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Monetary policy announcements and stock market reactions

Evidence from the Finnish stock markets in 2000-2022

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ABSTRACT:

After the global financial crisis in 2008, the monetary policy of central banks has changed dramatically, and especially in recent years, unconventional monetary policy actions have played a more central role in the monetary policy pursued by central banks around the world. Quantitative easing and historically low interest rates have directed capital to riskier investments such as the stock market. This thesis examines the relationship between the European Central Bank monetary policy and the Finnish stock market, focusing especially on the short-term effects that monetary policy announcements have on the Finnish stock market. Daily stock index returns are used as a measure for reactions. The research has been conducted as an event study, which examines the effect of individual events on changes in the share price. The event window is three days around monetary policy announcements, the day before, the day of the announcement, and the day after the announcement. Each monetary policy announcement is treated as its own event, and for each announcement, abnormal return from what is expected is calculated. The research material needed for the study has been compiled manually by going through all the monetary policy announcements of the European Central Bank from 2000 to 2022, and the monetary policy announcements have been divided into four categories: no changes in interest rates, interest rate increases, interest rate decreases, and unconventional monetary policy actions taken in the announcement. In addition to this, the data set contains 5778 daily observations of the OMXHPI price index of the Helsinki Stock Exchange. Based on the data, abnormal returns are calculated for each of the three days, and cumulative abnormal returns are calculated for the entire event window. The statistical significance of the abnormal returns obtained from each announcement is tested with a t-test. The statistical significance of average abnormal returns is tested over the entire data period through the examination of cumulative returns of individual days and the event window. This is done by using the average abnormal return in a t-test, and the average cumulative abnormal return is analyzed in the same way. Corresponding average abnormal returns are also calculated for market sentiments (bull and bear market) and monetary policy direction cycles (tightening and loosening monetary policy) to determine the effects of different market sentiments and monetary policy direction trends on the stock index.

The findings of this thesis show that during the three-day event window, the cumulative abnormal returns are statistically significant, while the individual days during the event window are not found to result in statistically significant abnormal returns. Market sentiment was found to be a significant factor in how the markets react to monetary policy announcements. The direction of monetary policy is also a significant factor in explaining market reactions; loosening monetary policy creates significant abnormal returns, while this was not found for tightening policy. Significant evidence of abnormal returns resulting from certain types of monetary policy actions during the event window was not found.

KEYWORDS: central banks, monetary policy, stock prices, interest policy, announcements

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TIIVISTELMÄ:
Vuoden 2008 globaalin finanssikriisin jälkeen keskuspankkien rahapolitiikka on muuttunut dramaattisesti ja erityisesti viime vuosien aikana epätavanomaiset rahapoliittiset toimet ovat näytelleet keskeisempää roolia keskuspankkien harjoittamassa rahapolitiikassa. Määrällinen elvytys ja historiallisen alhaiset korkotasot ovat ohjanneet pääomia riskialttiimpiin sijoituksiin kuten osakemarkkinoille. Tässä tutkielmassa tutkitaan Euroopan keskuspankin rahapolitiikan ja Suomen osakemarkkinoiden suhdetta, keskittyen erityisesti lyhytaikaisiin vaikutuksiin, joita rahapoliittisilla ilmoituksilla on Suomen osakemarkkinoille. Reaktioiden mittarina käytetään päivittäisiä osakeindeksin tuottoja. Tutkimus on toteutettu tapahtumatutkimuksena (engl. Event study) jolla tutkitaan yksittäisten tapahtumien vaikutusta osakkeiden hinnan muutoksiin. Tapahtumaikkuna on kolme päivää rahapoliittisten ilmoitusten ympärillä, päivä ennen, ilmoituspäivä sekä ilmoituksen jälkeinen päivä. Jokainen rahapoliittinen ilmoitus käsitellään omana tapahtumanaan ja jokaiselle ilmoitukselle lasketaan odotetusta tuotosta poikkeava tuotto.

Tutkimusta varten tarvittava tutkimusaineisto on koostettu manuaalisesti läpikäymällä kaikki Euroopan Keskuspankin rahapoliittiset ilmoitukset vuosien 2000–2022 ajalta ja rahapoliittiset ilmoitukset on jaettu neljään kategoriaan: ei muutoksia koroissa, koron nosto, koron lasku ja epätavanomaiset rahapoliittiset toimet, joita ilmoituksella on ilmoitettu. Tämän lisäksi aineisto sisältää 5778 päivittäistä havaintoa Helsingin pörssin hintaindeksi OMXHPI:stä. Aineiston pohjalta jokaiselle kolmelle päivälle lasketaan odotuksesta poikkeavat tuotot ja koko tapahtumaikkunalle lasketaan kumulatiivinen poikkeava tuotto. Jokaisesta ilmoituksesta saatava poikkeava tuoton tilastollinen merkitsevyys testataan t-testillä. Yksittäisten päivien sekä tapahtumaikkunan kumulatiiviset tuotot testataan myös keskimääräistä poikkeavaa tuottoa hyödyntäen siten, että koko aineiston ajalta laskettujen poikkeavien tuottojen keskiarvon tilastollinen merkitsevyys testataan t-testillä ja keskimääräinen kumulatiivinen poikkeava tuotto testataan samoin. Vastaavat keskimääräiset poikkeavat tuotot lasketaan myös markkinasentimenteille (härkä ja karhumarkkina) sekä rahapolitiikan suunnan sykleille (tiukentava ja löysentävä rahapolitiikka) jotta eri markkinasentimenttien ja rahapolitiikan suunnan trendin vaikutuksia voidaan selvittää.

Tutkimuksen tuloksista huomataan, että käsitellyn kolmen päivän aikaikkunan kumulatiiviset tuotot poikkeavat tilastollisesti merkittävästi odotetusta tuotosta, mutta yksittäisten päivien tuotot eivät poikkea merkittävästi odotuksista. Markkinasentimentin huomattiin olevan merkittävä tekijä siinä, miten markkinat reagoivat rahapoliittisiin ilmoituksiin. Myös rahapolitiikan suunta on merkittävä tekijä markkinareaktioiden selittäjänä; löysentävä rahapolitiikka tuottaa merkittäviä poikkeavia tuottoja, kun tiukentavan politiikan osalta tätä ei havaittu. Todisteita tietynlaisten rahapoliittisten toimien aiheuttamista poikkeavista tuotoista kolmen päivän aikaikkunan aikana ei löydetty.

KEYWORDS: central banks, monetary policy, stock prices, interest policy, announcements

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1. Introduction

Central Bank monetary policy decisions and actions have been one very topical subject in the stock markets since the financial crisis in 2008. The monetary policy we see today might seem radical to the past economists and policymakers. Large-scale security purchase programs and policy frameworks, which are new, remain a source of confusion for investors as well as ordinary citizens. (Bernanke, 2022) After the financial crisis, different sorts of unconventional monetary policies have moved the markets and we have witnessed historically low interest rates, even negative rates in some areas. According to Baumann, Lodge & Miescu (2024), the support provided by central bank policies acted a significant role in the GDP growth during the financial crisis. For a long time, the zero lower bound was seen as a limitation of conventional monetary policy, but as we have seen in recent years, this has been tackled with what we know as unconventional actions, and negative market interest and deposit rates have been the reality. In the 2020s we have witnessed massive actions to support the economy in the form of quantitative easing (QE) and very recently as inflation started to rise, quantitative tightening.

Covid-19, for example, caused a massive decline in economic activity, which could have led to recession, with more radical consequences than we saw. The main reason why we did not end in a more radical decline in the economy is the monetary policy which was conducted by central banks all over the world. This has been shown as an effective way of boosting the outcome of the economy and returns of stock markets by Feldkircher, Huber, and Pfarrhofer (2021). Hartley, Jimenéz, and Rebucci (2022) focused on quantitative easing and bond yields, finding that quantitative easing has not lost its effectiveness in the developed markets. We can say that central banks are playing a valuable role in the economy. There has been extensive examination of causality with monetary policy decisions and changes in financial markets. It is quite commonly known that unexpected changes in monetary policy have a larger impact on stock prices, as well as all the non-anticipated information.

While price stability is the main mandate for most central banks, the fluctuations of prices are not so easily controlled, and it requires a large toolbox so the complex dynamics of price development can be kept smooth. The central bank of the United States, the Federal Reserve, also serves another mandate, which is maximum employment. As this thesis focuses on the European Central Bank, the maximum employment mandate is not discussed deeply. The strategy of the ECB and Federal Reserve is mostly built on statistics that are gathered in the Euro area or the US, and published at some point in time, which is later than the actual timing of the data. This makes the monetary policy usually come with a little delay compared to the markets where prices are formed. This requires flexibility and forecasting from central banks and their policies. The Federal Reserve's monetary policy has been described as forecast targeting (Svensson, 2020) and the ECB's strategy as forward-looking (Hartmann & Smets, 2018) which means the same goal; being ahead to maintain low volatility and uncertainty in economies.

Central banks' announcements are closely followed and monitored by financial markets, the general public, the media, and investors (Abel, Bernanke, & Croushore 2014). Economists and analysts are all the time analyzing and forecasting the movements in markets and stock prices. One thing that is frequently measured is the effect of some economic event or other kind of event on stock prices. One relevant question is, what happens to the stock prices when central banks are publishing an announcement on their monetary policy actions, in other words, how do stock markets react to this new information? An interesting aspect of central bank announcements is, that the timing of these announcements is usually well known in advance and therefore tried to price in as well as possible. Do the forecasts given by economists and analysts guide the market to price efficiently the upcoming actions taken by central banks? The theory suggests that only surprises will affect market prices.

Common sense says that if the markets are efficient towards interest rate policies, prices should change approximately the amount that the change in discount factor presumes. I.e., the future cash flows are discounted with a new discount rate when central banks raise or decrease the interest rates. If this is not the case, then it seems that the markets

are reflecting also other information, like expectations, etc. which might not have factual fundamentals, and inefficiencies might appear. To measure the impact of something on the financial markets, economists as well as academics often employ a methodology known as event study.

The objective of this thesis is to investigate the relationship between European Central Bank monetary policy announcements and the market returns in the Finnish stock market, the Helsinki Stock Exchange. The study aims to analyze the impact of the announcements on stock market returns and identify statistically significant abnormal returns associated with monetary policy decision announcements around the announcement.

To examine the impacts of the announcement, this study employs a traditional event study method on how the monetary policy decisions by central banks are affecting the Finnish stock market. The study is conducted to examine if the monetary policy announcements are creating systematically, and on average significant abnormal returns in the Finnish stock market by the given event window, and testing the significance of the abnormal returns.

1.1 Purpose of the Study

As said, this study examines monetary policy announcements by the European Central Bank, the results these announcements create in the stock market, and the significance of these reactions. The study is conducted by forming a data set with all monetary policy announcements by the ECB from 2000 to 2022, with information on actions taken in the announcement. The actions are divided into four categories; no changes in rates (if the announcement did not include a change in any of the three main rates), interest rate raise, interest rate decrease, and whether the announcement included unconventional monetary policy actions. The purpose is not to analyze the qualities of the decisions but to examine the reaction that is seen in the markets on the day before the announcement, announcement day, and day after the announcement. As the qualities of the decisions

are not analyzed more in-depth, these four categories are simply yes or no questions in the data set.

Many studies have been conducted to measure the volatility or trading activity in the markets at the time of the announcement. Vähämaa & Äijö (2011) examined how the Federal Reserve's monetary policy decisions affected the implied volatility of the S&P500 index. A similar approach would have been suitable for this thesis, but as the Helsinki stock exchange is a rather small market, the implied volatility for Finnish stock markets is not calculated as it is for the S&P500. This makes the defining of surprise a little bit hard, which the implied volatility would have expressed.

The interest in this study is to examine the pre-event day, event day, and post-event day returns of the stock markets, not the trading volumes or volatility. With this 3-day event window, it can be tested, if the market movements are stronger around the announcement date or if the strongest abnormal returns are seen on the actual announcement day. This event window provides a short time horizon view on the effectiveness of monetary policy and market efficiency towards these announcements from the stock market perspective.

1.2 Research question

The research question is the following: to what extent do European Central Bank monetary policy announcements impact Finnish stock markets on the announcement day and around the announcement date? The primary objective of this study is to assess the stock market efficiency, concerning the actions undertaken by European Central Bank. Each monetary policy announcement is treated as an independent event. The purpose is to assess if the different characteristics of announcement contents have different outcomes in stock markets. The main idea is to focus on the specific date when the announcement is made and on the contents of the announcement itself, not analyze the possible speeches or interviews given by representatives of the European Central Bank.

After all, the purpose is to understand how the markets are reacting to new information that is given in the announcement release.

The period, which will be used in this study includes announcements from the beginning of 2000 to the end of 2022. By taking over 20 years to the scope, the possible stronger effects of the unconventional actions we have seen lately can be eliminated. With over 20 years of observations, it is also easier to identify if the reactions differ in times of recession and strong economic environments. In the analysis, this aspect is analyzed by examining the cycles of monetary policy and the reactions seen during tightening cycles and loosening cycles.

1.3 Development of Hypotheses

This subchapter discusses the hypotheses of the thesis. Based on the existing literature, discussed further in Chapter 3, and the purpose of this study the following hypotheses have been formed:

H1a: The European Central Bank's monetary policy announcements have a significant impact on the Finnish stock market on the days surrounding the announcement and announcement day.

H1b: The European Central Bank's monetary policy announcements have a significant impact on the Finnish stock market on the three-day event window measured by cumulative abnormal returns.

H2: Announcement day creates the highest abnormal returns in the event window.

H3: Investor sentiment has a significant effect on how markets react to monetary policy announcements.

H4: The direction of the monetary policy cycle is a significant factor in the stock market reaction toward monetary policy announcements.

These hypotheses help to test the relationship between Finnish stock markets and Central Bank monetary policy while considering also how the stage of the economy will affect the results.

1.4 Contribution

This study examines the market reactions using stock market returns as a measurement. There are numerous studies conducted with volatility as a measure for the reactions. This study gives insight into how the returns will be distributed between pre-announcement day, announcement day, and post-announcement day in the Helsinki stock exchange.

To understand how the content of the announcement affects markets, the four different characteristics are also analyzed individually. On the other words, the cumulative average abnormal returns and average abnormal returns are calculated as well for all announcements with different characteristics. The findings of this study help interpret the reactions seen in the Helsinki stock exchange and examine how efficiently markets are pricing the new information.

It is also examined if the abnormal returns are on average highest on the event day or the day before or after, this helps to understand how markets are anticipating the announcements. The analysis of abnormal returns can also help to understand the effect of expectations and confidence about the future on the reaction seen toward the monetary policy announcements. As the timing of most monetary policy announcements is known in advance, this is a good way to measure how efficient the expectations of the markets, and forecasts of the markets are toward these announcements. The analysis of bull- and bear market sentiments and different directions of monetary policy gives a

wide perspective on the relationship and helps also to understand how efficient markets see the monetary policy actions from the financial markets perspective.

2 Theoretical background

This section discusses the theoretical background related to the topic of this study and the basic causalities between the stock market and central bank monetary policy. The first chapter discusses shortly the history and development of central banking and the main tasks of central banks in general. The functions of the European Central Bank will be discussed, as it is at the center of this thesis.

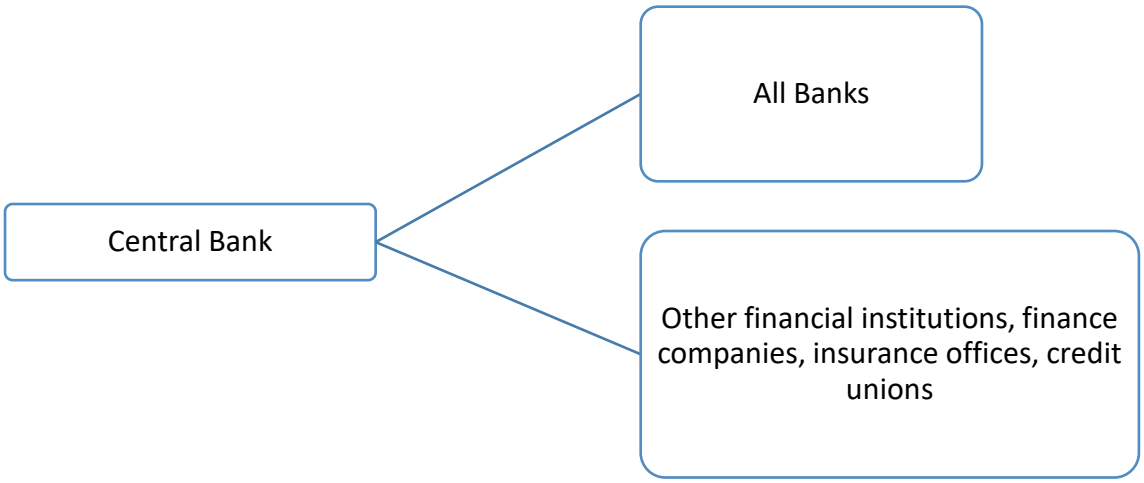
2.1 Central Banks

The early stage of central banking reaches as far back as the seventeenth century, i.e. to the 1600s. The first institution that could be described as a central bank is the Swedish Riksbank, founded in 1668. Some years later the Bank of England was established. What was in common with these first central banks, was the purpose which they were founded for; to purchase government debt. Later, other central banks were founded also to deal with the disorder in the context of monetary. The earliest central banks issued notes to serve as currency on which they often had a monopoly. The major change, when it comes to the goals of central banks and their focus areas, happened after the First World War. The interest of central banks started to move towards employment and price levels. (Bordo, 2007)

The actions of central banks and the central banks in general, can still nowadays be a little blurred, although most central banks do argue in favor of transparent central banking. The business of central banks is technical, and it requires a very high skill set to do successfully, which leads to situation where the actions cannot be easily described or explained, and understanding the actions requires a prerequisite about how the economy works and what is the purpose that central bankers try to fulfill. (Singleton, 2011)

As it is seen, central banks have a long history, and they are playing a crucial role in the economy. In today's economy, they are a public institution that has the power to control

the money supply, meaning the actual amount of money in circulation. Some countries have their own central banks, for example, the Bank of England or the Sveriges Riksbank, and some areas, like the euro area have their own central bank, which is the responsible authority for the euro area. Setting the interest rates is one of the main tools central bankers have. Interest rates are the ‘’cost of money’’ and by setting the interest rates, central banks can make an impact on the market rates, by which commercial banks loan money forward to individuals, companies, etc. A central bank is therefore not a commercial bank, and individual people cannot open accounts in central banks. (ECB, 2015) One of the most important outcomes of the Central Bank monetary policy is the effect seen in the market interest rates. When central banks raise rates, they control the risk-free rate level, which is crucial in the valuation of different asset classes. Therefore, the role is instrumental also from the perspective of an equity investor and the stock market in general. The following picture expresses how central banks can lend money and who can take loans from central banks:



Picture 1. Simplified channels for traditional monetary policy tools.

The role of the European Central Bank in the European economy is stated clearly on the front page of their website: ''*We work to keep prices stable in the euro area*'' (ECB, 2023). This means keeping inflation under control, contributing to keep safety in the banking system, and keeping financial infrastructure running smoothly.

The price stability being the priority, the ECB uses monetary policy as a tool to impact inflation and possibly heating economy. In recent years the slowing economy has also been something that ECB has backed. The central bank makes decisions on monetary policy every six weeks, determining what should be done to meet the 2% annual inflation target. The meetings are followed by a press conference where the decisions are discussed by the president of the ECB. The monetary policy decisions are usually included with information on changes in interest rates and possible unconventional actions.

Lately, we have seen a turn in the inflation rates as inflation has been the highest in 30 years in the euro area. European Central Bank has reacted strongly to the increasing

prices by increasing the interest rates. This has been a major driver in the markets since early 2022. This is a textbook example of the actions that will be conducted to keep prices stable.

Monetary policy is generally controlling and changing the amount of domestic currency in circulation to influence nominal exchange, interest rates, and domestic liquidity conditions. Movements in interest rates and exchange rates are affecting the behavior of macroeconomic variables widely. There have been disagreements in the past on how monetary policy should be conducted. Today, controlling inflation is seen as the foremost end goal of monetary policy. (Makin, 2002, p. 97) Nowadays European Central Bank has set the target level at 2%, as it can be achieved most efficiently. In recent years, as there has been a global pandemic situation which interrupted the normal economic behavior of individuals, central banks have employed unconventional monetary policies to support the economy. Three employed unconventional policies by ECB after the financial crisis are the OMT program (Outright Monetary Transactions), negative policy rates, and corporate bond purchases. (Ferrando, Popov & Udell. 2022) Central banks have also started to give more forward guidance on the future policy directions which is considered as unconventional monetary policy action.

When the European Central Bank is pursuing to fulfill its mandate to keep the prices stable, they do this by controlling the three key interest rates. The rates are main refinancing operations (MRO), which is providing bulk liquidity into the banking system, deposit facility rate which banks may use to make overnight deposits in the Eurosystem and rate of marginal lending, which is offering overnight credit to banks from the Eurosystem (ECB, 2023). When the ECB is changing interest rates, it will affect to market rates, and this will lead to changes in the discount factors and therefore valuations of companies. This has straight impact on stock markets as willingness to take risk might change when attractive returns are within reach with lower risk level. The valuation method is discussed later to explain the relationship between rate changes and valuations.

2.1.1 European Central Bank

European Central Bank is the central bank for the Euro area. The first steps in forming ECB were taken in 1988 when it was decided to build an Economic and Monetary Union. The reasons behind the decision can be seen today in the Euro area as there is free capital movements and a common monetary authority. Operating of ECB began in 1998 when it started to operate as a custodian with a mandate to maintain price stability. (ECB, 2023)

In Finland euro was taken as a currency in 1999 and at that time, the possibility to devaluate the former Finnish currency ''markka'' started to become history. The European Central Bank's monetary policy has been at the core of the Finnish economy since then.

In recent years, the role of the European Central Bank has become more and more important, also in the security markets. This has also changed the strategy of the European Central Bank. Markets are waiting for central banks to take actions when things are starting to look bearish. Until March 2022, we lived for years in an environment where ECB target rates were close to zero and Euribor 12 months was negative. The negative interest rate environment started approximately in the first quarter of 2016. Before that, the existence of negative interest rates was argued in a paper by Jarrow, R. (2013) where Jarrow stated that negative interest rates are possible, and the zero lower bound does not exist unlike it was believed before, and on what the unconventional monetary policy tools were previously based on.

The mandate of central banks is needed to pursue, no matter what the macroeconomic circumstances are. This includes the fact, that central banks need to prepare for turbulent periods and times of instability that may arise from their actions. In times of financial crisis back in 2007-2009, according to Mojon (2010), the ECB had very little it could have done to prevent the financial crisis, which was caused by the fragility of the US economy. As a response to the financial crisis European Central Bank had three major steps it took:

Distribution of liquidity to the banking sector, lowering interest rates, and 12-month full-allotment refinancing operations.

After the financial crisis, the role of the ECB has grown significantly, or at least the actions they have done have had a larger and more straightforward impact on security markets. This has been conducted in the form of quantitative easing, with operations called asset purchase programs. These operations are in nature buying securities from the markets, with the main focus on bonds. These asset purchasing programs have continued from the aftermath of the financial crisis and the Covid-19 crisis until this day in some form.

2.1.2 Monetary policy decisions

The monetary policy in the euro area is formulated by the Governing Council of the European Central Bank. The formulation includes decisions related to key interest rates, supply of reserves in the Euro system, monetary objectives, and establishment of guidelines for the implementation of mentioned decisions. They also have the responsibility to adopt the guidelines and make decisions to ensure the performance of the tasks entrusted. The council consists of six members of the Executive Board and governors of the national central banks of the euro area countries. Meetings of the Governing Council are usually set up twice a month in Frankfurt am Main in Germany at ECB's premises. The economic and monetary developments are assessed, and monetary policy decisions are done every six weeks. When the council has other meetings, they discuss issues related to other responsibilities of the European Central Bank and the Euro system. The decisions for monetary policy and other responsibilities are held in different meetings to ensure the separation of decisions. (ECB, 2023)

2.2 Stock markets and monetary policy

One of the key issues and questions in existing literature is how monetary policy decisions move the stock markets, and it is often associated with large movements in prices.

The value of an individual company is often calculated as the value of its discounted cash flows. This method is one of the most used valuation methods and it is linked to the market rates heavily as the market rates usually are in contact with the discount factor.

The discounted cash flow model is expressed as follows:

$$DCF = \frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + \frac{CF_n}{(1+r)^n} \quad (1)$$

Where:

CF_1 = Cash flow, year one

CF_2= Cash flow, year two

CF_n= The cash flow for additional years, until year n

r = The discount rate.

As can be seen, the changes in discount rate have a direct impact to the value of the future cash flows. The further in the future we go, the stronger the impact is. This said the characteristics of an individual company will affect how strong the impact of the rate change is on the valuation done with the DCF model. In growth-stage companies, cash flows are usually further in the future and so-called value companies might generate cash flows constantly and therefore changes in discount factor has a higher impact on the prices of growth companies than value companies.

2.3 Market efficiency

When assessing the impact of an event on stock markets, one key theoretical aspect is the efficiency of pricing the new information to prices. According to Fama (1970), stock prices should always reflect and incorporate all the relevant information. This means

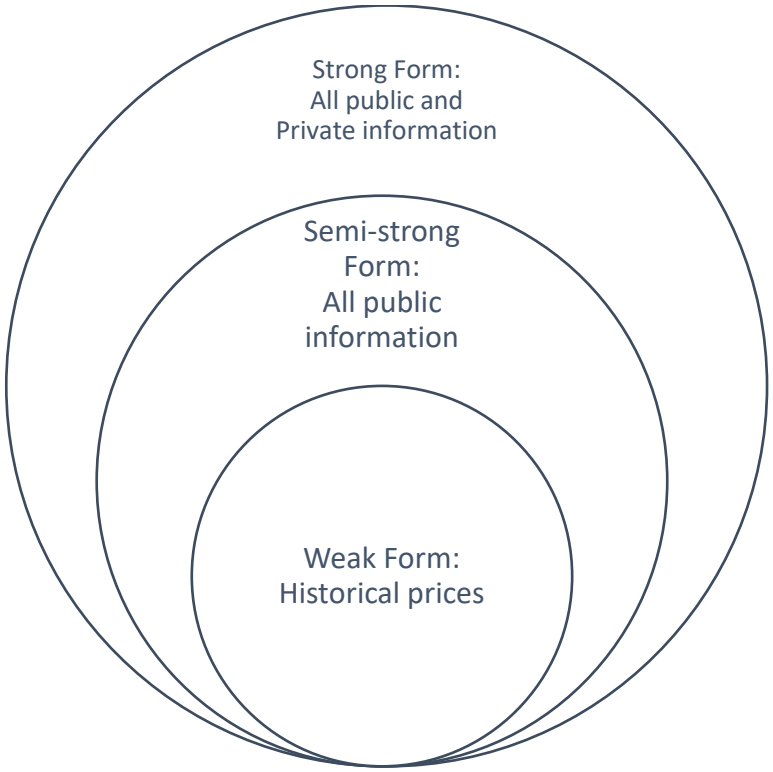
that all the prices should always be correct, and there is no mispricing in the markets, assuming of course that markets are efficient. New relevant information should therefore be in the prices immediately and this is at the center of this thesis. This is known as the efficient market hypothesis.

When central banks are pursuing to fulfill their responsibility to keep the prices stable, they do this by controlling the three key interest rates. The rates are main refinancing operations (MRO), which provides bulk liquidity into the banking system, deposit facility rate which banks may use to make overnight deposits in the Euro system and rate of marginal lending, which offers overnight credit to banks from Euro system (ECB, 2023). As they are changing interest rates that will affect market rates, this will lead to changes in the discount factors and therefore valuations of companies. This has a direct impact on stock markets as the risk willing might change when returns are available with lower risk.

Back in the first paper on efficient capital markets, Fama (1970) divided market efficiency into three forms: weak, semi-strong, and strong form. The weak form is the least rigorous of the three forms. When the weak form is found in the markets, the prices are reflecting the information about the historical prices and therefore move randomly. In a weak form of efficiency, excess returns cannot be earned by following investing strategies that are based on historical prices.

Semi-strong form of efficiency implies that assets are reflecting all public information available. This means, that investors with non-public information, known as inside information, may have an advantage. Anomalies in pricing are found quickly.

The strong form of market efficiency means a state in the markets, where prices are reflecting all information, both public and insider information. This is basically a situation where no additional value-bringing data is available.



Picture 2. Three forms of market efficiency

2.4 Monetary policy tools

When discussing central banks, it is important to understand the different interest rates that are the traditional tools of monetary policy. Nowadays understanding also the other monetary policy tools is important. In this subchapter, the main interest rates, which the European Central Bank uses, are shortly discussed as well as the other tools.

Marginal lending facility

Marginal lending facility is the interest rate, that is used when banks borrow from the European Central Bank overnight. To be able to borrow, banks must provide collateral to ECB. Collateral can be for example securities. As it is usual in banking, these collaterals

are given to guarantee the payback for ECB. (ECB, 2018) This is the rate, which is used to provide overnight credit for banks in the Euro system.

Main refinancing operations rate

Also known as MRO, is the rate that is used when banks borrow from the European Central Bank for one week. As well as a marginal lending facility, also for MRO collateral is needed. (ECB, 2018) This is the rate, which is used to provide bulk liquidity to the banking system.

Deposit Facility Rate

The two interest rates above are rates for banks when they borrow from the central bank. The deposit facility rate is the interest rate when banks make deposits to the central bank. Deposits are overnight deposits. (ECB, 2022) This is the rate for banks to make overnight deposits in the European Central Bank.

These are the three main interest rates, that the European Central Bank sets every six weeks to fulfill their mandate of stable prices in the Euro area. In the previous years, as is generally known, there have been negative interest rates.

Other monetary policy tools, which are considered mostly unconventional policy tools include the following themes:

- Offering central bank loans for banks as they face the need for it. These loans are given against collateral at fixed interest rates.
- Negative interest rates - This has been in use for several years in the Euro area and is used to encourage banks to lend with lower rates, so businesses and people can borrow with lower interest expense, in other words, cheaper.

- Targeted longer-term refinancing operations (TLTROs). This means long-term lending for banks with the condition that banks will lend this money to businesses and people.

- Asset purchases – This gives the central bank the possibility to buy private and public financial assets.

- Forward guidance – Clear communication on the central bank's intentions for future monetary policy. (ECB, 2024)

As seen from the possible tools central banks can use, they have a significant ability to impact economic activity, in good times as well as in bad times. This gives the central bank a massive responsibility to keep up its credibility, so markets will function normally even when things start to look downwards and not rely too much on central bank interventions.

3 Literature review

In this chapter the focus is on the previous studies on central bank's monetary policy, the relationship of monetary policy and stock markets, and the theories relevant for this thesis. Methodology and previous literature related to the methods of this thesis is discussed later in Chapter 4. Previous research gives an essential wide perspective on the topic and on the findings of existing literature. Previous literature in this context has found that monetary policy may have a significant impact on the stock market's returns and volatility. Many of the studies in the field were conducted before the financial crises that we have seen lately. After the financial crisis in 2008, the role of the European Central Bank has grown significantly, as unconventional tools have become an important tool for the central bank in the Euro area.

When looking back in time and the research conducted in the context of monetary policy and stock markets, we can say there has been a large amount of research done. Money supply announcements have been in the interest of researchers long before the European Central Bank was founded. Pearce and Roley (1983) found in their paper, where they examined stock reactions to weekly money supply announcements, that stock prices respond only to unanticipated changes in money supply. This is in line with the efficient market hypothesis, and it can be assumed that markets should only have significant abnormal reactions if the announcement includes unanticipated information.

Later Pearce & Roley (1985) tested efficient market hypothesis by identifying unexpected components of the announcements and stated that surprises move stock prices. They also found that there is only weak evidence that stocks are responding to surprises beyond the announcement day. This is one aspect of this thesis, as the abnormal returns are observed also from the day after the announcement day. This is tested in paper by Thoerbecke (1997) where the findings state monetary policy exerting large effects on ex-ante and ex-post stock returns, and the effects are in line with the DCF model presented earlier, where we saw that further in the future incoming cash flows are affected more heavily by the changes in discount factor.

Thoerbecke had results where small firms were more effected by monetary policy than large firms. Thoerbecke's findings also explains the greater impact on growth companies than value companies we saw in 2022, when interest rates started to rise. Monetary policy also affects firms' ability to get credit. In the previous years, credit ability of all companies has been quite good, even for smaller and non-profitable companies as interest expenses have been so low. After the rapid rise of interest rates, the effects have also been strongest in small-cap companies.

One of the first significant papers by Bernanke & Blinder (1992) studied the informativeness of the Federal fund rate of monetary policy actions. This was found to be a very informative indicator. Stock market reactions to the policy of the Federal Reserve are discussed in a paper by Bernanke and Kuttner (2005). They found that on average, a hypothetical unanticipated 25-basis-point decrease in the Federal Funds rate target is increasing 1% in stock indexes.

The close relationship between market interest rates and central bank interest rates has been shown. Vance and Sellon Jr (1995) examined the relationship between central bank monetary policy actions and long-term interest. They found that long-term interest rates seem to move well in advance of policy actions. According to Ellingsen & Söderström (1998), if monetary policy reveals information about the development of the economy, interest rates are moving in the same direction in all maturities to policy innovation. On the other hand, if monetary policy is revealing information about the central bank preferences of policy, short rates and long rates move in opposite directions. These studies show a clear relationship between market rates and central bank monetary actions. As we know market rates are crucial in determining the value of a company, determining the risk-free rate often used for example in the capital asset pricing model. Vance and Sellon also made clear points that expectations play a crucial role in the response of long-term rates to monetary actions.

The announcements from central banks have been proven to have a significant effect on investor sentiment, in both bear market and bull market (Kurov 2010). Kurov's findings also show that monetary policy, in times of bear market periods, tends to have a larger effect on stocks that are more sensitive to changes in investor sentiment. This study will test the reactions in different market sentiments, to test whether reactions differ depending on the investor sentiment, in other words, if the reaction differs when markets are bullish or if markets are considered to be bearish. Another paper by Kurov discussing the relationship between the stock market and monetary policy was done in 2012. He found that during economic growth cycles, stocks tend to react negatively to announcements of higher rates ahead, and in recessions, stocks have positive reactions to signals of monetary tightening.

When deciding, whether some new information have been anticipated or can be considered as a surprise, the central bank's announcement schedule is known in advance and therefore forecasted carefully. The surprise effect of a monetary policy announcement has been researched extensively in the past. Nikkinen & Sahlström (2004) found that the S&P 100 index implied volatility is increasing before a scheduled announcement of macroeconomic factors, for example, a Federal Reserve Open Market Committee meeting (FOMC), and after the meeting volatility is decreasing.

Bekaert et al (2013) studied the risk aversion of markets and monetary policy. They found that loosening or lax monetary policy decreases risk aversion and uncertainty. This should support the stock market, as the investors are not afraid of the additional risk as much.

Ricci (2015) studied the impact of monetary policy announcements on large European banks during the financial crisis. She found that banks tend to be more sensitive towards unconventional policies than interest rate decisions. She also states that the same type of announcement, or action may result in different kinds of impact in the markets,

depending on the stage of the crisis. Weaker balance-sheet banks and higher-risk operating banks were more sensitive to monetary policy.

According to Jarocinski & Karadi (2018) surprise monetary policy tightening raises interest rates while it lowers stock prices. The opposite monetary policy information, loosening, on the other hand, raises both interest rates and stock prices. This statement lines up with the basic DCF model presented in Chapter 2.2; as the risk-free rate decreases, the discount factor is lower. On the other hand, when policy is loosening the market interest rates lower which encourages more risk-taking by investors and therefore supports stock markets. Their findings follow the findings of Bekaert et al (2013). Both, policy loosening and tightening are discussed later in empirical analysis, and CAARs and AARs are calculated to test the effect of policy directions.

The quantitative easing, as a method as well as a tool, was clearly described by Claeys, Leandro & Mandra (2015). They showed how the quantitative easing programs are designed to work by describing the process of how the Central Bank is easing the economy. The simplest way to describe the QE is through a monthly purchasing program where the central bank will buy corporate bonds, government bonds, and supranational bonds from the markets and add them to the central bank's balance sheet. This describes easily what is the basics of the tool being used. In this study and its dataset, the unconventional policies are mostly QE programs that are either begun or continued or some kind of instructions on how the program will be done in the future is given.

Fratzscher et al (2016) examined the impact of the ECB's unconventional actions during and right after the financial crisis. They tested a large range of asset prices and portfolios to see if ECB policies have an effect on asset prices. They found that the European Central Bank's monetary policy boosted equity prices. They also found a spillover effect on developed markets and emerging markets, as the policy of the ECB had a positive impact on equity markets and market confidence. They found also a relationship between ECB

policy and lowering credit risk among banks in the euro area as well as in other G20 countries.

Bernanke (2020) talks about overcoming the limits that traditional monetary policy has. He focuses on quantitative easing and forward guidance, which have been the new tools in use by the ECB, Federal Reserve, and other advanced economies central banks. He argues in favor of these new tools, as they have proven to be efficient at easing financial conditions. He also argues that these new tools should become part of the standard toolkit of central banks. These tools are supporting, or at least stabilizing the stock market in default, as forward guidance reduces uncertainty and quantitative easing programs reallocate money into the stock markets.

The unconventional policy by the European Central Bank was discussed by Zabala & Prats (2020) when they tested the effectiveness of unconventional monetary policy on inflation and the growth of the economy. They found a slight impact of balance sheet policies on the inflation rate and growth rate of the economy in the Eurozone. These findings support the effectiveness of monetary policy adopted by the European Central Bank to its mandate of price stability.

When discussing central banks, the financial and economic disruptions especially in the last couple of years been at the center of the discussion. The COVID-19 pandemic caused the latest significant and fast drop in stock prices and economic activity that required central banks to take quick actions to support the economy. Deng, Xu & Lee (2022) discussed COVID-19-related policies and found that for stock markets, rate cuts were significant actions to support stock markets. The findings align with Jarocinski & Karadi (2018), but in a more specific sample period, as stock prices increased when rates were cut. This although does not apply in the euro area, as the rates were already at zero when the pandemic burst.

Blampied & Mahadeo (2023) discussed about uncertainties of monetary policy and stock market uncertainties by testing responses to tightening or easing shocks. They found evidence of monetary policy being a potentially effective tool to reduce uncertainties, through easing policies during recessions and tightening policies during expansion periods. This is discussed later in this thesis when different cycles of monetary policy, tightening cycles, and loosening cycles, are tested.

Bekaert et. al (2023) discussed risk, monetary policy, and asset prices in the context of the global world. The study highlights the importance of central bank policies and the relationship it has with the stock markets. They found that monetary policy has strong domestic effects on stock market prices in both, the US, and Euro area. There are also international spillover effects in US monetary policy to international stock markets, which is somewhat expected given the importance of the US economy and stock markets globally. An interesting finding is the spillover effect in Europe being economically stronger than the US. This is interesting given the relatively small size of European stock markets. Given this, it can be said that the euro area's monetary policy is more significant on stock markets in relative terms.

The impact of conventional and unconventional monetary policy actions by the European Central Bank was recently examined in the context of Swiss stock markets by Fausch & Sutter (2024). They tested the impact of both monetary policy types on the Swiss stock markets and found that the Swiss equity market returns responded significantly to both conventional and unconventional monetary policy. They found that conventional actions only had an impact before the financial crisis.

As seen in the previous literature, the relationship between central bank policies and the stock market exists and is significant. This study tries to explain the short-term relationship between the Finnish stock market and the European Central Bank. The expectation based on previous literature is that the stock market should only result in significant

abnormal results if the announcement included a surprise element that was not already anticipated.

From the literature review, the findings of Kurov (2010), Jarocinski & Karadi (2018), and Bernanke (2020) are especially in touch with this thesis, as their findings are in touch with investor sentiment, interest rate changes and the unconventional monetary policies respectively, and which are in the core of this thesis hypothesis testing. The main previous studies related to the methods are discussed later in chapter 4.

4 Data and research methodology

This chapter discusses the data and methodology used to conduct this thesis. The necessary data for this thesis is easy to find, as the data includes the daily index points from the Helsinki stock exchange and the information from ECB monetary policy releases. The index in this study is the Helsinki Stock Exchange Price Index (OMXHPI). With this data the necessary calculations for returns, standard deviations, abnormal returns, expected normal returns and cumulative abnormal returns can be calculated. Data for the returns is collected from the Nasdaq Nordic website and the European Central Bank release archive.

The data used in the empirical analysis consists of the daily returns from the Finnish stock market main index, the dates of ECB monetary policy announcements, and the actions stated in the announcement. This information is freely available on the central bank's websites. The longer the period in which the research is conducted, the more there needs to go through the historical releases of monetary policy announcements. For this study, all the announcements are gone through manually and the data set is formed by hand to see what the actions have been in the announcement.

Since the purpose is not to study directly what the actions have been, i.e. what the announcements said precisely, the actions are divided into four categories: no changes in rates, interest rate raise, interest rate decline, and information of unconventional monetary policy actions (yes or no). The unconventional actions, as well as the size of the interest rate changes, are not analyzed deeply, or considered in the analysis. It is important to note that the unconventional actions in the announcements are not exactly new actions conducted by the central bank but rather if the announcement included for example some sort of guidance on asset purchase programs or other unconventional actions, it is noted as unconventional actions in the data set.

If the announcement included information that had an impact on the ongoing unconventional actions, for example, change in the amount of asset purchase program or

change in the length of it, it is noted as unconventional actions taken. The purpose is to see what the market reaction is when the announcement is given and to recognize the difference in reaction between different policies. The sample period in the study spans from 2.1.2000 to 30.12.2022. During the sample period European Central Bank has given 268 monetary policy announcements in total, but which three were given on Finland's Independence Day when markets are closed in Finland, and for this reason are left out of the analysis.

Rates were changed 43 times and unconventional actions were included in the total of 63 announcements. Rates remain unchanged in 222 announcements. The sample period includes 5 778 daily observations of the Helsinki stock exchange price index. The returns have been calculated as daily logarithmic returns. For the assessment of the significance of each announcement, there is an expected return needed. The expected returns and how they are calculated are explained in detail later.

Descriptive statistics for the data set and real returns of the event windows are represented below in Table 1.

Table 1: Descriptive Statistics

	No. Of Obs	*Mean*	*Median*	*St.Dev*	*Min*	*Max*
ECB announcements	265					
Daily obs. of OMXH_PI	5778					
No changes in rates	222					
Unconventional actions	63					
Interest rate raise	20					
Interest rate decline	23					
Prior event day returns		-0,0459	0,0603	1,8700	-7,8606	5,8082
Event day returns		0,1427	0,0784	2,4770	-10,7876	14,5631
Post-event day returns		-0,0066	0,0975	1,8838	-5,4717	5,0251

Table 1 gives an overall summary of the statistics regarding the data set. In the table, the event window daily returns are real returns. As we see from the table, In the event window, on average daily returns are positive only on the event day.

4.1 OMXH PI Index

The index used in this study is the Helsinki Stock Exchange price index, known as OMX Helsinki PI. PI means price index. This index tracks the stock performance of all listed companies in the Helsinki stock exchange, without including the effect of dividends. It includes all companies in different business areas and different sizes. Helsinki stock exchange has also a few other indices: OMXH25 & OMXH15 which follows 25 and 15 most traded stocks respectively, and OMXH GI which includes the effect of dividends in the development. For smaller companies, First North Finland PI provides the possibility to become publicly traded, even with a smaller market capitalization.

To assess the effect on prices, and measure the effect of announcements, the price index is most suitable. It is notable that in the early 2000s one company, Nokia, had a significantly large weight on the index. This said some of the movements can be highly correlated with the sensitivity of one company to monetary policy.

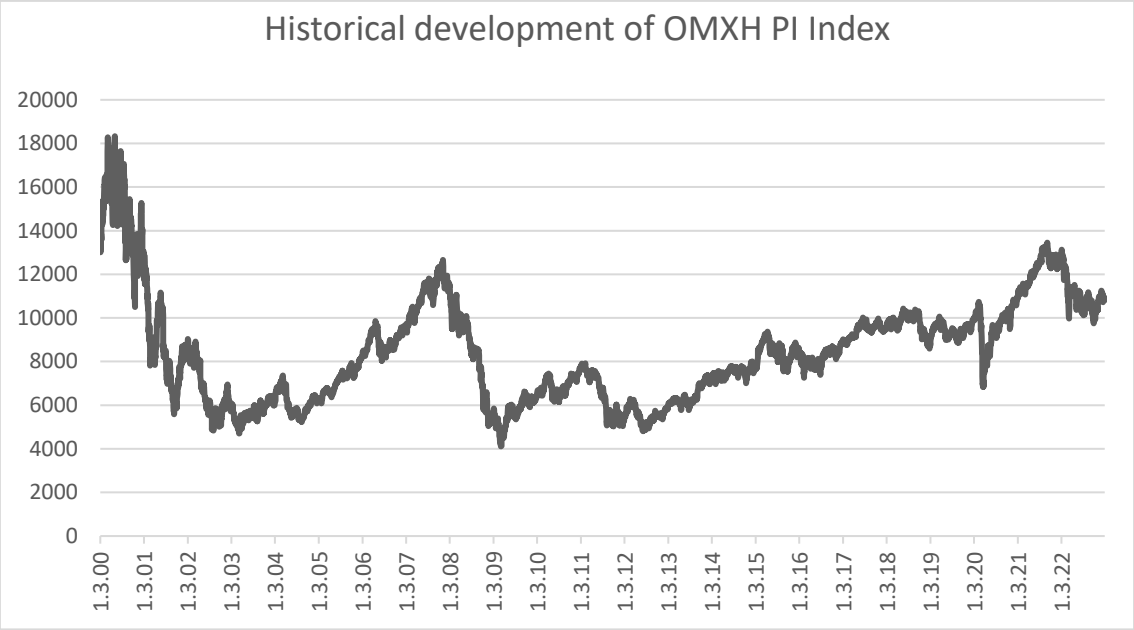
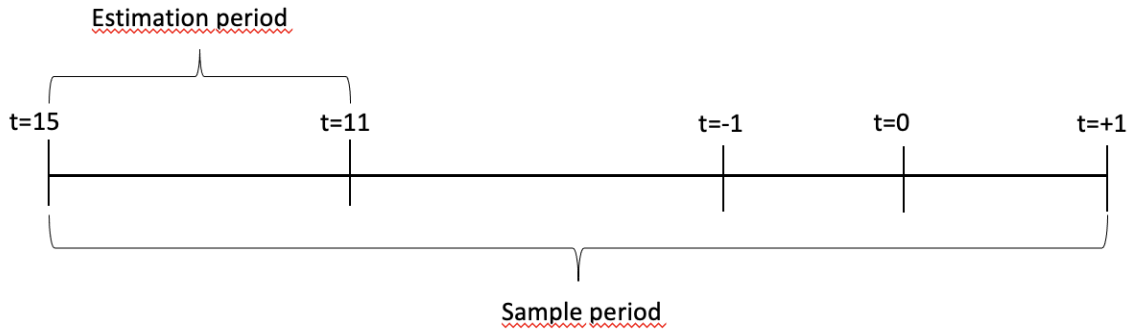


Figure 1: Historical price levels of the OMXH PI Index (Nasdaq, 2023)

4.2 Methodology

This thesis is built on a quantitative approach to examine whether the announcements have a significant effect on the Finnish stock index. The method in this thesis follows the method described by Brown &Warner (1985). With this approach, all the events can be handled as individual events, and measure the market level abnormal returns of each event. This can be achieved by statistically comparing the difference between pre-, event day, and post-event day returns and cumulative returns with the estimation period return (expected return). If there are large abnormal returns, which are statistically significant, the null hypothesis can be rejected and the market has seen the event**,** i.e. the announcement important or containing non-anticipated information.



Picture 3: Event study timeline

Where:
t= trading days relative to event day

To extract monetary policy announcements' effect on the stock index, I use a very traditional abnormal return approach. For the event study, I use a 3-day event window including the day before the announcement, the announcement day, and the day after the announcement. This approach lets us measure how the markets are reacting on the announcement day but also to see if there is delay or anticipation towards the announcement in the market. This will also link to the efficient market hypothesis, which assumes that all relevant information is priced in.

To calculate abnormal returns, the expected returns need to be determined. There are different methods to do this. In this study, we have observations of a market index, and therefore applying some traditional expected return model such as the capital asset pricing model is not a good choice for determining the expected return. The expected return for the index is calculated as an average return from the index for a specific time. As we are going through many events, which some might be very close to each other, determining the estimation window is crucial.

As the efficient market hypothesis assumes, new information is priced in markets efficiently and rapidly, we can assume that market movements will be concentrated around the event. The daily data might give us some noise in the market, which we want to

reduce as much as possible. To do that the estimation period is set to be 5 days and the estimation period is set to be after every event so the new information given in the announcement will be known in the markets on the estimation period. The expected return is discussed later more carefully. This kind of abnormal return approach is widely used in the literature. This approach gives insight which is examined by looking at every announcement individually.

4.3 Issues with Daily Data

When dealing with daily data, there are a couple of important issues that need to be considered. According to Brown and Warner (1985), using daily data might have the following problems:

Non-normality issues

Daily observations of stock returns might differ substantially from normality. There is evidence of daily observations being fat-tailed relative to normal distribution. This is not similarly observed when using monthly data.

Estimation of variance

Estimation of the variance for mean excess return is an important for testing statistical significance. Brown and Warner discuss about an issue that is shown by Beaver (1968) and Patell & Wolfson (1979), they showed that variances of returns are increasing in the days around the events.

4.4 Event study

Event study is an important methodology in finance and economics. It has become an important tool for testing market efficiency after Fama, Fisher, Jensen & Roll (1969) published their somewhat seminal paper. They investigated stock price adjustments to new

information, for example, earnings announcements or some macroeconomic indicators. The theory of efficient markets is most famously stated by Eugene Fama (1970).

After these papers, there has been conducted many relevant papers about event studies and using event study methodology. Brown and Warner (1985) wrote a paper about using daily stock returns in event studies and Campbell and Wasley (1993) discussed the issues of using daily NASDAQ security returns in event studies. Both studies have similarities in the data set and in this thesis, daily data from the Finnish stock market is being used. In 1997 Campbell, Lo & MacKinlay stated modifications for the basic methodology, one of them being using daily return data instead of monthly data. They also stated that the methods to estimate the abnormal return and their significance have become more sophisticated.

MacKinlay (1997) did a study on Event studies, where he discussed the usefulness of the method in the context of finance and economics. The study is a good starting point when looking at the basics of the method and how to conduct the study. Some important models are gone through in the study.

Kothari and Warner (2007) stated in their report that between 1974 and 2000, major journals which they listed being five, have published over 560 articles containing event study results. This said as those are the ones that were published in the five major journals, the number of published papers might be significantly higher if we consider all the journals in the context of finance and accounting.

Some widely known purposes for the event study method have been published in papers that have investigated the effects of terrorist attacks on stock prices (Chen & Siems. 2004), stock price reaction to environmental performance (Yamaguchi. 2008), Aggarwal, Akhigbe, and Mohanty (2012) discussed on the effect of oil price shock to asset prices.

In this study, all the announcements are divided into their own events. From every event, the abnormal returns will be calculated for three days, as well as the cumulative abnormal returns and standard deviation of the abnormal returns. These derive one test statistic, t-statistic which is employed to examine if the announcement has statistically significant impact on the three-day event period.

Identification of the correct event date is essential in event studies. If the date for announcement is known precisely, one day event period that is including the announcement date only is usually the best choice. However, in practice, it might not be possible to know the exact time when the new information is reaching the investors. This causes a problem estimating the event window; if it is too short, it might not include the time when investors truly learn the event, and if it is too long there might be also other factors affecting the price, rather than just the event of interest.

4.5 Measuring the abnormal returns

The measurement of abnormal returns requires the measure of expected normal return. The normal return in this study is measured as an average return of 5 days, ten days before the event window begins. This methodology is known as mean adjusted return. As there have been changes in the pace of monetary policy announcements in the estimation period 2000-2022, especially in the early 2000s the expected returns are mostly estimated from 5 days average, beginning right after event window have closed.

The logarithmic daily returns are calculated as follows:

$$Daily\ return\ R_{it} = \ 100 * log \frac{P_{t+1}}{P_t} \ (2)$$

Where:

R_{it} = the daily return of the index i at time t

P_t= the value of the index at time t

To be able to assess the event's impact, a measure of abnormal returns for index i is calculated as follows:

$$AR_{it} = R_{it} - E(R_{it}) \quad (3)$$

Where:

AR_{it} = Abnormal return

R_{it}= The actual return of index i in time t

$E\ (R_{it})$ = The average return of the share index in time t

In this thesis, the expected return $E\ (R_{it})$ is calculated as a mean of the index returns in time period of five days, 10 days before the event window begins. As the events might be very close to each other, in cases where the estimation period would overlap with the previous event window, the expected returns are calculated from the five-day period starting right after the event window. By doing this, we can estimate the expected returns with the previous event priced in the expected return. Without this, the expected returns would include possibly larger impacts caused by the announcement given in the previous event window. It is also wanted to have a break between the estimation window and the next event window, so the possible anticipation effect of upcoming events can be reduced as much as possible. This is important, so the expected return is not affected by the previous event. With the short estimation period, the dynamic changes over time can be captured in the expected returns and when markets are more volatile, it is also captured in the expected return.

Mathematically the expected return is expressed as follows:

$$Pre\ event\ expected\ return\ \bar{R}_\iota = \frac{1}{5}\sum_{t=-15}^{-11} R_{it} \quad (4)$$

The date of the actual event is *t*=+1 and the event window start one day before; the pre-event day is *t*=0. The model to calculate the expected return is known as mean adjusted return model. The expected return is calculated over 5 days from *t*=-15 to *t*=-11.

The abnormal returns are calculated for the event window, which includes 3 days. The cumulative abnormal returns are the measure of the abnormal returns of the whole event window and is calculated as follows:

$$CAR_{it} = \sum_{n=t-1}^{t+1} AR_{it} \quad (5)$$

Where:

$CAR_{it} =$ sum of abnormal returns of index i in time t

AR_{it} = Abnormal return of index i at time t

In the formula t-1 and t+1 denote the beginning and ending of the event window, with respect to the event day.

The average abnormal returns, AARs are calculated as follows:

$$AAR_t = \frac{1}{N}\sum_{i=1}^{N} AR_{it} \quad (6)$$

Where:

N= presents the number of abnormal returns in the sample

AR_{it}= abnormal returns of index i in time t

And Cumulative average abnormal returns are calculated as follows:

$$CAAR = \frac{1}{N}\sum_{i=1}^{N} CAR_{it} \quad (7)$$

Where:

CAR_{it}= Cumulative abnormal returns of the event windows.

N= presents the number of cumulative abnormal returns in the sample

4.6 Statistical testing

When testing the statistical significance of abnormal returns, there are different tests for evaluating the statistical significance. The most widely employed tests are probably t-tests, z-tests, and F-tests. These have been derived by Patell (1976), and Boehmer, Musumeci, and Poulsen (1991). In 1976 Patell proposed a test statistic, where the event window's abnormal returns are standardized by the standard deviation of the specific estimate window.

4.7 Testing procedure

To test the significance of the abnormal returns, in this thesis t-test is applied. The t-test is one of the most suitable procedures for testing the significance. The mathematical formula which is applied in this data set to get the t value is presented below.

$$t = \frac{Cumulative\ Abnormal\ Returns\ (CAR)}{Standard\ Deviation\ of\ Cumulative\ Abnormal\ Returns\ of\ the\ event}$$

The t-statistic is employed to test the null hypothesis of abnormal returns and cumulative abnormal returns:

For the average abnormal returns (AARs) and cumulative average abnormal returns (CAARs), the t-test is employed. For the mean returns, the t-test is calculated as follows:

$$t = \frac{\bar{x}}{s/\sqrt{N}} \quad (8)$$

Where:

$\bar{x}$ = the mean of ARs and CARs

s = standard deviation of the observations

N = number of observations (no. of abnormal returns and events)

5 Empirical Analysis

The following chapter goes through the empirical analysis and findings of the study. First part discusses the overall results of all the events and are presented in Table 2. Second subchapter discusses the effect of different announcement types, and the third subchapter tests the effects of investor sentiment in respect of the market reactions. The last subchapter discusses how the different cycles of monetary policy will impact the markets.

The empirical analysis includes the ECB monetary policy announcements from the beginning of 2000 until the end of 2022. There are three announcements in total, which are left out of the analysis as they have been given on Finland's Independence Day, and therefore the reaction differs from all the other events as the markets are closed on the event day. All the monetary policy announcements are handled as independent events and for all events cumulative abnormal returns are calculated.

5.1 Results of all announcements from 2000 to 2022

This subchapter discusses the findings of all announcements given between 2000 and 2022.

Table 2. Average abnormal and cumulative abnormal returns of all announcements

ECB announcements 2000–2022	
$CAAR_{\text{event window}}$	0,4519
t-statistic	1,7696*
$AAR_{\text{pre event day}}$	0,0681
t-statistic	0,5730
$AAR_{\text{event Day}}$	0,2770
t-statistic	1,7080
$AAR_{\text{Post Event Day}}$	0,1067
t-statistic	0,8443
Number of announcements	265

*= significant at 10% level

As we can see in Table 2, most market reactions seen in Finnish stock markets are somewhat reflecting the efficient market hypothesis. However, with the chosen event window, the positive cumulative abnormal return of 0.45% implicates a significant abnormal return at the 10% level. This said, we can see that reactions are more likely to cumulate than on average create significant abnormal returns in one day. From the individual days in the event window, the event day itself creates the most significant abnormal returns. This implies, that there is more movement in the market on the announcement day than on the days surrounding it. The movement although is not statistically significant and can be said that on average there is no surprise in the announcement and markets tend to behave efficiently towards monetary policy announcements.

There is not enough evidence to reject the null hypothesis of hypothesis 1a as the abnormal returns associated with the individual days in the event window are not statistically significant. There is moderately significant evidence to reject the null hypothesis of hypothesis 1b and the cumulative abnormal returns associated with the three-day event window are statistically significant. In Table 2 we see that event day does generate the highest abnormal returns, but there is no significant evidence to reject the null hypothesis and therefore hypothesis 2 cannot be confirmed.

In Figure 2 below we see how the different levels of significance have been distributed in all the announcements. Over 60% of the announcements do not create significant abnormal returns over the event window. However, the number of significant announcements is still rather high, as it is almost a third of all announcements. It is notable that on the given event window there are almost identical amounts of announcements significant at 5% and 10% and less at 1%. This given, only 4,5% of the results of the announcement are significant at 1% and therefore markets seem to forecast the announcements rather well.

As the central bank is acting reactively on the economic environment, the announcements are also given in times of crises or other significant events with effects on the markets, and therefore saying the reaction in the markets is caused only by the central bank announcement is not sensible.

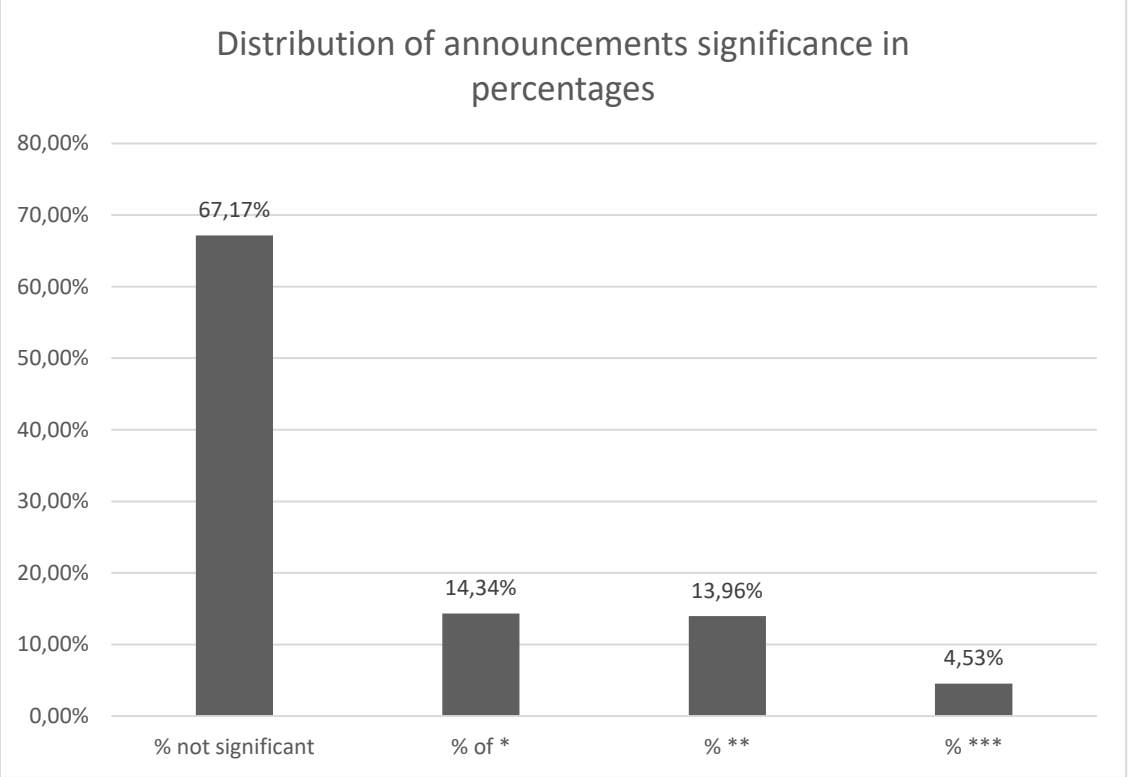


Figure 2: Distribution of cumulative abnormal returns in significance level over the event window period.

Where: *, **, *** indicate the level of significance at 10%, 5%, and 1% respectively.

The announcements in Figure 2 also include an error term for non-announcement-related matters that have an impact on markets. One example of this kind of matter is when 9/11 took place and central banks gave guidance on how they will support the economy. Markets were not only reacting to the announcement but to the aftermath of the whole catastrophe. The distribution of significance levels supports markets being efficient towards the announcements known in advance and is in line with the overall expectation of only surprises resulting in significant abnormal returns.

5.2 The effect of different announcements

This subchapter discusses how the results of different announcement characteristics result in stock markets. In other words, how the actual information in the announcement affects the market reaction. The AARs and CAARs are calculated by taking all the announcements with the same information, i.e. if the announcement included an interest rate raise and unconventional actions the abnormal return of that announcement is included in both.

Table 3. Different announcements and reactions.

	AAR_{-1}	AAR_0	AAR_{+1}	$CAAR_{Event\ window}$
No changes in rates	0,0975	0,2444	0,0763	0,4182
Unconventional actions	0,2894	0,0793	-0,2090	0,1597
Interest rate raise	-0,0128	0,2458	0,4853	0,7183
Interest rate decline	-0,1544	0,6405	0,0328	0,5189

From Table 3, we can see the interesting distribution of how average abnormal returns are highest in the event day when there are no changes in the rates and when interest rates are declining. This is an expected reaction, as most of the announcements do not include a change of interest rates, and therefore can be said that this is the most common, and most anticipated announcement. The interest rate decline and the immediate reaction to it is in line with Jarocinski & Karadi (2018) and the expectation that declining interest rates are supporting higher returns in stocks.

On the other hand, an interest rate raise seems to make the market think longer on the direction, as the post-announcement day is creating the highest average abnormal

returns on interest rate raise. The anticipation towards interest rate changes is negative, no matter if markets are waiting for rising or declining rates. This indicates that the forecasts might be slightly more negative when it is likely to see a change in rates and the correction is seen more rapidly in the case of lowering interest rates.

The unconventional actions seem to make markets excited, as they have been at least for the last couple of years a big speculation before the meetings. Markets seem to forecast these more optimistically than any other announcements. This is also a very logical reaction, as the buyback programs for example can re-direct huge amounts of money from bond markets into the stock markets, but also support the overall economy. The reaction seen on the event day is positive on average, but markets seem to be a little too optimistic towards the unconventional actions, as there is a correction seen on the post-announcement day, which is negative. It is still important to point out, that none of the reactions seen are statistically significant at 10% or lower, but more likely a trend that can be revealed by using average abnormal returns as a measure.

So significant evidence of mispricing and false forecasts cannot be found. Therefore, the hypothesis of one specific announcement characteristic creating significant abnormal returns cannot be rejected. Notable is that cumulative abnormal returns are positive in all announcement types and are highest when interest rates are raised. This is an interesting finding, especially as the expected results should, at least based on the previous findings to be somewhat the other way around as higher interest rate levels do not support the stock market similarly to lower interest rates. However, the findings are not statistically significant, so therefore hard evidence to support the reaction in the Finnish stock market cannot be proved and the results might be caused by too pessimistic forecasts about the announcements.

Table 4. Event window significance, % of total announcement of the same kind.

	No changes in rates	*Unconventional*	*Interest raise*	*Interest decrease*
Significant at 10% level	10,36%	11,11%	20,00%	0,00%
No. of observations	23	7	4	0
Significant at 5% level	19,37%	22,22%	20,00%	10,00%
No. of observations	43	14	4	2
Significant at 1% level	13,51%	15,87%	10,00%	0,00%
No. of observations	30	10	2	0
No. of announcements	222	63	20	23
Significant CARs % of total announcements	43,24%	49,21%	50,00%	8,70%

From Table 4 we see the percentages that different announcements resulted in significant abnormal returns at given significance levels, measured with the cumulative abnormal returns of the event window. The highest abnormal returns resulted when interest rates rose, and almost as high a percentage of announcements resulted in significant abnormal returns when announcements included unconventional actions. Given that most of the announcements included no changes in interest rates, and it is probable that in the 222 announcements, there were other factors also moving the market, at least in some of the announcements, not only the given announcement of the central bank.

The overall results are in line with Bernanke (2020), who stated that unconventional policies are supportive and effective for the economy, and the stock market seems to react in that way. The results show that stock markets have in almost half of the announcements resulted in significant abnormal returns when unconventional actions were taken. The strong reaction towards rising interest seems to support the hypothesis of higher interest rates lowering stock prices and once interest has been increased, stocks are rapidly evaluated for new prices.

5.3 Investor sentiment

This subchapter discusses the monetary policy effects on different market sentiments. According to Kurov (2010), there is no perfect measurement of investor sentiment. This thesis follows the common rule of thumb of defining bear markets; a 20% decrease in stock prices from their last high marks a so-called bear market. Other times, as the markets tend to be more upward than downward in the long run, are defined as bull markets. In total, there are five periods, which are considered as bear markets. Their maturity varies and the focus is on longer periods of downward trend periods. One exception is the Covid-19 crash, which lasted for a relatively short period but was actually a very quick transition from one of the longest bull market periods in history to a bear market. Also, as mentioned in the beginning, central banks acted as major players in creating trust in the economy during the pandemic period.

The periods when markets are bearish and the profit from this period is calculated by dividing the lowest point (where the bear market is also considered to end) by the highest point of the market (the point where the bear market is considered to begin). This gives the time window for sentiment and the overall decrease can also be seen.

The five periods of bear markets in this thesis are as follows:
1. 28.4.2000-10.3.2003 – a total decrease from the highest -74%,
2. 7.11.2007-6.3.2009 – a total decrease from highest -68%
3. 9.2.2011-4.6.2012 – a total decrease from highest -39%
4. 11.2.2020-18.3.2020 – a total decrease from highest -36%
5. 6.9.2021-29.9.2022 – a total decrease from highest -27%

Other periods are considered bull markets. The only exception is the time frame from 30.9.2022-30.12.2022 because at this time market did not achieve the 20% increase

which is considered here as the definition of the bull market. This period had 2 ECB announcements which were left out of the calculations to make analysis more consistent.

Table 5. Cumulative abnormal returns and abnormal returns bull & bear market

	Bull market	*Bear market*
$CAAR_{(event\ window)}$	0,1558	1,0098
t-statistic	0,6342	1,8013*
$AAR_{(pre\ event\ day)}$	0,0267	0,1260
t-statistic	0,2397	0,4717
$AAR_{(event\ Day)}$	-0,0146	0,8216
t-statistic	-0,104	2,207**
$AAR_{(Post\ Event\ Day)}$	0,1437	0,0622
t-statistic	1,4526	0,2130

*= statistically significant at 10%,

**= statistically significant at 5%

In Table 5 we see the cumulative abnormal returns for the event window and individual daily abnormal returns of the event window. The results of the analysis are partially in line with Kurov (2010). Bear markets tend to result in more significant abnormal returns for the three-day event window, but also on event day. This meaning that monetary policy decisions seem to support stock markets more in a bear market, while the investor sentiment is negative. This is a logical outcome as central banks are pursuing their policy by supporting the economy during difficult times. Most and largest of the unconventional actions by central banks are seen in times of unclear future forecasts, for example in the aftermath of the financial crisis or the Covid-19 pandemic.

The results also show that stock markets are not anticipating the monetary policy actions correctly during harder times. This is not necessarily market inefficiency, but more likely the actions undertaken by central banks are hard to forecast and some of the actions are not very often done. There is enough evidence to support the hypothesis that investor

sentiment has a significant effect on how markets react to monetary policy announcements. The results differ significantly, with bear market reactions being significant for event day and through the event window, while the bull market does not result in significant abnormal returns.

5.4 Tightening cycles and loosening cycles of monetary policy

This subchapter of the empirical part discusses the different cycles of monetary policy and the effects the cycles have on stock markets. Loosening cycles and tightening cycles are in this study considered as follows: On the loosening cycle, interest rates are lowered and on the tightening cycle interest rates are raised. There are in total 5 different cycles when the rates are trending downwards or upwards. Mostly the policy that ECB has practiced has been loosening. This means, that most of the time central bank has kept the rates low or lowered them versus the previous announcement.

According to Jarocinski & Karadi (2018) loosening policy should support stock markets. The options in lower-risk level assets are not profitable, and money is transferred to more risky assets. In Table 6 we can see how the different cycles are affecting to stock market index when measured with CAARs and AARs.

Table 6. Tightening and loosening cycles of monetary policy

	Loosening cycle	*Tightening cycle*
$CAAR_{(event\ window)}$	0,5846	0,5316
t-statistic	2,3412**	0,7963
$AAR_{(pre\ event\ day)}$	0,2504	-0,4299
t-statistic	2,2951**	1,3307
$AAR_{(event\ Day)}$	0,2927	0,2344
t-statistic	1,9974**	0,5132
$AAR_{(Post\ Event\ Day)}$	0,0415	0,2849

t-statistic	0,3242	0,8974
Total No. of observations	194	71

** = statistically significant at 5%

As we see from the results, the cycles of tightening and loosening policy do have a significant impact on stock prices. This is in line with Jarocinski & Karadi (2018), as the loosening monetary policy should support the stock market. This finding also supports Blampied & Mahadeo (2023), as in the easing cycles the monetary policy supports stock markets significantly, at least on a short time horizon. It seems that on loosening cycles markets either see monetary policy as surprising or encourage investors to carry the additional risk when holding stock positions which is shown by Bekaert et al (2013).

Tightening, i.e. increasing interest rates on the other hand does not result in significant abnormal returns in the stock market. The rising interest rates do not support risk-taking holding stocks similarly, as new bonds begin to yield better. This might also be caused by the forecast of increasing interest rates. If the expectations of higher interest rates are anticipated, it will be efficiently priced in the stock markets. The evidence supports the hypothesis that the direction of monetary policy is a significant factor in the stock market reaction around the announcement, and there is strong evidence to reject the null hypothesis.

6 Conclusions

This study focuses on the stock market reactions to central bank monetary policy announcements. Particularly the focus is on European Central Bank monetary policy announcements and Finnish stock markets. The main purpose is to understand better how the Finnish stock markets are behaving around the Central Bank's monetary policy actions. In the study, a very traditional event study approach was applied to test different announcement characteristics, and how different market sentiment and different directions of monetary policy affects on stock returns. This study extends the prior literature in the context of central banks and stock market relationships, especially related to the Finnish stock market. As the main idea is to observe a very short period around the announcements, this study does not account for the possible effects that can be seen in a longer time horizon.

The empirical findings of this study show that Finnish stock markets tend to anticipate the monetary policy announcement moderately well, and therefore can be said that markets tend to be efficient towards monetary policy actions. The three-day event window results in moderately statistically significant positive abnormal returns and individual days in the event window do not differ significantly from what is expected. It is notable that the average abnormal return seen in all the three days around the announcement were positive.

As the findings are not statistically significant, the economic significance is based on too many random factors, and therefore solid evidence was not found to make predictions in the future direction. One aspect of these results might be the direction of the monetary policy in the sample period, but also the direction of monetary policy conducted by the ECB in its whole history, which has been mostly loosening, or interest rates have been historically low, even negative.

Investor sentiment was found to have slightly different results. Markets tend to react similarly measured by cumulative abnormal returns, but on average, on the event day

reaction is statically more significant. The findings of investor sentiment's effect on the reaction is in line with the findings of Kurov (2010). In bear markets stock market returns differ from expected significantly versus on bull markets.

Loosening cycles of monetary policy were found to be significant while abnormal returns in tightening cycles were not significant. The average abnormal returns associated with loosening monetary policy as well as tightening policy were mostly positive, which is similar to the abnormal returns in the total amount of announcements.

This study examines only the short-term effects of monetary policy decisions on stock returns and does not reveal any longer-term effects there might be. The short-term effects are important to understand, as markets tend to react on surprising, or other economically significant new information strongly. To understand the longer-term effects of monetary policy on stock markets, more research is needed to conduct. This study gives a starting point for understanding the short-term reactions in Finnish stock markets and adds into the literature of studies conducted on the relationship between Finnish stock markets and macroeconomic events.

When it comes to the effects of monetary policy on the stock markets, policymakers, especially in the central banks, need to understand the consequences of their actions in the stock markets. If the markets become too reliant on central banks, it may have serious consequences when it comes to functional financial markets and of course efficient markets. The effects of being too reliant on the Central Banks will also be seen in the real economy as the economic machine is not working properly, not only in the financial markets. As there has been several crises in the near past, this is something that needs to be researched over time, in different economic conditions and different investment environments.

An understanding of the effects on stock markets can also be helpful in times of crises when financial markets need to be kept functioning. The effectiveness of central bank

policies has been shown to be good, but the economic crises, for example, are usually not copies of the previous crises, and therefore the research is important over time.

7 Future research

This chapter briefly discusses the future research ideas on the relationship between stock markets and monetary policy conducted by central banks, mainly focusing on the Finnish stock markets. Future research is necessary, as the relationship between the Helsinki stock exchange and monetary policy is not widely examined. As Finland is a part of the European Union and part of the euro system, it is important to understand the effects that the European Central Banks's monetary policy has on its financial markets.

As this study helps to understand how efficiently markets predict actions and how the monetary policy announcements result in equity prices, future research ideas in this context would be a comprehensive study on the volatility of the Finnish stock markets during monetary policy announcements and testing if the volatility follows the same pattern of the individual day's abnormal returns founded in this thesis. The data for volatility in the Finnish stock market is not available similarly to some bigger markets, and for example a good measurement of surprises, implied volatility is not calculated. As said earlier, a similar study method to Vähämaa & Äijö (2011), where the implied volatility is employed would give valuable insight into the monetary policy surprises and reactions to the surprises.

Although Finnish stock markets are probably mostly affected by the monetary policy conducted by the European Central Bank, a study that examines the spillover effect from the monetary policy conducted by the US Federal Reserve would give valuable insight into the relationship also to monetary policy conducted by other central banks than ECB. This could help to understand the dependencies between the Finnish economy and the US, and also the dependencies between the Finnish financial markets and US monetary policy actions.

It is important to examine how the monetary policy affects the smaller market areas such as Finland. In the case of Finnish stock markets, this is crucial, as the monetary policy is practiced mostly based on what is happening in the European economy, not just in

Finland. It is also valuable to understand better how the actions by central banks are forecasted in the smaller market areas where analyst coverage is smaller and test if the results differ significantly from the bigger market areas.

As mentioned earlier, this study focuses only on a short time horizon and the effects that can be seen immediately after a monetary policy announcement. Examining the effects on a longer time horizon can reveal a better understanding on how much the monetary policy cycles impact stock markets and how effective the monetary policy is in the context of equity markets. It would also be interesting to see if the findings are similar to the shorter time period.

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