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Abstract

Our thesis captures the daily stock market excess returns on days when important macroeconomic news, such as FOMC announcements, PPI announcements, and employment announcements are scheduled for release. We focus on capturing the difference between the stock market excess return on announcement days versus non-announcement days on both the Norwegian stock market and the U.S. stock market using announcements from the U.S. By doing so, we capture a significantly higher daily excess return on announcement days on the U.S. stock market. FOMC announcements affect the stock market excess return the most on both the Norwegian stock market and the U.S. stock market, while also being the only announcement type that is statistically significant.

We would like to express our deepest appreciation to our supervisor Alessandro Graniero, Professor of the Department of Finance at BI Norwegian Business School for exceptional guidance throughout the entire process of this Master Thesis.

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Introduction

Asset prices and the overall stock market are highly affected by several macroeconomic events happening around the globe. While the world is more connected to each other, so does the stock markets around the globe. From the perspective of investors, it is highly valuable to find some sort of connection between the prices and the macroeconomic events to make profitable financial decisions. In the second half of the 1990s, equity prices were highly affected by the tech industry and rose accordingly (Claessens, S & Ayhan Kose, M, 2017). While in 2000-2001 it became more and more evident that a bubble was present. The bubble bursted and the equity prices plummeted. Other relevant periods have happened over the years, for example, the great financial crisis in 2007-2009, which also led to a recession worldwide and was mainly caused by the housing market in the U.S. The financial crisis and the Covid-19 pandemic also caused a great deal for the stock market worldwide, which we can see later in the paper that both the maximum and minimum values occur in the timespan of these events.

In this empirical study, we want to investigate how important pre-scheduled announcements, such as interest rate announcements (FOMC), inflation announcements (PPI), and employment announcements affect the stock market return in both the U.S. stock market and the Norwegian stock market. From the U.S. stock market, we used the S&P 500 as the index and from the Norwegian stock market, we used the OSEBX index.

We provide evidence that the OSEBX index is significantly affected by FOMC announcements, which is also the case for the S&P 500 index. We find no significant evidence to support our main hypothesis that important pre-scheduled announcements increase stock market returns on the Norwegian stock market, however, we do find evidence that the U.S. stock market is positively affected by macroeconomic news on announcement days. This is similar to many other studies, such as Savor and Wilson (2013), which is a paper we follow. In their paper, they have chosen to capture the announcement effect solely on the U.S. market through the Center of Research in Security Prices (CRSP) value-weighted NYSE/NASDAQ/AMEX all share index, including dividends. They find that on days when important macroeconomic news is scheduled for release, the average market excess return increases by 11.4 bps against 1.1 bps on days when no news is scheduled for release. They also find that over 60% of the annual excess return is earned on 13% of the trading days. We differentiate ourselves from this paper by researching both the U.S. and the Norwegian stock market, and by also conducting the research in a smaller timespan. Our contribution to the literature with regards to Savor and Wilson (2013) is that we include a smaller economy than only the U.S., as well as focusing on the effects of different kinds of announcements and not only the announcement as a whole. We get slightly different results when comparing to Savor and Wilson (2013) on the U.S. stock market. This is due to a difference in the collected data.

We will also want to examine if there is a great difference between local & domestic events and foreign events, to see if the impact of the one is greater or lower than the other. Most of the recent studies we have looked at have either only used local & domestic or only foreign. Our main motivation for this thesis is to look at the effects of these in the Norwegian stock market, as well as in the U.S. stock market, and then compare these, nevertheless, we focus on the effects in the Norwegian stock market. It would be interesting to see whether or not macroeconomic events from the U.S. has a higher effect on the Norwegian stock market than on the U.S. stock market and vice versa. One should expect that the U.S. stock market should be more affected by news within its own country, however, the Norwegian stock market highly relies on the U.S. economy and news.

A lot of previous studies including Brusa, Savor and Wilson (2019) use the surprise of the announced number on an announcement day as the indicator. Our paper does not necessarily care about the surprise effect, but rather how macroeconomic announcements affect the average stock market return. We also study the week-day-effect, to capture if any of the weekdays shows a sign of higher stock market return.

Our main results consist of an increase of the average stock market return on the Norwegian stock market by 6.96 bps on announcement days compared to 2.43 bps on non-announcement days, while not being statistically significant at any level. This is also the case for the difference in means analysis. For the U.S. stock market, we provide evidence of an increase in the average stock market return by 8.95 bps on announcement days versus 1.80 bps on non-announcement days, while also being statistically significant at a 5%-level on announcement days. Pre-scheduled FOMC announcements from the U.S. increases the stock market return on the Norwegian stock market by 25.73 bps while being statistically significant at a 5%-level with a p-value of 0.019. Evidence also suggests that pre-scheduled FOMC announcements increase the average stock market return by 22.80 bps on the U.S. stock market with a significance level of 1%. When we divide the sample into four different subsamples in our robustness test, we see that FOMC announcements increase the average stock market return on the Norwegian stock market in two out of four subsamples. While on the U.S. stock market, FOMC announcements increase the average stock market return in only one out of four subsamples. This is also statistically significant at 1% and 5%-level.

We begin this paper by introducing some similar studies that are related to our paper. Then we move on to describe the relevant theory, which includes inflation, money supply, and other macroeconomic variables. Further, we state the different hypotheses which we want to test, and we then dive into our methodology. The last part consists of our results, and also our robustness tests that are divided into subsamples and the exclusion of outliers.

Literature review

Similar studies

Savor and Wilson (2014) did a study on how asset prices were affected by macroeconomic announcements. They show how asset prices behave very differently on the days when macroeconomic announcements occur. This study focuses more on how the stock market beta is related to the average returns. They find evidence that the stock market beta is positively related to the average returns on days when news about inflation, interest, and employment is announced. However, they find evidence that the stock market beta is negatively related to average returns on days where there are no announcements.

Another relevant study is done by Bernanke, S. & Kuttner, K. (2005). This study emphasizes how changes in monetary policies impact equity prices. The authors measure the reaction of the stock market, and the paper consists of the economic reasoning behind these reactions. The samples in their study are based on the changes in the fund's rate target from the FOMC meetings. Bernanke and Kuttner provide evidence that the stock market responds to unexpected monetary policy announcements. For instance, an unexpected 25 basis point cut in the federal funds rate could lead to a 1% increase in the stock market prices. As to why this effect occurs, provided evidence suggests that monetary policies' effect on real interest rates is not necessarily descriptive enough. It seems that monetary policy effects on the stock market are rather explained by either the effect it has on the expected future excess returns or expected future dividends.

There are many other relevant studies done on the subject, and most of the studies are using U.S. macroeconomic news to see how these affect the asset prices of other nations. Mostly large and similar economies like Canada and the European market, but also using smaller economies. This is the segment we would like to place our thesis in. To our knowledge, there has not been a study on U.S. and Norwegian macroeconomic events, and how these affect the stock market in the respective countries.

Theory

Macroeconomic announcements

According to Ai & Bansal (2018), macroeconomic announcements resolve uncertainty about the future course of macroeconomics. Hence, asset prices will act on these announcements instantly. They developed a theoretical model to understand the features of the financial markets and they assumed that macroeconomic announcements state something about economic growth in the future and that the announcement premium can be interpreted as asset-market-based evidence. Shiller (2003) also states that the market tends to overreact or underreact to anomalies.

Theory from Knight (1921) suggests that because of the uncertainty regarding upcoming macroeconomic announcements, investors will bear the risk of receiving news that the economy performs worse than expected. Knight developed a theory that suggests that the investors` utility functions become more concave on announcement days because of the higher weights on the worst outcomes. Hence, investors become more risk-averse on announcement days, mostly because this can be seen as a non-diversifiable risk. These investors should then be able to demand a higher stock return on days when a macroeconomic announcement is scheduled to be released due to the abnormal risk they are facing, which you will, later, be able to see is our main hypothesis of this paper.

Interest rates

According to Barsky, R. & Bogusz, T (2014) there have to be large changes in the short-term interest rate, as well as them being persistent to have a large effect on the asset prices. They also gathered evidence that a higher risk premium will cause the interest rates to have less effect on the asset prices. If interest rates decrease, then the cost of borrowing decreases. Investors and other that operates within the asset market (homebuyers etc.) will have an increased will to invest in these assets and the asset prices will increase thereby. The same logic applies the other way around.

Money supply

The money supply is an important component used by both the Federal Reserve in the U.S. and Norges Bank in Norway to deal with inflation. The way it deals with inflation is that when a country tightens its money supply, the current interest rate will increase. As the interest rate increases, the discount rate will increase. According to Dr. Chapman, M., & Maskay, B. (2007), a stock price is determined by the present value of the future cash flows. Due to the present value of future cash flows being discounted using the discount rate, an increase in this rate will impact the stock price negatively and most people will lose money on their investments. Which again affects consumption and the real economy, and inflation will also be affected.

Real activity economists argue that an increase in the money supply means a higher demand for money, which again indicates anticipation of an increase in economic activity. When this anticipation occurs, the anticipation of higher profitability occurs and causes stock prices to rise accordingly. Hence, real activity economists believe that there is a positive relationship between stock prices and money supply (Sellin, 2001, cited in Dr. Chapman, M., & Maskay, B., 2007).

Real economic activity

Positive news regarding real economic activity might increase the expectations of future growth, thus the share price increasing. However, if the positive news regarding real economic activity is better than anticipated, it might create worrisome among agents, because it might involve a restrictive monetary policy to avoid inflation. Thus, it can also lead to decreasing stock prices (Hu, Zuliu. & Li, Li., 1998).

Research question

"How do macroeconomic events affect asset prices in the Norwegian stock market and the U.S. stock market, and how can these be compared?"

We derive different hypotheses to test what we think of as interesting and necessary to form a decisive conclusion. We are highly dependent on the availability of data when performing these hypotheses, which is also why we have chosen these hypotheses. We would want to use data from 1996-2022, and to highlight periods when important macroeconomic events happened. This either be foreign events or domestic events. Macroeconomic events include central bank announcements on monetary policies, such as PPI, as well as FOMC interest rate announcements and announcements regarding the employment situation. We choose PPI over CPI because the news regarding PPI is always published a couple of days earlier than the CPI, which makes the news about PPI diminish the value of the news by CPI (Savor and Wilson, 2013).

Hypotheses

Data and theory suggest that in periods with high inflation and where interest rates increase, the asset prices decrease as mentioned before. There is however little, but some evidence of how other macroeconomic events have affected the stock market. This is why we have created these hypotheses to dive further into the subject:

Hypothesis 1: The Norwegian stock market is not affected by foreign macroeconomic events in the time frame of 1996-2022

This hypothesis tests if foreign macroeconomic events, from the U.S. to be exact, have a significant positive or negative effect on the stock market prices at Oslo stock exchange. Because the U.S. is one of the largest economies in the world, we expect different macroeconomic events from the U.S. to have an effect, hence we expect this hypothesis to be rejected.

Hypothesis 2: The U.S. stock market is not affected by domestic macroeconomic events in the time frame of 1996-2022

The second hypothesis tests if there is any significant evidence that suggests the U.S. stock market is affected by events happening within the country or not.

Hypothesis 3: Interest rate decisions made by the Federal Reserve impact the stock market more significantly than inflation and employment news on the Norwegian stock market in the time frame of 1996-2022.

Hypothesis 4: Interest rate decisions made by the Federal Reserve impact the stock market more significantly than inflation and employment news on the U.S. stock market in the time frame of 1996-2022.

Research Methodology

The research methodology section contains our objectives, the scope of the paper, and how we will work to obtain the results needed to find the answer to what effect macroeconomic announcements has on asset prices in the Norwegian market and the U.S. market. We use the stock market return to capture the difference between returns on announcement days and non-announcement days. We use data from the Oslo Børs Benchmark Index, which is registered at the Oslo stock exchange, as well as the S&P 500, which is an index consisting of the 500 largest companies in the U.S. We will use data from the 27-year time period 1996-2022 and the paper will be highly quantitative and focus on quantitative data, while still consider previous finding and empirical work. It is crucial to use data from a long time period, to avoid the small sample bias.

To test our given hypotheses, we decided to run different tests and regressions. The regressions will give us an idea of how the different variables will behave during given scenarios. We assign dummy variables for the different announcements and the announcements combined. This means that when an announcement occurs, the dummy variable will equal 1, otherwise 0. This allows us to capture the stock market returns on days when announcements take place, and to compare it with the stock market returns on days when no announcements take place. For the regressions, we use the Newey West standard error with 5 lags. We decided to use 5 lags as this is recommended for a series with a high number of observations (Baum, 2006).

1) $R_t = \alpha + \beta 1 D1 + \varepsilon$
2) $R_t = \alpha + \beta 1 D2 + \beta 2 D3 + \beta 3 D4 + \varepsilon$
3) $R_t = \alpha + \beta 1 D1 + \beta 2_{Monday} + \beta 3_{Tuesday} + \beta 4_{Wednesday} + \beta 5_{Thursday} + \varepsilon$

The first regression we create is the simple one where we account for all announcements combined, where $D1$ is denoted as the dummy variable for announcements. Hence, this regression captures the effect all announcements combined have on the stock market returns R_t. If $\beta 1$ is positive, it signals that announcement days has a positive effect on the average stock market return. We use this regression as a baseline and build on it further.

Our second regression captures the effect the different kind of announcements has on the average stock market return. We use dummy variables in this as well, where FOMC interest rate announcements are captured by the dummy variable $D2$. The PPI announcements are captured by the dummy variable $D3$ and the dummy variable $D4$, captures the employment announcements. The betas will be considered separately, to capture the effect each of the announcements has on the average stock market return. The statistical significance of each beta will also be taken into consideration as it will be crucial for us to make conclusions about our hypotheses.

The last regression accounts for the different weekdays, to capture the week-day effect. We also look at the statistical significance to capture which days of the week affect the average stock market return.

Data

We are extracting daily stock market data from Bloomberg for both the S&P 500 and the OSEBX index. We extract data from 1996 because that is the first available year of the OSEBX index on Bloomberg. We use day-to-day data to ensure that the price at a given time is influenced by the event at a given time. If we were to use data at a weekly or monthly interval, one could encounter a problem due to several events happening in the given week or month, thus we would not be able to separate the effect from all of them.

Due to the different days of holidays and that the stock exchange in Norway has more trading days than the U.S. one in our timeline, we had to fill in some empty slots in the U.S. data. Specifically, nine slots. We went around this by using the closing price from the day before the empty slot. When they only differ by nine days, the results and validity will most likely not be affected.

Stock market return

We calculate the stock market returns using the prices from the OSEBX index and the S&P 500 index, both collected from the Bloomberg terminal. When we calculate the returns, we assume that the returns are continuously compounded, and we extract them by using this formula:

$$\boldsymbol{R_t = 100 * log\left(\frac{P_t}{P_{t-1}}\right)} \quad (1$$

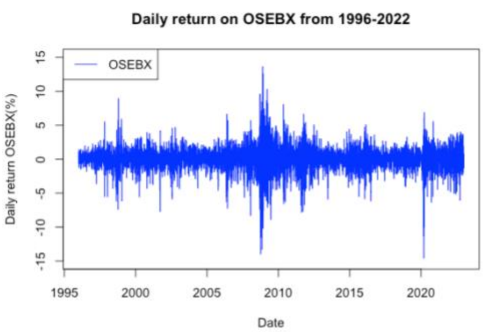
Where R_i equals the return at a given time t, P_t is the stock price at a given time t, and P_{t-1} is the stock price at time t minus one period.

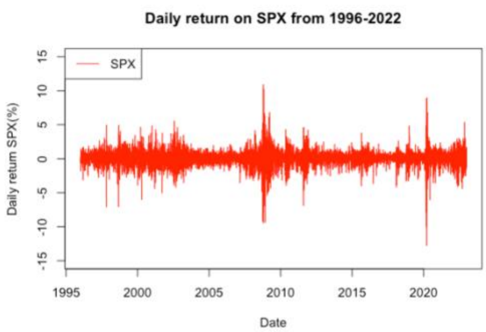
Table (1): Includes descriptive statistics for the daily log return for the OSEBX index and the S&P 500 index. Numbers are expressed in basis points (because these are more convenient and represent an absolute value).

	OSEBX	**S&P**
Minimum	-1456.93	-1276.52
Mean	2.98	2.68
Median	8.07	6.23
Maximum	1362.50	1095.72
Standard deviation	171.70	123.05
Skewness	-0.60	-0.39
Kurtosis	10.37	12.75
N	6797	6797

The OSEBX index and the S&P index have had somewhat similar minimum, mean, and maximum values, but the S&P index performs better in all aspects of the given time period. Both indexes are slightly skewed towards the left side of the tail, which indicates slightly more negative values. The extreme values from both the minimum and maximum result in a high kurtosis, and the S&P 500 index contains more extreme values than the OSEBX index. The minimum value for both indexes appears in the month of March 2020 during the Covid-19 pandemic and the maximum value for both indexes appears during the year 2008, in the time of the financial crisis. A graph of the stock market return for both given indexes can be seen in Figure (1) below:

Figure (1):





Macroeconomic events

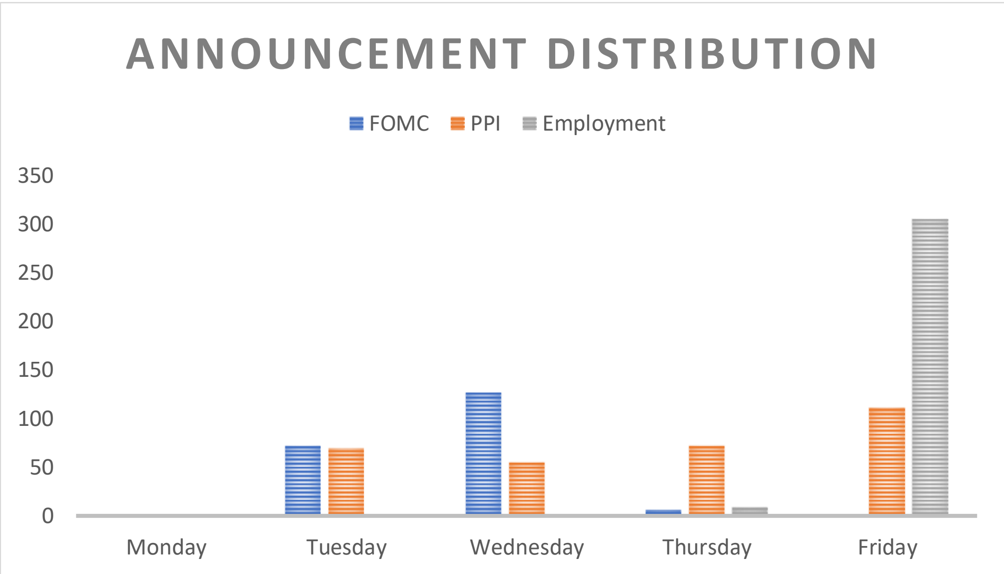
The macroeconomic events consist of announcements by the Federal Reserve regarding important macroeconomic variables. We have to make sure that the different events do not coincide, or else we will not be able to separate and analyze the effects of the different events. We will isolate unexpected policy announcements, as done in Bernanke & Kuttner (2005) and Savor and Wilson (2013). This is done by not accounting for announcements that have not been scheduled in advance. We were able to do this as we have gathered the data manually. The type of announcements we use are mostly depicted by the availability of data, but also the relevance it has for the economy. Hence, we believe that FOMC announcements, as well as inflation and employment data, are to be seen as relevant. This is mostly due to earlier studies, which gave us an intuition of which announcements to account for.

FOMC started publishing interest rate data in 1967, until this date. We obtain data from the Federal Reserve from the start of 1996 until the end of 2022, and they consist of 216 interest rate announcements. The publishment of the data has been between 11:30 and 14:15, while one was announced at 16:00 due to the Covid-19 pandemic (while still being a pre-scheduled announcement). 62% of the announcements were published on a Wednesday, while not a single announcement was published on either Monday or Friday. 72 interest rate announcements occurred on a Tuesday and 6 announcements occurred on a Thursday.

PPI announcements were obtained from the U.S. Bureau of Labor Statistics and involved a total of 325 announcements. The announcements are spread out in the week, with the most popular weekday being Thursday with 79 announcements. Not a single announcement happened on a Monday. The employment announcements are also gathered from the U.S. Bureau of Labor Statistics and involve the same number of announcement days as PPI announcements, hence 325. Both of these measures are published once a month. 94% of the employment announcements occurred on Fridays, while nine occurred on Thursdays and one announcement on a Tuesday, and one on Monday. Not a single announcement occurred on a Wednesday.

When excluding days where several announcements occur and announcements on non-trading days, we end up with a total of 836 announcement days and 5961 non-announcement days on the U.S. stock market. However, there is a slight difference between the U.S. and the Norwegian stock market regarding announcement days. The Norwegian stock market has some non-trading days on announcement days from the U.S., which means there is a total of 828 announcement days and 5969 non-announcement days on the Norwegian stock market. Several previous studies including Savor and Wilson (2013) have studied the Week-Days-Effect, which implies that the stock market returns are affected by the different weekdays. They can only confirm that the returns are significantly lower on Mondays and get no significant data for the other days of the week. A summary of the announcement days is provided below, and we will also consider the effect of our study.

Figure (2):



When accounting for the macroeconomic events many studies incorporate the differences between the actual indicator announced by the Federal Reserve and the expected value from the market. This has been commonly used in several event studies, also by Hussain, S. (2010), who followed the work of Buldazzi et al. (2001). They call this the standardized surprise, which is given by this formula:

$$S_{i,t} = \frac{A_{i,t} - E_{i,t}}{\sigma_i} \quad (2$$

Where $A_{i,t}$ *equals the actually announced indicator,* $E_{i,t}$ *equals the expected value from the market, and* σ_i *equals the standard deviation of each surprise, thus the standard deviation of* $A_{i,t} - E_{i,t}$.

According to Hussain, S. (2010), the standardized surprise will not affect the significance nor the fit of the test in any way, due to the standard deviation σ_i of the difference between the actually announced indicator and the expected value from the market being constant for every indicator *i*. They divide the surprise with the standard deviation σ_i to implement interpretation. Bernanke & Kuttner (2005) uses the surprise element as well, just in a slightly different manner. They use Federal funds futures rates to capture this element, which is derived from a futures contracts price relative to the day before a policy change. To test this, most studies use this regression:

$$ER = \alpha + \beta_{Si,t} + \epsilon \quad (3$$

We are determined to see the effect of macroeconomic announcements on stock market returns. We identify the difference between historical stock market returns on announcement days versus historical stock market returns on non-announcement days. This means that we are not particularly interested in the standardized surprise $S_{i,t}$, which involves not having to assume the expectation for a given variable and not having to account for what constitute good or bad news at any given time (Savor and Wilson, 2013).

Empirical results

Our main purpose for this thesis is to test how macroeconomic announcements from the U.S. affect the stock market returns on the OSEBX index from the Norwegian stock market and the S&P 500 index from the U.S. stock market. We expect the stock market returns for both indexes to increase on announcement days, which also is our main hypothesis.

Stock market returns

OSEBX

Table (2) contains our main results for the stock market returns on OSEBX. This includes both announcement days and non-announcement days, as well as the difference between the two. Similar to Savor and Wilson (2013), we use a difference in means analysis, which allows for different variances. Normally, when comparing the means of two samples we can use a normal t-test which uses equal variances. However, our two samples have slightly different variances. When we run the t-test for the difference in means, we take this difference into account.

As shown in Table (2), the average stock market return on announcement days is 6.96 bps with a t-statistic of 1.162, which does not make it statistically significant on any level and we cannot reject the null hypothesis from our hypothesis 1. On days where there have not occurred any announcements, we get a lower average stock market return, however not significant on any level. When comparing these numbers with a difference in means analysis, we get 4.53 bps and a t-statistic of 0.709. This tells us that we cannot reject our null hypothesis from hypothesis 1 and cannot conclude that the average stock market return is higher on announcement days than on non-announcement days on the Norwegian stock market. We also observe that the kurtosis is higher on announcement days compared to non-announcement days, 13.98 and 9.86, respectively. Which indicates more extreme values, in both positive and negative terms.

Table (2): Includes the stock market returns on announcement days and non-announcement days, with descriptive numbers for the Norwegian stock market. The difference is found using difference in means analysis.
**** 1%, ** 5%, * 10%. Numbers are expressed in basis points.*

OSEBX			
	Announcement days	**Non-announcement days**	**Difference**
Mean	6.96	2.43	4.53
T-statistic	1.162	1.091	0.709
1%-percentile	-445.59	-533.76	78.17
25%-percentile	-65.91	-76.54	10.63
Median	12.39	7.68	4.71
75%-percentile	95.27	89.25	6.02
99%-percentile	455.17	428.71	26.46
Std.dev	172.37	171.74	
Skewness	-1.41	-0.49	
Kurtosis	13.98	9.86	
N	828	5969	

S&P 500

Table (3) contains our main results for the stock market return on the S&P 500 index on announcement days and non-announcement days. The same method is used for the S&P 500 as the OSEBX index as described above.

We observe that the average stock market return on announcement days for the S&P 500 is 8.95 bps, with a t-statistic of 2.058 which makes it statistically significant at a 5%-level and we can then reject the null hypothesis from our hypothesis 2 and conclude that macroeconomic announcements affect the U.S. stock market. On non-announcement days, the average stock market return drops significantly compared to announcement days. However, with a t-statistic of 1.134, it is not statistically significant on any level. This is consistent with the findings from Savor and Wilson (2013). As opposed to Savor and Wilson (2013), we do not manage to capture a statistically significant difference in means between the average return on announcement days versus non-announcement days, due to differences in the data. However, the general numbers state the same in our paper as in theirs.

Table (3): Includes the stock market returns on announcement days and on non-announcement days, with descriptive numbers for the U.S. stock market. The difference is found using a difference in means analysis.
**** 1%, ** 5%, * 10%. Numbers are expressed in basis points.*

	S&P 500		
	Announcement days	**Non-announcement days**	**Difference**
Mean	8.95**	1.80	7.15
T-statistic	2.058	1.134	1.543
1%-percentile	-297.42	-352.04	54.62
25%-percentile	-52.63	-49.06	-3.57
Median	11.28	5.65	5.63
75%-percentile	73.28	59.36	13.92
99%-percentile	329.47	335.18	-5.71
Std.dev	125.67	122.69	
Skewness	-1.13	-0.28	
Kurtosis	12.79	12.77	
N	836	5961	

When comparing the findings from the Norwegian stock market and the U.S. stock market, we are not surprised. Our initial thoughts were that the U.S. stock market would be affected the most by macroeconomic news within their own country rather than how the U.S. macroeconomic news would affect the Norwegian stock market. We get a higher average return on announcement days on the U.S. stock market than on the Norwegian stock market, while the results on announcement days on the U.S. stock market is also statistically significant.

Separate announcement types

Further, we wanted to test the stock market return on the different kinds of announcements, to check how each of them separately impacts the returns. Hence, to perform this OLS regression, we used the Newey West standard error with 5 lags. The regression is created using dummy variables, for which the variables equal 1 if the respective announcement occurs and 0 otherwise. The results from the Norwegian stock market can be seen in Table (4).

Table (4): Includes the OLS-regression for the three different announcement types on stock market returns on both announcement days (Estimate) and non-announcement days (Intercept) on the Norwegian stock market. t-statistics are calculated using the Newey West standard error with 5 lags. The different announcements are dummy variables, where it equals 1 if the announcement occurs and 0 otherwise.
***** 1%, ** 5%, * 10%. Numbers are expressed in basis points.**

OSEBX				
	Non-announcement	**FOMC**	**PPI**	**Employment**
Intercept	2.43	-	-	-
Estimate	-	25.73**	-11.54	6.40
Std.dev	2.24	10.99	10.77	9.77
P-value	0.279	0.019	0.284	0.512
R^2	0.0009			
N	6797			

We can see that the return on the OSEBX index increases on FOMC interest rate announcement days by 25.73 bps, and this is also statistically significant at a 5%-level with a p-value of 0.019. We are then able to reject the null hypothesis from our hypothesis 3, which indicates that the FOMC interest rate announcement impacts the Norwegian stock market more than the PPI announcements and the employment announcements. This might be because the Norwegian market is in general more dependent on how the U.S. handles its monetary policy as Norway does a lot of business with the U.S. Hence, they are more reliant on the currency status of the U.S. dollar, as well as uncertainties regarding the monetary status. The business side of the aspect may weigh more than other parts of the economy, thus higher average returns on FOMC announcement days. On PPI announcement days, the log return decreases with 11.54 bps but is statistically insignificant with a p-value of 0.284. On days when news regarding the employment status is revealed, the return decreases with 6.40 bps, while being statistically insignificant with a p-value of 0.512. On non-announcement days, the average return is 2.43 bps, however, this is not significant on any significance level. The same procedure is done for the S&P 500 index in Table (5) below.

Table (5): Includes the OLS regression for the three different announcement types on stock market returns on both announcement days (Estimate) and on non-announcement days (Intercept) on the U.S. stock market. t-statistics are calculated using the Newey West standard error with 5 lags. The different announcements are dummy variables, where it equals 1 if the announcement occurs and 0 otherwise.
**** 1%, ** 5%, * 10%. Numbers are expressed in basis points.*

S&P 500

	Non-announcement	**FOMC**	**PPI**	**Employment**
Intercept	1.78	-	-	-
Estimate	-	22.80***	-3.85	8.32
Std.dev	1.43	8.32	7.72	6.96
P-value	0.214	0.006	0.618	0.232
R^2	0.0013			
N	6797			

On the S&P index, the return increases by 22.80 on FOMC interest rate announcement days, this is also statistically significant at a 1%-level which means that we can reject our null hypothesis from hypothesis 4 and we can conclude that FOMC interest rate announcements impact the U.S. stock market more significantly than both inflation and employment announcements. On PPI announcement days, the return decreases by 3.85 bps, and on employment announcement days, returns increase by 8.32 bps. However, none of these are statistically significant with a p-value of 0.618 and 0.232, respectively. On non-announcement days, the return increases by 1.78 bps. This is not statistically significant on any level.

Savor and Wilson (2013) tested all the announcements combined and concluded that stock market returns increase on days when important macroeconomic news is scheduled for release. When we tested for separate announcements, we find that PPI announcements and employment announcements are statistically insignificant, while FOMC announcements is statistically significant. The reason for this might be that investors in the Norwegian market and the U.S. market do not necessarily rely on the announcements of PPI and employment news when they make decisions, but rather as a measurement tool regarding the state of the economy. FOMC announcements have a more direct involvement in both markets, since this is a rate that affects a lot of businesses in the U.S. market regarding accessing credit and their overall financial status, and the investors react thereby. Since the Norwegian and the U.S. often do business together, the investors in the Norwegian market readjust their expectations thereby.

We also created dummy variables for the different weekdays, to capture the week-day effect. Savor and Wilson (2013) captured significantly lower returns on Mondays, the same applies to Gibbons & Hess (1981). We would not be able to test this hypothesized effect because we only have one announcement on a Monday. As done in Savor and Wilson (2013), we only consider the weekdays from Monday to Thursday. The results can be seen in appendix (1) and (2). On the Norwegian stock market, the only statistically significant value is Wednesday, which has a negative value of 28.05 bps. The U.S. stock market also experiences negative average stock market returns when announcements are announced on a Wednesday, none of the weekdays are statistically significant on any level. This is opposed to Savor and Wilson (2013), who found a positive average return on Wednesday, but it was not statistically significant.

Comparison to Savor and Wilson (2013)

Our results somewhat differ from the work done by Savor and Wilson (2013) when we focus on the U.S. market only. This difference comes from different collection methods, as well as different time periods. Savor and Wilson`s paper includes 20 more years of data than our paper and ends in 2009. Hence, the Covid-19 pandemic did not affect their data, which was when our minimum value occurred. Even though the general idea behind the results is the same, the abovementioned will differentiate the results.

Robustness tests

Subsample testing

For our first robustness test, we wanted to divide our data into four separate periods to see how the main sample behaves differently in different economic conditions or if our results hold in every aspect of the economy. The four different samples from both OSEBX and S&P 500 are shown in the tables below:

The results from the Norwegian stock market show us that three out of four subsamples have a positive difference in means for the average stock market return. Which is in fact in alignment with the results. None of the subsamples are statistically significant on any level. Thus, we cannot conclude that the average return on the Norwegian stock market is affected by U.S. macroeconomic announcements on any of the subsamples.

Table (6): Includes the stock market returns on announcement days and non-announcement days of four different subsamples for the Norwegian stock market. The difference is found using difference in means analysis.
**** 1%, ** 5%, * 10%.*
The t-statistics are presented in brackets. Numbers are expressed in basis points.

OSEBX

	Announcement	**Non-announcement**	**Difference**
1996-2002	8.28	-0.94	9.22 (0.991)
2003-2009	19.87	5.98	13.89 (0.857)
2010-2016	-5.67	2.15	-7.82 (-0.694)
2017-2022	4.81	2.51	2.3 (0.172)

For the U.S. stock market, the average stock market return on announcement days and the difference in means are positive on three out of four subsamples. The first subsample has an average return of 23.27 bps and a difference in means of 24.31 bps, which is statistically significant on a 5%-level. The only negative subsample is the last one, an explanation for this might be the Covid-19 pandemic where the expectation on announcement days was somewhat low due to a recession in the economy.

Table (7): Includes the stock market returns on announcement days and non-announcement days of four different subsamples for the U.S. stock market. The difference is found using difference in means analysis.
**** 1%, ** 5%, * 10%.*
The t-statistics are presented in brackets. Numbers are expressed in basis points.

S&P 500

	Announcement	**Non-announcement**	**Difference**
1996-2002	23.27	-1.04	24.31** (2.508)
2003-2009	6.73	0.59	6.14 (0.654)
2010-2016	4.74	3.85	0.89 (0.123)
2017-2022	-0.42	4.14	-4.56 (-0.431)

Table (8) presents the subsamples for the dummy variables of FOMC, PPI, and employment on the OSEBX index. We see that FOMC announcements are positive on 3 out of 4 subsamples, with a significant p-value on the subsamples 2003-2009 and 2017-2022. The second subsample is significant at a 5%-level and the last subsample is statistically significant at a 1%-level. The PPI-values are negative on 3 out of 4 subsamples, however not statistically significant on 3 out of 4 subsamples. In the last subsample, the PPI announcements decrease stock market returns by 44.21 bps at a 10% significance level. Employment announcement dates are positive for 3 out of 4 subsamples, but only statistically significant on a 10%-level in the first subsample, where releases of employment news increase the stock market returns by 26.41 bps.

Table (8): Includes the OLS regression for the three different announcement types on stock market returns on both announcement days (Estimate) and on non-announcement days (Intercept) on the Norwegian stock market, for the four subsamples. t-statistics are calculated using the Newey West standard error with 5 lags. The different announcements are dummy variables, where it equals 1 if the announcement occurs and 0 otherwise.
**** 1%, ** 5%, * 10%*
The p-values are presented in brackets. Numbers are expressed in basis points.

OSEBX

	1996-2002	**2003-2009**	**2010-2016**	**2017-2022**
Intercept	-0.94	5.98	2.15	2.51
	(0.796)	(0.290)	(0.589)	(0.557)
FOMC	-6.74	57.80 **	5.86	50.77***
	(0.677)	(0.049)	(0.757)	(0.007)
PPI	2.59	-7.52	-1.25	-44.21*
	(0.852)	(0.783)	(0.942)	(0.084)
Employment	26.41*	6.26	-23.2	16.80
	(0.08)	(0.803)	(0.206)	(0.318)

Table (9) presents the subsamples for the different announcements on the S&P 500 index. We see that FOMC announcements impact the S&P index differently than the OSEBX index with positive values in all four subsamples. However, the only statistically significant subsample is the second one, where FOMC interest rate announcements increase stock market returns by 47.95 at a 1%-level. PPI announcements have negative values in the last three subsamples and a positive value in the first one, however, it is not significant on any significance level. Employment announcement is only positive for the first and last subsample, but we only manage to get a statistically significant value on the first subsample, with a value of 28.75 and a p-value of 0.089, which makes it significant on a 10%-level.

Table (9): Includes the OLS regression for the three different announcement types on stock market returns on both announcement days (Estimate) and on non-announcement days (Intercept) on the U.S. stock market, for the four subsamples. t-statistics are calculated using the Newey West standard error with 5 lags. The different announcements are dummy variables, where it equals 1 if the announcement occurs and 0 otherwise.
**** 1%, ** 5%, * 10%*
The p-values are presented in brackets. Numbers are expressed in basis points.

S&P 500

	1996-2002	**2003-2009**	**2010-2016**	**2017-2022**
Intercept	-1.04	0.50	3.85	4.14
	(0.728)	(0.873)	(0.101)	(0.163)
FOMC	20.64	47.95***	14.41	6.15
	(0.145)	(0.007)	(0.366)	(0.742)
PPI	22.32	-11.57	-4.56	-24.57
	(0.146)	(0.467)	(0.649)	(0.208)
Employment	28.75*	-1.44	-2.61	8.51
	(0.089)	(0.913)	(0.819)	(0.513)

The subsamples are mainly consistent with our main results and support our hypothesis of FOMC announcements having the highest impact on stock market returns on the OSEBX index and the S&P index. However, it is more surprising that the FOMC announcements affect the stock market returns on the S&P index less than on the OSEBX index and with an overall lower significance. One should believe that FOMC announcements would have a larger effect in the country it is given, rather than in another country. Nevertheless, it is consistent with what we gathered from our main results above. When looking at all four subsamples separately, the differences could be explained by the different states of the economy in the different time periods.

Excluding outliers

For the second and last robustness tests, we wanted to exclude outliers. We exclude the observations that are outside the 1st and 99th percentile. The excluding of outliers is mainly done to check if our main results still hold when removing the most extreme values. When excluding the outliers, the data sample was reduced from 6979 observations to 6661 observations, thus 318 observations were removed. Total announcement days that match trading days are reduced by 16 days on the OSEBX index. While on the S&P 500 index, it was reduced by 12 days. The test results can be seen in appendix (3) and (4). We still find no significant positive returns on announcement days on the Norwegian stock market. However, we do find significant positive returns on non-announcement days, which was 3.9 bps and statistically significant on a 5%-level. On the U.S. stock market, we still find that the stock market return is statistically significantly higher on announcement days, which is in line with the results gathered from Savor and Wilson (2013). In contrast to what they find, we find lower returns when excluding outliers, while they find higher returns. On the U.S. market, we also manage to find statistically significant returns on non-announcement days, with an average stock market return of 2.33 bps and significant on a 10%-level. The difference in means is still positive for both the Norwegian and the U.S. markets, but not statistically significant for either.

When looking at the announcements separately, FOMC announcements still have the highest impact on the stock market returns in both markets. On the Norwegian stock market, the average stock market return on FOMC announcement days decreases from 25.73 bps to 18.05 bps, while also being less significant (5%-level to 10%-level). On the U.S. stock market, the average stock market return on FOMC announcement days decreases from 22.80 bps to 19.41, while still being statistically significant on a 1%-level.

Conclusion

This paper studies how macroeconomic announcements from the U.S., such as interest rate announcements (FOMC), inflation announcements (PPI), and employment announcements affect the stock market return on the S&P 500 index on the U.S. stock market and the OSEBX index on the Norwegian stock market. The study is relevant due to its relative importance to investors, and due to its relevance towards today's situation with several interest rate changes and high inflation worldwide. Our beliefs were that stock market returns for both the Norwegian stock market and the U.S. stock market should increase on days when important macroeconomic news was up for release and that FOMC announcements would have the highest effect on the stock market returns on both markets.

Our beliefs were indeed confirmed for the U.S. stock market as on days when interest rate announcements (FOMC), inflation announcements (PPI), and employment news is scheduled to be released the average stock market return increase by 8.95 bps, compared to 1.80 bps on non-announcement days. On the Norwegian market, we provide evidence that on announcement days, the average stock market return increases by 6.96 bps, compared to 2.43 bps on non-announcement days. However, this was not statistically significant on any level. When we divide the macroeconomic news into different news types, we experience that the average stock market return on both the Norwegian stock market and the U.S. stock market is mostly affected by the FOMC news. As well as being the only news type that is statistically significant.

This empirical study and the result from this empirical study follow several other studies, as well as the study done by Savor and Wilson (2013). We differentiate ourselves in this study by separating the different news types, different time period and by including a smaller economy to capture the effects. Which leads to different results than Savor and Wilson (2013). The effects are somewhat similar between the Norwegian stock market and the U.S. stock market, which is not at all surprising as the Norwegian investors and the market in general highly rely on what is happening in the United States of America.

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Appendix

Appendix (1): Includes the weekday effects on the Norwegian stock market, where the weekdays Monday to Thursday equals dummy variables.
**** 1%, ** 5%, * 10%.*
The p-values are presented in brackets. Numbers are expressed in basis points.

Weekday effects - OSEBX	
Intercept	8.09
	(0.243)
Announcement	1.92
	(0.895)
Monday	24.04
	(0.861)
Tuesday	-2.15
	(0.872)
Wednesday	-28.05**
	(0.021)
Thursday	3.65
	(0.821)

Appendix (2): Includes the weekday effects on the Norwegian stock market, where the weekdays Monday to Thursday equals dummy variables.
**** 1%, ** 5%, * 10%.*
The p-values are presented in brackets. Numbers are expressed in basis points.

Weekday effects - S&P 500

Intercept	9.25*
	(0.099)
Announcement	25.63**
	(0.027)
Monday	32.89
	(0.765)
Tuesday	0.49
	(0.963)
Wednesday	-14.33
	(0.141)
Thursday	0.31
	(0.981)

Appendix (3): Includes the stock market returns on announcement days and on non-announcement days for the Norwegian stock market, after removing outliers outside 1st percentile and 99th percentile. The difference is found using difference in means analysis.
**** 1%, ** 5%, * 10%. Numbers are expressed in basis points.*

OSEBX (Excluding outliers 1st percentile & 99th percentile)

	Announcement days	**Non-announcement days**	**Difference**
Mean	7.74	3.90**	3.84
T-statistic	1.572	2.096	0.730
N	812	5849	

Appendix (4): Includes the stock market returns on announcement days and on non-announcement days for the U.S. stock market, after removing outliers outside 1st percentile and 99th percentile. The difference is found using difference in means analysis.
**** 1%, ** 5%, * 10%. Numbers are expressed in basis points.*

S&P 500 (Excluding outliers 1st percentile & 99th percentile)

	Announcement days	Non-announcement days	Difference
Mean	8.62**	2.33*	6.29
T-statistic	2.311	1.799	1.595
N	824	5837	

Appendix (5): Includes the OLS-regression for the three different announcement types on stock market returns on both announcement days (Estimate) and on non-announcement days (Intercept) on the Norwegian stock market, after excluding outliers outside 1st percentile and 99th percentile. t-statistics are calculated using the Newey West standard error with 5 lags. The different announcements are dummy variables, where it equals 1 if the announcement occurs and 0 otherwise.
**** 1%, ** 5%, * 10%. Numbers are expressed in basis points.*

OSEBX (Excluding outliers 1st percentile & 99th percentile)

	Non-announcement	FOMC	PPI	Employment
Intercept	3.85**	-	-	-
Estimate	-	18.05*	-4.97	4.31
Std.dev	1.83	9.32	7.90	8.78
P-value	0.035	0.053	0.529	0.624
R^2		0.0006		
N		6661		

Appendix (6): Includes the OLS-regression for the three different announcement types on stock market returns on both announcement days (Estimate) and on non-announcement days (Intercept) on the U.S. stock market, after excluding outliers outside 1st percentile and 99th percentile. t-statistics are calculated using the Newey West standard error with 5 lags. The different announcements are dummy variables, where it equals 1 if the announcement occurs and 0 otherwise.
**** 1%, ** 5%, * 10%. Numbers are expressed in basis points.*

S&P 500 (Excluding outliers 1st percentile & 99th percentile)

	Non-announcement	FOMC	PPI	Employment
Intercept	2.23*	-	-	-
Estimate	-	19.41***	-0.54	6.71
Std.dev	1.24	7.60	5.82	6.60
P-value	0.071	0.009	0.926	0.309
R^2	0.001			
N	6661			

Appendix (7): Includes the weekday effects on the Norwegian stock market, after excluding outliers outside 1st percentile and 99th percentile. The weekdays Monday to Thursday equals dummy variables.
**** 1%, ** 5%, * 10%.*
The p-values are presented in brackets. Numbers are expressed in basis points.

Weekday effects – OSEBX (Excluding outliers 1st percentile & 99th percentile)	
Intercept	7.76
	(0.185)
Announcement	4.67
	(0.702)
Monday	24.37
	(0.832)
Tuesday	-20.01*
	(0.076)
Wednesday	-18.83*
	(0.067)
Thursday	3.72
	(0.783)

Appendix (8): Includes the weekday effects on the U.S. stock market, after excluding outliers outside 1st percentile and 99th percentile. The weekdays Monday to Thursday equals dummy variables.
**** 1%, ** 5%, * 10%.*
The p-values are presented in brackets. Numbers are expressed in basis points.

Weekday effects – S&P 500 (Excluding outliers 1st percentile & 99th percentile)	
Intercept	10.18**
	(0.042)
Announcement	20.81**
	(0.045)
Monday	31.96
	(0.7432)
Tuesday	-2.31
	(0.8080)
Wednesday	-8.64
	(0.3195)
Thursday	-8.28
	(0.4619)