TALLINN UNIVERSITY OF TECHNOLOGY

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MARKET REACTIONS TO EUROPEAN CENTRAL BANK ANNOUNCEMENTS

Bachelor's thesis

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I hereby declare that I have compiled the thesis independently

and all works, important standpoints and data by other authors

have been properly referenced and the same paper

has not been previously presented for grading.

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ABSTRACT

The aim of the study is to find out how the ECB monetary policy announcements impact stock prices and have the relationship been affected by the Global Financial crises. The paper is going to compare EU bank stock prices and EU stock markets to the ECB monetary policy announcements. The Global Financial crisis is the main interest in the study. The data used for the study is STOXX 600 Europe index and four large EU bank stock prices, namely Deutche bank, Paribas banco, Credit Agricole and Santander Banco. The period studied is 2006-2014. The study is conducted by using the cumulative abnormal return model and correlation analysis. The study results show that the Global Financial Crises effected ECB monetary policy implementations on the EU stock prices and bank stocks. Due to the limitations of the study, the results can not be generalized to all public banks but only for the largest EU banks.

INTRODUCTION

The 2007-08 global financial crises, is widely considered the worst economic crisis since 1930 great depression. Financial crises were caused by subprime mortgage defaults in U.S and then it developed into the collapse of investment bank Lehman Brothers that caused international banking crises. The crises and possible collapse of the world financial system were solved by government bail-outs and monetary and fiscal policies. Crises were followed by economic downturn and the European debt crises which touched banking systems that used euro as a currency.

Shiller (2012) argues that the event that started the financial crises was that one of the main functions of the financial institutions that is granting mortgages was not closely monitored or regulated in the US or in rest of the world. Financial institutions started to grant really risky mortgages to people whose probability to default was high and when the risky mortgages interest rates rise people who had these loans defaulted according to Shiller (2012).

These functions of the both retail and investment banks were not working correctly in Financial crises and it created credit crises which caused Central Banks to take action. The whole modern financial system is relying on the credit channel that banks give. To understand how monetary policy affects the stock market in an unusual market situation helps in future crises. Global financial crises affected the world's financial system in a way that the effects can be seen even in today's world. Debt of nations has increased and European economic area has not fully recovered after the financial crises.

The effects of monetary policy on the stock market have been studied a lot, for example in Ricci (2015) and Chen (2007). Federal Reserve banks monetary policy announcements effects on global and U.S stock markets have been studied but ECB policy announcements effects on European stock market and EU banks stocks has not been studied as much. Understanding how monetary policy announcement effects in different economic trends helps to keep price stability in different assets. Financial crises occur when some assets nominal value decreases by a large amount. Financial crises create unemployment and a decrease in the standard of living.

This paper analyses how the stock markets and bank stocks react to monetary policy announcements before and after the 2008 financial crises. The focus of the paper is in the ECB interest rate stance and its effects on stock markets. The aim of the study is to find out has the stock market reactions to ECB monetary policy changed after the financial crises. The timeline of the study is 2006-2014, during these years the European economic area has experienced Global financial crises and Sovereign debt crises. In the study, the main financial and economic shock that the paper focuses on is the Global financial crises. The European debt crises can be seen that it was caused by the global financial crises and it is also included in the study.

In the study, there is an event study that will be comparing ECB interest rate changes and how the stock market and bank stocks react to changes. Monetary policy effects on the stock market and before and after the crises are important to know for the study. Also understanding how monetary policy affects banks and their stock price is crucial to study. The study includes time before crises, 2008 Financial crises, Sovereign debt crises and time after both crises.

There are four hypothesis for the study and they include how monetary policy announcements affect stock markets and bank stocks. Also how sensitive bank stocks are compared to EU stock markets when ECB monetary policy announcements occur.

The first hypothesis is that stock markets and bank stocks react both the same ways to monetary policy changes. Bank stocks are not more sensitive compared to EU stock markets, and there is no excess returns or deficit.

The second hypothesis is that the monetary policy effects on the stock market have not changed and the reactions remain same as before the crises. Also, that bank stocks react more positively to monetary policy decreases and more negative to increases.

The third hypothesis of the study is that stock markets continue react same to monetary policy changes after the financial crises and that bank stocks reactions change to interest rate increases and decreases. Hypothesis include that change is not temporary.

The fourth hypothesis is that there are clear changes in the bank stock reaction and in EU stock market reactions during the 2008 financial crises and sovereign crises, but after that reactions change back to a time before 2008.

In this paper to understand how ECB monetary policy has affected bank stock returns before and after financial crises, it is needed to conduct an event study. For the study, it is needed to analyze stock return data. Markets tend to react to the news with a lag and for this reason, a time window of two days will be used. Stock return data in this study is analysed based on the cumulative abnormal return (CAR). Finding the cumulative abnormal return illustrates the stock market reactions to interest rate changes in this study.

This study uses STOXX Europe 600 index as a proxy for market return. This index represents the number of large, medium, and small size companies from 17 EU countries. For bank stock data three different banks are used to represent the bank stock reactions. These banks are Deutche bank, Paribas banco, Credit Agricole and Santander Banco.

1. THEORETICAL BACKGROUND

1.1. European Central Bank

According to Blinder 1998 Central bank functions are controlling the supply of euro currency and maintain price stability in the region. The macroeconomic variables like inflation and real output are important objectives that ECB tries to influence. European Central Bank implements EU economy and monetary policy, aim of the policy is to support economic growth and job creation according to Blinder (1998).

Blinder (1988) thoughts in monetary policy are that, monetary policy can be defined as the governing of interest rates and money supply in an economy, or in other words to target inflation. These actions aim at influencing macroeconomic variables such as prices, employment and output. The central bank tries to affect these variables indirectly and reactions usually come with a lag.

European Central Bank (ECB) monetary policy has a set of different instruments that it can use. In ECB website there are listed all the instruments that ECB can use and those are open market operations, standing facilities and minimum reserve requirements for credit institutions can be used to create price stability. Also since 2009, the ECB started to use different non-standard monetary programs, for example asset purchase programs (*The Eurosystem's instruments*). Open market operations are an important instrument in the guiding of interest rates, managing liquidity situation, and showing monetary policy stance (*Ibid.*). For open market operations, there are five different instruments that ECB can use. These are reverse transactions, outright transactions, issuance of debt certificates, foreign exchange, and collection of a fixed-term deposit. The most important instrument is the reverse transaction, which may be used in the form of a repurchase agreement and collection of a fixed-term deposit (*Ibid.*).

The standing facilities function is to provide and absorb overnight liquidity, also signaling general policy stance and bound overnight market interest. The minimum reserve system is used to pursue

the aims of stabilizing money market interest rates and creating a structural liquidity shortage. (*The Eurosystem's instruments*)

The asset purchas programme aim is to address the risks of the too long period of low inflation. APP consists of third covered bond purchase, asset-backed securities purchase, public sector purchase and corporate sector purchase program. (*Ibid.*)

The governing council of the ECB sets key interest rates which are, main refinancing operations, deposit facility, and marginal lending facility. The ECB has an interest rate stance which it can change.

There has been a lot of studies that try to determine how ECB decides on its interest rate policy stance. According to Gerlach (2007) who studied ECB interest rate policy before financial crises found that interest rates are determined by ECB based on real economic output, M3 and exchange rate changes. In the study inflation is not seen as an variable that causes ECB to react because spike on inflation is seen to be temporaly and caused by economic real output.

1.2. ECB response to financial crises

Financial crises in Europe can be divided into three periods according to the head of ECB council from year 2003 to year 2011 Trichet (2010): financial turmoil, the crisis period and a gradual phasing-out. According to Trichet (2010) the financial turmoil started for ECB on the 9th of August 2007 when interbank market problems arise. Short-term money market rates problems are also recognized by Cassola and Morana (2008). According to Trichet (2010), this was caused mainly by two factors, external and domestic imbalances worldwide, the real economy and financial systems. Trichet 2010 and Claassen 2015 argue that also poorly regulated and supervised financial markets, non-bank entities, and financial instruments. The new financial products were complex which made it difficult to assess the risk according to Trichet (2010).

The 15th of September was the day when Lehman Brothers went to bankruptcy. According to Trichet (2010) this event triggered confidence crises in the financial markets into global financial crises period from 15th September 2008 to 3rd December 2009. The bankruptcy of Lehman Brothers caused a breakdown of the money markets according to Gentile and Giordano (2013) and the financial

activity of the financial markets collapsed and credit spreads grew significantly. Also, global trade fell significantly and it caused errors in economies according to Trichet (2010).

In response many central banks co-ordinated reductions in key policy interest rates on 8th October 2008 shown in ECB historic announcements. Also looking at the historic announcements the ECB lowered its key rates by 50 basis points and also considering inflationary worries caused by weak economic outlook and the upside risk of price stability. Between October 2008 and May 2009 the refinancing level of the ECB decreased by 325 basis points to 1 per cent level. Problem that ECB faced was that money markets were not functioning correctly and monetary policy changes did not have the expected influence to the outlook of price stability according to Trichet (2010). The ECB started to use some non-standard measures to bring the credit spreads down and to boost economy (*The Eurosystem's instruments*). The non-standard methods helped banks to channel credit to the economy according to Trichet (2010).

After the breakdown of money was avoided there is a period called "A gradual phasing-out" (Trichet 2010). From the beginning, the Governing Council of ECB announced that these non-standard methods will not be implemented for long period of time. Trichet (2010) tells that there was an understanding that lower interest rates would remain for long time and there was no possibility to increase them for a certain period. European debt problems occurred and interfered with the gradual phasing out program and non-standard measured had to be used again according to Trichet (2010).

The way central banks set interest rates always depends on a current situation. There are different equations and principals on how to set these interest rates.

1.3. Taylor Rule

The most popular theory on how the central banks should set their interest is the Taylor Rule. According to Taylor 1993 Taylor rule gives the guideline to Central banks how the set interest rates in order to have short term stabilization and at the same time keeping long term growth. Equation 1 follows Taylor 1993:

$$i = r + pi + 0.5(pi - p*) + 0.5(y - y*) \tag{1}$$

where
i= nominal rate
r = real rate
pi = rate of inflation
p* = target inflation rate
Y = logarithm of real output
y* = logarithm of potential output

Factors in the Taylor rule are targeted and actual inflation levels, full employment and actual level, and the short-term interest rate appropriately consistent with full employment. Taylor rule suggests that interest rates should be raised when inflation and employment is high, and vice versa. Taylor rule can be modified by central bankers for different purposes.

1.4. The efficient market hypothesis

The efficient market hypothesis is important when analyzing the effects of monetary policy on stock prices and returns. The efficient market hypothesis finds that the market is considered efficient when stock prices reflect all information available. Stock prices change with the new information. If the stock does not reflect the new information investors will trade on it until the price changes. The three stages of the efficient market hypothesis are Weak efficiency, Semi-Strong efficiency, and Strong efficiency (Bodie et al. 2011).

Different stages of EMH show how stock markets react to new information according to Bodie et al (2011). Weak efficiency means that stock markets react slowly to new information and returns or

losses will accumulate long after news emerges. In semi-strong efficiency, market react quickly to the news. In semi-strong market investors can exceed market return by getting information that is not available to public. Strong efficiency, markets have already anticipated coming news and stock prices are already adjusted. In strong efficient market stage investors are not able to beat the market. In weak market stage it is possible to find over or under valued stocks and to beat the market, because only the past information is reflected in stock prices.

Markets not always follow the EMH theory. There are anomalies in most of the stock exchanges and they tend to change and appear in differently (Bodie et al. 2011).

1.5. The discounted cash flow model

The discounted cash flow model helps to understand monetary policy changes. The present value model the stock price(St) is the present value of expected future dividend(Dt) with the assumption of the constant discount rate(R) according to Ioannidis and Kontonikas (2006) it can be shown that:

$$St = \left(\frac{1}{1+R}\right) Dt \tag{2}$$

where
St – stock price
R – discount rate
Dt – expected future dividend

The discount cash flow model shows that monetary policy affects stock returns in a dual manner. Strick monetary policy can cause increase in the rate that is used finance companies future cash flows and that causes stock price to decline. Assumptions of cource are that Central Bank can influence market interest rates and that the discount factors used by companies are linked to market rates of interest.

According to Ioannidis and Kontonikas (2006) indirect effect of monetary policy changes on companies stock price comes from changes in expected future cash flows. Easing monetary policy has a positive effect on economic activity and stock prices tend to react same way. Assumption in easing is that there is a link between monetary policy and the aggregate real economy. There are

arguments that stocks are claims on future output, then if real economy is effected by monetary policy logically stock market is also effected by monetary policy conditions.

1.6. Previous empirical research

Rao and Somaiya (2006) studied the impact of monetary policy on Indian banks. She listed monetary policy instruments that impact banks profitability which are bank rate, lending rate, reserve requirements, and open market operations. Bank rate affects the banking systems most because it shows the rate in which the central bank can rediscount or buy the bills of exchange. Bank rate shows at which cost central bank would borrow money for domestic banks. Lending rates are the rates banks lend money to consumers and other banks and the prime rate usually guides lending rates. With reserve requirements, Central banks can control the capacity of creating credit. Open market operation like purchase and sale of securities are Central bank's way to reduce or increase currency held by the public. Purchases of government securities increase the currency and sales of the securities decrease it. Basically, open market operation helps central banks affect banks' capability to create credit.

Cambacorta (2005) studied the effectiveness of the lending channel, his findings show that well-capitalized bank react to monetary policy tightening better than risky banks and that bank size is not relevant. They can increase uninsured deposit and they do not have to decrease lending as much the risky banks have to. His findings also show that liquidity protects banks loan portfolios and functioning internal capital market protects from monetary policy tightening.

Gambacorta and Marques-Ibanez (2014) studied financial crises and their effects on bank lending channels. They argue that the monetary policy transmission channel had changed before financial crises, due to new funding channels and business models. Their findings prove also that banking had experienced structural changes during financial crises. Their finding follow Cambacorta (2006) findings that banks with poor capitalization, depending on funding and noninterest sources of funding had to decrease their loan giving.

Negative interest rates are relatively new phenomena and 2014 ECB was one of the first central banks to use them. Demiralp et al. (2017) studied how banks adjusted to negative interest rates. They found

that banks adjusted their balance sheets to a negative interest rate. Banks in Europe extended more loans, tried to rely on less to market funding and hold more nondomestic government bonds

Altavilla et al. (2019) studied negative policy rates effects on banks. Their studies show that banks can operate with negative rates but their function becomes more difficult the more negative rates become. Banks can hold on to their corporate depositors and not lose funding. The negative increases the companies willing to invest and decreases their cash holdings. Problem with the negative interest rates is that when short-term rates reach zero, Central bankers cant expand demand with short-term rates, which mean economy is zero lower bound.

Botzen and Marey (2010) argue that ECB monetary policymakers' view on asset prices is changing due to financial crises. Asset prices have before only taken into consideration if they affect inflation. Their study shows that the ECB interest rate policy has been affected by the stock prices before crises. The stock prices influence in monetary policy in their point of view has developed de facto.

Ricci (2015) conducted a study measuring the effects of monetary policy on stock prices of EU banks during Financial crises using cumulated abnormal returns. Findings indicate that bank stocks did react more strongly to non-standard measures compared to interest rate changes. Also they found that more risky banks with soft balance sheet the more sensitive it is to monetary policy changes.

Kim, Lee and Wu (2013), have studied FED and ECB interest rate stance effects on bank stocks using GARCH model. Their findings show that ECB monetary policy has little impact on German bank stock but on the US bank stocks, it increases volatility. Their study indicates that the European banking system responds heterogeneously to monetary policy news and that financial crises increased banks stock sensitivity to any policy news.

There have been studies that have provided evidence about structural change or break in stock market reactions to monetary policy announcements after the 2008 financial crises (Gould and Kamin, 2001). In the study, they tried to identify interest rate impact on credit spreads and stock returns. After the estimating equation for the exchange rate, they also did a broad array of Granger-causality tests for identifying the impact of monetary policy variables. Evidence shows that stock return-rate change relationship has become positive during credit crises when before crises high-interest rates caused stock markets to react negatively.

Other researchers have also conducted studies that have shown same results as Gould and Kamin (2001). Also Gregoriou et al. (2009) studied monetary policy and stock returns. They studied anticipated and unanticipated actions of Bank of England on UK sectoral stock returns and aggregate. The study was conducted using data from 3-month sterling LIBOR futures, time series and panel regressions analysis. Results of the study show that in the UK the crises affected the stock price response to announcements. Before the crises reactions were highly negative and positive during crises. These prove that monetary policymakers are unable to make a reverse to the negative trend in stock markets using interest rate cuts after the credit crises. Monetary policy in Europe has faced a problem called a zero bound when making monetary policy.

Zero bound problem means that interest rate has been lowered to the lowest point possible to boost the economy. Problem with the zero bound is that ones interest rate has been lowered and the economy is still underperforming, monetary policy affects the markets through interest rates and this is called liquidity trap. These actions have limited tools that European Central Bank has to stimulate euro economy.

According to Haitsma et al. (2016) study on the impact of monetary policy to stock markets, shows that value stocks are impacted more than growth stocks by monetary policy. Also their findings indicate that unconventional policy suprises the markets most these finding were found using Rigobon-Sack heteroscedasticity approach.

Monetary policy effects on stock market depend on ongoing interest rate policy. Also there has been studies showing that ongoing business cycle effects how monetary policy affects stock prices. Fausch and Sigonius (2017) have studied unanticipated changes of ECB monetary policy effects on the German stock market. To measure monetary policy effect on stock returns they have used the regression model and VAR model to decompose excess returns to the news. According to their results, companies' stock return changes are linked to future expectations and those market reactions to monetary policy shocks are linked to ongoing interest rate policy. Also, the stock market reactions to monetary policy changes are especially strong when interest rates are negative. They also say that negative real interest rates regime is also linked to recession and to high uncertainty.

Aït-Sahalia and Jobsta (2012) have studied market response to policy initiatives during the global financial crisis. In the study they used event study with five-day time window. They also used parametric and nonparamentric means test evaluate policy announcements impact on interbank risk

premia.One of their findings is that at the beginning of the crises, positive market respond to policy announcement shows can the monetary policy actions restore confidence at all. The main focus in their study was on risk premia in interbank markets. One the findings indicate that monetary policy interest rate stance and recapitalization of banks were seen as the most effective way to solve crises. Interbank crises risk premia also did not decline because of increasing domestic liquidity support but because of forex swaps. Also, paper shows that the best way to restore investor confidence was internationally coordinated policy announcements. Interbank and liquidity risk premia were also increasing highly when bank recapitalization was done based on ad hoc manner rather than on systematic basis. Systematic based manner have shown to create a more positive response from markets.

Fiordelisi and Mare (2014) studied competition and stability of the European banks using Z-score, their finding show high competition brings stability to banks and that financial crises have not effected that. Also the policy implemation of ECB has brought stability to banks which supports Aït-Sahalia and Jobsta (2012) findings.

Comparing the papers that have studied monetary policy announcements effects on stock market before and after Global financial crises show results that stock market reactions have changed. Ioannidis and Kontonikas (2006) study is based on the period before the financial crises. Methodology they used was regression analysis and after that they calculated correlation coeffecient with local stock returns with US stock returns. They have found that strict monetary policy has a negative effect on future stock return which is in line with Gould and Kamin (2001). Their findings also indicate that by changing interest rates stance monetary policy can affect stock returns. Two different points of view on how central bankers should take action on stock price misalignments are also dicussed by Ioannidis and Kontonikas (2006), proactive or reactive actions can be used by central bankers and in both actions assumption is that stock returns are affected by interest rate stance of monetary policy.

When deciding whether central banks should be proactive or rective it is impostant to have knowledge how monetary policy affects stock markets in different business cycles. Shiu-Sheng Chen (2007) studied monetary policy effects in the bull and bear market to determine whether the monetary policy has asymmetric effects. In their study methodology they used was Markov-switching model and time-varying-transition-model-probability Markov-swithcing model where comparing between bull and bear market is possible. They found that strict monetary policy has a strong and negative effect on stock returns which indicates that monetary policy is more effective on bear market trends. Paper also

suggested that monetary policy might be affect dynamic when switching from a bull market to a bear market by lowering the returns directly and by making the returns more likely to shift to low-return regimes.

2. SAMPLE AND METHODOLOGY

2.1. Sample

This paper analyses how the stock markets and bank stocks react to monetary policy announcements before and after the 2008 financial crises. The main interest is in the ECB monetary policy interest rate changes. ECB announcements data is gathered from the European Central Bank website. Data is gathered by following the press releases and looking at the interest rate changes. The study includes announcements where either no changes, increase, or decrease to interest rate was announced.

The analyses concentrates on the biggest EU banks that also had a big role in the 2008 financial crises and who are the main credit channel in Europe. Thus, banks chosen to the sample are Deutsche Bank, BNB Paribas, Credit Agricole, and Santander banco. These banks were also ranked to be the four of the five largest banks in Europe by measuring the balance sheet according to Banks around the world 2017 (*Top European Banks*). Historical bank stock price data is collected from Yahoo finance.

Deutsche Bank is included in the study because it is one of the Europe's largest banks, and also Deutsche is world's largest investment bank according to Banks around the world 2017. Deutsche Bank is also included in the world's 30 most systematically important bank list kept by Financial Stability Boarding according to FSB publications. The bank has a big influence on the Eurozone and on the whole world.

BNP Paribas stock price history is in the study because the bank is one of the world's largest banks. according to Banks around the world 2017. BNP Paribas formed when BNP and Paribas bank merged according to BNP Paribas Official Website. Financial Stability Boarding listed BNP Paribas to the list that consists of 30 most systematically important bank list according to FSB publications.

Credit Agricole is a large France bank and it is listed in the STOXX Europe 600 list just like other banks in the study. The bank is one of the largest in Europe by measuring the balance sheet according

to Banks around the world 2017 and is also listed in a 30 most systematically important banks list according to FSB publications.

Grupo Santander is also included in the bank stock data because it is the largest bank of Spain and one of the largest in Europe according to Banks around the world 2017. Santander is also included in the 30 most systematically important bank list according to FSB publications.

To measure stock return in the European stock markets it is needed to have a measure that represents all of the EU countries' Stock exchanges. Measuring the stock market of only one country does not show the full impact of the ECB monetary policy. When comparing stock markets of Germany and Finland they can react differently to ECB monetary policy changes. In the study, it is important to capture the impact of ECB announcements to EU sotck markets in general as the banks included in the sample are incorporated in different EU countries. That's why using the stock market index that shows the whole European stock market returns is important.

In the study the stock return is represented by the STOXX Europe 600 index because it is one of the major stock indexes in Europe. STOXX Europe 600 includes 600 components holding large, medium and small companies among 17 EU countries. Index covers somewhere around 90% of the publicly hold market capitalization of the EU stock market so it is good indicator of the European stock market return. Historic price data of the STOXX Europe 600 is collected from Yahoo finance.

2.2. Methodology

The main focus is to find out how the monetary policy interest rate stance affects stock markets in different market trends and how the largest EU banks react compared to the stock market. The method used to study market reactions to ECB interest rate announcements for this paper is the cumulative abnormal return (CAR). Reaction to announcements come always with a lag and in this study, the time window used is 2 days. CAR model is able to compare bank stock and stock market reactions to monetary policy announcements.

The first step is to calculate daily market return for all the two days included in the event window. In the equation 3 below the STOXX denotes the market index, t is the time (day). The market return is

calculated daily for all of the days in the event window. STOXXt represents the closing price of the index in day t and STOXXt-1 represents the closing price of the previous day. RMt represents the market return for the day t. This way the study includes the last closing price as a start and the days closing price in the study. In the study two days, the time window is used and both day's market return is calculated separately.

$$Rm, t = \frac{STOXXt - STOXX\ t-1}{STOXX_{t-1}}$$ (3)

The second step is calculating daily stock return Ri for all the banks for all the days included in the event window. The daily stock return is calculated separately for the days included in the study. Pi,t-1 represents the closing price of the stock the day before and Pi,t represents the closing price of the actual announcement day in the equation. Ri represents the stock return for the day.

$$Ri, t = \frac{Pi,t - Pi,t-1}{Pi,t-1}$$ (4)

Calculating daily abnormal return ARi for the stock of the bank for all the days included in the event window is the next step. It means calculating the excess or deficit of the stock price compared to the market return. This is simply found by subtracting the market return from the stock price return. The Ari,t repesents the abnormal return and Ri,t bank stock return and Rm,t the market return at day t. Abnormal return is calculated for all of the days included in the time window.

$$ARi, t = Ri, t - Rm, t$$ (5)

The last step is to calculate cumulative abnormal return CAR for the event by summing all the daily abnormal returns during the event window. This way the full impact on the market and stock prices is measured. In the study, the impact of the ECB announcements is expected to be fully shown within two days after the announcement as shown in equation 6.

$$CARi(t1, t2) = \sum_{t=t1}^{t2} ARi, t$$ (6)

where

CARi (t1, t2) – cumulative abnormal return of stock *i* from day *t1* to day *t2*

ARi,t – abnormal return of stock *i* at day *t*

In the study, there is also correlation analysis to find out the linkage between ECB announcements and the CAR results. Correlation captures the relationship between the two variables. The correlation coefficient shows how correlated two variables are. The correlation coefficient can be valued between

-1 and +1. -1 and +1 represent perfect correlation between variables and 0 represents no correlation. Correlation is studied based on the CAR and dummy variables capturing the interest rate change announcement. In total three different dummies were created.

First, there is a correlation analysis showing the correlation between CAR averages and a dummy variable that captures is there an ECB monetary policy announcement or not. Dummy variable has two values 0 or 1, 0 for no announcement, and 1 for ECB monetary policy announcement.

Next, there is a separate correlation analysis for the increase and decrease announcements. These correlation analyses are calculated using dummy variables. For the increase announcement and CAR value correlation analysis dummy variable for the increase, the announcement has a value 0 representing no decrease and value 1 for the increase announcement. In correlation analysis between decrease announcements and CAR averages dummy variable showing decrease announcements value 1 is for decrease announcement and 0 for no decrease announcement.

The first hypothesis is that stock markets and bank stocks react both the same ways to monetary policy changes which is would not follow Kim, Lee and Wu (2013) findings on bank stock sensitivity to policy news. In the hypothesis bank stocks are not more sensitive compared to EU stock markets, and there is no excess returns or deficit which would also abolish Ioannidis and Kontonikas (2006) finding how monetary policy effects markets. The hypothesis would also prove that the markets are efficient and have already adjusted to changes according to EMH theory.

The second hypothesis is that the monetary policy effects on the stock market have not changed and the reactions remain the same as before the crises which would support that markets are efficient according to EMH theory. Also, that bank stocks react more positively to monetary policy decreases and more negative to increases like Ioannidis and Kontonikas (2006) had proven in their study. Proving that monetary policy effects remain normal during the crises also that there is no problem implementing interest rates and their effect on the economy remain normal.

The third hypothesis of the study is that stock markets continue to react the same to monetary policy changes after the financial crises and that bank stocks reactions change to interest rate increases and decreases. Hypothesis includes that change is not temporary which would support Gould and Kamin

findings about the structural change in stock market reactions to monetary policy. This hypothesis proves that the banks suffered from financial crises and that the monetary policy has not the influence of interest rate changes on banks that ECB expected which supports Trichet 2010 arguments how EU lending channel suffered during the crises.

The fourth hypothesis is that there are clear changes in the bank stock reaction and in EU stock market reactions during the 2008 financial crises and sovereign crises, supporting Gambacorta and Marques-Ibanez (2014) findings of a structural change of reactions of lending channel during the crisis. After that reactions change back to a time before 2008. Also that the ECB monetary policy announcements did not have the implementation that was expected which supports Trichet 2010 arguments. The financial crises and freeze in money markets caused unexpected reactions to ECB monetary policy announcements following Trichet 2010 arguments. But these effects were only temporary and the crises did not cause structural changes to financial markets or to banks following Deimralp et al. (2017) findings that banks adjusted their balance sheets and business models.

3. RESULTS

For the study, reactions to ECB announcements are the main interest. ECB monetary policy announcements occur around once a month. There is three options for the interest rate monetary policy announcement: increase, decrease, and no change of the interest rates. Interest rates that ECB can influence are refinancing operations rate, marginal lending facility rate, and deposit facility rate (*The Eurosystem's instruments*).

Every ECB monetary policy announcement does not include interest rate change. Out of 106 monetary policy announcement by ECB between 2006-2014, only 24 contain interest rate change. From the 24 announcements, 10 contain an interest rate increase and 14 interest decrease. Table 1 below shows the number and percent of monetary policy changes, increases and decreases.

Table 1. ECB monetary policy announcements by type, 2006-2014

YEAR	Announcements	No changes	%	Changes	%	Increase	%	Decrease	%
2006	12	7	58,33 %	5	41,67 %	5	41,67 %	0	0,00 %
2007	12	10	83,33 %	2	16,67 %	2	16,67 %	0	0,00 %
2008	13	9	69,23 %	4	30,77 %	1	7,69 %	3	23,08 %
2009	11	7	63,64 %	4	36,36 %	0	0,00 %	4	36,36 %
2010	12	12	100,00 %	0	0,00 %	0	0,00 %	0	0,00 %
2011	12	8	66,67 %	4	33,33 %	2	16,67 %	2	16,67 %
2012	12	11	91,67 %	1	8,33 %	0	0,00 %	1	8,33 %
2013	11	9	83,33 %	2	18,18 %	0	0,00 %	2	18,18 %
2014	11	9	81,82 %	2	18,18 %	0	0,00 %	2	18,18 %
2006-2014	106	82	77,57 %	24	22,64 %	10	9,43 %	14	13,21 %

The global financial crises 2008-2009 can be noticed by the changes in monetary policy announcements. From 8.10.2008 there is a period of decreases in main interest rates by ECB. After the global financial crises, there is a period when no changes are made to monetary policy and the low-interest rates remain. Low-interest rates that remain after the global financial crises are caused by the European debt crises. During dept crises 2010-2012 at first there are no changes in monetary

policy. After 7.4.2011 and 7.7.2011 increase in interest rates, there are multiple decrease announcements that continue to year 2014. European debt crises and financial crises can be seen to be over in 2012, but the monetary policy continued to expand and to boost. On 5.6.2014 the deposit facility went negative due to interest rate decrease according to ECB historic monetary policy announcements (*Monetary policy decisions*, 2014).

3.1. CAR analysis

EU stock market reactions to ECB monetary policy announcements are an important part of CAR model calculations. Stock market reactions in Table 2 are the returns that individual bank stock is compared to. During the financial crises and before the crises EU stock markets reacted negatively to ECB monetary policy announcements. That can result from the monetary policy increases before crises and the panic that occurred in during the crises. When looking at the returns during the crises interest rate decreases did not increase the year average stock returns. Also, in 2012 the monetary policy announcement to decrease interest rates more did not create positive stock returns that rate decreases usually do. In the years 2013 and 2014 decreases did create positive market returns and the economic expansion can be seen to be successful with monetary policy. Showing the market return for two days time window shows how the market reacted to announcements and helps to analyze CAR results for bank stocks.

Table 2. EU Stock market reactions to ECB monetary policy announcements

YEAR	Market reaction two days time window
2006	-0,056 %
2007	-0,644 %
2008	-4,194 %
2009	-0,103 %
2010	No changes
2011	0,086 %
2012	-1,145 %
2013	0,639 %
2014	0,917 %

The CAR model compares how EU stock markets and bank stocks react to monetary policy announcements. Study shows that car results for banks differ from each other. Results are expected due to that banks business models and balance sheets are different. But overall the bank averages are

somewhere coherent. There are some differences in bank stock reactions to announcements. Table 3 below shows the average CAR values yearly for the individual banks and for all the banks in the sample, and average values for the whole time period for individual banks and for all banks.

Table 3. CAR values yearly for the individual banks and for all the banks in the sample

YEAR	ACA.PA	SAN.MC	DKB.DE	DNP.PA	FOR ALL BANKS
2006	-0,666 %	-0,301 %	-0,320 %	-0,207 %	-0,374 %
2007	0,043 %	0,032 %	-0,422 %	-0,013 %	-0,090 %
2008	3,253 %	-0,835 %	-4,424 %	2,014 %	0,002 %
2009	0,009 %	0,654 %	-1,002 %	-3,208 %	-0,887 %
2010	No changes	No changes	No changes	No changes	No changes
2011	0,619 %	-0,139 %	-0,261 %	-0,173 %	0,011 %
2012	-6,715 %	-6,817 %	-5,289 %	-4,901 %	-5,931 %
2013	2,575 %	-0,520 %	1,977 %	0,903 %	1,234 %
2014	2,687 %	2,339 %	-0,485 %	1,664 %	1,307 %
2006-2014	0,670 %	-0,246 %	-1,146 %	-0,344 %	-0,266 %

When looking at the averages for all four banks results show that banks are more sensitive to monetary policy announcements than markets. From 2006 to 2011 bank stock reactions to announcements differ from the stock market reactions under one percent. From 2012 to 2014 bank stock reactions to monetary policy announcements differ to stock market reactions more than 1 percent. In the year 2012, the monetary policy announcement to decrease interest rates created the strongest negative reaction of the bank stocks compared to stock markets. Overall bank stock reactions are more sensitive to monetary policy announcements compared to stock markets.

When comparing bank stocks separately, Credit Agricole (ACA.PA) has a positive average for the whole period when the rest of the banks have a negative average. Credit Agricole stock reactions have the most difference to stock market reactions in yearly average from the rest of the bank in years 2006, 2011,2013,2014. Credit Agricole's average CAR results stand out in the 2007-2011 period. During the crises period, Credit Agricole CAR results remain positive when other of the bank stocks in the study have negative yearly average CAR results. For example, Deutsche bank (DKB.PA) had only negative CAR result in the 2007-2011 time period. Also after the crises, only the 2012 monetary policy announcement to decrease interest rates caused the Credit Agricole CAR result to go negative.

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Grupo Santander (SAN.MC) followed stock market reactions most from the bank stock by year average during years 2008, 2011, and 2013. In the year 2012 when ECB increased their interest rates Grupo Santander reacted 6,82% more negative compared to stock markets and the reaction was strongest from all the banks' stocks in the study. When comparing Grupo Santanders CAR results to other bank stocks CAR results only thing that stands out is that Santander CAR result are smaller to other banks.

Deutsche Bank (DKB.PA) stock reacted strongest compared to the stock market on average in 2008 to monetary policy announcements when compared to the rest of the bank stocks. In 2014 Deutsche bank stock followed stock market reactions better than the rest of the bank stocks. When comparing Deutsche bank CAR result to other banks, they show that Deutsche CAR results are all negative except 2013 and 2014. Other bank stocks have positive year averages during the financial crises and after the crises. Also when comparing Deutsche bank to other stock the car result are bigger in the study timeline.

DNP Paribas (DNP.PA) followed most closely stock market reactions from the bank stocks in the years 2006 and 2007. The only year when the DNP Paribas stock price reacted more strongly compared to the stock market reaction than other banks was 2009. When comparing DNP Paribas CAR results to other banks strong negative reaction to 2009 announcements stand out and the less negative reaction out of all the banks to 2012 interest rate decreases. Also that DNP Paribas is the second less sensitive bank stock out of the four banks in the study when comparing averages in the study timeline.

Average year CAR values for banks shows how sensitive bank stocks are for monetary policy announcements. For all banks included in the study average value for the time period is -0,266% which is relatively small. High CAR values can be found in the study but high negative and high positive values bring the average down. All the average values for the time period for bank stocks are negative except for Credit Agricole 0,67%. Deutsche Bank has the lowest CAR average value for the whole study period -1,146%.

These average values don't capture the effect of decreases and increases in interest rates separately. Next, there is a Table 4 about the bank stock average reactions to increases and decreases for the whole study period and Tables 5 and 6 about average CAR values yearly to increases and decreases

separately. Tables 5 and 6 that capture yearly average CAR values for increases and decreases show how bank stocks reactions have changed compared to stock market reactions from 2006-2014.

Looking at the average CAR bank stock values of all banks for the whole time period in Table 4 the interest rate changes, interest rate increases, or interest rate decreases have almost identical averages. Average for rate change is -0,266%, rate increase average is -0,22%, and rate decrease is -0,298%. These CAR values don't allow much room to analyze. To analyze bank stock CAR values it is needed to look at the yearly averages and how the decreases and increases in interest rates effects have changed in the study period.

Table 4. Average CAR values for the whole study period to monetary policy changes, interest rate increases, and interest rate decreases.

Rate changes	ACA.PA	SAN.MC	DKB.DE	DNP.PA	FOR ALL BANKS
Interest rate changed	0,670 %	-0,246 %	-1,146 %	-0,344 %	-0,266 %
Rate increase	-0,079 %	-0,440 %	-0,204 %	-0,156 %	-0,222 %
Rate decrease	1,211 %	-0,107 %	-1,818 %	-0,478 %	-0,298 %

First, it is logical to study monetary policy announcements to increase interest rates, because at the beginning of the study period there were a more interest rate increase announcements. ECB monetary policy announcement to increase the interest rates is usually seen as an action to curtain economic growth according to Ioannidis and Kontonikas (2006). So it is expected to see that stock market returns are negative by these actions. But for banks increases in interest rates means that lending money is more profitable because they are able to charge more from given loans. When looking at the average CAR values for all banks to interest rate increase announcements in Table 5, the reactions are more negative compared to EU stock markets. Except in 2008 when bank stock prices had excess return compared to EU stock market return.

Table 5. The average CAR results for individual banks and for all the banks for ECB monetary policy announcements where interest rates were increased

YEAR	ACA.PA	SAN.MC	DKB.DE	DNP.PA	FOR ALL BANKS
2006	-0,666 %	-0,301 %	-0,320 %	-0,207 %	-0,374 %
2007	0,043 %	0,032 %	-0,422 %	-0,013 %	-0,090 %
2008	3,728 %	-2,453 %	-0,044 %	1,979 %	0,802 %
2011	-0,672 %	-0,253 %	0,225 %	-1,240 %	-0,485 %

Looking at the average CAR values of Credit Agricole only 2006 and 2011 values are only negative to ECB interest rate increase announcements. 2007 and 2008 Credit Agricole reacted positively to interest rate increases. When comparing Credit Agricole's average CAR values yearly to other banks, Credit Agricole has car values that are numerically larger than other banks except 2011. It shows that Agricole reacts more different when compared to EU stock markets than other banks. Comparing Credit Agricoles CAR values to yearly averages of all the banks, in 2007 there is a difference when Credit Agricole CAR value is positive when all bank average is slightly negative.

Grupo Santander CAR values for interest rate increases follow closely to all bank averages except in 2008 when Santander has a 2,45% negative CAR value compared to 0,8% all bank average for the period. Otherwise, Santander follows closely to all bank averages in other years.

Deutsche Bank CAR values for interest rate increases follow closely to all bank averages except 2008 and 2011. In 2008 Deutsche has -0,044% CAR average and all bank average is 0,8%. Also in 2011, all bank average CAR is-0,485% and Deutsche CAR average is 0,225%.

DNP Paribas follows also close all bank averages every year. The difference in DNP Paribas CAR values to is that the CAR values are higher in 2008 and more negative in 2011. DNP Paribas 2008 CAR average 1,979% compared to all bank average 0,8% and 2011 DNP paribas -1,2% compared to all bank average -0,485%.

In Table 6, there is a comparison of the CAR values of individual banks and CAR average values for all banks when ECB monetary policy decreases interest rates. Decreases of interest rates are usually seen as a market expanding action. For banks decrease in interest rates means that profit from the loan is smaller but companies might take more loans. When analyzing CAR averages of all banks 2008, 2009, and 2010 decreases caused negative CAR values for all bank averages. Especially the 2012 interest rate decrease caused a -5,93% CAR value for all bank stock average. Those years' interest rate decreases were seen to be more unprofitable to banks than to EU stock market companies. The years 2013 and 2014 banks CAR values were positive and banks had excess return when comparing to the EU stock market, that means that decrease was seen as an action that increased banks profitability. Table 6 below shows the average CAR values for individual banks and for all banks.

Table 6. The average CAR results for individual banks and for all the banks for ECB monetary policy announcements where interest rates were decreased

YEAR	ACA.PA	SAN.MC	DKB.DE	DNP.PA	FOR ALL BANKS
2008	3,095 %	-0,295 %	-5,884 %	2,026 %	-0,264 %
2009	0,009 %	0,654 %	-1,002 %	-3,208 %	-0,887 %
2011	1,910 %	-0,025 %	-0,747 %	0,893 %	0,041 %
2012	-6,715 %	-6,817 %	-5,289 %	-4,901 %	-5,931 %
2013	2,575 %	-0,520 %	1,977 %	0,903 %	1,234 %
2014	2,687 %	2,339 %	-0,485 %	0,687 %	1,307 %

Credit Agricole Average CAR values are more positive than CAR averages for all the banks in the study except the year 2012. Credit Agricole CAR values show that they don't mind lover interest rate and the possible increase in new loans is seen as a positive thing for the bank.

Grupo Santander follows closely to all bank average CAR values except 2009 and 2013. In 2009 Santander average CAR value is 0,65% when all bank average is -0,887% and in 2013 Santander CAR -0,519% and all bank average 1,234%.

Deutsche Bank CAR average values follow all bank averages except 2008, 2011, and 2013. The year 2008 Deutsche banks' high negative CAR value -5,88% stands out when comparing to all banks average -0,265%.

DNP Paribas follows closely to bank averages except for the years 2008 and 2009. In 2008 Paribas CAR value is positive 2,026% compared to -0,264 for all banks, this could show that fewer profits from the loans are not seen as a negative thing. During financial crises 2009 DNP Paribas CAR value -3,2% is more negative compared to the average for all banks -0,887% which is the lowest of all the banks included in the study.

3.2. Correlation analysis

The correlation analysis comparing CAR average value and ECB announcements in general shows is there any relationship between those two variables. General ECB announcements include no change, increase, and, decrease monetary policy announcements. The table below shows the correlation coefficient value between general ECB announcements and CAR averages for banks.

Table 7. Correlation coefficient value between general ECB announcements and CAR averages for banks

	Announcement General	AVERAGE CAR
Announcement General	1	
AVERAGE CAR	0,024	1

The correlation coefficient for ECB announcements in general and CAR averages is positive 0,0236. However, the correlation coefficient is very small and indicates that ECB announcements do not have a correlation with the average CAR..

The next correlation analysis is between ECB monetary policy increase announcements and CAR values. The correlation analysis in Table 8 shows that there is no correlation between CAR values and interest rate increase announcements.

Table 8. Correlation coefficient between CAR values and interest rate increase announcements

	Increase	Average CAR
Increase	1	
Average CAR	-0,005	1

The correlation coefficient between increase announcements and CAR averages is negative -0,005. The results show that the correlation is slightly negative which means that when there is an interest rate increase announcement then the average CAR decreases. However, the coefficient is very close to zero and it cannot be claimed that there is a correlation between interest rate increase announcements and CAR average values.

The last correlation analysis is between ECB decrease announcements and CAR average values. The correlation coefficient is shown below in the Table 9.

Table 9. Correlation coefficient between CAR values and interest rate decrease announcements

	Decrease	Average CAR
Decrease	1	
Average CAR	-0,010	1

The correlation coefficient between ECB monetary policy decrease announcements and average CAR values is -0,01. The result shows again that there is no correlation between the interest rate decrease announcements and average CAR.

3.3. Bank stock sensitivity

When analyzing the year average CAR values for ECB monetary policy changes, the results showed that individual bank averages differ often from all bank average. Looking at the CAR year averages for both changes does not leave much room to analyze. Year averages include both changes and results vary much year to year. Looking at the CAR year averages to changes results to it is possible to measure bank stock sensitivity compared to EU stock markets.

Ricci (2015) findings of the monetary policy effects on EU bank stocks show that banks with weak balance sheets are more sensitive to monetary policy changes which could be the case also in this paper. Also according to Ricci (2015) bank stocks reacted more strongly to non-standard measures than interest rate changes, which supports and explains the relatively low CAR averages for all banks in this study.

The sensitivity of bank stocks compared to stock markets looking at the averages is under 1% from 2006 to 2011. There is a clear change in the sensitivity of the bank stock average of all banks from 2012 to 2014 when CAR values are higher than 1%. These results get support from Kim, Lee, and Wu (2013) study where they studied FED and ECB rates. Their results suggest that ECB monetary policy affects the EU banking system heterogeneously and that financial crises caused bank stock to react more sensitively to policy news.

From 2006 to 2014 CAR yearly averages for all banks increased during the study period. Fausch and Sigonius (2017) who studied unanticipated changes of ECB announcements showed results that

markets reacted strongly when interest rates are negative. This could explain the increase of CAR result when interest rates decrease and finally in 2014 turn negative. The year 2014 had the largest CAR value of the period. Demiralp et al. (2017) findings could explain why CAR average value for all banks is positive in 2014 when negative rates occur. They found that banks could adjust their balance sheets to negative rates.

Altavilla et al. (2019) studied negative policy rates effects on banks and they found that their business becomes more difficult when interest rates turn negative. Their findings don't line with the findings of this paper because 2014 all bank CAR averages suggest that banks had excess returns compared to markets. One possibility could be that EU stock markets suffer more than banks which explains 2014 positive CAR values and Altavilla et al. (2019) findings are in line with the CAR values in this study.

3.4. Reactions to changes

Interest rate changes are the main focus of the study and the reactions of the markets and banks are not consistent in the ether of the changes. The most meaning full way to look at the CAR-Model results is to look at the yearly averages for both increases and decreases separately.

According to Ioannidis and Kontonikas (2006) cash flow model increase of the interest rates causes markets and stock prices to react positively, logically decreases should cause stock prices to fall. Yearly CAR averages for increases are negative except 2008 which supports the Ioannidis and Kontonikas (2006) findings. For decreases in 2011, 2013 and 2014 have positive CAR averages which also support Ioannidis and Kontonikas (2006) findings. For decreases 2008 and 2009 which were the years when financial crises occurred were negative which could show that financial crises had an effect on monetary policy announcements.

Shiu-Sheng Chen (2007) studied monetary policy effects in the bull and bear found that strict monetary policy has a negative effect on stock markets. Also her findings indicate that monetary policy is most effective in bear markets. When looking at the CAR average results for all banks in increase announcements the CAR averages are negative except 2008 which supports Shiu-Sheng Chen (2007) findings.

3.5. Hypotheses

There are four hypotheses for this study, sensitivity and bank stock reactions are the two variables in the hypothesis. The first hypothesis was that stock markets and bank stocks react both the same ways to monetary policy changes. Bank stocks are not more sensitive compared to EU stock markets, and there is no excess returns or deficit. Looking at the CAR averages this hypothesis is not proven because the CAR values are not zero or close to zero except 2008. Bank stocks are more sensitive to monetary policy changes and especially in 2012. In the year 2008 CAR results are more negative than the rest of the year due to problems with the balance sheets that banks had.

The second hypothesis was that the monetary policy effects on the stock market have not changed and the reactions remain same as before the crises. Also, that bank stock react more positively to monetary policy decreases and more negative to increases. The second hypothesis is not proven entirely. First bank CAR values increase during the timeline and banks are more sensitive to monetary policy announcements. Also when interest rate increases occur all the CAR value yearly averages are negative except 2008, which abolishes this hypothesis. When decrease announcements come during financial crises and 2012 CAR values are negative which also abolishes this hypothesis.

The third hypothesis of the study is that stock markets continue react same to monetary policy changes after the financial crises and that bank stocks reactions change to interest rate increases and decreases. Hypothesis include that change is not temporary. This hypothesis is also proven partly. There is a clear change in CAR average values in decreases and increases during global financial crises. Also there is 2012 average CAR value for decreases which is highly negative. But after financial crises CAR values for decreases are turning again positive which proves that the change is temporary.

The fourth hypothesis is that there are clear changes in the bank stock reaction and in EU stock market reactions during the 2008 financial crises and sovereign crises, but after that reactions change back to a time before 2008. The fourth hypothesis is following the results closely. There is a clear change in CAR values during the financial crises but after that, the CAR values follow expectations.

CONCLUSION

The objective of the study was to find out how EU stock markets and large EU banks react to monetary policy changes after the financial crises. The 2008 global financial crisis affected the European Union and the whole world, and Central Banks had to take action to save the economy. One of the actions of Central Banks is to change interest rates.

The 2008-09 Global Financial crisis is considered one of the worst financial crises. The paper focuses closely on the 2008-09 financial crises and tries to study the changes in ECB interest rates and if these change announcements have different effects on stock prices during the crises. The study timeline includes the Global Financial crisis and the European debt crises. The European debt crises affect the study results but the main focus in the study is the Global Financial crises.

In the study, the tool to find out how the ECB monetary policy affected bank stocks and EU stock markets is the cumulative abnormal return (CAR) model. The banks representing bank stock data are Deutsche Bank, Credit Agricole, Grupo Santander, and DNP Paribas. The timeline of the study was 2006-2014 and the market reactions are calculated using two days time window. The CAR-model shows the excess return of the bank stocks compared to EU stock markets (STOXX 600) when ECB monetary policy announcements occur in two days time window. These results were calculated for the increase, decrease, and no change announcements.

CAR results in the study were analyzed by looking at the average values. There are different average values for individual banks and for all banks in the study. Also there are averages for years for increases, decreases and no change announcements. This method causes the results to be affected by extreme values and that the sample size is quite small.

The results in the study show that there is a clear change in the CAR values during the Global Financial crises and European debt crises. The sensitivity of the bank stocks also seems to be higher after the Financial crises, which shows that there is a change in market reactions to ECB

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announcements. The claim that there is a structural change in how EU markets and bank stocks react to monetary policy changes is not proven in the study. There is a change in the sensitivity of the market reactions but the positive and negative reaction relationship with interest rate changes has not experienced structural change. The Financial crisis affected the relationship between the positive and negative relationship with the interest rate changes but after 2012, the relationship changed back to time before financial crises.

The study included four hypotheses including sensitivity and the market reactions to increases and decreases. From these hypotheses, the fourth hypothesis was proven. The fourth hypothesis was that there are clear changes in the bank stock reaction and in EU stock market reactions during the 2008 financial crises and sovereign crises, but after that reactions change back to a time before 2008.

There are some limitations to the study. The first limitation is the small sample of banks which is four banks. The idea in the study was to study the largest EU bank measured by the balance sheet. The sample of four banks does not represent the whole banking industry. The four banks in the study still have such an effect on the economy that they are considered too big to fall. Also, EU countries don't have one stock market which could be measured and that's the reason why the STOXX 600 Europe index is used for the study. However, the STOXX 600 Europe doesn't represent the whole of EU stock markets.

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