days, however this cannot be proven to exist during normal days. Maybe this can be explained by this thought. A rational and risk-averse investor is aware of that on pre-scheduled announcement days, new information is released about the economy which is associated with macroeconomic risk, which as Boyd, Hu, and Jagannathan (2005) and Bernanke and Kutter (2005) states, affect asset returns. This investor would anticipate a higher risk on this kind of days since he knows that there will be new information released. But he does not know if the information will affect the market in a positive or a negative way but nevertheless he knows that the risk will be higher on announcement days. This investor would demand a higher return on announcement days compared to normal days for compensating for this higher risk exposure, ceteris paribus. This may be the reason that the risk premium is significantly different from zero on announcement days 2010-2013 in the findings of this thesis.

5.2 The Cross-Sectional Model with Multifactor Betas as Explanatory Variables

Two multifactor models have been estimated. The findings of a 3-factor model with the CAPM market beta, the logarithmic market value, and the book-to-market ratio, as factors and a 4-factor model with the CAPM market beta, the logarithmic market value, the book-to-market ratio, and the past-one year return, as factors will be analysed in this section. Because the results from the two different multifactor models are very similar, focus will be on the 4-factor model in this section. The results from 3-model can be found in the appendix.

One main difference between announcement days and normal days for the 4-factor model is that the intercept in general is highly significantly different from zero during normal days and never significant during announcement days. For coefficients other than the intercept during the whole period, announcement days do not appear to be much different than normal days. But there is a noticeable difference between announcement days and normal days in the sub periods 2003-2005 and 2010-2013. In the time period 2003-2005 on announcement days the logarithmic market value is statistically positive at the 90 per cent level. In the same time period during normal days, $\hat{\gamma}_2 - MV$, is instead significantly negatively related to returns. $\hat{\gamma}_3 - BtM$, is negatively significant during 2003-2005 for announcement days. No such results can be found for normal days only. Both the estimate $\hat{\gamma}_2 - MV$ and $\hat{\gamma}_3 - BtM$ on announcement days in this thesis contradicts the findings of Fama and French (1992). While the estimate for $\hat{\gamma}_2 - MV$ on normal days is negatively related to average excess stock return, similar to the findings of Fama and French (1992). Fama and French (1992) find that smaller firms have higher average returns, that market value has a negative relation to average stock return. Maybe this is the case since the smaller firms are more risky to hold and that therefore a higher risk premium is required in order to hold them. The interpretation of this could be that smaller firms relatively to larger firms have a higher risk premium on normal days. However, on announcement days, the larger firms have a higher risk premium compared to the smaller firms. The prices of the larger firms react to news faster and prices of the smaller firms react relatively slower. Maybe less liquidity and less frequent trading in smaller firms delay the price changes due to new information. This may indicate that price changes on the smaller firms, due to new information on the announcement days are first observed later, which would be on a normal day. Larger firms might also be more dependent on changes in the macroeconomic variables which make the risk premium relatively higher for larger firms during announcement days. It is important to state that these results only hold for the specific time period, 2010-2013, and that this may be due to the limitations of the model.

The findings of Fama and French (1992) suggest a positive relationship between the book-to-market ratio and the average returns while the empirical finding of this thesis suggests that there is a negative relationship. The Fama and French (1992) finding make sense from a logical point of view while the finding in this thesis does not, that is one of the reasons why focus in the analyses is on other time period than 2003-2005. Other differences between the days can be found when looking at the estimates of the other factors. In the time period 2010-2013 the CAPM market beta, $\hat{\gamma}_1 - OMX$, is positively significant on the 95 per cent level while the coefficient for the past one-year return, $\hat{\gamma}_4 - 1YR$, is negatively related to the excess return, on the 90 per cent significant level for announcement days. This finding cannot be found on normal days where no coefficient other than the intercept is significantly different from zero between 2010-2013. The positively significant CAPM market beta means that taking market risk is rewarded with a higher return. That the coefficient for the one-year past return is negative indicating that holding stocks with a bad past performance the previous year is rewarded.

Similar to the one-factor model the most interesting differences between announcement days and normal days can be seen in the time period 2010-2013, where the intercept is zero and there is a positive risk premium for the risk factor for the market portfolio on announcement days but not for normal days. The multifactor models overall does not give the best findings since no significant findings are obtained for the factors on all days (see appendix). This is a disappointment since at least one factor was expected to explain the stock returns. After all, Fama and French (1992) found evidence for including two factors other than the excess returns on the market and concluded that CAPM was dead. The findings of this thesis does rather contradict their results since the taken market risk is rewarded on announcement days, at least for the time period 2010-2013.

Table v: Multifactor 4-factors Announcement Days

	$\hat{\gamma}_0$	$\hat{\gamma}_1 - OMX$	$\hat{\gamma}_2 - MV$	$\hat{\gamma}_3 - BtM$	$\hat{\gamma}_4 - 1YR$
2003-2014	-0.00035	0.00037	0.00209	-0.00170	-0.00965
	[-0.646]	[0.464]	[0.618]	[-1.210]	[-0.937]
2003-2005	0.00068	-0.00003	0.01712¤	-0.00867*	0.00933
	[0.830]	[-0.026]	[1.964]	[-2.339]	[0.447]
2006-2009	-0.00086	-0.00153	-0.00524	0.00137	-0.00150
	[-0.709]	[-0.928]	[-0.961]	[0.558]	[-0.103]
2010-2013	-0.00074	0.00298*	-0.00177	0.00031	-0.03431¤
	[-0.985]	[2.169]	[-0.399]	[0.226]	[-1.714]

The table reports estimates and t-statistics from the cross-sectional regression of daily excess returns for 93 individual firms on their stock market betas (OMX), log market values (MV), book-to-market ratios (BtM), and past one-year return (1YR) when looking at announcement days only $\hat{\gamma}_0$ is the intercept coefficient.

Table vi: Multifactor 4-factors Normal Days

	$\hat{\gamma}_0$	$\hat{\gamma}_1 - OMX$	$\hat{\gamma}_2 - MV$	$\hat{\gamma}_3 - BtM$	$\hat{\gamma}_4 - 1YR$
2003-2014	0.00097**	-0.00025	-0.00120	0.00048	0.00381
	[4.998]	[-0.814]	[-1.073]	[1.021]	[1.056]
2003-2005	0.00138**	0.00017	-0.00545*	0.00187	0.00164
	[5.719]	[0.412]	[-1.993]	[1.494]	[0.250]
2006-2009	0.00039	0.00012	0.00079	0.00005	0.00663
	[0.954]	[0.171]	[0.379]	[0.058]	[1.404]
2010-2013	0.00098**	-0.00069	-0.00028	-0.00012	0.00051
	[3.321]	[-1.532]	[-0.220]	[-0.260]	[0.069]

The table reports estimates and t-statistics from the cross-sectional regression of daily excess returns for 93 individual firms on their stock market betas (OMX), log market values (MV), book-to-market ratios (BtM), and past one-year return (1YR) when looking at normal days only $\hat{\gamma}_0$ is the intercept coefficient.

6 Conclusion

The purpose of this thesis has been to investigate if the differences, between normal days and days when important macroeconomic data is scheduled to be released, found by Savor and Wilson (2013a) on the American market can be found on the Swedish stock market as well. The method which has been adopted for finding such a difference, is the cross-sectional regression method as developed by Fama and Macbeth (1973). Both a one-factor model with the CAPM market betas as the explanatory variable and two multifactor models with the additional factors the logarithmic market value, the book-to-market ratio, and the past-one year return as the explanatory variables, have been used.

The question of this thesis is if announcement days are different from normal days. The cross-sectional regressions show that for the whole period there is not much of a difference. However, for the time period 2010-2013 there is a clear difference between the two kinds of days. On normal days the coefficient for the intercept $\hat{\gamma}_0$ is highly frequently significant and the coefficient for the slope $\hat{\gamma}_1$ is always insignificant. On announcement days the opposite occur, where there is a positive risk premium for market risk and no evidence can be found for the intercept to be different from zero. This can be interpreted as if the two implications of the CAPM, which is a positive market risk premium and a zero intercept, hold for the time period 2010-2013 on announcement days but not for normal days. The differences in results for 2010-2013 between the two days is caught in all the models used in this thesis and this show the robustness of these results. One answer to why the results were not better for the other time periods may of course be due to misspecifications in the model. The frequently very significant intercept values and insignificant values on the other factors when looking at all days, and not separating for announcement days and normal days, could be symptoms of this. Another problem might be the errors-in-variables problem but tests of significance in the beta estimations have been made for each day and firm and show that 83.6 per cent are significant on the 95 per cent significance level for the individual firms. In order to decrease any potential errors-in-variables portfolios have been constructed. However, maybe the poor result is not caused by the problems previously mentioned. Perhaps the fault lies with the data and more specifically in the time period from which the data have been extracted from. The oldest data for the stocks that is used in this thesis originates from 2001 and the latest data are from 2014/06/17 and this might not be the most ideal time frame for the estimations. This period contains two major events that have caused major financial disturbances. The first event is the "Dot-com bubble" which peaked around year 2000 and then later busted. The second event is the Great Recession which began in 2007 and a major panic broke out after the fall of the Lehman Brothers in 2008. Some of the impact of these events can be seen in Figure 2 that shows the variation in the OMXSPI index for the relevant time period. This troubling time is the reason to why the estimates have been divided into smaller sub-periods.

Figure 2: OMXSPI 2000-01-03 - 2014-06-17

Figure 2 show the variation in the OMXSPI index for 2000-01-13 to 2014-06-17

Risk and reward is one of the fundamental topics in finance, we show that a risk premium is rewarded on announcement days but not on normal days on the Swedish stock market. Perhaps the reason, why macroeconomic risk is rewarded on days when pre-scheduled macroeconomic news is released, for the time period 2010-2013, is that risk-averse and rational investors, in this post financial crisis period, expect to be compensated for the macroeconomic risk that is present on announcement days, which affect the return of assets. Our results are similar to the results found by Savor and Wilson (2013b), on the American market, but on the Swedish market for Swedish announcement days during 2010-2013.

Some suggestions for further research that could be of interest are to use a longer time period although it will be difficult to find the necessary data; another interesting aspect would be to include other type of pre-scheduled news days as macro days. Some of them could be major indicators of the American and the Eurozone economy, such as the FOMC and the ECB interest rate announcements. It would also be of great interest if the method used in this thesis were to be replicated with future data. Will there still be a difference between announcement days and normal days as in the time period 2010-2013? The models and regressions might generate better results with future data.

A final answer to the hypothesis of this thesis is that there is a robust statistical difference between announcement days and normal days during the time period 2010-2013.

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Appendix

Table A1: 177 Firms (Time-Varying Betas)

	$\hat{\gamma}_0^{All}$	$\hat{\gamma}_1^{All}$	$\hat{\gamma}_0^{A}$	$\hat{\gamma}_1^{A}$	$\hat{\gamma}_0^{N}$	$\hat{\gamma}_1^{N}$
2002-2014	0.00061**	-0.00010	0.00075*	-0.00054	0.00060**	-0.00004
	[3.900]	[-0.331]	[2.004]	[-0.739]	[3.491]	[-0.133]
2002-2005	0.00103**	-0.00004	0.00230**	-0.00113	0.00087*	0.00010
	[3.263]	[-0.060]	[3.974]	[-0.952]	[2.497]	[0.148]
2006-2009	0.00016	0.00002	0.00016	-0.00255¤	0.00016	0.00036
	[0.545]	[0.041]	[0.199]	[-1.721]	[0.507]	[0.585]
2010-2013	0.00052*	-0.00016	-0.00010	0.00218¤	0.00060*	-0.00046
	[2.341]	[-0.408]	[-0.166]	[1.822]	[2.500]	[-1.077]

The table reports estimates and t-statistics from the cross-sectional regression of daily excess returns for 100 individual firms on their stock market betas. The stock market betas have been estimated by the method of time-varying betas previously mentioned. The superscripts denote if we look at all days (All), announcement days (A) or normal days (N) while the subscript denotes the intercept (0) or the factor risk premium (1).

Table A2: 177 Firms (Full-Sample Betas)

	$\hat{\gamma}_0^{All}$	$\hat{\gamma}_1^{All}$	$\hat{\gamma}_0^{A}$	$\hat{\gamma}_1^{A}$	$\hat{\gamma}_0^{N}$	$\hat{\gamma}_1^{N}$
2002-2014	0.00068**	-0.00019	0.00078	-0.00059	0.00067**	-0.00013
	[4.510]	[-0.622]	[1.898]	[-0.681]	[4.125]	[-0.423]
2002-2005	0.00119**	-0.00026	0.00180**	-0.00038	0.00111**	-0.00025
	[4.707]	[-0.549]	[2.754]	[-0.246]	[4.080]	[-0.493]
2006-2009	0.00017	0.00002	0.00032	-0.00301¤	0.00015	0.00042
	[0.548]	[0.031]	[0.386]	[-1.854]	[0.451]	[0.584]
2010-2013	0.00059*	-0.00025	0.00029	0.00184	0.00063*	-0.00051
	[2.468]	[-0.563]	[0.402]	[1.291]	[2.473]	[-1.095]

The table reports estimates and t-statistics from the cross-sectional regression of daily excess returns for 177 individual firms on their stock market betas. The stock market betas have been estimated by the method of full-sample betas previously mentioned. The superscripts denote if we look at all days (All), announcement days (A) or normal days (N) while the subscript denotes the intercept (0) or the factor risk premium (1).

Table A3: 100 Firms (Full-Sample Betas)

	$\hat{\gamma}_0^{All}$	$\hat{\gamma}_1^{All}$	$\hat{\gamma}_0^{A}$	$\hat{\gamma}_1^{A}$	$\hat{\gamma}_0^{N}$	$\hat{\gamma}_1^{N}$
2002-2014	0.00071**	-0.00023	-0.00026	0.00070	0.00083**	-0.00035
	[3.525]	[-0.726]	[-0.438]	[0.740]	[3.905]	[-1.029]
2002-2005	0.00094**	-0.00022	0.00117	0.00056	0.00091*	-0.00032
	[2.741]	[-0.404]	[1.243]	[0.338]	[2.477]	[-0.549]
2006-2009	0.00032	-0.00011	-0.00122	-0.00127	0.00052	0.00004
	[0.766]	[-0.161]	[-0.920]	[-0.669]	[1.188]	[0.049]
2010-2013	0.00074*	-0.00029	-0.00062	0.00298*	0.00091**	-0.00070
	[2.540]	[-0.666]	[-0.727]	[2.024]	[2.935]	[-1.532]

The table reports estimates and t-statistics from the cross-sectional regression of daily excess returns for 100 individual firms on their stock market betas. The stock market betas have been estimated by the method of full-sample betas previously mentioned. The superscripts denote if we look at all days (All), announcement days (A) or normal days (N) while the subscript denotes the intercept (0) or the factor risk premium (1).

Table A4: Beta-Sorted Portfolios (Full-Sample Betas)

	$\hat{\gamma}_0^{All}$	$\hat{\gamma}_1^{All}$	$\hat{\gamma}_0^{A}$	$\hat{\gamma}_1^{A}$	$\hat{\gamma}_0^{N}$	$\hat{\gamma}_1^{N}$
2002-2014	0.00022	0.00003	-0.00042	0.00078	0.00030	-0.00007
	[1.124]	[0.088]	[-0.701]	[0.845]	[1.461]	[-0.211]
2002-2005	0.00024	0.00007	0.00142	0.00004	0.00010	0.00008
	[0.702]	[0.135]	[1.304]	[0.023]	[0.260]	[0.135]
2006-2009	-0.00011	0.00008	-0.00230¤	-0.00022	0.00017	0.00012
	[-0.294]	[0.129]	[-1.926]	[-0.122]	[0.419]	[0.176]
2010-2013	0.00039	0.00001	-0.00032	0.00279¤	0.00048	-0.00034
	[1.396]	[0.025]	[-0.387]	[1.964]	[1.612]	[-0.754]

The table reports estimates and t-statistics from the cross-sectional regression of daily excess returns for 10 constructed beta-sorted portfolios on their stock market betas. The stock market betas have been estimated by the method of full-sample betas previously mentioned. The superscripts denote if we look at all days (All), announcement days (A) or normal days (N) while the subscript denotes the intercept (0) or the factor risk premium (1).

Table A5: Multifactor 3-factors Announcement Days

	$\hat{\gamma}_0$	$\hat{\gamma}_1 - OMX$	$\hat{\gamma}_2 - MV$	$\hat{\gamma}_3 - BtM$
2003-2014	-0.00005	0.00005	0.00035	-0.00021
	[-0.832]	[0.577]	[0.870]	[-1.288]
2003-2005	0.00009	0.00002	0.00140	-0.00076*
	[0.969]	[0.197]	[1.525]	[-2.023]
2006-2009	-0.00008	-0.00020	-0.00033	0.00014
	[-0.581]	[-1.065]	[-0.489]	[0.464]
2010-2013	-0.00014¤	0.00037*	0.00027	-0.00017
	[-1.730]	[2.351]	[0.466]	[-0.799]

The table reports estimates and t-statistics from the cross-sectional regression of daily excess returns for 93 individual firms on their stock market betas (OMX), log market values (MV), and book-to-market ratios (BtM) when looking at announcement days only. $\hat{\gamma}_0$ is the intercept coefficient.

Table A6: Multifactor 3-factors Normal Days

	$\hat{\gamma}_0$	$\hat{\gamma}_1 - OMX$	$\hat{\gamma}_2 - MV$	$\hat{\gamma}_3 - BtM$
2003-2014	0.00086**	-0.00021	-0.00171	0.00024
	[4.984]	[-0.766]	[-1.547]	[0.545]
2003-2005	0.00125**	0.00014	-0.00614*	0.00116
	[5.950]	[0.384]	[-2.114]	[1.001]
2006-2009	0.00031	0.00016	0.00064	-0.00046
	[0.880]	[0.261]	[0.324]	[-0.546]
2010-2013	0.00085**	-0.00061	-0.00100	0.00024
	[3.215]	[-1.501]	[-0.870]	[0.593]

The table reports estimates and t-statistics from the cross-sectional regression of daily excess returns for 93 individual firms on their stock market betas (OMX), log market values (MV), and book-to-market ratios (BtM) when looking at normal days only. $\hat{\gamma}_0$ is the intercept coefficient.

Table A7: Multifactor 3-factors All Days

	$\hat{\gamma}_0$	$\hat{\gamma}_1 - BtM$	$\hat{\gamma}_2 - MV$	$\hat{\gamma}_3 - OMX$
2003-2014	0.00081**	0.00003	-0.00136	-0.00016
	[4.410]	[0.072]	[-1.161]	[-0.547]
2003-2005	0.00133**	0.00040	-0.00473	0.00016
	[5.864]	[0.327]	[-1.552]	[0.426]
2006-2009	0.00023	-0.00032	0.00031	-0.00004
	[0.604]	[-0.357]	[0.146]	[-0.066]
2010-2013	0.00071**	0.00007	-0.00072	-0.00024
	[2.568]	[0.157]	[-0.561]	[-0.555]

The table reports estimates and t-statistics from the cross-sectional regression of daily excess returns for 93 individual firms on their stock market betas (OMX), log market values (MV), and book-to-market ratios (BtM) when looking at all days. $\hat{\gamma}_0$ is the intercept coefficient.

Table A8: Multifactor 4-factors All-Days

	$\hat{\gamma}_0$	$\hat{\gamma}_1 - OMX$	$\hat{\gamma}_2 - MV$	$\hat{\gamma}_3 - BtM$	$\hat{\gamma}_4 - 1YR$
2003-2014	0.00082**	-0.00018	-0.00083	0.00024	0.00228
	[4.479]	[-0.627]	[-0.777]	[0.524]	[0.670]
2003-2005	0.00130**	0.00015	-0.00288	0.00067	0.00252
	[5.574]	[0.384]	[-1.094]	[0.563]	[0.401]
2006-2009	0.00024	-0.00007	0.00009	0.00020	0.00569
	[0.632]	[-0.114]	[0.049]	[0.248]	[1.264]
2010-2013	0.00079**	-0.00029	-0.00045	-0.00007	-0.00337
	[2.859]	[-0.661]	[-0.360]	[-0.163]	[-0.487]

The table reports estimates and t-statistics from the cross-sectional regression of daily excess returns for 93 individual firms on their stock market betas (OMX), log market values (MV), book-to-market ratios (BtM), and past one-year return (1YR) when looking at all days. $\hat{\gamma}_0$ is the intercept coefficient.

Figure A1: Announcement Days and Normal Days 2002-2014

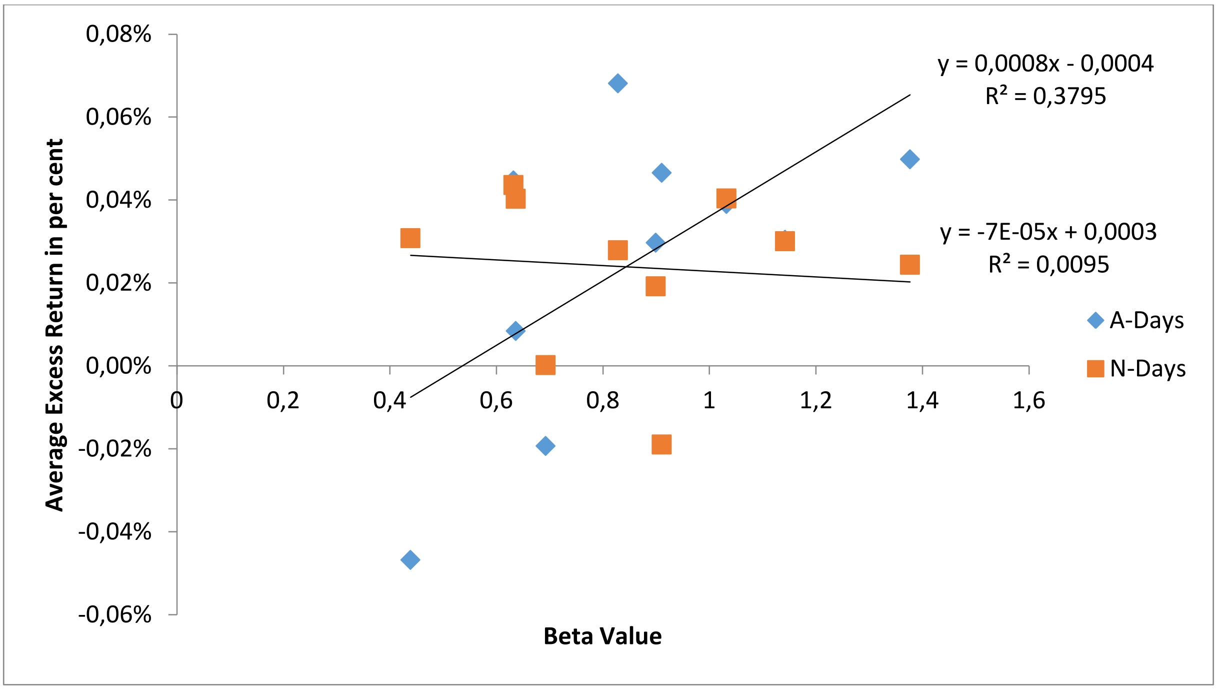

Figure 1 show the average excess returns for the 10-beta sorted portfolios on the y-axis and their beta value on the x-axis. The blue dots represent the values for all the announcement days (A-Days) during 2002 to 2014 while the orange dots represent the values for all the normal days (N-Days) during 2002 to 2014. The R-Squared value is 0.3795 during announcement days and 0.0095 during normal days.

The 177 Firms:

ABB (OME)
ASSA ABLOY 'B'
ACANDO 'B'
ACTIVE BIOTECH
ADDNODE 'B'
ANOTO GROUP
ARCAM 'B'
ASPIRO
ASTRAZENECA (OME)
ATLAS COPCO 'A'
ATLAS COPCO 'B'
ATRIUM LJUNGBERG 'B'
AUTOLIV SDB
AVANZA BANK HOLDING
AXFOOD
AXIS
B&B TOOLS 'B'
BEIJER ALMA 'B'
BEIJER ELECTRONICS
BEIJER REF AB
BERGS TIMBER 'B'
BETSSON 'B'
BILIA 'A'
BIOGAIA 'B'
BIOTAGE
BOLIDEN
BONG
BURE EQUITY
CTT SYSTEMS
CASTELLUM
CISION
CLAS OHLSON 'B'
CONCORDIA MARITIME 'B'
CONSILIUM 'B'
COREM PROPERTY GROUP
CYBERCOM GROUP EUROPE
DORO
DUROC 'B'
ELANDERS 'B'
ELECTROLUX 'A'
ELECTROLUX 'B'
ELEKTA 'B'
ELOS 'B'
ENEA
ENIRO
ERICSSON 'A'
SSAB 'A'
SSAB 'B'
SWECO 'A'
SWECO 'B'
SAGAX
ERICSSON 'B'
FABEGE
FAGERHULT
FAST PARTNER
FASTIGHETS BALDER 'B'
FEELGOOD SVENSKA
FENIX OUTDOOR 'B'
FINGERPRINT CARDS 'B'
GETINGE
GEVEKO 'B'
GUNNEBO
HALDEX
HEBA 'B'
HENNES & MAURITZ 'B'
HEXAGON 'B'
HIQ INTERNATIONAL
HOLMEN 'A'
HOLMEN 'B'
HUFVUDSTADEN 'A'
HUFVUDSTADEN 'C'
I A R SYSTEMS GROUP
IMAGE SYSTEMS
INDL.& FINL.SYS.'A'
INDL.& FINL.SYS.'B'
INDUSTRIVARDEN 'A'
INDUSTRIVARDEN 'C'
INTELLECTA 'B'
INVESTOR 'A'
INVESTOR 'B'
JM
KABE HUSVAGNAR 'B'
KARO BIO
KINNEVIK 'A'
KINNEVIK 'B'
KNOW IT
KUNGSLEDEN
LAMMHULTS DESIGN GROUP
LATOUR INVESTMENT 'B'
LUNDBERGFORETAGEN 'B'
MSC KONSULT 'B'
MALMBERGS ELEKTRISKA 'B'
MEDA 'A'
MEDIVIR 'B'
MEKONOMEN
MICRO SYSTEMATION 'B'
SANDVIK
SECURITAS 'B'
SEMCON
SHELTON PETROLEUM
SINTERCAST
MIDSONA 'A'
MIDSONA 'B'
MIDWAY HOLDINGS 'A'
MIDWAY HOLDINGS 'B'
MODERN TIMES GP.MTG 'A'
MODERN TIMES GP.MTG 'B'
MULTIQ INTERNATIONAL
MYCRONIC
NCC 'A'
NCC 'B'
NIBE INDUSTRIER 'B'
NOVOTEK 'B'
NET INSIGHT 'B'
NEW WAVE GROUP 'B'
NOLATO 'B'
NORDEA BANK
NORDIC SER.PTNS.HDG.'B'
NORDNET 'B'
NOVESTRA
OEM INTERNATIONAL 'B'
OPCON
ORTIVUS 'A'
ORTIVUS 'B'
PA RESOURCES 'B'
PARTNERTECH
PEAB 'B'
POOLIA 'B'
PRECISE BIOMETRICS
PREVAS 'B'
PRICER 'B'
PROACT IT GROUP
PROBI
PROFFICE 'B'
PROFILGRUPPEN 'B'
RATOS 'A'
RATOS 'B'
RAYSEARCH LABS.'B'
READSOFT 'B'
REDERI AB TNSAT.'B'
ROTTNEROS
RORVIK TIMBER
SAAB 'B'
SAS
SECTRA 'B'
SKF 'A'
SKF 'B'
SEB 'A'
SEB 'C'
SKANSKA 'B'
SKISTAR 'B'
SOFTRONIC 'B'

STOCKWIK FORVALTNING
STORA ENSO 'A'
STORA ENSO 'R'
SVEDBERGS I DALSTORP 'B'
SCA 'A'
SCA 'B'
SVENSKA HANDBKN.'A'
SVENSKA HANDBKN.'B'
SWEDBANK 'A'
SWEDISH MATCH
TELE2 'A'
TELE2 'B'
TELIASONERA
TIETO CORPORATION (OME)
TRACTION 'B'
TRELLEBORG 'B'
VBG GROUP
VENUE RETAIL GROUP 'B'
VITEC SOFTWARE GROUP 'B'
VOLVO 'A'
VOLVO 'B'
WALLENSTAM 'B'
XANO INDUSTRI 'B'
AF 'B'
ORESUND INVESTMENT

The 100 Firms:

ABB (OME)
ACTIVE BIOTEC
ANOTO GROUP
ASSA ABLOY 'B'
ASTRAZENECA (OME)
ATLAS COPCO 'A'
ATLAS COPCO 'B'
AUTOLIV SDB
AVANZA BANK HOLDING
AXFOOD
AXIS
BETSSON 'B'
BILIA 'A'
BIOGAIA 'B'
BOLIDEN
BURE EQUITY
CASTELLUM
CISION
CLAS OHLSON 'B'
CYBERCOM GROUP EUROPE
ELECTROLUX 'B'
ELEKTA 'B'
ENEA
ENIRO
ERICSSON 'A'
ERICSSON 'B'
FABEGE
FINGERPRINT CARDS 'B'
GETINGE
GUNNEBO
HALDEX
HENNES & MAURITZ 'B'
HEXAGON 'B'
HIQ INTERNATIONAL
HOLMEN 'B'
HUFVUDSTADEN 'A'
I A R SYSTEMS GROUP
INDL.& FINL.SYS.'B'
INDUSTRIVARDEN 'A'
INDUSTRIVARDEN 'C'
INVESTOR 'A'
INVESTOR 'B'
JM
KINNEVIK 'B'
KUNGSLEDEN
LATOUR INVESTMENT 'B'
LUNDBERGFORETAGEN 'B'
MEDA 'A'
MEDIVIR 'B'
MEKONOMEN
MODERN TIMES GP.MTG 'B'
MYCRONIC
NCC 'A'
NCC 'B'
NET INSIGHT 'B'
NEW WAVE GROUP 'B'
NIBE INDUSTRIER 'B'
NOLATO 'B'
NORDEA BANK
NORDNET 'B'
PARTNERTECH
PEAB 'B'
PRECISE BIOMETRICS
PROACT IT GROUP
PROFFICE 'B'
RATOS 'B'
READSOFT 'B'
SAAB 'B'
SAGAX
SANDVIK
SAS
SCA 'A'
SCA 'B'
SEB 'A'
SEB 'C'
SECTRA 'B'
SECURITAS 'B'
SEMCON
SINTERCAST
SKANSKA 'B'
SKF 'A'
SKF 'B'
SKISTAR 'B'
SSAB 'A'
SSAB 'B'
STORA ENSO 'A'
STORA ENSO 'R'
SWEDBANK 'A'
SWEDISH MATCH
SVENSKA HANDBKN.'A'
SVENSKA HANDBKN.'B'
TELE2 'B'
TELIASONERA
TIETO CORPORATION (OME)
TRELLEBORG 'B'
WALLENSTAM 'B'
VOLVO 'A'
VOLVO 'B'
AF 'B'
ORESUND INVESTMENT

The 93 Firms:

ACTIVE BIOTECH
ANOTO GROUP
ASSA ABLOY 'B'
ATLAS COPCO 'A'
ATLAS COPCO 'B'
AVANZA BANK HOLDING
AXFOOD
AXIS
BETSSON 'B'
BILIA 'A'
BIOGAIA 'B'
BOLIDEN
BURE EQUITY
CASTELLUM
CISION
CLAS OHLSON 'B'
CYBERCOM GROUP EUROPE
ELECTROLUX 'B'
ELEKTA 'B'
ENEA
ENIRO
ERICSSON 'A'
ERICSSON 'B'
FABEGE
FINGERPRINT CARDS 'B'
GETINGE
GUNNEBO
HALDEX
HENNES & MAURITZ 'B'
HEXAGON 'B'
HIQ INTERNATIONAL
HOLMEN 'B'
HUFVUDSTADEN 'A'
I A R SYSTEMS GROUP
INDL.& FINL.SYS.'B'
INDUSTRIVARDEN 'A'
INDUSTRIVARDEN 'C'
INVESTOR 'A'
INVESTOR 'B'
JM
KINNEVIK 'B'
KUNGSLEDEN
LATOUR INVESTMENT 'B'
LUNDBERGFORETAGEN 'B'
MEDA 'A'
MEDIVIR 'B'
MEKONOMEN
MODERN TIMES GP.MTG 'B'
MYCRONIC
NCC 'A'
NCC 'B'
NET INSIGHT 'B'
NEW WAVE GROUP 'B'
NIBE INDUSTRIER 'B'
NOLATO 'B'
NORDEA BANK
NORDNET 'B'
PARTNERTECH
PEAB 'B'
PRECISE BIOMETRICS
PROACT IT GROUP
PROFFICE 'B'
RATOS 'B'
READSOFT 'B'
SAAB 'B'
SANDVIK
SAS
SCA 'A'
SCA 'B'
SEB 'A'
SEB 'C'
SECTRA 'B'
SECURITAS 'B'
SEMCON
SINTERCAST
SKANSKA 'B'
SKF 'A'
SKF 'B'
SKISTAR 'B'
SSAB 'A'
SSAB 'B'
SWEDBANK 'A'
SWEDISH MATCH
SVENSKA HANDBKN.'A'
SVENSKA HANDBKN.'B'
TELE2 'B'
TELIASONERA
TRELLEBORG 'B'
WALLENSTAM 'B'
VOLVO 'A'
VOLVO 'B'
AF 'B'
ORESUND INVESTMENT

The 10-Beta Sorted Portfolios:

Portfolio 1:	**Full-Sample Beta**
SWEDISH MATCH	0.32
SKISTAR 'B'	0.33
AXFOOD	0.35
ASTRAZENECA (OME)	0.42
MEKONOMEN	0.46
SECTRA 'B'	0.48
HUFVUDSTADEN 'A'	0.50
LATOUR INVESTMENT 'B'	0.53
PROACT IT GROUP	0.54
ORESUND INVESTMENT	0.55

Portfolio 2:	**Full-Sample Beta**
BURE EQUITY	0.55
WALLENSTAM 'B'	0.56
BILIA 'A'	0.56
MEDA 'A'	0.58
AF 'B'	0.59
NIBE INDUSTRIER 'B'	0.59
SINTERCAST	0.59
ELEKTA 'B'	0.59
CLAS OHLSON 'B'	0.60
MEDIVIR 'B'	0.60

Portfolio 3:	**Full-Sample Beta**
LUNDBERGFORETAGEN 'B'	0.62
GETINGE	0.62
SAAB 'B'	0.62
CASTELLUM	0.64
GUNNEBO	0.64
FINGERPRINT CARDS 'B'	0.66
SCA 'A'	0.67
BETSSON 'B'	0.67
SAGAX	0.67
AVANZA BANK HOLDING	0.67

Portfolio 4:	**Full-Sample Beta**
BIOGAIA 'B'	0.68
HOLMEN 'B'	0.68
PARTNERTECH	0.68
CISION	0.69
PROFFICE 'B'	0.69
ACTIVE BIOTECH	0.70
SCA 'B'	0.72
NOLATO 'B'	0.73
STORA ENSO 'A'	0.74
READSOFT 'B'	0.75

Portfolio 5:	**Full-Sample Beta**
I A R SYSTEMS GROUP	0.76
KUNGSLEDEN	0.76
PRECISE BIOMETRICS	0.76
NCC 'A'	0.76
FABEGE	0.77
TIETO CORPORATION (OME)	0.79
RATOS 'B'	0.80
AUTOLIV SDB	0.81
NEW WAVE GROUP 'B'	0.82
AXIS	0.82

Portfolio 6:	**Full-Sample Beta**
ANOTO GROUP	0.82
HENNES & MAURITZ 'B'	0.82
PEAB 'B'	0.83
NORDNET 'B'	0.85
SECURITAS 'B'	0.86
HALDEX	0.86
INDL.& FINL.SYS.'B'	0.87
TELIASONERA	0.88
NCC 'B'	0.89
SEMCON	0.90

Portfolio 7:	**Full-Sample Beta**
MYCRONIC	0.92
STORA ENSO 'R'	0.92
ENEA	0.92
SVENSKA HANDBKN.'B'	0.94
ENIRO	0.95
SAS	0.95
TELE2 'B'	0.96
SKANSKA 'B'	0.97
HIQ INTERNATIONAL	0.97
JM	0.97

Portfolio 8:	**Full-Sample Beta**
CYBERCOM GROUP EUROPE	0.97
SVENSKA HANDBKN.'A'	0.98
HEXAGON 'B'	1.01
KINNEVIK 'B'	1.01
INVESTOR 'A'	1.02
NET INSIGHT 'B'	1.02
TRELLEBORG 'B'	1.03
INVESTOR 'B'	1.04
ASSA ABLOY 'B'	1.05
SKF 'A'	1.08

Portfolio 9:	**Full-Sample Beta**
ELECTROLUX 'B'	1.10
SKF 'B'	1.10
SSAB 'B'	1.16

ABB (OME)	1.16
SSAB 'A'	1.16
INDUSTRIVARDEN 'A'	1.17
SANDVIK	1.17
INDUSTRIVARDEN 'C'	1.17
SWEDBANK 'A'	1.18
MODERN TIMES GP.MTG 'B'	1.18

Portfolio 10:	**Full-Sample Beta**
VOLVO 'B'	1.19
NORDEA BANK	1.19
VOLVO 'A'	1.20
ATLAS COPCO 'A'	1.24
SEB 'C'	1.24
ATLAS COPCO 'B'	1.29
BOLIDEN	1.29
ERICSSON 'A'	1.35
SEB 'A'	1.39
ERICSSON 'B'	1.44