T.C.

TURKISH- GERMAN UNIVERSITY

INSTITUTE OF SOCIAL SCIENCES

BUSSINESS DEPARTMENT

EFFECT OF THE FED AND ECB INTEREST RATE HIKES ACCORDING TO CHANGES OF MONETARY POLICY AGAINST THE UNPRECEDENTED GLOBAL INFLATION INCREASE OF THE LOCATION ON THE STOCK PRICES OF THE COMPANIES INCLUDED IN THE DAX INDEX – A MULTIPLE TIMES EVENT STUDY ANALYSIS

MASTER'S THESIS

Burak YILDIZ

ADVISOR

Prof. Dr. Felix ZEIDLER

ISTANBUL, July 2023

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MASTER'S THESIS

Burak YILDIZ

(228113001)

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Thesis Advisor : ……Prof. Dr. Felix ZEIDLER……..
Other Jury Members : … Doç. Dr. Mehtap ÖNER..
: …Dr. Öğr. Üyesi Çiydem ÇATAK...
Substitute Jury Members : Prof. Dr. Ela Sibel BAYRAK MEYDANOĞLU…
:..Dr. Öğr. Üyesi Alican UMUT…

ISTANBUL, July 2023

TÜRK-ALMAN ÜNİVERSİTESİ
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TEZ SAVUNMA SINAV TUTANAĞI

ÖĞRENCİNİN,

Numarası	:	228113001
Adı Soyadı	:	Burak Yıldız
Anabilim Bilim Dalı	:	Sosyal Bilimler Enstitüsü
Programı	:	İşletme Yönetimi (İkinci Öğretim Tezli) İngilizce
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Prof Dr. Felix Zeidler	Doç. Dr. Mehtap Öner	Dr. Öğr. Üyesi Ciyden ÇATAL
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TURKISH ABSTRACT

DAX ENDEKSİNDE YER ALAN ŞİRKETLERİN HİSSE SENEDİ FİYATLARI ÜZERİNDEKİ BENZERSİZ KÜRESEL ENFLASYON ARTIŞINA KARŞI PARA POLİTİKASINDA DEĞİŞİKLİKLERE GÖRE FED VE ECB FAİZ ARTIRIMLARININ ETKİSİ – BİRDEN ÇOK ZAMANLI OLAY ETÜDÜ ANALİZİ

2020 yılıyla beraber pandeminin getirdiği olumsuz ekonomik koşulları önlemek için başta Federal Rezerv ve Avrupa Merkez Bankası olmak üzere birçok merkez bankası parasal gevşemeye gitmiştir. Uluslararası etkiye sahip Fed ve Avrupa merkez bankasının piyasaya sağladıkları likidite enflasyonist ortamın oluşmasına olanak tanımıştır. Gelişmiş olarak tanımlanan ülkelerde ortaya çıkan ve hızla yükselen enflasyon aynı zamanda küresel diğer faktörlerinde etkisiyle son yılların rekorlarını kırmıştır. Fed ve ECB tarafından enflasyona karşı sıkılaştırıcı para politikalarına geri dönüş yapılmasıyla beraber birbirini takip eden faiz artışları gerçekleşmiştir. Faiz artışlarının firmaların borçlanma maliyetleri üzerindeki etkisi hisse senetlerinin piyasa tarafından genellikle negatif fiyatlanması ile sonuçlandığı bilinmektedir. Bu çalışmada Fed ve ECB para politikası kararlarının Alman DAX endeksi ve endeks içerisinde yer alan hisse senetleri üzerindeki fiyatlama etkisi incelenmiştir. Araştırma için olay etüdü (event study) yöntemi tercih edilmiştir. Bu çalışmanın literatüre olan katkısı her iki merkez bankasının oldukça şahin duruş sergilemesine karşın endekslerin süreç içerisinde fiyatlama davranışlarındaki mevcut farklılıkların incelenmesine yönelik analizlerin yapılmasıdır. Yapılan analizler sonucunda Fed kararlarının DAX endeksi üzerinde daha fazla etkiye sahip olduğu, piyasaların agresif ve ardışık faiz artışına rağmen toplantı özelindeki açıklamalara da bakarak pozitif fiyatlama davranışı sergiledikleri, buna bağlı olarak kümülatif anormal getirilerde faiz artışlarına rağmen yükselişler gerçekleşmiştir.

Anahtar Kelimeler: Enflasyon, DAX Endeksi**,** olay çalışması
Date: July 2023

ENGLISH ABSTRACT

EFFECT OF THE FED AND ECB INTEREST RATE HIKES ACCORDING TO CHANGES OF MONETARY POLICY AGAINST THE UNPRECEDENTED GLOBAL INFLATION INCREASE OF THE LOCATION ON THE STOCK PRICES OF THE COMPANIES INCLUDED IN THE DAX INDEX – A MULTIPLE TIMES EVENT STUDY ANALYSIS

To avoid the detrimental economic effects the epidemic will have in 2020, many central banks, especially the Federal Reserve and the European Central Bank, have gone for monetary expansion. The liquidity provided to the market by the internationally influential Federal Reserve, and the European Central Bank allowed the formation of an inflationary environment. Rapidly rising inflation, which emerged in developed countries, broke the records of recent years with the effect of other global factors as well. Following the return of the Fed and ECB to their tightening monetary policies against inflation, successive rate hikes took place. It is well recognized that interest rate increases have an impact. on firms' borrowing costs results in generally negative pricing of stocks by the market. In this study, the pricing effect of the Fed and ECB monetary policy decisions on the German DAX index and the stocks in the index has been examined. The event study method was preferred for the research. The study's contribution to the literature is to analyze the existing differences in the pricing behavior of the indices in the process, even though both central banks have a very hawkish stance. As a result of the analyzes made, it was observed that the Fed's decisions had more impact on the DAX index, the markets displayed positive pricing behavior despite the aggressive and consecutive interest rate hikes, by looking at the meeting-specific explanations, and accordingly, the cumulative abnormal returns increased despite the interest rate hikes.

Key Words: Inflation, DAX index, event study
Date: July 2023

LIST OF SYMBOLS

M3	**:** Broad Money Supply
α	**:** Intercept
β	**:** Slope Coefficients
$	**:** American Dollar
€	**:** Euro
δ	**:** Standard Deviation

LIST OF ABBREVIATIONS

AAR : Average Abnormal Return
AEX : Amsterdam Stock Exchange
APP : Asset Purchase Programme
AR : Abnormal Return
CAAR : Cumulative Average Abnormal Return
CAC 40 : Cotation Assistée en Continu
CAR : Cumulative Abnormal Return
CBRT : Central Bank of the Turkish Republic
CPI : Consumer Price Index
DAX : Deutscher Aktienindex
ECB : European Central Bank
EU : European Union
FAIT : Flexible Average Inflation Targeting
FED : United States Federal Reserve System
FOMC : Federal Open Market Committee
IBEX 35 : Índice Bursátil Español
PMI : The Purchasing Managers' Index
USA : United States of America
US : United States
XETRA : German Electronic Exchange

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CHAPTER 1 INTRODUCTION

Every independent country in the world either independently or under the umbrella of a union has its currency (etc. Eurozone) (Goodhart, C., 1988). Furthermore, there are for the purpose of printing the local currency, central banks and to be active in a balanced way according to the supply-demand conditions in the market. Although the job description of central banks is determined according to the constitution of each country, their main duty is to ensure price stability, while ensuring the security of the local currency in general (Goodhart, 2008). Financial markets are directly affected by global developments. Especially some announcement in the market has a decisive effect on the financial markets. These announcements can hold many different information inside. Company developments, dividend distribution, mergers, acquisitions, agreements with other companies, country events, global disasters, and changeable monetary policies by local central banks especially made by reserve currency banks can be examples of this information. Since it has one of the biggest economies in worldwide the USA has a significant impact on global markets and pricing. The Fed frequently gets referred to as the US central bank, is the only authorized institution that determines monetary policies. For this reason, it is known that the monetary policy decisions taken by The FED significantly affect asset values, particularly stock prices, globally (Kishor & Marfatia, 2013). In the joint work of Bernanke and Kuttner, the Fed's reduction of the policy rate by 25 basis points caused an increase of approximately 1% in the index of S&P 500, which is an important indicates in the USA (B. Bernanke & Kuttner, 2004). Among the main reasons for this change, it can be said that the companies' borrowing at lower costs, in this case, the companies' reduction in the discount rate and the reaction of the markets on the fact that it will make a positive contribution to the profitability rate in the future. With the rapid increase in globalization and production, countries' trade with each other has also improved. As a result of this development, the effects of the decisions taken on each other have increased daily. As a result of their studies, Ehrmann and Fratzscher (2009) and Hausman and Wongswan (2011) found that the policy rate changes made by the Fed also caused a significant change in foreign stock returns. The investigations led researchers to draw the following conclusion, while surprise rates of interest cuts had a favorable impact on stocks while having a negative impact on interest rate increases (Ehrmann & Fratzscher, 2009).

To secure the continued existence of economic activity and the pandemic that occurred since the beginning of 2020, central banks on a global scale preferred expansionary policies over the market (Mosser, 2020). Towards the end of the pandemic, global inflation increased due to expansionary monetary policies as well as other factors (etc. chip crisis, and supply chain problems) (Ha et al., 2022). Although countries preferred expansionary policies during the pandemic, then developed countries began to make decisions for monetary tightening against increasing inflation for the first time in many years.

In this study, we will examine and analyze the changes in the monetary policy of two important central banks, which significantly manage the money flow in the world, on the DAX index. One of the two central banks subject to the study was designated as the Federal Reserve from the USA, and the second major responsible for the euro area is the European Central Bank, which manages the monetary policy in the euro area. The DAX index, which is considered an important indicator of Germany's economic performance, is also closely followed by international investors. This situation provides an idea about the changes in the performance of the DAX index as well as the changes in the global financial markets. Another important factor in the selection of the DAX index is that the economic integration between the USA and Germany is at a high level and accordingly, any decision taken by the FED has a great impact on the DAX index as well as the European indices. In addition, it aims to reach a conclusion about the fact that the DAX index has broken historical records since the beginning of the monetary tightening, how effective the decision to increase the interest rates on the index, and to what extent the current returns coincide with the information in the literature.

CHAPTER 2 CENTRAL BANKS, MARKETS AND INDICES IN THE FINANCIAL ECOSYSTEM: LITERATURE REVIEW

There are many financial indicator factors that can affect the economy. Some affect it directly, while some of them affect it indirectly. But in a whole perspective, all factors have an influence on the economic circumstances. These financial indicators such as inflation, monetary policy, stock market, current deficient/surplus, cash flow, profit margin, and many others. Some of these factors are a cause factor for the economy, while others can be a result. According to do indicators results, significant decisions can be taken by governments, central banks, companies, and even individual investors. The decisions taken are very important to protect the future economic environment and ensure stability, especially for the macroeconomic framework. Some of the indicators among others are more important for the central banks and investors. Central banks pursue inflation, and employment rates closely in order to designate monetary policy and guide market stakeholders. On the other hand, the current deficient/surplus, the balance of foreign trade, inflation rate, and the rate of policy by central bank fellow closely by national ministry of finance. In addition to these two dominant institutions, investors and international financial institutions follow these indicators. But only central banks and the national ministry of finance can determine a path to avoid financial disruption and ensure sustainable financial stability according to indicators results. For this reason, although the job descriptions of the central bank and the national ministry of finance are different from each other, but they need to work in cooperation.

In the literature there are many research have existed about inflation, monetary policy, and stock markets. Inflation means increasing of the price levels and it ends up increasing goods and services generally (Ball & Mankiw, 2002). Inflation can be caused instability and it helps to decrease purchasing power from consumers. In addition to inflation can be limited to national growth (Blanchard et al., 2007). For this reason, especially economists have a common thought that maintaining stability calls on controlling inflation. That's why economists search for reasons of inflation, they try to find how can overcome inflation and they suggest appropriating various policy tools (Romer, 2016). On the other hand, stocks are financial entities and represent that the company possession (Fama, 1970). Equity is

known as an investment tool by investors by purchasing the shares sold by companies by foreigners (Malkiel, 1999). The profitability, reputation, and activities of the company may vary in the stock price. That's why investors follow the stock price movements with the performance of the company (Shiller, 2000).

Another important indicator is the central bank's policy rate, which is set in accordance with the shifting the dynamics of economic conditions. The ratio of policy rate affects borrowing and loaning between banks and therefore it directly impacts on the economy (Goodfriend & King, 1997). Besides policy rates can be using to control on the inflation by central bank. Considering the literature, a low policy rate promotes economic growth while the high ratio of policy rate serves to control inflation. As a result, inflation, policy rates, and stocks are fundamental indicators of the economy and there is much research about the relationship between them. For instance, according to literature increasing of inflation has a negative effect on stocks (Taylor, 1993). In addition to inflation, it has been observed that the stock market is negatively impacted by the boost in the policy rate.

In this part, we are going to define stock, stock market, inflation, monetary policy, two reserved unit currency central banks, and their meetings definition with specific Germany DAX index according to investors, companies, and the perspective of the market. What are the stocks and how can we have them? Who can achieve stock and how can they use it? Is it profitable for the investors or it is just can changeably tool for the market. How many types of stock have existed? Companies also can have a stock, or they can be a stock and represent companies in the stock market? What is happened at the central banks meeting? What is inflation and how it affects the economy? The answers to all questions will be explained in this section based on the literature.

2.1 FINANCIAL MARKETS

Financial markets play a critical role in the division of extreme savings to ensure the continuation of business in the economy ("Purpose and Structure of Financial Markets," 2011). All these operations can be in progress with different varieties. The commercial banking system can be counted on the top of this variety because they are vital for the financial sector and the sustainability of the economy. Commercial banks take money from depositors and provide credit options to producers, and manufacturers. Similarly,

individuals consumers, and shareholders of service sectors can take advantage of these credit options. All these partners from manufacturers to home buyers lead to contribute to economic improvements firstly where they are secondly and generally global economy. On the other hand, governments expel short- and long-term bonds to finance to set up new schools, hospitals, public transportation networks, or new roads ("Purpose and Structure of Financial Markets," 2011). Individuals or corporate investors provide funds on purpose to earn more gains than their consumption.

In the last few decades, not only the world but also the financial environment has evolved. Globalization of the world leads to development to enable finance to participate in this trend. Nevertheless, globalization with came an unparagoned increase in the volume of funds and the growing size of financial industries. Through the process, many different institutions occur all around the world. With increasing institutionalization, individual investors and companies became more effective not only in their local market but also in foreign markets where investing foreign funds and establishing the place of production. Furthermore, technological developments have made this easier. In the modern world, people can communicate with each other in easier and more inexpensive ways courtesy of technological improvements. Information spreads fast and governments are reduced control and pressure on funds significantly. On the contrary to this, after years of the growth of international trade, countries, and companies have become more dependent each other with contributions of globalization. These factors have encouraged demand like management of foreign currency, lend of in foreign countries, borrowing debt, and currencies (Pilbeam, K., 2018). That situation has occurred the international financial integration and that's why the financial markets became more sensitive to external news and facts.

Two types of financial markets exist. One of these money markets and another one is capital markets. Money markets are interested in short-term entities that transform into money quickly. Short-term is defined as one year or less maturity. On the other hand, capital markets are concerned collect new stock and present stock or trading of bonds and it is defined as including more than one year of maturity (Valdez & Molyneux, 2016). In addition to these two financial markets, the currency market and derivative market exist. In a currency market, different currencies are processed to each other reciprocal, while a

derivative market lead to today's buy and sell options or following purchase and sell function be treated in terms of financial (Pilbeam, K., 2018).

2.2 CENTRAL BANKS

Central banks have a significant impact on the economy and are a crucial component of financial institutions. They determine discount rates for the economy in order to sustain the stability of the wheel of the economy continuously. At the same time, significant duties of central banks such as money supply, and regulation of the monetary base can be impartible (Wu, 2022). Each independent country has its own central bank, as well as a central bank that manages and controls the common currency of the countries in the union. Among all central banks, some of them are more well-known than others and they have high linguistic power in the financial markets. For instance, the Federal Reserve (FED), the Bank of England, the Bundesbank of Germany, the Bank of Italy, the Bank of France and the Bank of Japan can countable. Following the establishment of the European Central Bank in January 1999, the importance of the Bank of France, the Bank of the Nation of Italy, and the Bundesbank of Germany has declined because the decision and the monetary policy have started to be taken by European Central Banks (Pilbeam, 2018). However, The People's Bank of China is a significant central bank that has gained notice recently. Although central banks worldwide duties are defined by their own country's dynamics, and regulations and be determined by the circumstances but generally they share a common mission to protect and keep going their own economy. The objectives of monetary policy include full employment and specific tasks involving price stability. Economic theory prefix that the stability of price provides essential benefits to the economy and monetary policy indicates an essential tool and has an important role in order to reach sustainable macroeconomic stability (Mishkin, 2007, p. 39; Scheller, 2004, p. 45). Although every national central bank has distinguishing characteristics from another national central bank. For instance, the Federal Reserve System of the United States has the authority to price stability and full employment. The Federal Reserve (FED) also controls and regulates domestic commercial banks. The European Central Bank, the second-largest central bank, on the other hand, is solely focused on maintaining and ensuring price stability. In addition to two of these major central banks, the Bank of England also has an additional duty to maintain financial stability (Clapham, 1944, p. 64). According to most circumstances, central banks have evolved into

"lenders of last resort," as Walter Bagehot (1873) put them, in terms of supplying liquidity when financial crises happen (Bagehot, 1873).

General the central bank important roles can orderable as follows;

- Controlling the nation’s local currency and reserves
- Supervising the banking system
- Monetize domestic currency
- Acting as banker to the other banks and governments
- Admonish the government on fiscal and monetary policy
- Interacting with international organizations and central banks
- Executing monetary policy and managing currency rates

2.2.1 Central Bank Independence

Managing monetary policy requires quite sure determination and financial market actors want to see and observe decisions taken by the central bank. According to economic logic, there managing monetary policy by a central bank that is independent has been the subject of numerous long-standing research in the economic literature (Alesina & Stella 2010). A controller of money can support the economy temporarily. Unfortunately, if this economic boost is non-rational anywise that situation could create and turn into inflationary conditions without any employment, positive current surplus, and income (Kydland & Prescott 1977; Barro & Gordon 1983). Time is needed to see the outputs of monetary policy and to observe its effects on the market. But there is a time inconsistency in the nature of monetary policy and central banks aware of this inconsistency completely. One of the possible ways to get rid of inflationary prejudice transfer to let more anti-inflationary policies espouse more conservative central banks (Rogoff K., 1985). When investors invest in stocks, facilities, or government bonds in order to gain more money than consumption. Investors invest in an environment of trust. When they invest in any financial product and anything happens to these investments, they seek legal and legal security. In that part, this is where the central bank's independence comes in. In an inflationary environment, the central bank has to take serious decisions in terms of monetary policy. On the contrary, politicians put pressure on

the central banks to expansionary monetary policy, especially during election times. However, the central bank policymakers who implement expansionary monetary policy under unfavorable conditions can save time on short-term trade growth and employment. Although this circumstance aids the central bank in easing political pressure on it, it accelerates impact of its decisions on inflation and price stability. Independence shields the central bank from the blindness that frequently characterizes politics and results from politicians' worries about winning elections promptly which should provide better policy outcomes (Mishkin, F. S., 2007). Therefore, the central bank should be more reliable, and it has to endure pressure from politicians related to elections in order to procure independent monetary policy. Both academic and real-life evidence support macroeconomic performance is getting improved when the monetary authority is impartial. The countries with the most autonomous central banks exhibit the best inflation performance when the legal independence of central banks in developed nations is ranked from least to highest (Fernández-Albertos, 2015).

2.2.2 Federal Reserve System

On December 23, 1913, President Woodrow Wilson signed the Federal Reserve Act into law, establishing the Federal Reserve System (Federal Reserve Board - Federal Reserve History, 2017). The sole recognized national central bank is the Federal Reserve (FED) of the United States. The FED consists of a central and major structure situated in Washington, D.C. The Federal Reserve System is constituted total of 12 members and at the same time, all members also represent regional federal reserve banks. There are 12 federal reserve banks in all, and they are spread across the country's major cities (Federal Open Market Committee, 2023).

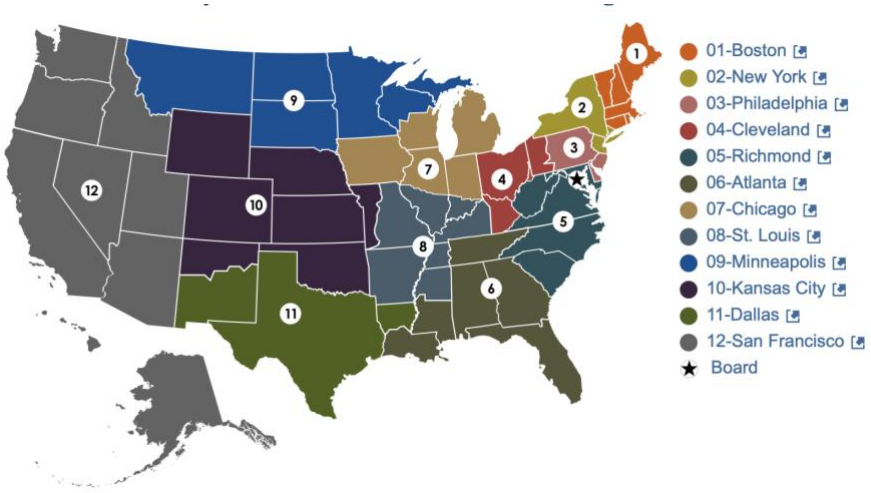

Figure 2.1 All Federal Reserve Banks Member with Regional Locations, Source: Federal Reserve History, 2017

The Federal Reserve System is an institution so mentioning its history means the decisions made and the actions they took. During American central banking's track record throughout history, several different practices had been applied in terms of providing financial stability and result to make effective trade with appropriate exchange rates with other countries. These decisions showed many different results. The United States was referred to as an economy that was developing at the start of 1913 (Meltzer, A. H., 2010). According to historical research and proofs are showed that Great Britain was the financial center of the world. Especially international financial events and systems are developed around Great Britain. At that time approximately 30% of the working population worked in the agriculture field (U.S. Department of Commerce 1966, p.178–79). When the fall comes generally agricultural products from the United States, demand increased and most of them are financed by the London market. That's why the control of the interest rate is a hand of Great Britain. The American bankers desired to work with London bankers instead. They knew that couldn't change the export credits at a central bank and these conditions brought a huge disadvantage for them. American politicians wanted to expand credit and they reduce interest rates to increase the export of products to create better financial surroundings for both sides. Finally, this idea was accepted and applied just being seasonal options by both sides with pleasure. This option, which started as a seasonal option, is an important but not the only factor in establishing the Federal Reserve System. According to Federal Economic Research Institution, the recession affected the Unites States economy many times and very long time, especially during 1893-94, 1895-1897, 1899–1900, 1902-1902, 1907-1908, and 1910-1912 (Meltzer, A. H., 2010). Based on information in the institution's archives, the

recession continued averaging nineteen months. Many companies faced financial failure and most of them bankrupt because most recessions were highly effective. The United States didn't have any harbourage to improve financial problems and avoid possible crises compared to other countries. Several crises and non-financial stability helped to establish the Federal Reserve System with raise support creating an entirely new central bank institution. After its establishment, the FED took credit in order to increase financial performance in 1920. Fed removed seasonal credit and changeable interest rates which trigger financial instability. These major changes led to overcoming the financial crisis relatively even though, the United States faced some financial fluctuations at that time.

By the 1950s, the positive response to the steps taken began to be received, and the gross national product in the first quarter of 1951 was almost three times higher than in 1914 when started of Federal Reserve System operations. Although, the main real warrant of FED, the main purpose is to support financial and economic stability to provide liquidity for business trade with the intention of definitive goal to apply flexible monetary policy opinion. However, many economic historians indicated the federal reserve bank increased the money supply when trade actions and price movements pressure upstream times. In this way, movements of the Federal Reserve were disposed to increase economic activities and high volatility on price instead of decreasing (Friedman and Schwartz 1963; Humphrey 1982; Meltzer 2003).

In history, Federal Reserve faced many difficult times. But the most critical challenge was the Great Depression for the FED impartible. In 1930, the Federal Reserve supplied a considerable amount of money to banks. Unfortunately, the Federal Reserve failed because banks couldn't manage monetary and credits respectively. These problems were the most important cause of ensuring the economic recession. As a result of insufficient policies, the FED collapsed under economic failures, political developments, and new ideas, and unfortunately, Federal Reserve lost its prestige after the 1930s economic disaster. In 1935, Banking law according to part of the Federal Reserve Act section of 12A(c) was changed as regards of credit status of the general country status rather than supply-only focus on short-term liquidity to the market (B. S. Bernanke, 2013). Besides congress expanded the Fed's discount credit ability with more extensive assurance variety under the guarantee and allowed support in order to supply expanded credit to opponents. The reality of the great

depression encountered by the FED has resulted in three crucial changes for the FED. These three aspects are objectives, accountability to the public, and frame of policy (B. S. Bernanke, 2013). United States authorities and Federal Reserve were afraid of high unemployment rates after the Second World War. For this reason, FED supported to continuing full employment on purpose macroeconomic policy. In 1935, Federal Reserve has been increased its constitutional independence with the help of the Banking Act and supported more central power by Federal Reserve Commission. Especially, Federal Open Market Commission (FOMC) became modern status, and this helped to appear more accountable to the market stakeholders (B. S. Bernanke, 2013). During the Second World War, Federal Reserve tried to keep not only low interest rates but also used other tools on purpose to financial support to the government. Federal Reserve monetary policies were influenced by the treasury until it gained its full independence according to the 1951 agreement with the United States Treasury. During the 1950s and until the beginning of the 1960s United States had a low inflation rate that was acquired from policymakers in FED. After the 1960s policymakers believed that sustainable rapid growing can happen without inflation and they took actions, but they distanced themselves from reality against what they thought, and inflation was on the rise again (Orphanides, 2003). The FED, which decided to fight against the rapidly increasing inflation, did not give up the idea it adopted and refrained from using the monetary policy, which is the most important tool to directly fight inflation, which is not sustainable such as price controls and wage increases. By the 1970s, the double-digit inflation rate, unfortunately, did not provide the assurance of a real struggle against inflation by the authorities, and the inflation forecasts made for the future pushed the long-term interest rates into an unstable and unpredictable situation. Together with Paul Volcker, who became the chairman of the Federal Reserve in 1979, the institution fundamentally changed its definition of price stability. At least, they accepted that the double-digit inflation seen in America would continue for the medium and long term by the FED officials, and they started to be more aware of the risks that were too optimistic for the economy (B. S. Bernanke, 2013). In addition, with the newly appointed administration, the understanding to give more assurance to the private sector regarding the fight against inflation has been demonstrated. The reason for this was known to be the conditions necessary to ensure permanent employment together with price stability (Lindsey, Orphanides & Rasche 2005). The time frame, which began in the USA in 1984 and lasted until 2007 and was dubbed "Great Moderation" by the markets, created an area where price

stability was defined as the main goal for the Fed and the policy targeted for full employment. However, when we look at the events that took place in history, it made it very difficult for the Fed to achieve the success it aimed in financial stability in the terrorist incidents that took place in 2001 with the stock market collapse in 1987. Nevertheless, in such difficult times, the Fed continued to support the financial markets and decided to share the supervisory authority given to it by the constitution more regularly with other banking institutions (B. S. Bernanke, 2013).

History not only provides people with information about past events but also teaches people the lessons to be learned from the past. For this reason, it would not be wrong to say that it has undergone a change in the same way in institutions and organizations created by people. One of the best examples of this has contributed not only to the Federal Reserve but also to the developments that will lead to the adoption of different central banks of the world, as a result of the steps taken by the FED. People who make up parts of a whole, such as policymakers, economists, and state administrators, met in a common consensus about the value of institutions' communication so that they can achieve the goals they set. This situation has increased the emphasis of other central banks in the world on transparency and correct communication (Woodford, 2005).

As for today, the Federal Reserve is aware that the provision and continuity of financial stability and monetary policy should be shaped accordingly. It takes an equal distance approach to the tasks that should be within both goals. In this, he returned to his main goals when he was established in order to prevent sudden financial attacks primarily and then control them (B. Bernanke, 2011). Today, the FED cooperates with other regulatory bodies in order to both provide confidence and guide the market. In addition, together with the Financial Stability and Oversight Council, it regularly gives direction and follows the developments in order to strengthen the markets. While the steps taken in the time known as the Great Moderation continues today, the markets always draw attention to the factors that show the credibility of the FED and its determination in the fight against inflation. Finally, the FED, which has experienced the importance of correct communication before, ensures that the monetary policy has a more transparent structure, informs the market with the FOMC meetings, which are repeated every three months, and regularly publishes the

minutes containing information about the future expectations and steps to be taken after the economic conditions of that day.

2.2.3 European Central Bank

European Central Bank was established in December 1991 by the Maastricht Treaty. But the first was agreed by the European Council in June 1988 for the gradual dissolution of the economic and monetary union (European Central Bank, 2022b). It was a significant development for all of Europe because more than 60 years, countless monetary union initiatives have been set in Europe. Eventually, at the end of the 20's century, European Monetary Union was established by European Council in 1989 (Scheller, 2004). At that time committee was consist of European community national central bank presidents. Alexandre Lamfalussy from General Manager of the Bank for International Settlements, professor of economics Niels Thygesen from Denmark, and Miguel Boyer from the president of Spain (European Central Bank, 2022b). According to the Delors Report, the unity of economic and monetary depended on three different treads. The first stage started on first July 1990 and it contained liberty to options and increasing collaboration among national central banks. The second stage was initialized on the first January 1994 and the process was taken one step further. European Monetary Institute was created in the second stage and increased co-ordination of monetary policies was just one of the requirements. In this phase, the most important requirement was the sovereignty of national banks until the time that establishing the European Central Bank. The third stage was initialized on the first of January 1999. The last phase included many significant details such as the introduction of the Euro, applying only one monetary policy between members. Moreover, before starting to use the euro currency other national currencies have been fixed irreversibly in this stage. The main purpose is starting to use a single currency among the members and in this way increase economic and trade activities. The first members were Germany, France, Ireland, Italy, Belgium, Netherlands, Austria, Portugal, Luxemburg, Spain, and Finland. Operation of the European Central Bank began on 1 June 1998 taking over all procedures from European Monetary Institute and the main building is located in Frankfurt of Germany (Valdez & Molyneux, 2017 p. 54).

As outlined, the duties of the European Central Bank (European Central Bank (ECB) | European Union, 2023);

- Support the system safety and ensure Europe’s banking strengths.
- Evaluate price stability and their risk.
- Produce euro banknote and allows to produce of banknote by other euro members.
- Manage to sell/buy money in order to protect and consolidate foreign reserves.
- Set interest rates and monetary policy.
- Provide governance to financial markets and institutions by national authorities.

The European Central Bank's primary objective is maintaining stable prices. The Maastricht Treaty states that it is to bolster the general economic policies of the EU (Valdez & Molyneux, 2017, pp. 54). The monetary policy decision is taken by the majority of votes from European Central Banks. Also, all national central banks carry out a large part of foreign currency actions and operations of the money market. But these actions apply with determined regulations as far as by ECB.

There are three bodies in the ECB, and this is called the Eurosystem. These three administrative entities are the General Council, the Executive Board, and the Governing Council. The Governing Council assesses financial and business trends. While the Executive Board oversees everyday operations and puts the monetary policy into action. The General Council, on the other hand, is in consultation and coordination work (TURNA, 2014). Also, it helps to prepare to join new countries into the eurozone. The Eurosystem helps to increase cooperation between eurozone countries and national central banks of European Union countries that do not use the euro. According to the ECB, Eurosystem will be continues until all EU countries joining the euro area.

Today the European Central Bank (ECB) board members determine by eurozone members among 20 presidents of national central banks. However, the executive members are consisting of a total of six members with four other members joining the vice president and the president at the front. All executive members are appointed by European Council and each person has a tenure of 8 years (Waibel, 2020). There is also another institution besides ECB, and it is known European System of Central Banks. According to law non-eurozone

countries also represent themself in the European System of Central Banks. In this way, eurozone countries and non-eurozone European Union (EU) members associated with their national central banks are included in this system. Though, non-eurozone EU countries don't have any take decisions or obligations on monetary policy.

The executive board's responsibilities as listed (European Central Bank, 2022a);

- To prepare Governing Council meetings
- Managing ECB affairs on daily
- Using a certain power given by the Council of Governors.
- Applying monetary policy in the eurozone and guidelines signified decision taken by the Governing Council

When initiatives were made by the European central bank on January 1, 1999, the beginning of the third phase, for the use and promotion of the euro, which is the single currency, eventually got into circulation in the market on 1 January 2002. One of the most fundament and mandatory conditions for using the Euro is to be a country with EU membership. With the UK officially leaving the union as of January 2020. There are currently 27 countries that make up the European Union.

Figure 2.2 The current European Union Member States, Source: Easy to Read – About the EU | European Union, 2023

Although not every member state uses the euro currency today, they must of course switch to the euro one day in accordance with the Maastricht Treaty except Denmark. The euro, which was initially used in 11 member countries, increased its number to 12 with its

inclusion in Greece in 2001. Although the number of countries that are members of the European Union increased during the process, Malta, Slovenia, and the Baltic countries also participated in the eurozone region (Kiohos & Stoupos, 2018). With the beginning of 2023, Croatia, which has been a member of the European Union, has been the last member country to join the eurozone region as of 1 January 2023 (Ströhm, 2023). Today, it is located in countries that are not within the Eurozone but are not members of the European Union but use euros. These countries are not authorized by the ECB to issue any euro banknotes, nor is there any central bank intervention in the face of financial difficulties that may occur.

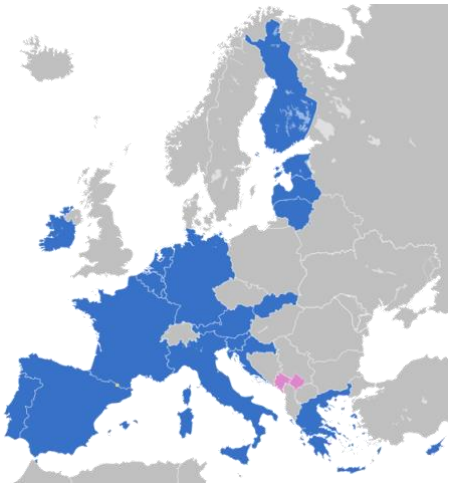

Figure 2.3 Eurozone map (those in pink are not EU members and are not supported by ECB), Source: Easy to Read – About the EU | European Union, 2023

2.3 STOCK AND STOCK MARKETS

Financial systems play a key role for the economy not only on local bases but also globally. The financial system is including a wide scope inside. Financial intermediaries occupy significant space in it such as pension funds, banks and insurance companies (Garcia & Liu, 1999). However, markets make up the second component of the financial system, and stock markets and bonds are counted in this area. Savings, one of the important factors that make up the economy, are generally evaluated within these two areas by individuals, companies and investors. For this reason, economic growth depends on these two important fields, and it can be clearly stated that there is a relationship between them. The first studies about the relationship between economic growth and financial developments are indicated with an essential connection by Schumpeter in 1912 and Bagehot in 1873. Stock markets are an

agreeable place to turn savings into finance. That’s why stock markets take are at the heart of the financial environment. Furthermore, today in many research stock market is known as stock exchanges and equity markets (Willey, 2019). They all essentially convey the same meaning.

Today, when people talk about stock and the stocks market, they usually think of many indices around the world, especially the Nasdaq and S&P indices in the USA. But today's stocks and their markets did not come into being all at once. As in everything else, stocks and the current stock market have also taken their current form by changing over time. When we look at the historical process, it is known that commercial exchange dates back to ancient times. However, it is known that the first examples of interaction, which we can describe as the first steps of financial trade similar to today, were made in the 1300s by the Venetians, who dominated the important trade routes of that period. Venice, which has a strong position in terms of naval the navy in the geographical regions where east and west meet, traded debt between each other, especially within Europe (Beattie, 2022). This debt trade consisted of high-risk and interest-bearing loans. Later, the interest-bearing loan lending process has evolved to include individual investors (Botticini, 1999). This power that the Venetians had in their hands allowed them to trade in their products, which were defined as securities between them and the state (Smith, 2004). The first instances of the stock exchange, which has a significant position in the field of finance today, are seen in Belgium in the 1500s (Poukens & Buelens, 2020). At that time, the stock market was in a position as a meeting place for the government, the individuals, and the lenders who held the money. In the 1500s, financial instruments such as bonds and promissory notes were present in the stock market, since there were no instruments such as stocks. Although there were income-generating tools in finance and business partnerships that functioned like stocks today, nothing officially changed hands (Smith, 2004). By the 1600s, nations like England, France, and the Netherlands, which had colonial influence in many Asian nations, particularly India, were transporting the wealth of the east to the west. The shipping of commodities from the east took a very long time and was fraught with danger. Therefore, financial resources have been sought to offer security and control in order to decrease the risk that could arise. On the other hand, investors made every effort to minimize risk by spreading out their money among a variety of journeys. Stocks were issued with the intention of paying "dividends" to the investors over the income that the firms will generate as a result of the business, as

opposed to seeking investors for each trip, with the development of companies that will carry out these commercial activities in India over time (Beattie, 2022). The financial resource produced as a result of the investors' keen interest in the stocks was used by the corporations to increase the size of their fleets and their business operations. The issue was still distant from its current state even though the steps for today's stock had been taken. There wasn't yet a situation in which shareholders of the stocks that the firms had issued could sell the papers they possessed to one another. Investors had to deal with any broker to be able to trade their equities for this reason. People conducted their stock buying and selling operations in cafes where people congregated in daily life in England, which at the time had greater financial development than other nations and held greater superiority over Asia. Investors started selling their stocks for more money as a result of receiving greater dividends over time, and a bubble with incorrect pricing started to form in the market. Due to the lack of any regulatory framework in this area, unfortunately, people's pursuit of inflated pricing in an effort to increase their wealth led to a significant collapse, which led the government to impose a prohibition on stock issuing until 1825 (Smith, 2004).

Although it is known that the commercial activities of commodities took place in ancient Rome and these activities took place in an area defined as the stock market in Belgium in the 1500s, it is accepted that the first applications for today's modern stock market started with the Amsterdam Stock Exchange established in the Netherlands in 1602. Securities are provided to the public on the Amsterdam Stock Exchange, which is regarded as the pioneer for transparent and systematic transactions. In addition, options and forward transactions started to use in that period. For this reason, Amsterdam Stock Market was led to develop into a financial market as center by purchasing and selling of financial instruments. Afterward, the London formal stock market was founded in 1773 (London Stock Exchange | London Stock Exchange, 2023). After the London market had existed for 19 years, the New York Stock Exchange was founded (Research Guides: Wall Street and the Stock Exchanges: Historical Resources: Stock Exchanges, 2023). Nevertheless, the New York Stock Market was not the first market in the United States, but it became the fastest improve stock market than others.

The stock exchange markets have two main functions. One of these support to liquidity to investors on an appropriate scale with confidential pricing, the other is to make it easier to

increase capital for companies who be treated in the stock market (Cleary, 2015). On the other hand, stock markets have been significantly changed from the 1960s all around the world. Especially with the start of technological developments, stock market and stock market systems have been tried to be integrated into this change. Along with the London, Frankfurt, and Paris stock exchanges, which are in an important position today, the American stock markets have also become more digitalized day by day, and thus the control and supervision of the transactions realized in the stock market have become easier (Pilbeam, 2005). In addition, many exchanges, particularly these exchanges, have strategic objectives within the confines of their own rules in order to offer their investors services and technology that will promote trade (Willey, 2019).

Companies with stock exchange listings issue their share capital at a price based on the company's market worth in a quantity decided by them. Investors buy these shares, which are made available to the general public. The major reason businesses issue stocks is so that the shares bought by investors can serve as a source of revenue for the businesses. Within the confines of their own goals and set strategies, corporations can use the funds they have earned for a variety of investments or payments. Examples of activities that can be done with the resource include building a new facility, increasing its equity, investing in R&D, and a long list of other things. When evaluated by the investor, an individual or legal entity that owns a stock is also entitled to the profit share (dividends) of the invested company (Busu, 2022). The existence of a great number of investors determines not only decreases investment risk for investors but also it helps to reduce the price of equity for the business who listed in the stock market. The existence of a great number of investors determines not only decreases investment risk for investors but also helps to reduce the price of equity for the business listed in the stock market (Willey, 2019). However, according to events in history, many significant regulator changes have been made up by the United States after the London stock market case as known the ‘Big Bang’ in 1986 and the ‘Bubble Term’ between 1997 & 2000 in the United States (Pilbeam, 2005). According to Keith Pilbeam (2005), the information about differences in individual and corporation investors ratio of each other has been changing from the 1950s until the 2000s. When the United Kingdom stock market is examined at least two-thirds of stocks belong to small investors in the last part of the 1950s, nevertheless that amount had changed under the one-five rate at the beginning of the 2000s. On the contrary, corporations’ stock ownership has increased from

proximately one-five to two-thirds starting from the end of the 1950s to the beginning of the 2000s (Pilbeam, 2005).

Today with the help of technology people can purchase and sell easily stocks from different stock exchanges due course of law. The feasibility of any investment by the investor develops based on democracy and independence of law in the country to be invested. Occasionally there are other examples (etc. Shanghai Stock Exchange, China). For this reason, when looking at the most successful stock markets in the world ranking, it is highly likely to see the stock markets of democracy and, accordingly, countries with a reliable legal order.

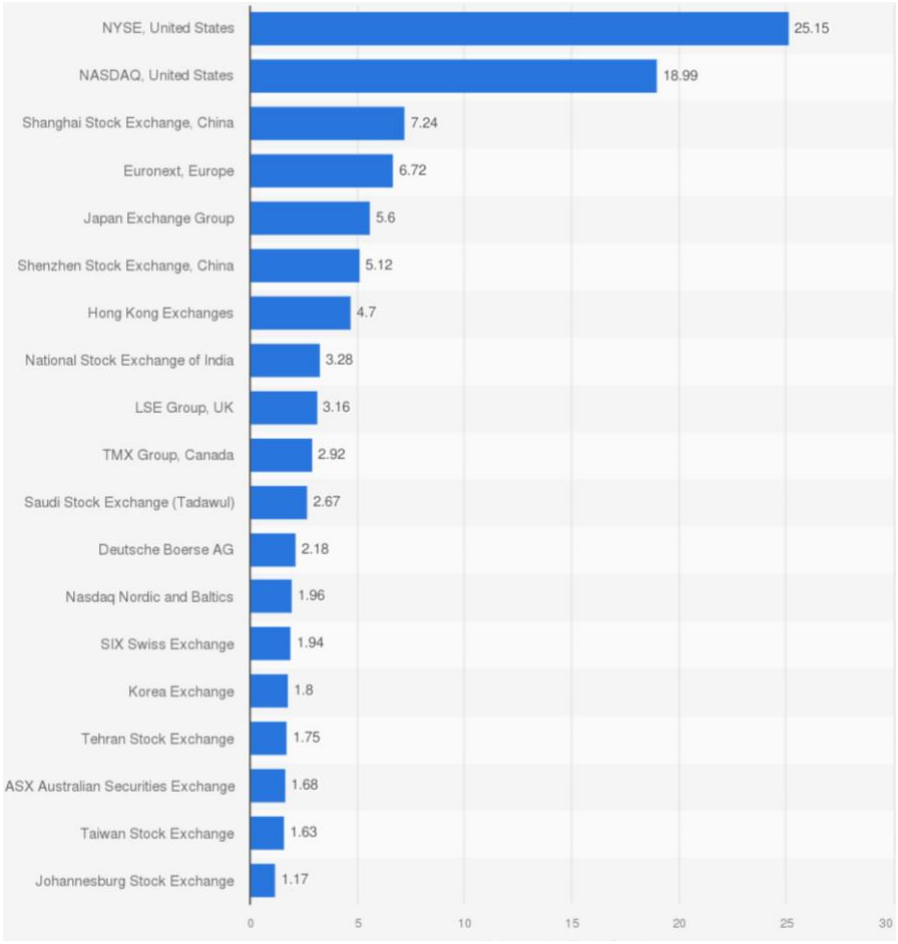

Figure 2.4 A list of the top stock exchange operators globally as of March 2023, ordered by market capitalization in trillions of dollars, Source: Largest Stock Exchange Operators by Market Cap 2023 | Statista, 2023

In some cases, as mentioned before, the relationship between stock and the stock market and the growth of the country's economy was mentioned. Due to this, countries with a stable

legal system and democratic stock markets will likely be found among the top stock markets in the world ranking. As previously said, there have been instances where the connection between the expansion of the nation's economy and stock prices and the stock market has been brought up. For this reason, it is well known that some countries have powerful economies as a result of their abundant mineral resources, large labor force, and production of value-added goods; as a result, they have large investor portfolios.

2.4 MONETARY POLICY AND INTEREST RATE

Monetary policy is important to the local economy to determine the future economic paths for all participants of the chain for the economy. The monetary policy provides an opportunity to indicate today's economic situation and it will lead to reflect future economic aspects and perspectives on how things will go in the long term to all participants. Generally, monetary policy decisions are taken by the central banks otherwise we cannot mention that about central bank independence. Either way, to preserve national economic stability, the government and central bank should cooperate. Government one of the duties is to determine and apply fiscal policy. That's why it is too important to cooperate between central banks and the government. Because something like cooperation like that allows to generate of suggestions on monetary policy with all indications and graphics of statistical outcomes. As in mention in the part of the central bank chapter, all countries have national central banks but some of them operate bank activities under the central bank of the union such as the European Central Bank. Although, all central banks duties are defined differently by each other under their national law but generally their duty is determining monetary policy and operating it in order to ensure economic stability in the financial market. Monetary policy leads to a modify in the money supply into the market which is held by banks with the society. In addition, it allows dominating short-term interest rates by possessing the market stakeholders. According to the literature, there are main three types of monetary policy exist. neutral, contractionary, and expansionary (Pilbeam, 2005). Central banks define monetary policy concerning inflation and national economic course. Some central banks like Federal Reserve also takes into account the unemployment rate, especially at non-farm employment rates. Monetary policy expresses interest rates and money demand by the market (Valdez & Molyneux, 2017, pp. 56). A neutral monetary policy means that the central bank does not make any changes in interest rates and the money supply accordingly (Clarida, 2019). In this policy, central banks generally prefer a wait-and-see policy. They continue to closely monitor the outcomes of any change in the direction of the economy and reserve the right to make changes in the policy if deemed necessary. In contractionary monetary policies, central banks increase interest rates to prevent

overheating in the economy, and thus reduce the economic activities that may occur by reducing the money supply in the market. This policy is often described as a 'bitter prescription' in the market, such as bringing down the country's growth and increasing unemployment (Carpenter & Rodgers III, 2004). For this reason, although it is not the first preferred method by both governments and the central bank, it is considered one of the most important tools that central banks have in their hands in case of necessity. Accordingly, central banks prefer to apply macroprudential measures first, rather than an interest rate hike, while making decisions about overheating in the economy (Galati & Moessner, 2012). Although these measures are effective under favorable conditions, none of them have an unmediated potency on the market as much as the interest rate policy. On the contrary, an expansionary monetary policy means lowering the interest rates and increasing the money supply to the market. Such policies are generally implemented in order to accelerate economic activities as a result of low inflation causing stagnation in the economy. With the money supply that will occur in the market, individuals and companies accelerate their investments and production and provide the revival of the economy in the country (Rawdanowicz et al., 2013). According to the OECD, expansionary monetary policies, especially when governments hold elections, provide financial support and incentives to voters (Alesina et al., 1992). However, while the central bank implements expansionary policies, it is very important for its independence that it decides according to the economic situation of the country independent of the government and the dynamics of the world economically. Providing more and more money to the market than necessary can cause the economy to overheat and increase inflation after a certain point. Therefore, the elements must be taken into consideration that will trigger overheating and an increase in inflation in expansionary policies, while trying to do not squeeze the economy too much while applying contractionary policies. For this reason, the independence of central banks and the correct reading of the market are among their important duties.

The monetary authority controls the economy's money supply by manipulating interest rates. The expansionary policy comes to mean that gives a low ratio of lend with a lower interest rate, and this leads to encouraging borrowing. As a result, economic growth is increased. For this reason, generally, in reference to literature, the expansionary policy has a linear relationship with low-interest rate environments because of the accelerating money supply. Besides, if the monetary authority desires to depress the demand for money in order

to control inflation and ensure reaching a defined inflation rate for the country scale, the interest rate is increased by the monetary authority. Usually, protecting price stability and low unemployment with optimal growth are the main goals among the monetary makers. For this reason, the central bank and government have to work with each other collaboratively. Because the central bank cannot control and manage all financial indicators. Fiscal policy has to be made by the Ministry of Finance authorities. Monetary policies are completely different than taxation and lending and especially these two factors cannot control or made by the central bank authorities (Valdez & Molyneux, 2017, pp. 56). When we examine the research in the literature, it becomes clear that the main method by which central banks carry out their monetary policy is through open market operations. There are many financial tools such as government bills, foreign currencies, and bonds that the central bank can buy and sell to affect the amount of money in the market. Selling bonds is known to impact the decreased amount of money on the market, whereas, buying bills helps to let out more money into the market (McLeay et al., 2014). The main purpose of the open operations impresses to the quantity of the base money. The monetary base is related to liquidity in the economy, and it consists of coins and banknotes with trade reserves of banks in the central bank (Goodhart, 1989).

These instruments are part of the monetary policy in addition to the functioning of an open market such as interest rates, discount window, and reserve requirements by central banks. Reserve requirements represent the central bank willingness to increase its own reserve. If the central bank decides to accumulate foreign currencies or national currency, this action leads to extracting money from the market (Axilrod, 1995). On the one hand, this indicates that it has a market-contractionary policy effect. Discount window lending allows to enable banks to increase their liquidity assets and allow them to be better allocated to reduce risk (Williamson, 1998). In this way, financial entities such as banks can obtain reserves from the central bank at a certain discount rate. Interest rates denote the possibility that authorities from institutions in other nations may be granted the ability to choose the interest and deposit rates and make use of this power (Valdez & Molyneux, 2016). As a result, monetary policy that is determined by the central bank focus on control of money demands between three and six months or longer period. During this period, it adopts policies or makes some minor changes week by week or month by month (Axilrod, 1995). That's why the central bank has to read the market correctly and it should follow the market demands as regards

economic indicators. Because the relationship between control of the money market and conditions of liquidity of banks with the demands of the public is relatively ambiguous predicting these requirements of part of the whole depends on the perfection of the central bank.

Each central bank implements its monetary policy, and they have specific policy instruments. In this article, since a study will be made on the effects of choices made by the FED and ECB regarding monetary policy, following the general conclusion, it will be tried to give details on the policy instruments of both central banks.

Table 2.1 Table of monetary policies with target and objectives, Source: (Valdez & Molyneux, 2016)

Monetary policy	Target market variable	Long-term objective
Inflation objectives	Amount of overnight debt at interest	A specific CPI (Consumer Price Index) fluctuation rate
Price level target	Amount of overnight debt at interest	A certain CPI value
Monetary aggregates	Money supply expansion	A specific CPI adjustment rate
Exchange rate	The currency's or a basket of currencies' price	The current exchange rate of the currency or the rate of a currency basket
Gold standard	The current gold spot price	Low inflation, based on by the gold price
Mixed policy	Interest rates	Unemployment and CPI change

The regional Fed banks and the Board of Governors share authority over the three major instruments that allow for adjustments in monetary policy in the United States. The Board of Governors makes decisions regarding free markets. The Board of Governors is represented by seven individuals in collaborative decision-making, whereas the FOMC is composed of five individuals among twelve reserve bank presidents (Sellon, 1984). The FOMC, which meets seven times a year, informs the open market management of its decisions unless extraordinary circumstances arise. We'll talk more about the significance and range of FOMC meetings in upcoming chapters. The reserve requirement and the discount rate are two examples where this is not the case. The Board of Governors is the sole body with the authority to decide on the reserve requirement, even if the decision on the discount rate is more difficult. The frequency of meetings, which allows everyone to convene on an equal footing, determines the participation of regional reserve banks in the process of deciding the discount rates. However, the Board of Governors must again vote

to approve the determined change. Reserve requirements provide that be established process of policy. The current reserve requirement level is constrained to make credit and deposit options. However, The Federal Reserve can make changes to the reserve requirements level such as the constraint of credit to tighten or loosen it. Besides, the Federal Reserve controls the reserve source by regulating to access discount windows with a discount rate that is taken from borrowing it (Sellon, 1984). The association between supply and demand for reserves has a significant impact on the growth of credit and interest rates in the market. The changes in interest rates promote not only companies but also the public to change credit demands. These three may be used however the Federal Reserve pleases. For instance, The Federal Reserve can decrease money growth to apply to tighten policy in an expanding economic condition by making changes to reserve requirements, discount rates, and open market operations. In this way, the FED can sell securities or may want to increase reserve requirements. Nevertheless, if the central bank wants to support economic activity in the country, it can reduce reserve requirements and apply to expand policy by injecting money into the market.

As was already noted, the European Central Bank now manages the financial affairs of the 20 nations that make up the European Union. It consists of union members whose money is recognized as the Euro. Even though the union's membership has grown over time, the addition of Croatia in January 2023 brought the total membership up to 20 (Ströhm, 2023). Other European Union member nations will have their financial management under the ECB's supervision and will be making the required preparations to switch over to the euro currency. The European Central Bank is in charge of overseeing the monetary policies of the union members using the euro, and this authority is exercised from a single administrative hub. The national Central banks (NCB) of the members make up the European Central Bank (ECB). In accordance with their legal obligations, these nations contribute money to the ECB and are in charge of carrying out the ECB's directives and tasks within their own borders. According to ECB is defined the only purpose is to protect price stability. In addition to price stability purposes, ECB has a mechanism to pass having more return with more risky assets when investors already bought assets and started to increase bond prices with the situation of supply lower yield return, investors can sell those assets to the central bank (Wu, 2022). This mechanism is called the portfolio rebalancing effect by the European Central Bank. Besides, the other notable purpose of the policy by the

ECB is to give credit and promote to invest in the euro area. Hereby the purpose of the European Central Bank reduce dependency on third countries outward and try to increase the investor base and bond owners in a diversified way. Although the euro area has long maintained price stability, it can be claimed that over time, it has been put to numerous challenges. Additionally, decisions were not just made during financially difficult times in order to make radical changes in monetary policy; additional decisions were made in order to boost economic activity throughout the process. The ECB, which initiated the expansionary policy at the appropriate time, has always been wary of an increase in inflation. For this reason, the central bank has adopted market-based policies when adjusting its monetary policy rather than relying on the interest rate as a weapon. It has done this by making a variety of purchases, including those of securities, and collateralized bonds, which, while having a smaller impact than the interest rate, still have a sizable impact on the market held by the Central Bank. The ECB has always made an effort to keep its balance sheet under control throughout these procedures. The market offers a wide variety of interest rates. While certain interest rates are set by the authorized organization, the central bank, some interest rates are based on market factors. It is intended to provide information about the central bank's predetermined policy interest rate, not other interest types and rates in the market, as this study is interested in investigating the impact of central bank choices regarding interest rates, the Federal Reserve, and the European Central Bank under inflationary conditions.

The interest rate is a term finance field. An expense imposed on a borrower for the use of any asset of her choosing is an interest rate, and such as cash, property, or consumer products can be counted as assets (Banton, 2023). For this reason, the interest rate can be thought the cost of money particularly, if the interest rate is high, the cost of the borrowed funds will be higher. Companies and the public borrow money in order to buy houses, pay education costs, start new entrepreneurship, or finance their business by doing invest new facilities or machines (Banton, 2023). This borrowed money will pay back with the interest rate amount in single disbursement or respective installment. As regards of economic analysis interest rate is the price of money, and it identifies according to demand and supply requirements in the market (Pilbeam, 2005). The interest rate has defined by a mathematical equation.

$$p(t,T) = \sum_{t_i>t} s_i e^{-(t_i-t)r(t,T)}$$

Equation 2.1 Interest Rates Formula, Source: (Shiller & Huston McCulloch, 1990)

Symbols are represents;

t is bond maturing on time,

T is time of interest rate of yield to maturity,

s_i is payments circular,

$r(t,T)$ is a rate for discount to $p(t,T)$,

The value of the remaining installments is on the right side of the calculation to bondholders. $p(t,T)$ is a ratio that is created by increasing the price between the various payment dates for $r(t,T)$. In this manner, the price will equal S_r at T time if it decreases by an amount of s_i before each time interval of t_i (Shiller & Huston McCulloch, 1990).

To maintain price stability in a climate of inflation, central banks can raise policy rates. Raising deposit interest rates is the goal here, as doing so will promote the saving of money rather than the spending of it. While at the same time encouraging an increase in deposits overall, especially for banks, this circumstance also promotes other factors. However, the rise in policy rates also raises borrowing rates, thus there are two sides to this coin. The fact that the amount that businesses and people who wish to utilize credit will have to pay in the future is significantly larger than the amount of credit they will be supplied today implies a rise in the price of money in this circumstance. Contrarily, when loan interest rates are lowered, consumers will find it more appealing to use loans, which will lead to an increase in direct consumption. Since there are opportunities to invest more affordably during this time, it is a very popular time for businesses and individuals. A causality relationship is found from interest rates to inflation cause when inflation starts to increase and money demand is starting to increase too besides, the interest rate increase too. On the other hand, when a causality relationship is found from interest to inflation conduces toward increasing the cost of production because of interest, that cause to increase in inflation directly (Baktemur, 2020).

There is also another important term that should be known in terms of defining appropriate interest rates against racing to inflation. Additionally, interest rate, nominal interest rate is

an important indicator to policymakers. In the field of economy, the nominal interest rate is defined interest rate before inflation doesn't count into the balance (Kenton, 2021). There are many researchers have been trying to prove the relationship between the nominal rate, and inflation. The first research started in the 18th century by William Douglass. He didn't express only the relationship among real and nominal rates but also he underlined that the value of money should completely adopt changes to an equilibrium of nominal rate on behalf of without permitting to change of real rate (Humphrey, 1983). Henry Thornton, who is of British origin, developed ideas for the inflationary conditions that resulted from the war his country was in with France at that time. In this process, many people after Mr. Thornton and Douglass tried to improve the research of those who came before him. One of the best examples of this comes from John Stuart Mill. He renovated that interest rates include a risk premium and expected inflation, and he wrote a section about the anticipation of greater currency decline to raise market yields under the 6th edition of a book and he explained the situation in 1865 (Humphrey, 1983). His contribution to the literature about inflation causes to decrease in the value of credit as well as the real value of interest rate. Additionally, he mentioned that money lenders should demand a risk premium in order to reduce both costs that are occasioned by inflation (Mill, 1865). Jacob de Haas, who is one of the Dutch economists, continued to develop research and he wrote about the name payment for capital and the third element in the market topic in 1889 (De Haas & Jacob, 1889). Moreover, he formulated to expression, which is shown in Equation 1.1, as regard as equation r shows the real rate and p changes in the expected price. After Haas, Alfred Marshall used firstly to express real and nominal different words in 1890. He analyzed the impression between happened real rate and observed inflation. On the contrary, John Bates Clark interpreted of the real rate as a constant.

$$n = r + p$$

Equation 2.2 Nominal Interest Rate Estimation Including Real Interest Rate and Inflation Premium Risk

In Equation 2.2, n represent itself as the nominal interest rate as a market interest rate by observed, r is the expected real interest rate and p shows the expected inflation rate. The nominal interest rate is defined by Federal Reserve in the United States, and it indicates federal fund rates.

In the pre-20th century, the work of the aforementioned people has been a good resource for Fisher. He developed a new formula using predecessor contributions in 1896. After that, he argued the boundary of value and behavior of variables on the formula (Fisher, 1896). Finally, he tested the formula using real data in regard of confirm realism between the real world and scientific hypothesis. According to the result, he developed an adjustment of alternative nominal rate theory under the defective prudence circumstances (Humphrey, 1983). As a result of the theory, he used it to explain the circle of trade and how it was formed by making changes to happened credit rates. Today Fisher's formula also knowns as the Fisher effect, finding in Equation 2.3, and it estimates two methods but gives similar results.

$$(1 + i) = (1 + R)\ x\ (1 + h)$$

Equation 2.3 Nominal Interest Rate Adjustment for Inflation Fisher Effect, Source: (Team, 2023)

In Equation 2.3, i represent the nominal interest rate, R is the real interest rate and h is the anticipated inflation rate.

The nominal interest rate provides a base in order to define short-term rates by national central banks, financial institutions, and commercial banks. Central banks can hold low nominal interest rates to revive economic activity. Sometimes that policy can work especially when an inflationary environment does not exist, or future expected inflation indicators may show lower itself (Francisco, 2016). On the contrary, central banks tend to keep a high nominal interest rate rather than low status in the inflationary environment. The nominal interest rate is found by the sum of the real rate and premium rate. The premium rate is represented itself expected inflation. Besides, the nominal interest rate, which regulates itself according to expected inflation, expresses itself as real interest (Humphrey, 1983).

2.5 INFLATION

Inflation represents the rate of increase in prices, and it is measured by the changes in the various goods and consumer products month by month or year by year which is consist of an index. If the level of the index is increased continuously that can be sayable inflationary environment started to happen. Inflation causes to reduction the value of money at a

particular time in terms of purchases. There are two main indexes that have existed in order to evaluate inflation. One of these is Consumer Price Index (CPI) and the other one is Producer Price Index (PPI). The consumer Price index is calculated by goods and services which are collected in a basket purchased by consumers in specific periods (Eğilmez, 2022). The price changes of services and products are calculated to be subtracted from the previous months or yearly rate from the basket in order to compare the rate of changes. The Producer Price Index, on the other hand, reflects changes in the cost for producers to create goods. The index records changes made by the nation's producers during a specific time frame, such as a month or a year. One of the ways the consumer price index and the producer's price index vary is that the latter measures the final disposal price of goods made by producers. The CPI index, on the other hand, displays the most recent selling price of goods or services along with any additional expenses like shipping or packing. Another difference is PPI doesn't include any taxes, but CPI includes all types of taxes according to the domestic and international trade laws of the country (Eğilmez, 2022).

According to the literature, three types of classification of inflation exist. First classification as regards of the rate of inflation. Economists divided the inflation rate into four types, these types are mild, moderate, severe, and hyperinflation. The mild inflation rate ranges from 0-10% a year, the moderate inflation rate is range between 10% and 30% a year. Severe inflation is lined up between 30% - 100% a year (Fahlevi et al., 2020). Finally, hyperinflation is started at 100% and continues above that amount for a year. The second classification takes shaped around of causes of inflations. Moreover, this classification has three types of inflation. The first of them is inflation in demand, while the second is inflation in costs or supplies. Demand inflation is when the money supply rises faster than the potential of own economic growth then demands are starting to increase to imports of products and services. That situation causes the increased price of products. The second type of inflation is cost or supply inflation in this classification. In the cost inflation emergences when the price of an input needed to produce a good or service starts to rise, the producer will have to charge more for the goods or services they are producing. Although, such as labor costs, wages, interest, capital, and rent can be counted as the cost to production factor, whereas such as new equipment, raw material, and energy are counted as input costs in order to produce products or services. In these two types of inflation, there is nothing to change about the output price but about the Gross Domestic Product (GDP) which indicates output

volume is different (Qiao, et al., 2019). Increases in final product prices occur prior to increases in input factor and good prices in the kind of demand inflation. On the other hand, operational costs cause the sort of cost or supply inflation to happen before the ultimate product price. However, cost inflation has resulted in a decline in sales turnover, which is referred to in the literature as business turnover (Bossone, 2019). Third and the last types of inflation in this classification is built-in inflation. In built-in inflation, people are already buying more than they require the products and services they want to purchase, taking into account the inflation conditions they are in and the situations that may happen in the future. While this situation also feeds demand inflation, it also brings about the price-wage spiral (Eğilmez, 2022). A wage-price spiral occurs when people's needs are met by companies raising the pricing of their goods one more time in order to give workers the money they will need.

The last and third classifications on the origin of inflation are categorized by the impact factor. Domestic factors and imported factors are located under the impact factor. Domestic factor means inflation environment is formed from inside of country dynamics. This problem can be caused by the budget deficit and oversupply by the central bank (Fahlevi et al., 2020). On the other side for impact factor leads to an increased price index because some of goods have to import from outside of the country. That will help to increase the cost of production because some raw materials and machines should be purchased, and the price of the index is affected indirectly.

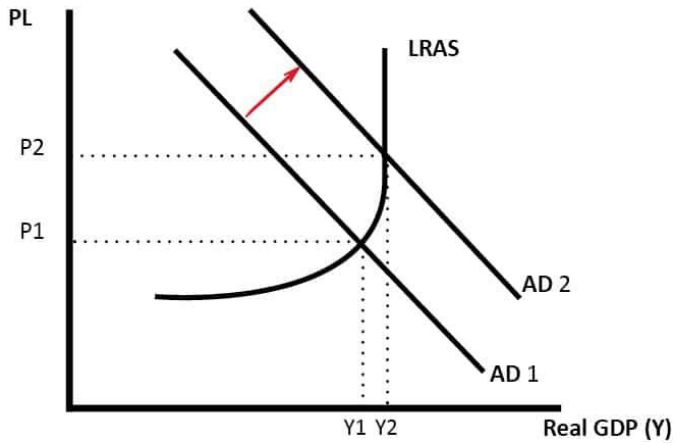

Figure 2.5 Graph of demand inflation, Source: (Pettinger, 2021)

Demand inflation graph is shown relationship between price and real GDP in Figure 2.2. In this figure AD represent aggregate demand, LRAS is long-run aggregate supply and PL is price axis. Economy is getting overheat when AD increase faster than LRAS.

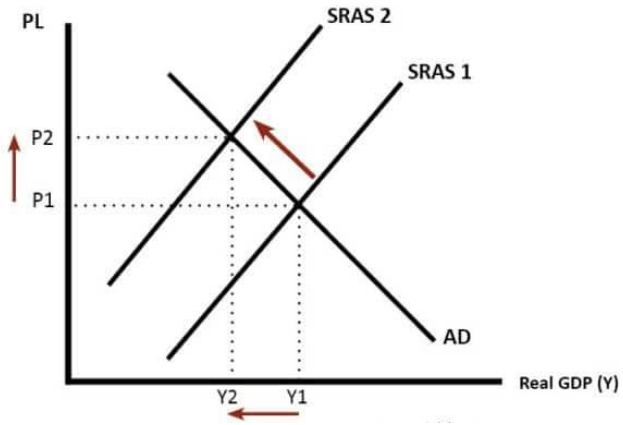

Figure 2.6 Graph of cost or supply inflation, Source: (Pettinger, 2021)

Cost or supply inflation graph is shown relationship between price and real GDP in Figure 2.3. In this figure AD represent aggregate demand, SRAS is short-run aggregate supply and PL is price axis.

The connection between interest rates and inflation has been the subject of extensive research. The research conducted involves an analysis of the relations between the two groups throughout the long run and in the short term which are interest rate and inflation under various circumstances (Summers, 1982). The link between nominal interest rates and anticipated inflation forms the foundation of one of the most well-known models, the Fisher hypothesis. Fisher's hypothesis states that the real interest rate plus anticipated inflation should equal the nominal interest rates, which he explains using a mathematical calculation (Hacıoğlu, 2014). Some studies have shown that the Fisher effect is insufficient in some circumstances, particularly given the fact that a hypothesis based on the continuity of the fixed real interest rate produces satisfactory findings under all circumstances. Consequently, other solutions have emerged over time. In order to ensure the scope of the hypothesis and to provide reliable results under various circumstances, Fama (1975) devised a novel alternative based on Fisher's work by performing a study on government treasury bills (Garbade & Wachtel, 1978). Therefore, before policymakers, especially economists, decide how to combat inflation and anticipate inflation, it would be more accurate to study the

methodology and experiments created by Fisher and Fama as well as the research's shortcomings.

Inflation is the main problem not just only country bases but also globally especially when the globalize integration is started all around the world. In addition, the expected inflation rate for the future is of great importance rather than the actual inflation. Various researchers mentioned earlier have developed mathematical formulas for expected inflation in their hypotheses. However, in addition to the expected inflation rate, important factors such as variables and predictability must be considered in order to accurately determine the nominal interest rate. The downward inflation expectations for the future cause the yields on interest and bonds to be lower in terms of the market (Pilbeam, 2005). Unfortunately, forecasting inflation is not an easy situation and it can change very easily due to both local and global factors. For this reason, economists determine the nominal interest rate by including the risk premium in addition to the real interest rate and expected inflation rate in their calculations during the determination of the interest rate (Pilbeam, 2005). In conclusion, the expected inflation rate may determine whether or not a particular interest rate represents a fair value and reveal it to the market (Muscatelli et al., 2002). Since the decisions regarding inflation are the responsibility of each country's central bank, policymakers have to determine the monetary policy and decide by taking into account many variables, including expected inflation rates and risk premiums.

2.6 History of Policy Rate Changes

Today, monetary policy is defined by central banks. That’s why the central bank is set of the center of the economy in the countries. Monetary policy leads to define not just only policy rates but also guides everyone who is a part of the economy. The central bank uses many tools at its disposal, primarily the policy rate, in order to ensure that the changes in the economy continue in a stable and sustainable position according to the monetary policy supply and demand outputs determined according to the economic indicators. Decisions taken are of particular concern to everyone, from individuals to legal entities. Because investors and companies need stability and an environment of trust in order to continue their production. Modifications to monetary policy, causing a change in borrowing costs in the market, can be listed as another important reason for producers and investors. It is known

that the hawkish decisions to be taken for overheating in the economy have a direct negative effect on the market. On the other hand, although the preference for dovish policies by central banks without providing price stability has a positive effect on investors and producers in the beginning, inflationary pressures that may occur later will lead to negative consequences for each individual who is a part of the economy.

Throughout history, countries have experienced many economic crises, both locally and globally. While some of these crises took place on a country basis as a result of wrong decisions and wrong policies implemented, some of them occurred as a result of a local effect turning into a global effect with the reflection of the markets in other countries.

In this section, besides giving information to explain the monetary policy meetings and decision-making mechanisms organized by the FOMC and the ECB, more information will be given about the historical changes in the policy rate.

2.6.1 FOMC Meetings

The United States consists of 50 independent states and each state operates with its own rules and an administrative unit. Despite, the United States has 12 separate banks which operate the central bank task in each region. San Francisco, Minneapolis, Kansas City, St. Louis, Atlanta, Cleveland, New York, Philadelphia, Richmond, Boston, Dallas, and Chicago are known regional central banks in the United States. The 12 separate regional central banks that make up the Federal Reserve Bank of Amerika each have their own president. Each central bank presidents manage the main Federal Reserve task and decision in their own region as well as they attend all Federal Reserve Open Market Committee meetings. Federal Reserve Open Market Committee is known abbreviated FOMC. FOMC meetings are important not only in the United States but also in all global markets. The fundamental purpose of FOMC meetings defines monetary policy and apply it to the market. That's why FOMC is an organization of decision makers. FOMC organize eight meeting a year regularly and details about the meeting are announced before the year to be held. Federal Reserve Committee observes financial conditions and defines appropriate monetary policy due to economic review. Additionally, Federal Reserve Committee evaluates long-

term economic conditions with risk. Besides, FOMC ensures price stability with sustainable economic growth. Before each meeting, regional reserve bank presidents come together and utilize economic conditions. Monetary policy starts with a report written by a member of the board employer. The board defines economic guesses, and they propose alternative policy options to apply to the system. However, these propositions are not final decisions and only present the beginning of the process. During the evaluation process, members propose their ideas in order to review policy. Script suggestions and possible decisions which are written by chosen members from primarily the president or vice-president can be taken. But the script is not the final version, also the script helps to reveal a more concrete essence. The predominant decision depends on the president. Because the president plays two significant roles during the process in order to develop the script. Firstly, the president can be turned the policy as he favors even if the road shows the opposite side. Secondly, the president can affect the details and main parts of the script report which is presented first to the committee (Chappell Jr. & McGregor, 2000).

With the detailed observation of the script and along the debates, the president proposes a federal fund rate to the committee. After that official voting period starts among the members of the committee. The Federal Reserve fund rate decision taken by majority of votes. Today FED is authorized to define monetary policy according to the 1913 Federal Reserve Act (Federal Open Market Committee, 2023). Besides, FOMC announces monetary policy actions, and it is not a single representative to have constant preference. FOMC is an echoer committee that takes decisions with various and changeable total unanimity.

Every FOMC summary details with monetary policy decisions are published after the meeting to the public. However, in the first years of FOMC, policy action records are consisting of only one or two paragraphs about the reason for changes, and the background of the action is published Annual Report (The Fed - Transcripts and Other Historical Materials, 2022). During the oncoming years, details increased, and when the time came to mid of the 1960s, policy decision action reached almost fifteen pages rather than one or two paragraphs. At the beginning of the 1990s records are published more than fifteen pages. On the contrary, FOMC wanted to be more transparent and concentric with the market. That’s why they changed the announcement days of the Record policy actions from the Annual Report. Policy action records were started to publish after 90 days following FOMC

meetings in 1967. After that, the record of policy actions changed to 45 days in 1975 (The Fed - Transcripts and Other Historical Materials, 2023). But starting with 1976, 45 days are reduced to 30 days which is coming from after the meeting. For the being more transparent and market-friendly, not only publish date of the record has changed but also the frequency of the meeting is changed. Meeting frequency is become eight meetings in a year instead of only yearly meetings. Historically, FOMC reports are kept from 1936 to 1967 but these reports consist of all arguments, decisions, and accession with deep details. From 1936 to 1955 official reports include both all committee meetings and committee discussions of voters presenting their ideas for the implementation of decisions. The differences between today's report and historical reports are announcement dates. Historical official reports didn't publish until 1964. The first official report which is called The Minutes of Actions published in 1967 in order to give information to all stakeholders. The Minutes of Actions reports transpire short information about all discussions and take precautions by the committee. After 1967, FOMC started to announce new report titles under the name of Memoranda of Discussion until March of 1976. Memoranda of Discussion contain records of record of actions policy and are published 90 days following meetings. Throughout this whole process, there are books that the FED has categorized according to the colors in which the records are kept. According to the Fed, these books are categorized by 2 different colors. The first book is called beige books and the second one is known as a red book. Beige books are recognized by their beige color cover. The beige book is written by reserve banks employers, and it publishes after two weeks later from each FOMC meeting regularly. In the book, the main subject is a summary of comments on the present economic condition in the area of the federal reserve. The first beige book was published in 1983 and it continued until 1970. Therefore, starting with the May of 1970, Fed announced Redbook, and the book is known as 'Current Economic Comment' depending on region (The Fed - Transcripts and Other Historical Materials, 2023). Redbook is accessible in contrast of beige book because of it consists of secret details. But Fed decided to publish a new version of beige books starting with 1983 and a new version of the red book was revised and published as a beige book in order to reach wider audiences. Today's Redbook didn't publish anymore.

All FOMC meeting official reports are publishing on the website. A new and the last version is published in 2012 and it expresses monetary policy with a base of committee policy actions. Also, most historical official reports such as policy statements, records of actions,

transcripts, and presentation materials and many of them can be reachable through the Federal Reserve System's official website. It is also possible to obtain documents that are not included on the website by contacting the FED.

Figure 2.7 United States monthly inflation rate changes include all items from 2000 to April 2023, Source: OECD, 2023

Figure 2.4

Figure 2.8 Federal Reserve interest rate changes from 2000 to April 2023, Source: Trading Economics, 2023

2.6.2 ECB Meetings

Today, European Central Bank is responsible to determine monetary policy for the eurozone area It is the only institution that legally has this authority. The European Central Bank (ECB) announced the first monetary policy strategy in 1998 (Fischer et al, 2006). Besides, ECB analyzes mid- and long-term price developments associated with money tendency. Economic analysis includes about economic improvements and price-cost parameters details while monetary analysis indicates financial institutions that carry on a business in the euro area. Both results of the economic and monetary analysis have become more

concrete documents in order to present to Governing Council every three months (Tillmann, 2021). In addition, employers of the euro system manage wide macroeconomic projections analysis for June and December twice in a year and, ECB employers repeat the process between the remaining times. These reports consist of an analysis of inflation and economic activity projections for the future two or three years (European Central Bank, 2022b). Governing Council members argue report results in every three months and ECB publishes these reports regularly. The Quarterly Monetary Assessment is analyzed by ECB and when it's necessary national central bank employers who are a part of the European Union but not part of the euro currency helps to complete the report. Also, three important aspects carry remarkable points in these assessments. Firstly, price development appearances and impact on monetary policy are effective in order to clarify rather than explaining monetary policy only using monetary developments on their own. Secondly, the aim is to explain in detail the effects of the factors in inflation dynamics on monetary expansion in the medium and long term (Howarth & Loedel, 2005). For this reason, since the analyzes are carried out every three months, the changes that occur from month to month are considered when examining the effects on monetary growth. The last and third, the analysis does not depend on only key monetary aggregate which is known M3 term. On the contrary, holistic evaluation is made the constrain analysis of other data sources with sectoral contribution, fiscal accounts, and financial price- yields are taken into account (Fischer et al, 2006).

European Central Bank has established the latest and newest institution. That's why the decision of monetary policy changes is more reachable compared to other national central banks. For this reason, historical decisions and reports are available on the official website of the European Central Bank. When we examine European market dynamic and inflation environments it can easily refer that economic activity and price stability were protected during the whole time except for some financial crises such as the great economic crises in 2007-08 and Greece's debt crises after 2007 and 2008. ECB started the first interest cycle from the beginning of the 2000s to 2003 and during these times central banks are followed under the recovery circumstances. Starting with 2007 and 2008 the bank faced some challenges with financial disturbance. Unfortunately, these challenges continued to be accompanied by major economic crises and great recessions between October 2008 and April 2010. Following that, ECB had to deal with debt crises of the euro area from 2010 to 2013. Additionally, beginning in the middle of 2013, low inflation and lower bound rates

precipitated several economic developments, and the coronavirus's emergence had even more detrimental impacts (Benito, 2022). By the ECB's perspective, monetary policies are categorized according to reasons of macroeconomic indicators. Macroeconomic indicators can be enumerable such as growth, conventional monetary policy, risk premium news, and unconventional monetary policy (Cieslak & Schrimpf, 2019).

According to the research by Cieslak and Schrimpf (2019), reactions of equity and yields changed beginning in 2013. Also, the results of the analysis confirm that with the start of guiding the market by the ECB, low inflation recovery environments were seen during this period. Considering the other results obtained from the analysis, before 2013, monetary policies were shaped depending on the growth outlook and risk premiums, but after 2013, it started to take shape according to the monetary-based news. This situation can be clearly reached as a result of the reports and decisions that the non-monetary news features, which were determined by the monetary policy of the ECB, became more dominant, especially in the period until 2008 (Benito, 2022). But from 2013 onwards, the board of directors at the ECB began to publish a report containing pinpoint estimates for extra targets. Although the text in this report contains information to explain the basic features, its difference from other reports is that it is considered on a large scale in the determined estimates. With the arrival of 2015, there are some important decisions taken as a result of ECB meetings. The most important of these was the Extended Asset Purchase Program, which was announced by the then central bank president Draghi, who had concerns about low inflation, at the monetary policy decision meeting on January 22, 2015 (Rostagno et al., 2019). In this process, the central bank, which succeeded in creating a positive perception about future inflation, showed its effect on the market with the program that it will put into practice without changing the interest rates.

Today, like the problems faced by every central bank in the world, the European Central Bank has had to take decisions to carry the financial burden brought by the pandemic and to ensure the continuity of economicial activity, while maintaining stability. With an unexpected meeting decision that was not included in their calendar before, the ECB temporarily announced a new program called the Pandemic Emergency Purchase Program (PEPP) during this period. The most important difference that distinguishes this period from other periods is that the central bank takes the risk premium shocks into consideration while

determining the monetary policy. The PEPP program was extended by the committee two times due to the ongoing effect of the pandemic longer than expected. Following to the table shows that the classification of ECB history;

Table 2.2 Table of monetary policies with target and objectives, Source: ECB, 2023

Period	Description
January 1999 - June 2003	The initial cycle of interest rates
July 2003 - July 2007	Rebound and Increasing Unbalances
August 2007 - September 2008	Financial Instability;
October 2008 - April 2010	The Great Financial Crisis and the Great Recession that followed it
May 2010 - June 2013	The Sovereign Debt Crisis
July 2013 - January 2020	Recovery from Low Inflation and an Effective Lower Bound;
February 2020 - June 2022	Pandemic Conditions
July 2022 -	Rapid Increase in Inflation

Nowadays, the ECB continues to fight inflationary pressures caused by reasons such as the global supply chain, the chip crisis, and climate change, along with the support given to the market during the pandemic. For this reason, perhaps unprecedented in history, in the post-pandemic period, there has been a successive increase in policy rates at ECB meetings.

Throughout this period, the ECB made changes in interest rates based on environmental conditions and changes in inflation in line with its monetary policy. Figure 2.6 shows that changes between the consumer price index (harmonized prices: all items: total for the euro area (19 countries), growth rate same period the previous year, monthly, not seasonally adjusted, and ECB deposit facility rate for euro area among a certain period (ECB Deposit Facility Rate for Euro Area, 2023).

Figure 2.9 Euro Area monthly inflation changes compare to ECB deposit facility rate for euro area from 1999 to April 2023, Source: ECB Deposit Facility Rate for Euro Area, 2023

2.7 HISTORICAL CHANGE OF MONETARY POLICY COMPARED TO FEDERAL RESERVE AND EUROPEAN CENTRAL BANK AND REACTION BY STOCK MARKETS

Every national central bank decision about policy rate changes directly affects the stock exchange market of that country. However, some biggest central banks decisions change not only affect that country's market but also can be impact on other countries stock exchange markets. Federal Reserve (FED) and European Central Bank are one of them. In this study, the main effects of policy rate changes focused on Fed and ECB policy rate announcements. Therefore, research will be conducted on the effects of the changes in the decisions of these two central banks on the market.

As mentioned in previous parts Federal Reserve organize FOMC meetings to announce changes towards monetary policy. Throughout history, they made a lot of changes to how to announce. But generally, announcements are made to the public in two ways. Until the end of 1993, Federal Reserve announced the intention of rate target opinions after the federal fund market closed. In this way, the gap between market operations and announcements had one day delay. However, starting with February 1994, FOMC changed the announcements decision and meeting report details time in order to ensure the connection between market reactions between participation. This, problem of tardiness in the market was removed. On the other hand, European Central Bank organizes meeting to announce monetary policy from 1999. Generally, the statement made by the ECB president to the press after the board

meeting is followed closely by the market and the market prices are the changes that may occur in the policy after this meeting. However, according to the research, the factor that the market takes into consideration more in the meetings is the direction in which future monetary policies can evolve. For this reason, the verbal guidance given by the ECB chairman during the meeting stands out as a powerful factor (Connolly and Kohler 2004 and Sebestyén and Sicilia 2005). Much research shows that ECB communications meetings have an impact on market movements in financial markets. Besides, it has been noted that this effect often makes interest rate hike decisions more volatile (De Haan, 2008).

Regard of current empirical studies as regard finance theory and treasury securities with forward market transactions support that monetary policy has an impact on short-term stock market volatility. Moreover, the results of empirical studies suggest two possibilities to think about influences. Firstly, Jones and his friends (1998) advocate that pre-announcements have a potential on the stock market, and they called the 'silence of before the storm' proposition (Bomfim, 2003). The second channel of monetary policy decision impacts on market volatility is related to the decisions themselves. The fact that the decision taken is out of expectations may accelerate the volatility in the market, and it can be said that this volatility is met more negatively or positively than expected on the market. In addition, according to his study by Olivier J. Blanchard (1981) a statement that the stock market and announcement output have a relationship. Since the stance in the monetary policy remains constant or any change will directly affect the interest and profit returns, it also creates dynamism in the stock market. The fact that the policy change causes firms to borrow at more or less cost has shown that the expectations of changes in production and related profits have a significant influence on the stock market. That's why foresight of policies is important, an announcement by the central bank to switch to an expansionary monetary policy may have more impact on the stock market than its implementation. Additionally, the stock market may not be significantly affected by minor changes in monetary policy compared to the decisions to be taken in an environment where inflation increases rapidly, and real interest rates are lower (Blanchard, 1981).

There are comprehensive shreds of evidence that monetary policy has an impact on inflation and economic activity as well as stock prices (Iacoviello & Minetti, 2003; Iacoviello & Raoul, 2008). The reaction of the given stocks prices pre-purchased before events but a

surprise announcement beyond expectations can create a completely different story on pricing. Thus, when the monetary policy decision is explained the real reaction of stock prices will move those by unexpected announcements. According to the study by Shen Wang and David G. Mayes (2012) on how policy decisions in four central banks effect on stock reactions indices, and it has been observed that decisions that can be described as surprises in monetary policy announcements create a negative reaction to stock prices, as seen in previous studies. In addition, although the reaction to the stock prices that occurred because of the surprise monetary policies of the central banks of England, Europe, Australia, and New Zealand, which is the subject of this study, is similar in the American, Eurozone, England, Australia, and New Zealand markets, there are still some important distinctions. Finally, the stock market behavior of the policy, which did not even reach zero nominal interest rates, such as Australia and New Zealand, especially during the global financial crisis, showed the same action as the eurozone and the UK (Wang & Mayes, 2012).

The volatility that occurs in the markets is not only seen on the meeting days but is priced in the pre-meeting process. However, it is known that the main movement took place during the monetary policy announcement of the central bank. The implied volatility occurring before and after the announcements creates a market-friendly impression that targets stability for the future. In addition, it is important in terms of showing the real interaction between monetary policies and stock markets between the previously planned central bank meetings and the volatility in the markets and guiding the studies on this subject. As a result of detailed analyzes in the literature, it has been seen that the announcements made by the ECB have a relationship with the stock markets of countries that are members of the European Union and have economic power, such as France, Italy, Spain, and the Netherlands, especially the German stock market. However, it has been found that the returns and market volatility on stocks between Europe and the USA, especially the German stock market, are more correlated with each other (Hussain, 2011). However, studies that clearly explain the relationship between implied volatility and monetary policy announcements by the ECB are insufficient in the literature. There are fundamental differences between the FOMC meetings organized by the Federal Reserve and the ECB. As mentioned before, at the beginning of these differences, it can be said that my priorities in both Central banks are different. While employment and price stability are prioritized for the Fed at the same time, it can be said that the most fundamental factor for the ECB is to

ensure and maintain price stability. Another important issue that explains the difference in the effect of the announcements of both Central banks on the market is that there is a greater consensus among the committee when making a policy decision within the ECB, while on the FOMC side, there are more members and opponents of different opinions (Krieger et al., 2015). Jiang et al. (2012) found that the effect of FOMC decisions on European stock markets is much greater than the impact of ECB decisions on American stock markets. In other words, it can be inferred that any changes to the FOMC's monetary policy cause volatility in other European stock markets, especially German stocks. However, it cannot be said that the monetary policy announcements made by the ECB have the same effect on the stock markets in the USA. Likewise, it is known that macroeconomic changes and news in America have an impact on European interest rates (Krieger et al., 2015). It is thought that this situation arises from the increasing integration with the economic development between the countries on both different continents.

According to the analysis made by Lucca and Moench (2015), it has been found that the DAX index, which is the German stock exchange, has higher returns when the FOMC meetings are held. He also states that the DAX index returns bring more returns, especially on FOMC days, compared to days without meetings. When we evaluate the historical monetary policies, the Federal Reserve preferred to implement go and stop policies in the 1970s. In this policy, there was a tendency to balance between inflation and unemployment. In go and stop policies, the central bank represents a policy of lowering interest rates until inflation increases significantly. In this way, the central bank made it a priority to support employment. With the increase in inflation at an alarming level, the central bank, which has come to a standstill, means making the fight against inflation a priority by using the interest rate tool. In the stagnation phase, there was a gradual increase in unemployment rates. When the interest rate instrument used to combat rising inflation significantly affected unemployment, the Federal Reserve made a policy change in interest rate increases (Goodfriend, 2007). In the 1970s, an erratic monetary policy prevailed in the United States. Especially in these years, the central bank preferred monetary policies to reduce unemployment until inflation became disturbing. Paul Volcker, who became the chairman of the Fed in 1979, took decisions known as aggressive in the market to combat the inflation that reached 11.8%. In the last quarter of the same year, the Fed increased the funds rate by about 3% in order to fight inflation (Goodfriend, 2007). With the global oil crisis in the late

1979 and 1980s, it created an effect that would trigger an increase in the already existing inflation in the USA. In response to the oil crisis, which could trigger a recession, the Fed switched to some monetary easing. However, at the same time, the easing and the inflationary environment created by the crisis resulted in the Fed's increase of the policy rate by 300 basis points again in March 1980. According to, Cline's (2015) research, found that the money supply realized at that time was not statistically sufficient to express the inflationary effect in the United States, and he found that the money quantity theory he tested for analysis was rejected between these periods. Struggling with a 17% policy rate against inflation, which was 14.6% in March 1980, the Fed started monetary easing again as of June due to a sharp decline in the gross national product (Schreft, 1990). Historically, economists, who evaluated monetary policies in 1980, stated that the Fed was very bad in managing the process in this period. In 1980, the US economy experienced a serious recession due to the policy implemented together with the fear of the participants in the market for an increase in inflation. Despite this recession, inflation rates were still in double digits. The Fed, which received the support of the administration to fight inflation with the change of president in the USA, made it a priority to fight inflation by increasing the federal funds rates to 19% in 1981 (Nelson, 2007). When it came to the last quarter of the year, the Fed showed a different reaction than the previous times, as the recession started to be seen again in the high interest rate environment. The Fed administration, which continued its tight monetary policies despite the increasing stagnation, showed a successful performance with inflation falling to 5% by 1982 (Broaddus, J. Alfred & Marvin Goodfriend, 1984). The Fed, which started to loosen the policy rate together with the serious decrease in inflation, managed to get out of the recession with the last quarter of 1982. It is the changes in bond prices that trigger the Fed's changes in policy rates. The increase in bond prices showed an upward trend as the market expects future inflation to increase. With the reoccurrence of such movements in 1984 and 1987, the Fed again increased policy rates. Alan Greenspan, who has been the chairman of the Federal Reserve since 1987, saw low inflation and low unemployment rates as the principles of monetary policy and pursued a policy aimed at maintaining this situation with a recession that did not have major effects (Goodfriend, 2007). Additionally, Alan Greenspan continued his tenure as Fed chair until 2005. The rapid decline in the US stock market in the years he took office limited the Fed's ability to combat inflation. In this process, the Fed, which provided liquidity to banks, caused inflation to increase again. In spite of that, when the studies examining the effects of the Fed's money

supply on inflation between 1985 and 2013 are evaluated, it is seen that there is a negative relationship between inflation and money supply (Cline, 2015). In summary, the money supply given to the market did not increase significantly during periods of increased inflation. The effect of the gulf war that occurred due to global developments, there was a slight recession in the economy and inflation decreased. By 2001, the American economy found itself in a recession again, and the FOMC board under the leadership of Alan Greenspan aimed to revive economic activity by cutting the interest rate from 6.5% to 1.75% by making a sharp interest rate cut.

By 2005, the Fed started to raise interest rates again in response to increasing inflation conditions and gradually increased interest rates to a level of 5.25% until mid-2006. With the onset of the world financial crisis show its effect in the USA in 2007, the Fed once again loosened its monetary policy and reduced the policy rate by 50 basis points to 4.75% in September. In order to ensure economic activity against the financial crisis and to minimize the crisis's impact, the Fed gradually reduced the interest rates, which it started in September 2007, until December 2008, and brought it down to 0.25%. At the same time, this policy was maintained from 2008 to 2015. Positioning the policy rate in a range close to zero in 2008 continued until 2013. During this period, the Fed preferred a market-supportive monetary policy and encouraged the market to recover the economy in order to mitigate the financial crisis's aftereffects. Since 2019, the Fed, which has made a comprehensive change in monetary policy, has activated the decision-making mechanism for possible changes. In this direction, it adopted an approach towards flexible inflation targeting (FAIT) in 2020, targeting an average of 2% inflation levels in 2020 (Naggert et al., 2021). However, with the pandemic that occurred in 2020, the next process developed beyond expectations and targets.

On the European side, with the establishment of the central bank more recently and the monetary union, the changes in the monetary policy have been shaped in a shorter period compared to the USA. However, when the monetary policy strategies of the European Central Bank (ECB) are examined, it is seen that the most striking aspect is to identify the risks to ensure price stability and to closely monitor the changes in prices. Historically, the ECB has changed from time to time on expansionary and tightening policies for the economic outlook. In April 1999, the ECB started its first activity by reducing the policy

rate by 50 basis points from 3% to 2.5%. Then, starting from the last quarter of 2000, the central bank decided to increase the interest rates due to the change in economic conditions and brought the policy rate to 4.75% by making a series of interest rate hikes. The ECB's fundamental duty is to ensure price stability, could not achieve a balancing act in this direction and gradually reduced the policy rate to 2% in the period from 2001 to the summer months of 2003. It is known that in the years he took duty, the average inflation levels were about 1% and below among the countries that adopted the euro, thanks to the implementation of decisive steps in fiscal policies and the implementation of disinflationary policies of the countries in the monetary union (Praet, Guilhem and Vidal, 2019). In the following periods, together with the strong course of production, inflation reached the level of about 3%. In this process, the significant decline in future inflation expectations was brought down to a historically low level of that period with when the central bank lowered nominal interest rates to levels almost equal to zero. When the financial crisis begins to manifest itself in the world, a difficult process begins in the European region and the euro. In these periods, which was the first test of the ECB and the euro, the inadequacies of the member states caused the necessity of monetary union to be deducted for the first time. The ECB, which repositioned the level of the policy rate to increase the demand again during the financial crisis, also provided liquidity to the banks. For this reason, the European central bank lowered the interest rate to 1% from October 2008 to May 2009, for a total of 325 basis points. In the same period, the Fed acted earlier, reducing policy rates from 4.75% to 0.25% in the period from 2007 to the end of 2008. In 2011, the ECB raised interest rates once more in response to the economic outlook, this time by a total of 25 basis points twice in April and July, bringing the policy rate up to 1.5%. The rate hike during this period was not seen as a logical move by the market. The reason for this is that although inflation was expected to reach 3% levels due to the upward trend in energy prices at that time, the economic outlook in Europe was quite weak and there was no chance to reverse this situation in the countries within the euro currency union (Christiano et al., 2008). During the 2011 financial crisis, known as Black Monday, economic growth for the European region was being revised downwards. While the market expects the ECB to go into monetary easing, the central bank has made statements that the inflation-monetary policy is in a harmonious position (Mody, 2018, p. 296). Towards the end of 2011, as it began to emerge that the central bank did not adopt the right approach, the central bank president also changed. Mario Draghi, who took over the presidency of the European central bank from

Jean- Claude Trichet, changed the monetary policy as his first job. With Draghi taking office, he gradually reduced the policy rates from 1.50% to 0.25% in the period from the last month of 2011 to the last quarter of 2013. The ECB, which can use the interest rate tool effectively, once again reduced the policy interest rate to 0.05% in September 2014, and then to 0% completely as of March 2016. The current low inflation was even lower than the 2% average target set by the central bank, which did not provide a good outlook for economic activity. For this reason, the ECB gradually reduced deposit rates by 10 basis points each until 2019, down to -0.50%, in order to encourage households to increase their spending and to encourage firms to produce more than save. Pandemic conditions in the world in 2020 forced central banks to change their policies unexpectedly, and the European Central Bank took its share of this change.

Both central banks have frequently adjusted their monetary policies to reflect changes in the global economy and local conditions in the areas they are in charge of. Stocks were impacted by these modifications as well. The Nasdaq index, one of the most traded indices in America, as well as the indices of the most traded economically powerful union members in Europe, have both changed how they react to changes in monetary policy (Appendix 1.1-1.8).

2.8 DAX (EXTRA) INDEX

Deutscher Aktienindex (DAX) is known as the German United Stock Index. Historically, eight stock exchanges in Germany participate in the electronic trade system (XETRA) for stock trading. The largest stock exchange among them all is the Frankfurt Stock Exchange. The Frankfurt Stock Exchange and the New York Stock Exchange both use a similar trading method. Investors may trade the index every day from 9.00 to 17.30, excluding national and religious holidays. In November 1997, it was announced that the IBIS system would be replaced by the XETRA trade system (Freihube & Theissen, 2001).

DAX index has established to control stock in order to prevent cartelization in the stock markets in Frankfurt in 1988. DAX index is constituted the most important companies stocks in Germany. That’s why in order to be a part of the DAX index is not something that can be easy. Companies should have, called ‘Prime Standard’ criteria to take part in the index (Deutsche Börse Group - Prime Standard, 2023). These criteria contain transparency

of commercial transactions by the company and at least 33% of the whole revenue should be tradeable in the DAX index (Deutsche Börse, 2019). Today, a total of 40 company tradeable in the index, and the DAX index shows a distribution of each stock with a total weight of 100%. Each stock has its own weight in the index together with the number of stocks in circulation. The weight of stock is identified to take into account company liquidity and market value. The DAX index has undergone many changes since the day it started trading. Depending on whether they meet the necessary conditions, some companies have been included in the index over time, and some have been excluded from the index.

2.8.1 History of DAX Index

As stated in the previous sections the most famous and biggest stock market is as known Frankfurt Stock Market in Germany. Historically the first constitutive of the Frankfurt stock market began in medieval. Since 1330, Frankfurt is progressed and become an important center for city development, trade, and monetary transactions (Deutsche Börse Group - History of the Frankfurt Stock Exchange, 2023). In time, French and Dutch merchant people came to Frankfurt and the banking system became dominant too. Unfortunately, at that time each country has its own currencies, and it was hard to trade to make financial transactions. In order to prevent this chaos all merchants came together in 1585. This meeting was accepted as the firstborn of the Frankfurt Stock Market. The official and first quotations sheet appeared in 1625 (Deutsche Börse Group - History of the Frankfurt Stock Exchange, 2023). These documents showed average prices for 12 different currencies. The receipt of the oldest transactions was made in 1721 and still exists today. The legal regulations that should be in every system have also been made for the Frankfurt stock exchange. The first regulation was announced in 1666 as exchange rules and regulations. This announcement leads to the establishment of the official stock exchange market management. Frankfurt stock market was a trustable market to purchase government bonds and funds but after the industrial revolution, financial costly industrial projects became more advantageous selling industrial companies stock in the exchange market. Today Germany has 29 stock markets, during the times when Berlin became the capital, historically, all past governments have signed decisions to ensure that Frankfurt remains a financial center (Deutsche Börse Group - History of the Frankfurt Stock Exchange, 2023). In line with other global markets, the First World War had a detrimental impact on the Frankfurt stock exchange. At the end of the war, Germany lost a significant amount of foreign securities with the defeat. With the increase

in post-war inflation, people who evaluated their investments in stocks, on October 25, 1929, with the crash of stock prices, recorded its place in history as 'Black Friday' (Deutsche Börse Group - History of the Frankfurt Stock Exchange, 2023). Later, with the coming of the administration of the Nazis, the Frankfurt stock market suffered one of the second and biggest blows when it was taken from the control states and gathered in a single center. The investment was made for the war economy, and the free-market conditions were abolished. In this period, the number of stock exchanges was reduced from 21 to 9, causing investors to exit the country once again. Due to its loss by Germany in the Second World War, the Frankfurt stock exchange was only able to start its first official trade in 1949 (Deutsche Börse Group - History of the Frankfurt Stock Exchange, 2023). However, the purchase of foreign securities has been possible since 1956. When it comes to the present day, the German Frankfurt stock exchange began to be digitalized as of 1969.

Germany is the most economically powerful country not just only Europe but also in the world. Today, Germany is the fourth biggest economy all around the world. Germany's economic success is also due to the good performance of its successful companies. That’s why the German stock market is the most tradable and active market starting in Europe and then later all around the world. Firstly, when it starts trading, the DAX index consists of 30 German companies stocks and these are selected by market capitalization and turnover. The DAX index is a capital-weighted index adjusted for changes in prices, which are affected by factors such as stock splits, dividends, and user rights (Buhler & Kempf, 1995). One of the most important features that distinguish the DAX index from other indices is that it uses the adjustment procedure in dividend payments, while the indices of known stocks are arranged according to share splits. For this reason, the DAX index is discernable and indicates the economic performance of Germany. Besides, it is an important testimonial for both international and local enterprises. Instead of the XETRA electronic system, the first DAX index established on 30 December 1987, and it has been started with a 1000 base scale. After the political situation changed with the unification of the west and east side in Germany, the DAX index was constituted in order to represent stocks that are trading in Frankfurt Stock Exchange. According to the historical background, the DAX index faced many fluctuation volatilities. The most remarkable failures of an index are as known the collapse of the technology balloon at the beginning of the 2000s and the world financial crisis in 2008. All these times index fell significantly, and the index lost important value.

However, the DAX index showed substantial performance in getting to grow with making a profit h the 2010s, it showed a good performance and reached a record level in history. The performance of the DAX index is related to German companies performance so that's why at that time many German companies are create value for their own economy.

Figure 2.10 DAX index pricing indicator from the beginning of Jan 1988 to 31 May 2023, Source: Google Finance, 2023

Today, the DAX index aims to increase the number of 30 stocks it owns to 40 by making regulations since the end of 2020. For this reason, it has made several important adjustments. One of these arrangements is the transition to a single parameter to be taken as a basis for the changes. Previously, market evaluation together with stock market turnover was taken into account, but stock market turnover is no longer an effective factor (Deutsche Börse Group - DAX Welcomes Ten New Members, 2021). As of September 2021, the DAX index, which includes 30 companies, has reached the number of 40 companies that can be traded in total with the inclusion of 10 more companies.

2.8.2 Current Components of DAX Index

In this day, the DAX index consists of many different companies stock prices that operate a business in many various sectors and industries. Most of the companies can be listed under the same industries. For example, a company operating in the technology sector may also be involved in the finance sector. In this case, it can be concluded that the companies operating in Germany and included in the DAX index have more than one work area at the same time and different effects related to it. At the same time, it can be said that the fact that the companies are in more than one sector, and their spheres of influence include wider and more target audiences.

Today, companies operating in the DAX index are listed in all components as follows;

Name		Symbol
1.	Adidas	(*ADSGn)*
2.	Airbus Group	*(AIRG)*
3.	Allianz	*(ALVG)*
4.	BASF	*(BASFn)*
5.	Bayer	*(BAYGn)*
6.	Beiersdorf AG	*(BEIG)*
7.	BMW ST	*(BMWG)*
8.	Brenntag AG	*(BNRGn)*
9.	Commerzbank	*(CBKG)*
10.	Continental AG	*(CONG)*
11.	Covestro	*(1COV)*
12.	Daimler Truck Holding	*(DTGGe)*
13.	Deutsche Bank AG	*(DBKGn)*
14.	Deutsche Boerse	*(DB1Gn)*
15.	Deutsche Post	*(DPWGn)*
16.	Deutsche Telekom AG	*(DTEGn)*
17.	Dr Ing hc F Porsche Prf	*(P911_p)*
18.	E.ON SE	*(EONGn)*
19.	Fresenius SE	*(FREG)*
20.	Hannover Rueckversicherung SE	*(HNRGn)*
21.	Heidelbergcement	*(HEIG)*
22.	Henkel VZO	*(HNKG_p)*
23.	Infineon	(*IFXGn)*
24.	Mercedes Benz Group	*(MBGn)*
25.	Merck	*(MRCG)*
26.	MTU Aero	*(MTXGn)*
27.	Munich Re Group	*(MUVGn)*
28.	Porsche	*(PSGH_p)*
29.	Qiagen	*(QIA)*
30.	Rheinmetall AG	*(RHMG)*

31.	RWE AG ST	*(RWEG)*
32.	SAP	*(SAPG)*
33.	Sartorius AG VZO	*(SATG_p)*
34.	Siemens AG	*(SIEGn)*
35.	Siemens Energy AG	*(ENR1n)*
36.	Siemens Healthineers	*(SHLG)*
37.	Symrise AG	*(SY1G)*
38.	Volkswagen VZO	*(VOWG_p)*
39.	Vonovia	*(VNAn)*
40.	Zalando SE	*(ZALG)*

Source: (*DAX Index Stocks Prices - Investing.com*, 2023)

CHAPTER 3 METHODOLOGY

Germany, which is the fourth economy of the world and the first economy of Europe, has many companies operating in different sectors with highly competitive power in the world market. These companies are engaged in production and activities not only in Germany but also in many different countries of the world, especially in the USA. It would not be wrong to say that the changes taking place on a global scale have an impact on these companies as well. There is high integration between the USA, known as the most massive economy in the world, and Germany, the fourth largest economy (Hausman & Wongswan, 2011). Any information that is produced or has economic value in any of these countries has great effects on each other, especially on stock market indices (Dimpfl, 2011). In this study, the effect of the changes in the policy rate by the US central bank during the period when global inflation increased rapidly on the German stock market DAX (XETRA) index, which includes 40 large companies, will be examined together with its components.

Event study studies emerge as a technique that aims to evaluate whether an abnormal return occurs on the security from which the specified announcement is yielded. The methodology in this study is also discussed in order to evaluate the effects of the central bank responsible for the monetary policy of one of the two countries with high economic integration and the effects of the stocks of the companies in Germany, which have a very important position in the world market in industry, production, and technology on the index. For this reason, event study approach was preferred to investigate the effects of which is taken by the Federal Reserve and the European Central Bank on the DAX index. The biggest factor in choosing this method is that there are 11 policy statements in total, 7 of which are by the Fed and 4 by the ECB. The examination of how each announcement's effect on the overall index is shaped will be carried out according to the approach adopted by the event study method. The reason for choosing this approach becomes clearer based on the information in Section 3.2.

3.1 OBJECTIVE OF RESEARCH

When the previous literature studies are examined. There are numerous research looking at how the Fed's interest rate decisions have an impact not only on the German stock market

but also on the global stock markets. What will distinguish this study from others and its contribution to the literature is that the factors involved in the analysis process occur simultaneously, not independently of each other. The Eurozone, which has been in negative interest and low inflation for a long time, unfortunately, could not escape from the increasing inflation conditions, and inflation broke the records of the last 70 years not only in Germany but also in many countries within the Eurozone (Welle, 2023). In Germany, this process was negatively affected, and inflation increased to 8.7% as of January 2023 (Statista, 2023). This rate has been recorded as the highest inflation rate Germany has seen after the second world war. Firms are expected to have an unfavorable impact on profitability rates and stocks as a result of tightening monetary policies with increasing inflation. However, especially considering the last periods, it has been seen that the indices react positively as returns, aside from being negatively affected. If we return to the contribution of this study to the literature, the fact that the FED started the tightening process before the increasing inflation in both regions and increased interest rates 7 times in a row within the specified period, and then the ECB's involvement in the interest increase has been caused quite a lot of volatility on stocks. Although it is rare for central banks that produce both different reserve currencies to increase interest rates in the same period, the fact that the inflation rates, especially in the European region, are quite high, stands out as an important factor that distinguishes the research from other studies. At the same time, the Fed's fight against inflation at a rate above expectations between interest rate hikes in the process allowed the ECB, which followed behind it, to fight the uncontrollable inflation more firmly and decisively, not to put the economy into trouble, but to increase interest rates has allowed rapidly at the same time.

Based on previous studies, it is seen that interest rate hike decisions have a negative effect on the DAX index. However, it has been observed that the DAX index has reached historical record levels in the determined period range. This situation led to the questioning of how the effect of both central banks, which went on a very stable tightening path, in terms of the direction of the index and the pricing behavior. The study examined the influence of the Fed's FOMC meetings on stocks within the date range will be investigated with an event study, and 7 separate events and 4 separate events by ECB will be examined. Then, a comparative evaluation will be made separately from other examinations during the week in which the ECB and FED meetings are jointly held. The German index DAX (XETRA), which will be the data for the study, was preferred. At the same time, the stocks of 40

companies included in the index will also be the subject of the research. The inverse relationship between the reaction of the companies' stocks and the change in the returns during this process, which is included in the literature, will be evaluated under these rare conditions. Besides, the research is aimed to analyze whether the DAX index, which has reached new record pricing levels, provides a real return. If there is a return, how the ECB and FED decisions contribute to this situation constitutes a basis for research. The analysis consists of two different parts. In the first part of the analysis, which is the subject of the research, only the alternative hypothesis (H1), which argues that FOMC decisions have a short-term positive return effect on the DAX index, and the null hypothesis, which argues that FOMC interest rates cause short-term negative returns on the DAX index, are tested. According to the results to be obtained, the alternative hypothesis will be accepted or rejected, and the null hypothesis will be supported. In the H1 hypotheses, the effects of the monetary policy decisions taken by the FED on the U.S. side on the DAX index and the abnormal returns occurring in the short term were intended to be evaluated. In the second analysis, which is the subject of another study independent of the FOMC decisions, the hypothesis (H2), which argues that the FED and ECB, which increased interest rates in the same period, showed significant differences in the DAX index in the European stock markets while examining the effect of the ECB interest rate decisions on the DAX index will be evaluated. As a result of rejecting this hypothesis, a secondary null hypothesis opposite to H2 will be supported. On the basis of the second analysis, it is aimed to statistically evaluate the short-term returns of the DAX index of both central banks that increased interest rates in the same period. The reason for this difference is that the Fed started the tightening process earlier and the ECB joined this process later. In addition, there are two joint announcement dates within the same week made by the FED and the ECB within the period determined for the analysis. While the first of these dates was arranged by the ECB on July 21, 2022, and the FED on July 27, 2022, the second joint announcement date was realized by the FED on December 14, 2022, and the ECB on December 15, 2022. This allows for a comparative evaluation of the effects of both central banks on the index.

H1: The impact of the FOMC interest rate hike decision on global markets causes a short-term positive return impact on the DAX index.

H2: The decisions of both major central banks, FED and ECB, to raise interest rates at the same period show significant difference on the DAX index in European stock markets.

An important point to note here is that both analyzes are different from each other, and the H1 hypothesis is only the evaluation criterion of the first analysis (FOMC decisions). On the other hand, the H2 hypothesis is the evaluation criterion of the second analysis (FOMC & ECB decisions). As a result of rejecting both hypotheses in their own analysis, their opposite null hypotheses will be supported.

An evaluation was made on the basis of the FED's monetary policy announcement dates in H1, which is the hypothesis of the first analysis, and on the basis of the ECB's announcement dates in the H2 hypothesis in the second study.

3.2 EVENT STUDY

Event study is a frequently used method to analyze the financial sector today. With this method, the changes in the stocks of the companies can be analyzed. Changes in stocks, on the other hand, occur as a result of the market's reaction depending on the performance of the companies, their economic indicators, acquisitions, mergers, and investments to be made. The event study is used not only to analyze the impact of the news on the company but also to analyze the change in pricing behavior that it will show on the news of the sector and macroeconomic changes (Peterson, 1989). The study on methods and applications about event study was published by MacKinlay in 1997 and is one of the most referenced sources in the literature. In the article, there are details to explain the case study techniques and the analysis method that can be preferred. In addition, it includes a sample application on how the information in the accounting values of a firm is positioned in terms of the market (MacKinlay, 1997). In the publication by James Dolley (1933), a study was conducted on the division of stocks and its effect on pricing. Although MacKinley (1977) describes this study as the first technical research on event study in the literature, in reality, it only shows similarities with modern case study studies. The common point of James Dolley's work with current studies is that he used a common definition of 'event' in order to analyze a sufficient number of firms in the definition of division in stocks (Findlay & Williams, 2000). It can be said that this situation is based on the same foundation stone for the definition used in today's event study. The basis of the studies on the modern event study method used today

was put forward in 1969 by Fama, Jensen, Fisher, and Roll, who have an academic background (Fama et al., 1969). Thanks to this new method, which had a great impact in the fields of both economics and finance, especially in the early days, it enables examination of results of many different types of activities on pricing behavior. Examples of these events are profit announcements, firm merger decisions, and money supply. With the emergence of the event study, its excessive use was attributed to two reasons. The first of these is to test the market efficiency by using the null hypothesis after the announcement, while the second reason is to evaluate the effect of the changes on the basis of companies on the investors holding the securities of these companies with the market efficiency hypothesis (Binder, 1998).

Case studies should be organized in such a way that they can answer the right research questions in line with the determined objectives. For this reason, it should be organized in such a way that they can answer the right research questions in line with the determined objectives. In the single case study, while the announcement made by a company examines the changes in the market pricing of the company's stock, in a larger sample, it refers to the analysis of the changes in the prices of different stocks within the same period, that is, how the market reacts (Lys and Vincent, 1995; Bruner, 1999). Another crucial aspect of the event study is the length of the event period to be selected in order to be able to make a correct analysis, as well as the accuracy and accessibility of the data. While the determined period can be weekly, monthly, and annual, in general, analyzes based on monthly and daily data sets are in the majority in the literature. (Sitthipongpanich, 2011). In order to carry out the event study, the person should determine the event he wants to research and prioritize the completion of the stock selections of the companies that will create the data set. Then, an event window should be determined for the event chosen by determining the events that occurred and accepting the day of the event as '0' point. There should be 2 different categories in the general window. The first part of this is the definition of the estimation period, in which event time estimations will be made, and the other part, the event window, where pricing will be tested, which will serve the purpose of the research. Numerous models can be applied to calculations using event study. Each model's primary objective is to compare the expected return to the actual return using the benchmark return.

Below is a list of event studies that are similar and exemplary to this study in the literature;

Table 3.1 Examples of Previous Studies in The Literature

Summary of the event study findings	
Announcement	Main findings
Stock Price Reaction Around New Product Announcements: An Event Study. Mann, B. J. S., & Babbar, S. (2017)	As a result of the research, it has been determined that with the realization of the announcement, abnormal returns have increased and a positive effect has been observed in the stock prices of the place, which is defined as strong by the market.
Stock Market Reaction to Shares Buyback in India: An Event Study Methodology. Gupta, M. (2014)	As a result of the analysis, it was determined that while a negative normal return performance was observed before the event day, positive abnormal returns were experienced in the days following the announcement. As a result of the research, it is said that abnormal returns, albeit short-term, are obtained in the purchases of stocks.
Sukuk Ijarah vs. Sukuk Musyarakah: Investigating Post-Crisis Stock Market Reactions. Ahmad, N., & Abd Rahim, S. (2013)	There are two possible interpretations for the positive market responses. Ijarah and musyarakah are these. The findings support our hypothesis that the issuance of ijarah and musyarakah in Malaysia caused a positive market reaction on the FTSEKLCI index.
The Impact of Monetary Policy Decisions on Stock Prices: An Ecent Study. Baykara, S. (2021)	It has been concluded that the policy rate hike decisions by the CBRT have very significant and negative effects on insurance and banks' stocks.
Dividend announcement and market response in Indian stock market: An event-study analysis. Maitra, D., & Dey, K. (2012)	When compared to the market model, the CAPM model provides superior outcomes and allows for more accurate interpretations. This study also suggests that the Indian stock market does not react quickly to information shortly following dividend announcements, as shown by the size of the average anomalous return calculated using the CAPM model.

Comparing US and European market volatility responses to interest rate policy announcements. Krieger, K., Mauck, N., & Vazquez, J. (2015)	There are some important differences between the United States and Europe across the ocean. While the interest rate decisions made by the USA significantly narrowed the fluctuation movements on the European stock markets, the American stock markets did not react to the announcements made by the European market. The volatility in the markets in the USA has an impact on the VDAX index, especially as it acts as a pioneer for Europe. This shows that the monetary policy announcements made by the Fed are more sensitive to Europe and the VDAX.
Monetary policy announcements and stock reactions: An international comparison. Wang, S., & Mayes, D. G. (2012)	The research's findings revealed that although there are still big differences between the central banks of the euro zone, the United States, Austria, New Zealand, and England, stock prices react in parallel to each other when they make unexpected monetary policy decisions.
Responses of the Warsaw Stock Exchange to the US macroeconomic data announcements. Gurgul, H., Suliga, M., & Wójtowicz, T. (2012)	Tests show that investor response to CPI announcements and vice versa is mostly unaffected by IIP releases. The results of the analysis show that, during the study period, U.S. unemployment rate announcements had no significant effect on the WSE.
Central Bank Independence and stock market outcomes: An event study on Borsa Istanbul. Bash, A., & Al-Awadhi, A. M. (2023)	It can be proven that political influences and central bank independence both have good and negative effects on stock market results. The study's findings revealed that, while changes in monetary policy brought about by the departure of two central bank presidents had a favorable impact on cumulative anomalous returns, situations where political decisions predominated also had a detrimental impact.
Event study and principal component analysis based on sentiment analysis–a combined methodology to study the stock market with an empirical study. Xu, Q., Chang, V., & Hsu, C. H. (2020).	When the rumor has prior to had a substantial impact, the stock price still responds to it strongly when it is first spread. The research has tried to explain that the investment decisions to be taken for the discourses will bring advantages for the investors in the processes before and after the publication of the announcement. The study concludes that the official clarification has a limited impact after the rumor has been cleared up. At a certain point, clarification greatly cancels out the bullish rumor-induced positive anomalous returns.

Exploiting the dividend month premium: evidence from Germany Kreidl, F., & Scholz, H. (2021).	In the analysis, it was found that the positive normal returns that occurred throughout the date of the declaration and the old dividend dates were the main drivers of the dividend premium. This demonstrated that between 2003 and 2017, the 45 days prior to the old dividend dates for German stocks exhibited an effective and noticeable cumulative abnormal return of about 1.79%. Additionally, it has been demonstrated that the cumulative anomalous return, which is considered positive for the market, has a significant impact on equities in addition to dividend news.

The single market model was favored in this study. This is due to the fact that, the presence of a sufficient number of events, as well as the market's response to each announcement varies, and performing and calculations based on each event window chosen prior to [-250, -11] will yield more accurate results for the abnormal returns to be found.

3.2.1 Single Market Model

$$E(R_{i,t}) = \alpha + \beta R_{m,t}$$

Equation 3.1 Single Market Model Formula

α & β are intercept and slope coefficients of the OLS regression model.

$R_{m,t}$ is the rate of return on the benchmark index (DAX) on day t.

The alpha and beta co-efficient will calculate with the data available chosen period.

3.2.2 Abnormal Return

$$AR_{it} = R_{it} - E(R_{i,t})$$

Equation 3.2 Abnormal Return Formula

AR_{it} is the abnormal return on index i on day t;

R_{it} is the actual return on index i on day t;

$E(R_{i,t})$ is the normal return on the index i on day t

The disparity between the realized and predicted returns is displayed by the abnormal return.

3.2.3 Cumulative Abnormal Return

$$CAR_{it} = \sum_{t=\tau 1}^{\tau 2} AR_{i,T}$$

Equation 3.3 Cumulative Abnormal Return Formula

CAR_{it} is the cumulative abnormal return on index i on day t;

3.2.4 Average Abnormal Return

$$AAR_{i,N} = \frac{1}{N}\sum_{i=1}^{N} AR_{it}$$

Equation 3.4 Average Abnormal Return Formula

The average abnormal return on day t is known as AAR.
N is the number of indices.

3.2.5 Cumulative Average Abnormal Return

$$CAAR_{i,N} = \frac{1}{N}\sum_{t=1}^{T} AAR_{it}$$

Equation 3.5 Cumulative Average Abnormal Return Formula

The $CAAR$ stands for the cumulative average abnormal return on day t.
N is the total number of indices.

To determine the statistical significance of the $CAAR_{i,N}$ results, the cross-sectionally t-test was used. Using this method yields more accurate findings in determining the statistical significance of the data because the sample size spans a big and wide range.

3.2.6 Cross- Sectional *t*-Test of the Cumulative Average Abnormal Return

Statistical t-test methods are divided into two groups. These groups are classified as parametric and non-parametric (Serra, 2004). While studies on parametric tests were defined by Brown and Warner (1980) as a crude independence adjustment, there are standardized

residual test applications by Patell (1976). Besides Boehmer et al., (1991) described the cross-sectional t- test method. On the other hand, non-parametric test methods are used in the literature as Wilcoxon signed rank test, Corrado (1989) rank test, and generalized sign test developed by Sanger et al., (1986). In order to determine the test method to be used in the analysis, first of all, it is necessary to pay attention to how the data is distributed. In this direction, it assumes that the abnormal returns seen in the stocks of companies in parametric tests show a normal distribution (Kolari, & Pynnönen, 2010). The stocks in the sample are in the same index and each of them showed pricing behavior in the face of the same event. In line with the Single Market model preferred for analysis, a retrospective regression analysis of the returns within the estimation period range (in our study, this range is [-250, -11]) of each stock in the index for each announcement date. As a result, a surplus occurs for each stock specific to the announcement (Brown & Warner, 1980). This is now a unit in which abnormal returns are evaluated in the single market model. This is now also considered a measure of performance so that statistical accuracy can be tested. In the study of Brown and Warner (1980), it is stated that the residual cross-sectional that will occur together with the evaluation of each announcement within itself is generally realized with a smaller value on the day of the announcement. The main reason is that each analysis takes place within the same time period. However, in the same study, it is mentioned that the cross-sectional correlation of the residuals was generally small in the analyzes performed within the same calendar. For this reason, it is emphasized that it does not require any dependency regulation unless there is a different situation. Accordingly, the t-test analysis is based on the absence of any correlation between the residual and stocks. In other words, it is taken as a basis that this surplus, which is specific to the stock, should not be related to the other stock.

In this study, the stocks included in the index for each announcement interval were subjected to regression analysis within themselves. Since it is assumed that each data has a normal distribution, the parametric cross-sectional t-test was preferred for statistical evaluation.

$$t = \frac{CAAR_t}{\delta_{CAAR_t}} \qquad \delta^2{}_{CAAR_t} = \frac{1}{N-1}\sum_{t_1}^{t_2}(CAR_t - CAAR)^2$$

Equation 3.6 Cumulative Average Abnormal Return *t*- test

δ_{CAARt} shows standard deviation of estimation period which is between -250 days to -11 days before event window. *N* represent the number of observations.

3.2.7 Selected Period

The analysis consists of 11 actions in total. The FOMC, which is governed by the Fed, made 7 of these pronouncements; the ECB made the other 4. The choice directly impacts the global markets, even if every decision is made in accordance with the economic prognosis of the region in which they operate. The study will also look at how monetary policy adjustments affected the DAX index in response to the region of America and Europe, which is comprised of industrialized nations and nations with reserve currencies, experiencing quickly rising and unexpected inflation. This is why the actions made by central banks to tighten one by one following the outbreak were taken into consideration. The first interest rate hike was implemented by the Fed in March 2022, according to an analysis of the monetary policy statements and interest rate decisions made by the Fed and ECB in 2022. The ECB started raising interest rates after the Fed. The ECB implemented its first interest rate rise in July 2022. The event study approach was chosen in order to precisely assess the impact of monetary policy to accurately evaluate the effects of tighter monetary policy measures, the event study approach was adopted, and policy rate rises on the DAX index. It became clear after looking at the case studies and the literature study that each announcement needed to be studied independently. A wide range of time has been taken into account in accordance with the single market model of each announcement in order to build a statistical relationship between the index movement before the announcement and the index price in the predetermined event period. The definition stipulates that it must take into account the starting point 250 days prior to each announcement day and the post-announcement index movement 20 days afterward. The event date is numbered as a '0'. Between -10 and 0 days are named 'before the event date' and 0 to 20 days are named 'after the event date' under the event window. The days that can be processed between 24/03/2022 and 13/01/2023 are used as a basis if we examine the date range selected as a foundation for the computations in the analysis.

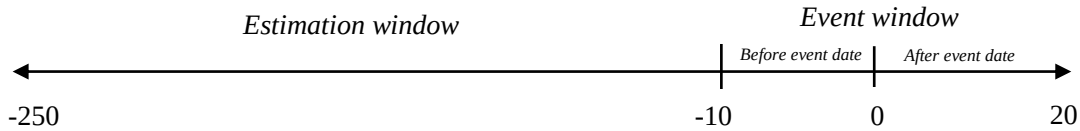

Figure 3.1 Depicts the event window and estimation window in schematic form

3.2.7.1 Selected FOMC Meeting Announcements

The FOMC meetings that are the focus of the study span the months of March and December 2022. Between the times mentioned, there were a total of 7 FOMC meetings. Despite the fact that the monetary policy decisions made at each meeting varied depending on the economic outlook, actions were nonetheless taken to tighten the monetary policy and raise the overall outlook policy rate. The dates of the FOMC meetings held in the selected period for the evaluation and preferences regarding the policy rate are shown in Appendix 1.9. The specified dates are obtained from the official page of the Federal Reserve.

3.2.7.2 Selected ECB Meeting Announcements

Between the July 2022 and December 2022 monetary policy meetings of the European Central Bank, a total of 4 distinct announcement events were identified for the analysis. Although the interest rates at each meeting vary, overall, policy rate decisions have become more restrictive. At the same time, although announcements were made in a close period of time at the meetings held by the Fed and ECB in 2022, as each analysis was assessed over its own time frame, it was excluded from this process. Besides, the analysis contains the time based on December 2022, when both central banks held monetary policy meetings one day apart too. As a result, the analysis took into consideration both individual and combined assessment of the most recent meetings in the process that was the focus of the study. Monetary policy announcements made by the European central bank are included in Appendix 1.9. The data for the specified dates are taken from the official website of the European Central Bank.

3.2.8 Event Window

Each stock should have a regression analysis run between the time periods calculated using the Single Market Model. This is because there are a significant number of stocks included in the study, which allows the calculations to produce reliable findings. Additionally, the precision of the model is necessary to identify slope variations between the variables. The pricing history between the estimation period [-250, -11], which is susceptible to regression analysis, is employed to establish the study's estimation window range. The event window's

[-10, 20] range is also specified. Additionally, the "0" base point was determined to be the day the central bank announced its monetary policy.

3.2.9 Data and Descriptive Analysis

First and foremost, access to the proper data is required for the analysis to be completed successfully. The DAX index's daily closing prices for 40 companies listed on the Frankfurt Stock Exchange are used as a foundation in this direction. At the same time, access to the DAX index's daily closing prices is required in order to compute abnormal returns using the single market model. The anticipated outcome calculation based on the index was then applied after the single market model first determined the percentage values of the difference between the price closings for the DAX index and each stock compared to the previous day. The discrepancy between the alteration in the stock and the projected return is what is referred to as an abnormal return. Every day and every event window interval involved the same procedure. The abnormal returns observed up to 20 days following the announcement, based on prior to the announcement of the event timeframe, by ten days, were gathered for the calculation of the cumulative abnormal return, as well as how the stock and the index truly responded to the monetary policy decisions. The standard deviation between the index and the stock was discovered at the same time as the model compatibility of each stock according to the overall performance of the index for each meeting was studied. *t*-test analysis of abnormal returns that occurred during the event window interval was carried out, and the model's statistical significance was assessed. Additionally, 5% was used to compute the statistical significance value.

The DAX index's overall performance between March 2021 and January 2023 as well as each of the index's components' daily historical closing prices were gathered for the study through the Investing.com website. On the website where the data was gathered, the names of the stocks that make up the index are specified in Section 2.6.2. The index, which consists of a total of 40 equities, was excluded from the research since the earliest trading date for one of the stocks (Dr. Ing. hc. F. Porsche AG Preferred) is September 2022. As a result, the research was finished using the pricing trends of a total of 39 stocks. The data were analyzed using Microsoft Excel 365 v16.74 program and the results were visualized.

CHAPTER 4 EVENT STUDY ANALYSIS

This section includes a breakdown of the DAX index and firms' responses to the FOMC and ECB's monetary policy decisions by grouping them by the sectors to which they belong. The study attempted to explain the analysis of 11 various announcements using the single market model, and it will be determined whether the findings are consistent with the proposed assumptions. Each announcement will be dealt with separately from the others, and the outcomes will be assessed separately. For each activity, there will essentially be regression analysis. In this way, the model's consistency, its error margin, and its relationship to the dependent variable will all be looked at, and the findings will be evaluated.

4.1 DAX INDEX WITH ALL STOCK'S RESPONSES TO ACCORDING TO AFTER EACH FOMC MEETING ANNOUNCEMENT

In anticipation of the pandemic's global effects in 2020, nations have begun the closure process. Direct production was hampered by this circumstance, and when necessary, it was even stopped. Due to production interruptions, oil prices plunged. In order to stop economic recessions and fresh financial crises, central banks have taken action to stabilize the market by purchasing bonds, notably through expansionary policies. Numerous nations have established incentive programs and provided their citizens with their gratis even during this process. All of actions are primarily intended to stop the diminish in economic activity brought on by the closures. However, the results, expansionary policies implemented near the end of the pandemic began to show themselves as inflation in many countries. Moreover, the rapid ascend in the price of commodities together with the rise in oil prices has created an effect that will trigger an increase in inflation in many countries, especially in Europe, which is an energy importer. At the same time, while the countries started to remove the restrictions with the epidemic gradually losing its effect, the zero covid policy of China, which has an important position in the world's supply chain, created another inflationary effect. The policy implemented by China, which is an important import-export partner of Europe, especially America, has also negatively affected American and German companies whose production center is here. At the same time, the delays in the supply of raw materials, which must be supplied by industrially developed countries, had a detrimental effect on the market, which was trying to recover after the pandemic. Finally, the war conditions that

took place in the European continent towards the end of 2022 had such a negative effect that prices in terms of energy increased significantly and inflation forecasts deteriorated. Experiencing all these processes led to a faster-than-expected increase in inflation in Europe and Germany, especially in the USA. The inflationary effects of the expansionary monetary policy they implemented, and the other global effects experienced afterward pushed the central banks to tighten and caused them to make changes in the monetary policy.

Along with these conditions, interest rates were increased 7 times during the period determined together with the FOMC activities organized by the FED. The pricing behavior of the DAX index for each event was examined using the event study technique, and the pricing behavior of the policy meetings on the index was analyzed. The event day in the analysis was determined to be the day the announcement from the central bank was issued, and the event window interval, during which the movement of the index was watched, was determined to be between [-10, 20]. The analysis uses the date range that can be processed between 250 days before the announcement and 11 days before the announcement as a basis for doing regression analysis in accordance with the single market factor. For each stock price in each index, the same procedure was performed, and abnormal returns were computed. The abnormal returns displayed by each stock were assessed as an average abnormal return (AAR) as a whole for the purpose of evaluating the index's overall pricing pattern.

4.1.1 Event 1 - 16 March 2022

FOMC events are repeated at certain intervals every year and information about monetary policy is announced to the public. In the first review for the analysis, the FOMC held a press conference on March 16, 2022, to determine the monetary policy and announce it to the public. In the press conference held, the benchmark interest rate rise of 25 basis points occurred in line with the market expectations, bringing the interest rate from 0.25% for a long time to 0.50%. In addition, during the meeting, the Fed gave strong signals that the tightening would continue in the following meetings, and accordingly, it revised its economic growth forecasts downwards. At the same time, they updated the outlook for the expected inflation in the future upwards. The FOMC meeting's decision to raise interest rates was significantly influenced by the fact that the inflation rate for February, which was released on March 10, 2022, was 7.9% on an annual basis. Although this rate was in line

with predictions, the Fed should act as quickly as possible based on future inflation expectations.

The impact of the 25 basis point rise in interest rates by the FOMC was examined on the DAX index. It has been stated before that America and Germany have a strong interaction with each other in terms of economic activity. In this direction, the analyses' findings derived from the literature were not surprising compared to the first interest rate increase.

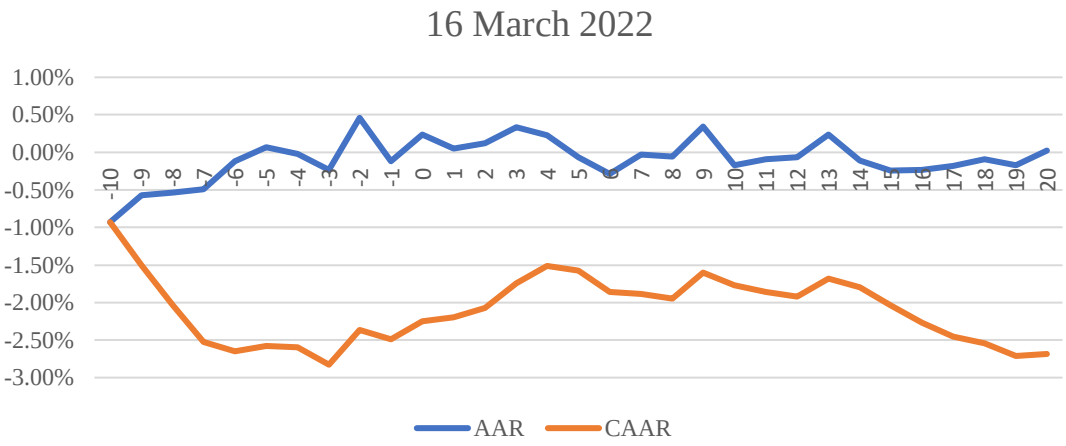

Figure 4.1 DAX Index Response $AAR_{i,N}$ and $CAR_{i,N}$, for FOMC Event 1- single market model

It has been observed that rising interest rates and the increase in borrowing costs have an adverse effect on companies, and the contraction in economic growth is also priced negatively by the markets. When the results are evaluated, the DAX index gave a negative reaction to the first interest rate increase by the Fed in terms of return. Since this situation coincides with the literature, the result was in line with the expectations. However, when looking at the cumulative average abnormal return (CAAR), it is clearly seen that the result is even more negative compared to AAR. While the index provided a positive average return before the announcement, cumulatively, on the contrary, it actually caused a negative return, that is, a loss. Although the FOMC meeting and the subsequent policy rate decision in line with market expectations did not create much volatility in abnormal returns, the impression that tightening monetary policies towards inflation would continue in the following days, even if there was an initial recovery in cumulative abnormal returns, caused the returns to continue on the negative side. In addition, it should be noted that the analysis outputs made

independently of each other for a total of 39 stocks that make up the index are considered as a whole, and average abnormal and cumulative abnormal return calculations are made.

Table 4.1 Statistical Results of FOMC Event 1

FED EVENT 1			
Event window	CAAR	t- test	p-value
[-1, 1]	-0,069	-0,249	0,8033
[-5, 5]	-0,242	-0,274	0,7845
[-10, 20]	-0,027	-0,132	0,8951

Considering the first meeting organized by the FOMC, the negative CAAR return, which started before the announcement, decreased to 3%, while it continued to provide negative returns in the days following the announcement. Although the AAR values fluctuated in a limited area and on the positive side, the CAAR values provided returns on the (-) side in terms of overall performance. The statistical test results point to the results supporting the movement seen in the graph. While the index has a CAAR value of -0.069, -0.242, -0.027 in the event interval [-1, 1], [-5, 5], [-10, 20], respectively, statistical results show that for the only FOMC decisions analysis H1 hypothesis rejected.

4.1.2 Event 2 – 4 May 2022

On May 4, 2022, the FOMC held its third annual meeting. The Fed raised interest rates by 50 basis points, conveying the policy rate to 1%, according to the meeting minutes. The inflation rate for April 2022, which was 8.5% and slightly higher than expected, was a key consideration in making this choice. Additionally, Fed officials highlighted that in order to combat inflation, interest rates should be raised above what the market anticipates. Additionally, representatives hinted that the interest rate hike might continue in subsequent meetings. The United States experienced the largest rate increase in the previous 22 years as a result of inflation reaching its highest levels in the recent 40 years. Another significant aspect that sets this meeting apart from the previous is the Fed chairman's unusual direct appeal to the public in an effort to fight inflation. The meeting's minutes state that although the supply chain issues and the ongoing conflict in Europe were highlighted as reasons why the economic outlook was not favorable, controlling inflation was still the main goal.

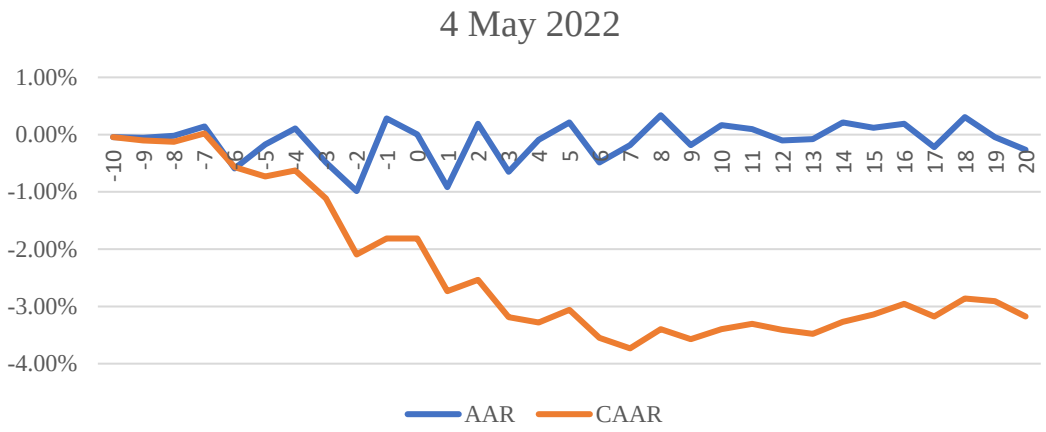

Figure 4.2 DAX Index Response $AAR_{i,N}$ and $CAR_{i,N}$, for FOMC Event 2- single market model

The markets responded rather harshly to the 50 basis point interest rate increase. The abnormal return in the days leading up to the conference was essentially cumulative and linear, first good, but as the meeting day drew near, it started to change unfavorably. The DAX index, which exhibits negative pricing due to the rise in market expectations of a 50 basis point interest rate increase just two days prior to the meeting day, is actually a measure of how strong the economic ties between Germany and America are. After the meeting day, abnormal returns did not have significant volatility, but cumulatively negative returns of more than 3.5% were attained.

Table 4.2 Statistical Results of FOMC Event 2

FED EVENT 2			
Event window	CAAR	t- test	p-value
[-1, 1]	0,017	0,163	0,870
[-5, 5]	0,087	-0,691	0,490
[-10, 20]	0,004	-0,507	0,612

As a result of the second monetary policy meeting held by the Fed on May 4, 2022, the index had a value of -0.04% CAAR ten days before the announcement, while this rate was -1.81% on the day of the announcement, and -3.73% CAAR on the seventh day following the announcement. Statistical values and event windows showed negative pricing behavior. In the second announcement, the p- values respectively, 0.087, 0.49, and 0.61 obtained for the [-1, 1], [-5, 5], and [-10, 20] ranges were obtained at the 5% significant level. According to the results, the H1 hypothesis has not been reached supporting and it can be rejected. In

its second event organized by the FOMC, it can be said that the DAX has a negative effect on the index.

4.1.3 Event 3 – 15 June 2022

The market conditions started to deteriorate as the summer months arrived. Data on inflation released on June 10 exceeded forecasts and set a new high by hitting 8.6%. Indicators of predicted inflation were also rising, furthermore. When the market conditions of the day were examined, the ongoing war had caused energy prices to reach their highest point in previous years. Meanwhile, continuous issues with the supply chain kept inflation from declining. Even though the US economy was in a state of stagnation, the Fed continued to tighten policy in an effort to decrease inflation. As a result, interest rates increased by 75 basis points on June 15, 2022, which was more than anticipated. The FOMC statement claims that after raising interest rates by 75 basis points, the Fed boosted the cost of funding to 1.75%. The Fed chairman reaffirmed that they established 2% inflation as their target, emphasizing that tightening policies should continue in order to fight inflation, which has historically reached its greatest levels since 1981, and to control the damage that inflation may create (Cox, 2022). Markets are well renowned for always pricing for expectations. Following the meeting, futures traders started to price in the possibility that the Fed could start lowering interest rates by 2023 and that it would not be able to continue its tightening monetary policies intended to combat the slowdown in economic growth for a considerable amount of time.

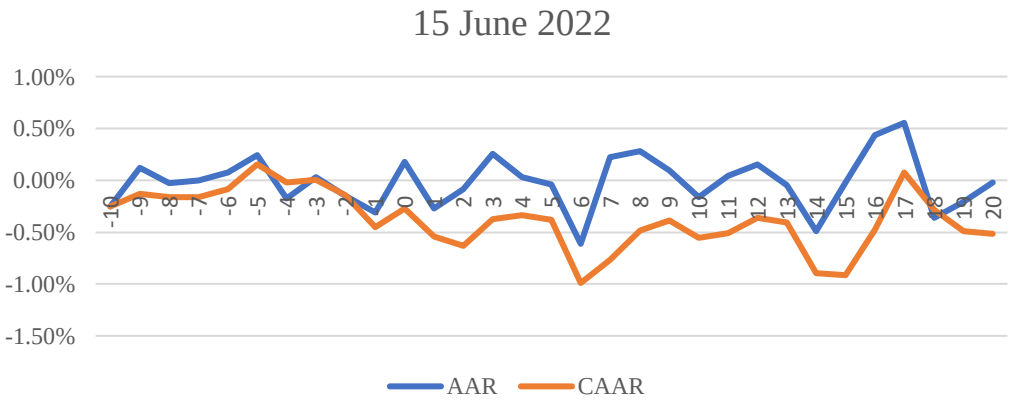

Figure 4.3 DAX Index Response $AAR_{i,N}$ and $CAR_{i,N}$, for FOMC Event 3- single market model

When the analysis's findings are properly interpreted, it becomes clear that abnormal returns and cumulative abnormal returns interact in the days leading up to the meeting. The day the announcement was made, when the interest rate increase was 75 basis points in line with not predictions, it was priced as a positive return; however, the realization of the interest rate increase over forecasts caused a negative market reaction in the DAX index in the days that followed. However, market pricing has demonstrated significantly less volatility than in recent meetings. The abnormal return and cumulative abnormal return from the event window range demonstrated a similar movement when the DAX index's pricing response to the interest rate adjustment was taken into consideration. The Fed and the market have agreed that fighting against inflation is vital as inflation hits its historical high and future expectations deteriorate.

Table 4.3 Statistical Results of FOMC Event 3

FED EVENT 3			
Event window	CAAR	t- test	p-value
[-1, 1]	-0,013	0,733	0,463
[-5, 5]	-0,030	1,727	0,084
[-10, 20]	-0,005	2,57133	0,0103*

* Significant at the 5% level

In the third meeting held, CAAR values of -0.013 and -0.030 were seen for the first two event windows. At the same time, while the index was at 0.15% CAAR five days before the announcement, this rate was -0.27% on the day of the announcement. While the p-value for both event windows [-1, 1] and [-5, 5] were respectively 0.46 and 0.08, the results support the H1 hypothesis. When the t-test is evaluated between the [-1, 1] and [-5, 5] periods in the analysis, it is seen that the mean difference values of the sample are not statistically different from the population mean values. Accordingly, it can be said that the interest rate hike by the Fed for the first two event windows had a negative effect on the index. On the other hand, in the [-10, 20] event window range, the index recovered from the eighth day. According to the results of the statistical analysis performed to the degree of the 5% significance level, the p-value is 0.010 in the third observation interval and the t-test result is 2.57 and the t-test value being greater than 1.96 indicates that there is a statistical mean difference between the sample and the population. This result shows that the index provides positive returns in this range. In this direction, for the range [-10, 20], the negative effect of the interest rate hike, which is supported by the null hypothesis, is rejected, while the

alternative hypothesis, H1, is supported. Moreover, the fact that an aggressive rate hike of 75 basis points took place in this meeting makes a difference in terms of the result.

4.1.4 Event 4 – 27 July 2022

When the dates showed July 27, 2022, all markets were witnessing a historical moment. Interest rates rose by 75 basis points consecutively as a result of the Fed's monetary policy response to the out-of-control inflation, bringing the policy rate to 2.5 percent. The inflation numbers that were released on July 13, 2022, prior to the meeting, are what led to the Fed's extremely aggressive stance. Although 8.8% was the predicted inflation rate, the actual rate of inflation of 9.1% raised numerous questions. Furthermore, the fact that the rate increases, which began in 2022, haven't yet affected inflation has increased hopes that the Fed will keep up its tightening tactics. The Federal Reserve continued to maintain a hawkish image by lowering its balance sheet in addition to utilizing interest rates as one tool in its arsenal to combat inflation. The market's decision to anticipate a rate increase of 50–75 basis points in July was expected given the announcements made following the interest rate hike in June. After the Fed chairman revealed that the next meeting would take place in September and that the announcement would be based on data from that month, stock prices responded favorably.

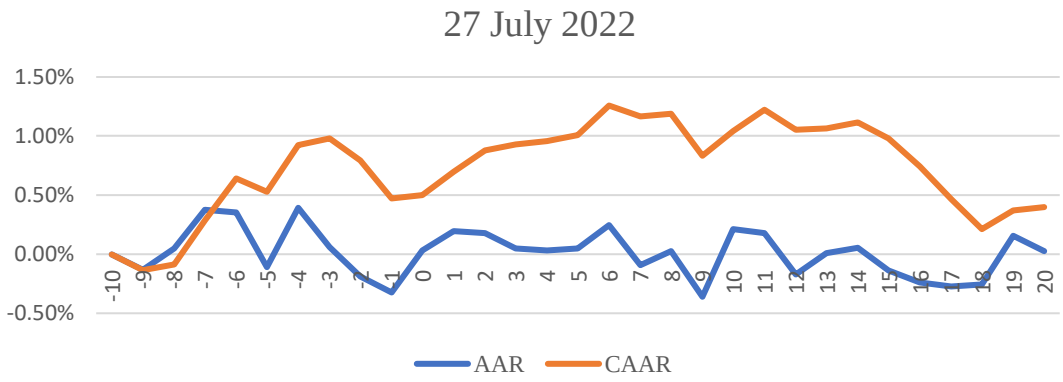

Figure 4.4 DAX Index Response $AAR_{i,N}$ and $CAR_{i,N}$, for FOMC Event 4- single market model

When the pricing behavior of the DAX index—which is defined as historically occurring increases in the federal funds rate of 75 basis points—is investigated, it is discovered that it displays characteristics resembling those of the American stock markets. Prior to the announcement, the concurrent movement of AAR and CAAR changed in the days that

followed. The average abnormal return did not vary significantly, even after the announcement, but the rise in cumulative abnormal return—which reached about 1.5% indicates a favorable market response to the DAX index. Depending on the literature, the analysis's findings are different. According to the research, equities typically experience a drop in situations where interest rates rise. While the DAX index's negative response to the interest rate decisions made in March and May can be used to explain this situation, it is unable to account for the market responses in June and July. Additionally, the DAX index should be significantly impacted negatively by the rapid interest rate increases of 75 basis points in quick succession during these two months. The recent surge in inflation is projected to continue, and central banks should keep tightening their monetary policies and reducing their balance sheets, which will make for a very negative situation for indices. The cumulative average abnormal return (CAAR), on the other hand, offered a return between 0% and 1.5% whereas the average abnormal return (AAR) in the DAX index varied between -0.5% and 0.5%. It can be said that this situation is due to the optimistic expectations at the meeting to be held in September.

Table 4.4 Statistical Results of FOMC Event 4

FED EVENT 4			
Event window	CAAR	t- test	p-value
[-1, 1]	0,017	0,544	0,586
[-5, 5]	0,087	0,460	0,645
[-10, 20]	0,004	1,131	0,258

In the fourth event, in which interest rates were raised by 75 basis points once again, the index followed a positive course in general performance. The index, which had a CAAR value of -0.13% nine days before the announcement, reached positive levels of 0.50% on the day of the announcement. On the fifth and eleventh days following the announcement, the index has a CAAR value of 1.01% and 1.22%, respectively, and a CAAR value of 0.40% on the twentieth day after the announcement. Although these values seem to be a positive return, it was found that there was no statistically significant difference. In other words, the null hypothesis is supported and H1 is rejected, which argues that the Fed's interest rate decision does not have positive returns in a short- time on the index, is supported for the fourth announcement.

4.1.5 Event 5 – 21 September 2022

In August, there was no Fed meeting. Throughout this process, the Fed kept a careful eye on market and economic indicators. As a result of less inflation than anticipated in August, it fell from its peak to 8.5%. Although the markets thought the reduction in inflation was beginning favorably, it was still too early to declare that the Fed had begun its usual downward course. The average price of brent oil, which was around $90 between August and September, continued to have an inflationary impact on the energy sector. Additionally, the ongoing state of the war did not aid the procedure. However, while China's retreat from its zero-covid policy helped to address the supply chain issues, commodity prices also began to rebound to levels seen before the outbreak. All of these results raised hopes that the market would slow the Fed's tightening tactics. In the periods that followed, the previously anticipated 75 basis point rise was changed to a 50 basis point increase. The policy rate was raised by 75 basis points to 3.25% as of July 21, 2022, as a result of the FOMC event. The FOMC reported that there had been a moderate increase in spending and production and that recent economic data were positive. At the same time, the unemployment data came positive—the second-most significant indication that the Fed monitors—was a significant contributor to the Fed's decision to raise interest rates. Finally, the stock markets suffered as a result of the Fed chairman's emphasis on the 2% inflation objective during the meeting and his remarks that funding levels could be raised above 4%, or even more if required.

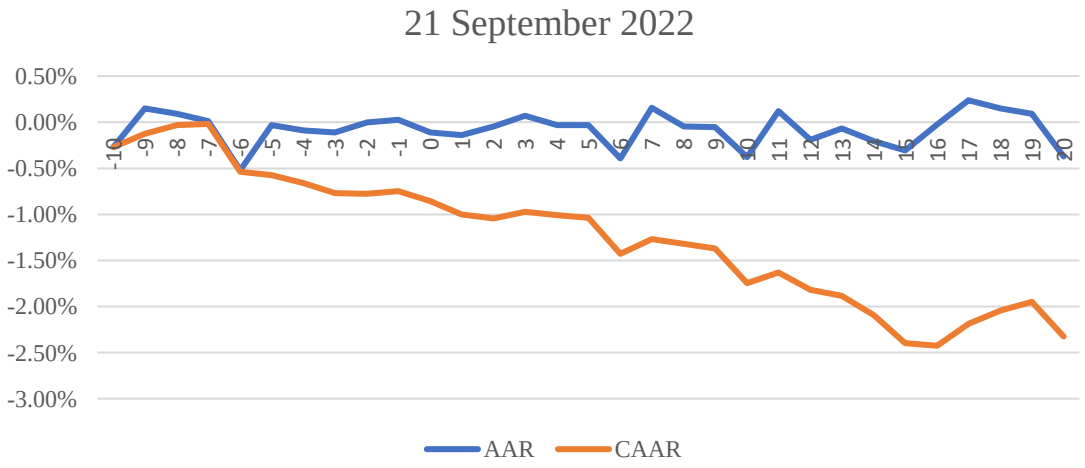

Figure 4.5 DAX Index Response $AAR_{i,N}$ and $CAR_{i,N}$, for FOMC Event 5- single market model

The DAX index showed a similar reaction to the Fed's first rate hike decision of the year. Before the meeting, ARR and CAAR showed parallel movements. Event window [-5, 5] Although the AAR did not show much volatility, according to the statistical analysis, CAAR started to show a negative reaction 6 days before the event. Moreover, this situation did not show recovery afterward and the general view of the DAX index provided a negative cumulative average abnormal return up to -2.5% in the days after the announcement. It can be said that the reason that triggered such a poor performance of the index is that the Fed chairman did not give any signal despite the markets' expectations for monetary relaxation by 2023.

Table 4.5 Statistical Results of FOMC Event 5

FED EVENT 5			
Event window	CAAR	t- test	p-value
[-1, 1]	-0,026	0,124	0,450
[-5, 5]	-0,095	0,507	0,306
[-10, 20]	-0,023	-0,859	0,195

With the fifth announcement, once again, the aggressive interest rate increase was more than the expectations of the markets, and the verbal guidance that the tightening would continue in the future had a very negative effect on the DAX index. The index, which had a CAAR value of -0.02% seven days before the announcement, reached the level of -0.86% by the day of the announcement. The index, which displays an even more negative outlook in the coming days, has CAAR returns of respectively, -1.43% and -2.43% in the sixth and sixteenth days after the announcement. The statistical results obtained were able to explain the interest-stock market inverse relationship in the literature and it was concluded that there was no statistically significant difference for all three event window intervals. As a result, the null hypothesis, which defends the argument that the aggressive interest rate hike by the Fed has a negative effect on the index, was supported, while the alternative hypothesis H1 was rejected.

4.1.6 Event 6 – 2 November 2022

On November 2, the FOMC held yet another meeting during the final quarter of 2020. The fourth-rate increase, which the markets have dubbed "jumbo," was announced at this meeting. The inflation rate, which in September was a little higher than anticipated, held

steady at 8.2% as of October. Despite being at a very high level, this is a strong indication that inflation has stopped rising and has even begun to drop. The Fed, which has been raising interest rates since the beginning of the year to tighten its monetary policy, noted that the prognosis for inflation may be deceiving and that there is no clear downward path at this time, so the tightening process should continue. The consequences of inflation have lessened somewhat over the same period as a result of the pandemic's increased economic activity and the war's detrimental impact on oil prices. However, the market's projections for a recession rose as a result of the market's emphasis on the need to sacrifice some economic growth in order to lower inflation and the rise in borrowing prices. In the FOMC event, the 75 basis point hike in the funding rate resulted in an increase in interest rates to 4%. For the United States, this was the highest level since January 2008 (Cox, 2022b).

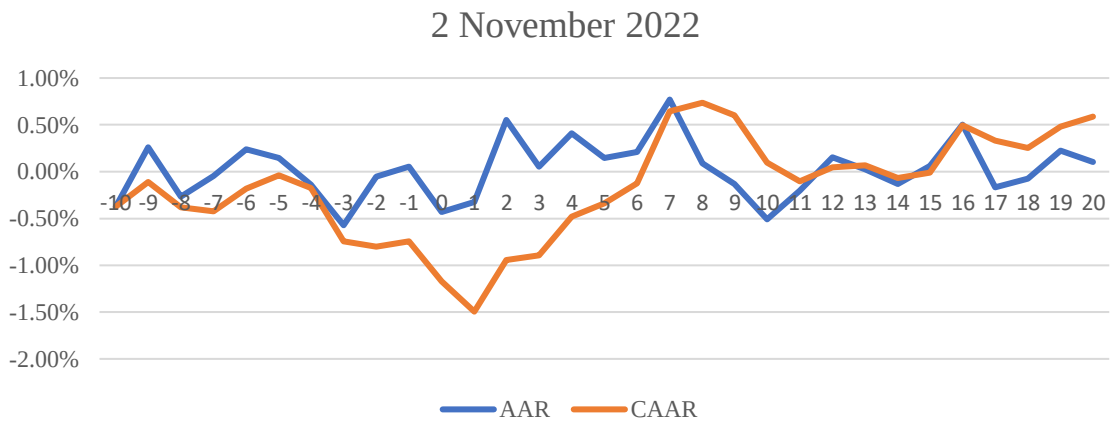

Figure 4.6 DAX Index Response $AAR_{i,N}$ and $CAR_{i,N}$, for FOMC Event 6- single market model

Stock prices were negatively impacted by the Fed's remark during the meeting that future choices regarding tightening monetary policy will continue to be made in accordance with inflation and economic activity. The CAAR showed a negative reaction 1-2 days before the annunciation, on the day of the meeting, and in following days. It decreased to negative 1.5%. The counteraction of the DAX index to the interest rate decision between the event study and the determined period, while the average abnormal return and cumulative average abnormal return move together in the date of between [-10, -3]. When both the average abnormal return (AAR) and the average abnormal performance (CAAR) become positive over the same time frame, it showed a movement again with the transition of both AAR and CAAR to the positive side.

Table 4.6 Statistical Results of FOMC Event 6

FED EVENT 6			
Event window	CAAR	t- test	p-value
[-1, 1]	-0,034	0,109	0,456
[-5, 5]	-0,078	1,609	0,054
[-10, 20]	0,006	3,496	0,000255*

* Significant at the 5% level

Another important monetary policy meeting, which took place as the sixth event in the research conducted in the third quarter of the year, caused a fluctuating movement on the index. Having a value of -0.04% CAAR on the fifth day before the announcement, the index accelerated its losses on the day of the announcement and regressed to -1.17% CAAR values. The index, which recovered from the second day after the announcement, rose to 0.74% on the positive side, especially on the eighth day after the announcement, and continued its performance on the positive side until the twentieth day after the announcement. When the statistical results were evaluated, the p- values were 0.45 and 0.054, respectively, between the [-1,1] and [-5, 5] event windows, and no statistically significant difference was found. The recovery of the index in the [-5, 5] range is particularly striking in terms of the 0.054 p- value obtained. Because the index, which recovered after the announcement, is more prone to support the alternative hypothesis, contrary to the negative effect advocated by the null hypothesis. However, the fact that the obtained value is larger than the significant value ($p< 0.05$), albeit with a small difference, resulted in the H1 hypothesis is rejected. In the last event window [-10, 20], the index's overall performance was on the positive side compared to the range before the announcement and showed CAAR values of 0.58% on the twentieth day after the event. Statistically, the last event window has a rather small p- value of 0.000255. As a result, null hypothesis, which argues that the interest rate hike decision has a negative effect on the index, is not supported. The alternative hypothesis (H1) is supported by finding a statistically significant difference.

4.1.7 Event 7 – 14 December 2022

The final meeting of 2022 took place on December 14. While the early forecasts for the November inflation statistics were 7.7% and 8% after the revision, 7.8% was reported on November 11. The most significant sign that the Fed's tightening monetary policy, which it has been implementing since the start of the year, is beginning to take effect is that December inflation, which was released the day before the meeting in December and came

in below expectations to conclude the year at a rate of 7.3%. The Fed chairman raised the policy rate by 50 basis points to 4.5% in accordance with forecasts, while emphasizing that even while it can be argued that the downward trend in inflation has started, the struggle persists. In the previous 15 years, this rate has been the highest financing rate. The Fed's announcement to the market that no rate decreases should be anticipated until 2024 is the key distinction between this meeting and past sessions. To avoid the sticky nature of inflation in the services sector and to prevent the ideas about high price expectations from becoming entrenched, even though there were decreases in inflation, the FOMC decided to maintain a slightly less aggressive but still tightening policy compared to the previous meetings. The Fed corrected the growth figures to the point of an almost recession at the same time and updated them in its policy documents. Additionally, even though consumption data showed a dip, the Fed stated that these results are encouraging, and that inflation will continue to decline, but that additional proofs are required to declare a clear decline. The Fed chairman noted that there are still efforts to be made and that they are still far from the desired inflation rate of 2%.

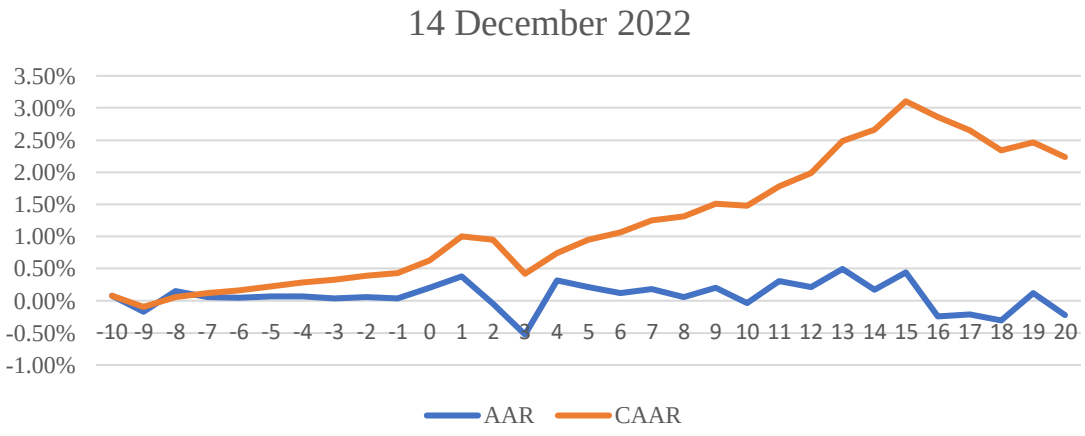

Figure 4.7 DAX Index Response $AAR_{i,N}$ and $CAR_{i,N}$, for all stocks following FOMC Event 7- single market model

After the interest rate decision, stocks initially showed a negative reaction due to the markets' expectations that interest rates will remain high for a longer time than expected. When the reaction of the DAX index to the last interest increase of the year is analyzed, surprising results were observed. First of all, although the optimism that the market will decide on the Fed's interest rate before the announcement did not make much difference on the abnormal return, the index slowly started to show a positive reaction in terms of CAAR.

Despite the expectation-driven aspect of the interest rate increase with the announcement was initially priced negatively by the index, the day was closed on the positive side since the calculation was made on the based on day closures in the analysis. When days within the event window are taken into account, the cumulative average anomalous return (CAAR) of the index showed a very positive reaction, showing a market reaction in the 3% positive area, showing a very positive reaction in the days after the announcement, although the average abnormal return (AAR) did not show much variation. The results are quite thought provoking. Because, according to the literature, it should be expected that the stock market will show a downward trend in the general view when interest increases are experienced. But the results show the opposite of this situation. Moreover, the DAX index showed a positive reaction even though funding costs have reached their peak in the last 15 years and that the aggressive and tightening policies will continue, albeit not as before. Of course, it would not be right to attribute the counteraction of the index only to the FOMC annunciation, so in the next sections of this study, the efficacy of the ECB's monetary policy decisions on the index will be discussed and the results will be interpreted.

Table 4.7 Statistical Results of FOMC Event 7

FED EVENT 7			
Event window	CAAR	t- test	p-value
[-1, 1]	0,021	0,917	0,179
[-5, 5]	0,064	2,000	0,023*
[-10, 20]	0,022	1,381	0,168

* Significant at the 5% level

The Fed monetary policy decision, which is the last and seventh announcement of the year, the index provided CAAR returns on the positive side. The index, which had a CAAR value of 0.08% ten days before the announcement, continued to rise with small steps until the day of the announcement. Having a positive CAAR return of 0.63% on the day of the announcement, the index reached 0.95%, 1.48% and 3.10% CAAR values respectively, in the fifth, tenth, and fifteenth days following the announcement, respectively. When the last announcement was evaluated, it was found that only the [-5, 5] interval had a statistically significant difference with a p- value of 0.023 in among all three event windows. This supports the H1 alternative hypothesis. It can be said that there is no statistically significant difference between the other two [-1, 1] and [-10, 20] event window intervals, but the

positive divergence seen in the index develops due to another reason. These reasons will be clarified in the conclusion section.

4.2 DAX INDEX WITH ALL STOCK'S RESPONSES TO ACCORDING TO AFTER EACH ECB ANNOUNCEMENT

The European Central Bank began raising interest rates much later than the Federal Reserve. Many economists argued at the time that the ECB was too late to raise interest rates and that inflationary conditions were getting worse and worse. But the ECB's hand is not as strong as the Fed and does not have the same dynamics to hike rates. The reason for this is primarily due to the fact that the ECB has determined a common monetary policy for 19 union countries using the euro as of 2022. Although the economic dynamics of the countries in the Union differed from each other, inflation data also increased with the effect of different items. However, it should be said that energy, which is one of the inflationary items, affects all countries in the eurozone. At the same time, the fact that European countries are almost completely foreign-dependent in energy is another important factor that distinguishes it from America. For this reason, unfortunately, it is not as easy as the Fed for the ECB to increase interest rates. In this part of the analysis, the effects of the monetary policy meetings organized by the ECB on the German DAX index, which is considered the economic leader of Europe, are examined. The results were evaluated separately for each meeting and compared with the Fed's rate hike decisions when necessary.

4.2.1 Event 1 – 21 July 2022

When the dates showed July 21, 2022, the ECB was about to make a substantial adjustment to its monetary policy. After the incentive packages applied to the market in the European region during the pandemic, the supply chain has seen record inflation rates in its history due to various inflationary effects such as war conditions in the continent, and high fluctuations in energy prices. While the increase in inflation is published separately for each country in the eurozone, the average inflation data of the eurozone is also published. In this direction, record levels of inflation were observed at different rates in the countries within the union, while the eurozone reached historical peaks as the average inflation rate. The fact that the annual inflation announced by Eurostat was 8.6% in June 2022 and 8.9% in July

has become an inevitable reality for the central bank to tighten. In line with the meeting held on July 21, the ECB increased the policy rate by 50 basis points, bringing the negative interest rates to 0% after 11 years. The shaping of expectations as 25 basis points surprised the market as a result of the decision. On the same day, the President of the Central Bank made a statement that it would be more appropriate to take a firm and big step against inflation, unlike the interest rate hike, which was signaled earlier. Another important reason for the central bank to take such a decision is the significant a deviation from the desired inflation rate of 2% and the point reached. In addition, the low growth rate and high inflation in Europe showed that the interest rate decision was a big step, and the priority of the central bank was to ensure price stability.

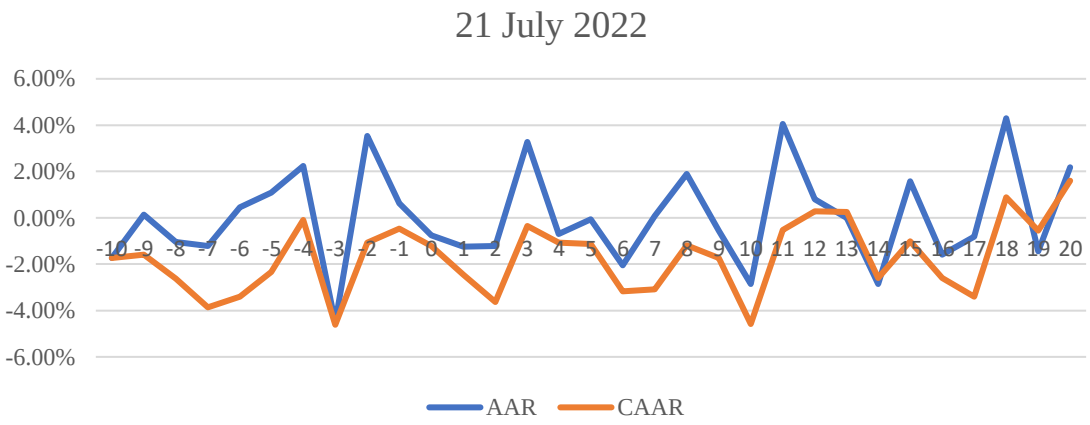

Figure 4.8 DAX Index Response $AAR_{i,N}$ and $CAR_{i,N}$, for ECB Event 1- single market model

The announcement by the ECB that the first interest rate hike of the year took place, the index displayed a wide range of pricing behavior. While it had a CAAR value of -1.74% ten days before the announcement, it performed quite poorly, falling to -4.61% three days before the announcement. The index, which yielded -1.21% CAAR on the day of the announcement, showed some recovery in the following days. Especially on the eleventh, thirteenth, eighteenth and twentieth days after the announcement, the CAAR values of (-0.53%, 0.26%, 0.89% and 1.60%), respectively, are a strong indicator that the index is recovering. Three different event windows were evaluated for statistical analysis. Accordingly, the p- value of 0.99 in the [-1, 1] range can explain the negative performance of the index in the announcement interval. Likewise, the p- value of 0.65 in the event window interval [-5, 5] rejects the H2 hypothesis and the null hypothesis of the second

analysis is supported, which argues that there is no significant difference in the DAX index in an environment where both central banks raise interest rates. In the wider event window range [-10, 20], although the index starts to recover on the positive side, it continues to reject the H2 hypothesis, which is not statistically significant. However, the p- value showing 0.055 in the [-10, 20] range indicates that there is a very small difference between the point where a significant difference is accepted ($p < 0.05$). Another significance of this announcement date is that there was an announcement event by the Fed on July 27 in the same week. In this study, the activity outputs under the name of the fourth announcement by the Fed show that the interest rate decision had a negative effect on the index.

Table 4.8 Statistical Results of ECB Event 1

ECB EVENT 1			
Event window	CAAR	t- test	p-value
[-1, 1]	-0,041	-0.004	0 ,996
[-5, 5]	-0,184	-0,448	0,653
[-10, 20]	0,016	-1,916	0,055

4.2.2 Event 2 – 8 September 2022

The ECB meeting, which was the second meeting of the year, was held on September 8, 2022. With the continuation of inflationary effects, the energy problem caused by war conditions had a direct negative impact on the European region. The European Union, which has prepared itself for the worst in the energy field, was already experiencing low growth concerns along with high inflation in line with any interruption that may occur. Nevertheless, the ECB, which is dependable for the monetary policy for 19 countries in the eurozone, preferred to increase interest rates for the second time in the year in order to achieve price stability and 2% inflation targets. It increased the policy rate from 0% to 0.75% with an aggressive increase of 75 basis points. In addition, during the meeting, ECB signaled that the interest rates would increase even more in future meetings and stated that inflation was too high, and they had to live with higher inflation for a while. At the same time, while the August inflation rate was at a record level of 9.1% for the eurozone region, it was 7.5% for Germany. In the European region, where growth rates were 0.8%, borrowing costs increased with the increase in interest rates for companies. On top of that, the energy

problems have strengthened the thoughts of economists that the recession expectations for the European region will most likely come true.

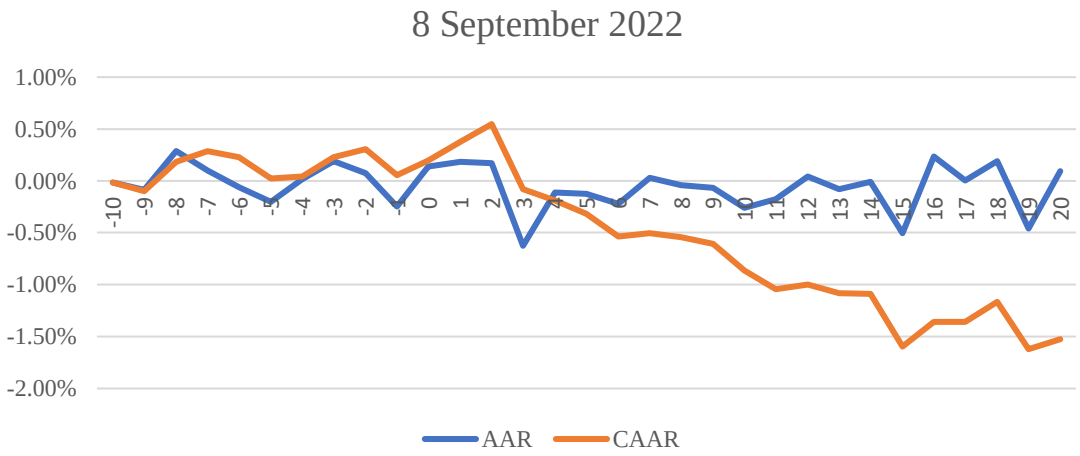

Figure 4.9 DAX Index Response $AAR_{i,N}$ and $CAR_{i,N}$, for ECB Event 2- single market model

In line with the second monetary policy organized by the ECB, the index had a CAAR value of -0.01% ten days before the announcement and increased to 0.20% with the day of the announcement. However, the index, which started to exhibit the negative performance from the third day following the announcement, decreased to -0.08%, -1.04% and -1.52% CAAR values on the third, eleventh and twentieth days, respectively. Statistically, the p- value of 0.233 in the [-1, 1] event window rejects the H2 hypothesis that there was no significant difference on the index in the period when both central banks increased interest rates. On the other hand, the acceleration of CAAR returns on the negative side in the [-5, 5] to [-10, 20] event window ranges indicates that the index reacts to the announcements after the event. The p- values of 0.023 and 0.016 for both event windows, respectively, support the H2 alternative hypothesis while rejecting the null hypothesis. Besides, t- test result revealed that it was observed the mean value difference between the sample and the population was significantly different between [-5, 5] and [-10, 20]. Accordingly, it can be concluded in the second and third event window on the basis of this announcement that the coordinated interest rate hikes by the central banks created a significant difference in the DAX index.

Table 4.9 Statistical Results of ECB Event 2

ECB EVENT 2			
Event window	CAAR	t- test	p-value
[-1, 1]	0,006	1,1928	0,233
[-5, 5]	0,012	2.274	0,023*
[-10, 20]	-0,015	2,412	0,016*

* Significant at the 5% level

4.2.3 Event 3 – 27 October 2022

As of September, 9.9% of inflation rates in the eurozone region and 7.9% of Germany's inflation are of great historical importance. Along with the continuation of energy-based inflation pressures, the existence of inflation in other items has created a great threat to the European region. The sticky nature of inflation, especially in items such as services, is a feature that needs to be taken action by central banks. The ECB, which started to increase interest rates quite behind compared to the Fed, increased the policy rate to 1.5% on 27 November 2022 by making front-loading interest rate increases. This marked a 75 basis point increase for the second time.

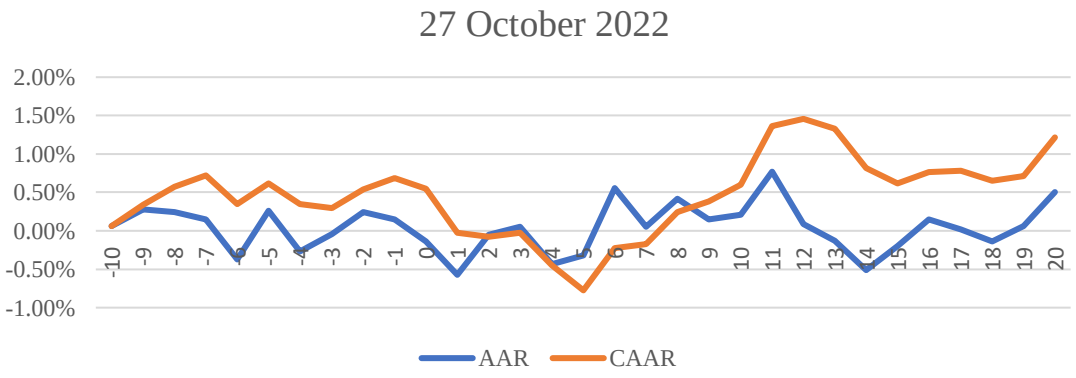

Figure 4.10 DAX Index Response $AAR_{i,N}$ and $CAR_{i,N}$, for ECB Event 3- single market model

At the same time, the ECB, which stated that it significantly reduced its support to European banks, gave a message to the market that interest rate hikes would and should continue. In the same meeting, the ECB chairman stated that it is still early to reduce the balance sheets and emphasized that they maintain their 2% inflation target. Big interest rate hikes three times in the last 6-month period supported the expectations that the expected stagnation would manifest itself much earlier. After the ECB chairman said that the possibilities of

recession had increased, a statement was made that the necessary steps would still be taken to ensure price stability.

In the meeting held by the ECB in October, the index had a CAAR return of 0.06% ten days before the announcement, while this rate was 0.55% on the day of the announcement. On the seventh, twelfth and twentieth days after the announcement, CAAR returns of respectively -0.17%, 1.46% and 1.21% were obtained. When the predetermined event windows were examined respectively [-1, 1], the p- value was 0.097. According to the result, H2 hypothesis is rejected. As a result, there was no significant difference in the index during the period when both central banks increased interest rates within this range. However, in the range of [-5, 5], the index showed a positive to negative trend. In the [-10, 20] event window range that covers the whole process, the index provided positive CAAR returns on a relatively better side compared to the beginning. The fact that the p-values for both event windows were smaller than the value at which a significant difference was accepted ($p < 0.05$) indicates that the null hypothesis of the second analysis is rejected and the alternative H2 hypothesis is supported. Accordingly, the interest rate hikes of both central banks between the [-5, 5] and [-10, 20] event windows created a significant difference on the DAX index.

Table 4.10 Statistical Results of ECB Event 3

ECB EVENT 3			
Event window	CAAR	t- test	p-value
[-1, 1]	0,012	1,6581	0,0979
[-5, 5]	0,017	3,033	0,0025*
[-10, 20]	0,012	4,543	< .00001*

* Significant at the 5% level

4.2.4 Event 4 – 15 December 2022

The monetary policy meeting on 15 December 2022, which was the last meeting of the year, resulted in an interest rate hike again. Inflation rates of 10.6% in October and 10.1% in November for the euro area are one of the main factors in taking this decision. Although inflation predictions are not particularly upbeat, concurrently continuation of the energy problem contained important messages that interest rates would continue to increase in future meetings. Unlike the last 2 meetings, the ECB, which increased interest rates by 50

basis points this time, increased the policy rate to 2%. Another important statement made at the meeting is that there will be a gradual reduction in the balance sheet as of 2023. The ECB, which is constantly compared with the Fed during the rate hike process, said that the inflation dynamics are different between the two central banks, so the steps taken are different. In addition, commenting on the fact that a substantially higher rate of inflation than the aim is anticipated in the period until 2025, the ECB chairman explained the decision to raise the interest rate by 50 basis points, not as a return but as one of the solid steps on a long road.

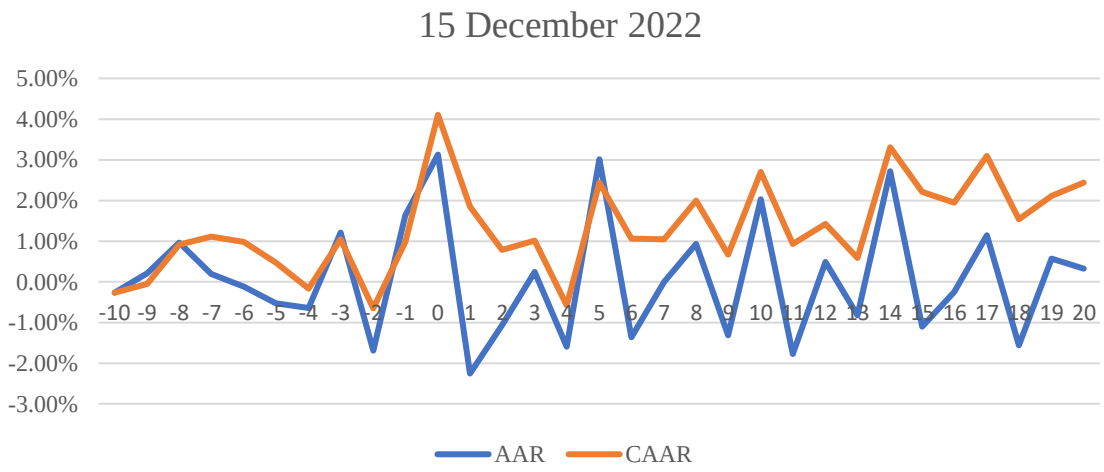

Figure 4.11 DAX Index Response $AAR_{i,N}$ and $CAR_{i,N}$, for ECB Event 4- single market model

In the last and fourth announcement of the year by the ECB, the index generally showed a positive movement. The index, which had a -0.26% CAAR return ten days before the announcement, reached positive 4.11% CAAR values on the day of the announcement. On the fifth, tenth and twentieth days following the announcement, the CAAR values were respectively 2,43%, 0.93% and 2.43%. As a result of the statistical analysis made in this direction, it was found that there was no statistically significant difference in all three event windows.

Table 4.11 Statistical Results of ECB Event 4

ECB EVENT 4			
Event window	CAAR	t- test	p-value
[-1, 1]	0,069	-0.3014	0,763178
[-5, 5]	0,113	1,3569	0,175427
[-10, 20]	0,024	1,6362	0,102377

Besides t- test result determined that the mean differences between the sample and the population were not statistically significant. Rejecting the H2 hypothesis in all three windows, even showing positive fluctuations within a certain range throughout the process, supports that the index does not show a significant difference against both central bank interest rate decisions.

CHAPTER 5 DISCUSSION OF FINDINGS

In this study, on the basis of Germany and America, where economic integration is high with each other, the effects of Germany's DAX index and the monetary tightening decisions of the Fed, which is in the position of the American central bank, on increasing global inflation are examined. For evaluation only when the alternative hypothesis H1 was established to evaluate the impact of FOMC decisions on the DAX index. In order to evaluate that both FOMC and ECB decisions make a statistically significant difference on the DAX index, the H2 alternative hypothesis was established. In total, two main hypotheses were established. While each hypothesis was evaluated within its own analysis, as a result of their rejection, the null hypotheses, which were the opposite of the arguments they defended, were supported. In total, 11 events were examined. The analysis was calculated according to the single market model method. Each event has been evaluated by applying it to the stocks that make up the index. As a result of the analysis, AAR and CAAR values were found for each activity. Cumulative average abnormal returns were calculated by the cross-sectional method and the results were evaluated statistically. The data obtained in the research differs according to the announcements made. In particular, when three different event window intervals for each announcement were examined, it was seen that previously established different hypotheses were supported.

According to results, before the Fed's announcement on March 16, 2022, the DAX index continued to be negatively affected by the current geographically unfavorable military conditions, while the ECB's interest rate increase signals throughout the year, monthly inflation data that came at the threshold of expectations and manufacturing production data that were less than expectations, the index recovered. It was one of the biggest obstacles. With the Fed's announcement dated March 16, messages were given about the downward revision of US growth expectations, the upward revision of inflation forecasts, and the possibility of holding more meetings than planned during the year, if necessary. The Fed, which increased interest rates at a rate that would not force the markets in terms of economic activities, resulted in a positive rise in indices at the time of the announcement of this decision. The main reason for this is that the unemployment data is good, and the Fed will not take immediate action to narrow the balance sheet, and it has not been seen as hawkish as expected in terms of the markets. In addition to the contribution of this situation to the DAX index, the fact that the producer price change in Germany in line with the expectations

made the inflation expectations somewhat optimistic, caused positive attacks in the index, but it was not enough to exceed the threshold levels. While the downward behavior of Germany's growth forecasts for 2022 caused negative pressure on the index, at the same time, the rise in German government bonds posed a risk to the index, which was another obstacle to the positive pricing of the index. In April, the revision of inflation in the ECB's European growth expectations downwards and the upward revision of inflation became a negative factor on the performance of the DAX index. In particular, the sharply lowering of growth expectations by the German Economics Institute has been one of the biggest obstacles to the index's recovery. In an environment where the rise in German government bonds also increased the uneasiness during this whole process, the index gained momentum in displaying a negative performance with the Fed decision. At the same time, the decision to terminate the Asset purchasing program (APP) carried out by the ECB during this period caused a negative reaction in the index. In addition, the thoughts that the quarantine conditions in China will cause problems in the supply chain of the Germans in the coming periods have been remarkable. Even if positive results were seen in an important item such as the service sector, the profit sales coming from the level where the index tried to recover itself caused the current decline to increase even more. Despite the positive non-farm employment data from the US at the time of the third announcement, market expectations for the continuation of the tightening process led to the negative pricing of indices. In the same period, the fact that data such as orders, construction PMI and industrial production in Germany were realized below expectations prevented the positive pricing of the DAX index. However, the announcement that the most important factor in the positive returns in this announcement was the removal of some trade restrictions imposed by the USA against China, which had an increasing effect on the DAX index, especially on the American stock markets. However, this situation remained limited due to the expectations that the ECB will start to increase interest rates in July 2022. In addition, the market has already priced in a 75 basis point rate hike for the ECB until September.

As a result of the increased interest rate expectations in the last week in June, the market was expected to increase the Fed's front loading and high rates in July. Even the statements of some local presidents that even 100 basis points are under evaluation were expected by the market. Despite the expectations that the interest rate increase will continue for a certain period of time, the unemployment data in the USA continued to be positive, which was interpreted positively by the market. The ECB, which had signaled an increase of 50 basis

points before, increased the interest rate in the same week, which did not cause significant volatility on the index. As a result of another event organized by the Fed on September 21, 2022, the index showed a negative reaction. One of the main reasons for this is that the August inflation data were higher than expected in the US, which significantly reduced the risk appetite in the markets. The possibility of higher-than-expected interest rate hikes before the announcement caused the indices to show their worst performance. Especially the DAX index gave a very negative response to this pricing behavior. Another important factor in the performance of the DAX index in this way is that the Economic Confidence Index showed a weaker outlook for the Eurozone and Germany than expected, which strengthened the perceptions that future economic activity will deteriorate. At the same time, the thoughts that the energy problem triggered by the war would have a separate negative effect in Germany caused the declines in the index to accelerate. As of the announcement, even though the interest rate increase was realized within the framework of expectations, its negative performance continued due to both poor economic indicators and geopolitical problems.

In November, indices experienced sales as a result of the corrections of the excessive increase experienced in general. Before the announcement, the expectations that the Fed might be aggressive in tightening in the same way against the possibility of high inflation expectations had a negative effect on the index. However, the fact that the inflation data were much better than expected in the following days was welcomed by the markets. If we pay attention to the graph in Figure 4.6, the index diverged positively in the days following the announcement. The most important reason for this was the Fed chairman's statement that interest rate increases could be realized at smaller rates during the tightening process. In addition, the strengthening of recession concerns in Europe had an impact on the expectations that the ECB, like the Fed, could raise interest rates at lower rates. On the tenth day after the announcement, the index showed some negative pricing behavior. The reason for this is that the Chinese central bank's statements that inflation could rise due to domestic demands created some volatility in the market and forced them to follow the process closely. Nevertheless, the expected bad results were not realized in the [-10, 20] event window range and the index was able to provide positive returns in line with the Fed's expectations that the tightening will continue with lower interest rates. As a result of the last monetary policy meetings of the year held by both central banks with one-day intervals, interest rates continued to increase in both institutions. The DAX index, which reacted more to the Fed's

interest rate decision, showed a very optimistic pricing behavior to the decisions of both central banks. The main reason for this is that although the Fed chairman stated that the tightening process will continue until the targeted inflation values are seen, the data shows a decrease in inflation as of November. The market stems from the increasing expectations that the Fed will complete the interest rate hike process, especially in the second half of 2023, and may even go for some easing. Especially in the [-5, 5] event window interval, the index's support for the H1 alternative hypothesis pre-priced the expectations that the tightening process of the market will be completed in the next year despite the increasing interest rates. At the same time, it can be said that the realization of interest rate increases at lower rates also causes positive pricing behavior in terms of balancing the indices.

The H2 hypothesis was evaluated as a result of the announcement analysis of the interest rate hikes by the ECB. This hypothesis was analyzed statistically, respectively, of the interest rate hike by both central banks, the null hypothesis of the second analysis which did not show a significant difference on the DAX index, and the alternative hypothesis H2, which stated that there was a significant difference. In this direction, while the null hypothesis of the second analysis was supported in the first and last announcements that the ECB increased the interest rate, it was concluded that the interest rate decision did not make a significant difference on the index. However, after the second announcement, the high-interest rate hikes, along with the concerns about the economic outlook of Germany and Europe, caused the index to be priced from positive to negative and resulted in the support of the H2 hypothesis. Likewise, the third announcement, November 2022. Despite the expectations that the Fed will continue to act aggressively, the inflation indicators were good, and the rumors that interest rates could be increased with lower rates in the future showed a statistically significant difference in the event window interval [-10, 20] as the index started to show a positive divergence after the announcement. In general, the index overlapped with the information in the literature and showed a negative reaction to interest rate increases in general. However, the fact that the current global high inflation will continue in the future has continued with the statements and decisions of the Fed and the ECB that monetary tightening will continue. However, in the third announcement of the first analysis by the Fed [-10, 20], the alternative hypothesis H1 supported in the event window interval and the statistically significant difference are explained by the positive effect of the USA's discourses on easing trade restrictions in China, along with the global indices, as well as the DAX index. However, the positive CAAR return, which occurred in

the range of [-10, 20] in the sixth announcement made by the Fed, has now developed due to the pricing of interest rate hikes at smaller rates. In the seventh event [-5, 5], which is the last announcement of the year, the expectations that the DAX index will provide positive CAAR returns in the event window and that the alternative hypothesis H1 is supported, that the monetary tightening will be completed with the year 2023, and that decisions can be taken even towards some easing, have been effective. On the other hand, in the second and third announcements organized by the ECB, the support of the alternative H2 hypothesis in the [-5, 5] and [-10, 20] event windows and the statistically significant difference, the US-led inflation data showing a downward trend were effective. In addition, it reasons from market expectations that the Fed would raise interest rates at lower rates and then end the tightening process.

CHAPTER 6 CONCLUSION

In this study, the effects of two major central banks on the DAX index were evaluated against rising inflation on a global scale, which is unprecedented in history. An analysis was made on how the abnormal returns are shaped on the DAX index, which lists the stocks of companies that have an impact on such as industry, production, and technology fields in the world, of both central banks. Especially the Fed has shown aggressive movements. As a result of the research, a total of 11 different monetary policy meetings were analyzed with the event study method and the Single Market model. In total, two alternative hypotheses were established. The H1 hypothesis evaluates the effect of only FOMC decisions on the DAX index. On the other hand, H2 alternative hypothesis is evaluated second analysis to examine both the FED and ECB interest rate decisions' effect on the DAX index. While the H1 hypothesis measure the argument that the Fed's rate hike has a positive effect on the index, the other H2 alternative hypothesis of second analysis measure the assessment of whether there is a significant change in the index during the period when both central banks increase interest rates. The majority of the results obtained according to the analysis outputs were found to coincide with the interest-stock inverse relationship in the literature. The alternative H1 hypothesis was rejected in most of the analyzes for the Fed. However, the positive effect created by the Fed was realized in the third and sixth announcements [-10, 20] event interval and the seventh announcement [-5, 5] event interval. On the ECB side, a statistically significant difference was found only in the event interval [-5, 5] and [-10, 20] on the second and third announcement dates, and the H2 hypothesis was supported. Although the index continues to rise within the specified periods, the general conclusion that the CAAR returns are on the positive side, contrary to the literature, could not be reached. In addition, it was concluded that the positive CAAR returns that occurred at certain event intervals were not caused by interest rate hikes. The main reason for this is the belief that the ECB will not be able to raise interest rates as much as it wants in the European region, where there are recession expectations. It has been deduced that it is due to the Fed's statements that the tightening will continue by increasing the interest rate at lower rates with the decline in inflation in the United States, and the market perception that the Fed will complete the tightening process by 2023, and even it will begin to cut interest rates anticipation affected.

CHAPTER 7 CONTRIBUTION AND LIMITATIONS

After the pandemic, increased commodity prices, supply chain delays, chip crises, and energy prices skyrocketed. Although many important factors trigger inflation in the selected period, it is not possible to control every factor by central banks. Policy rate decisions determined by central banks trying to maintain the balance between supply and demand do not affect external factors that will trigger inflation, such as the increase in energy prices or the chip crisis (Bonatti, Fracasso & Tamborini, 2021). Due to this, the relationship between these issues and the Fed and ECB policy rate was examined in this study, which will directly affect the financial borrowings of companies rather than their effects on stocks, examined. In addition, when the limits of the research are evaluated, energy, war situation, negative news about the supply chain and political developments, which have a very negative effect on the pricing of the index, were not included in the analysis as a variable factor in this study. Results were evaluated only as statistically significant according to the realized interest rate decisions.

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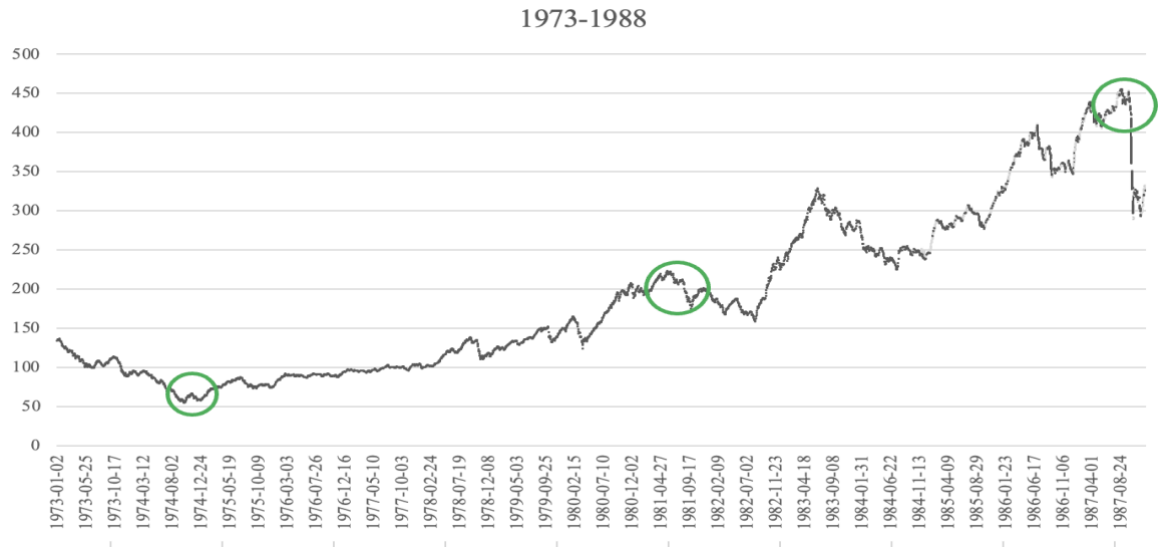
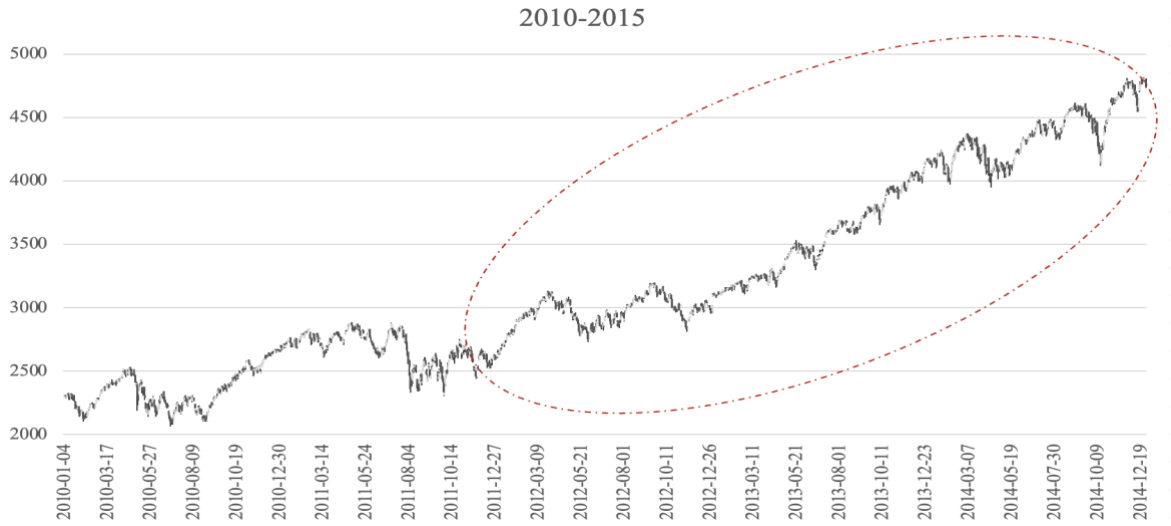
APPENDICES

App. 1A HISTORICAL INDICATORS OF THE WORLD'S LARGEST STOCK EXCHANGES



Appendix 1.1 Nasdaq Index response according to Fed interest rate hikes and cuts between 1973- 1988 (green circle is interest hike times)

Appendix 1.2 Nasdaq Index response according to Fed interest rate hikes and cuts between 2000- 2009 (purple circles represents by crises times)

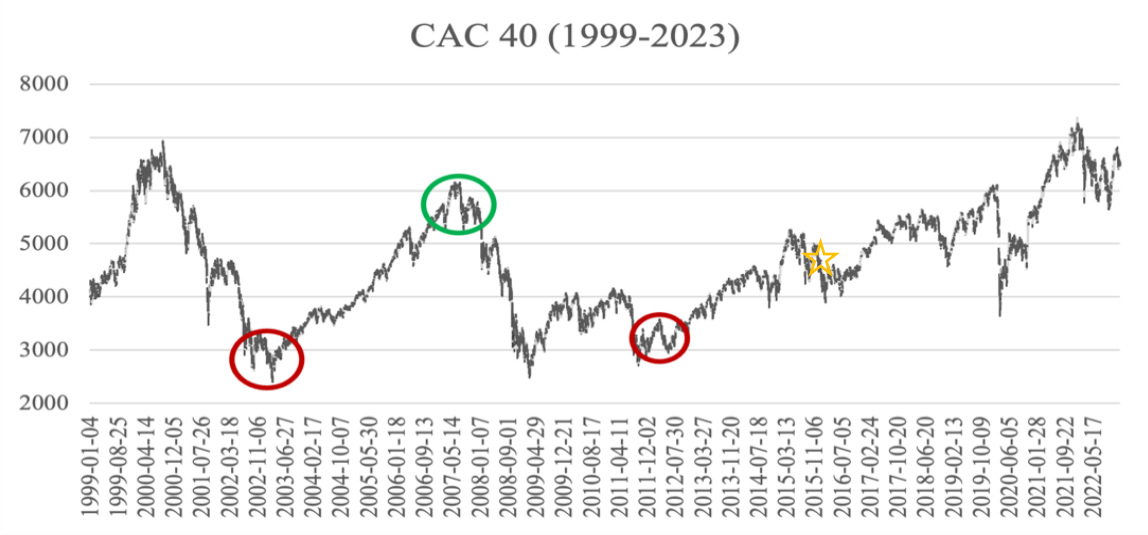


Appendix 1.3 Nasdaq Index response according to Fed interest rate hikes and cuts between 2010- 2015 (selected section represent low interest rate and financial stability times in U.S)

Appendix 1.4 Nasdaq Index response according to Fed interest rate hikes and cuts between 2019- 2023 (yellow shows pandemic times when Fed acted expansionary monetary policy and greens represent starting with monetary tightening)

Source: (*Yahoo Is Part of the Yahoo Family of Brands*, 2023)

Appendix 1.5 DAX Index response according to ECB interest rate hikes and cuts between 1999- 2023 (green circle is interest hikes and red circle is interest cuts, yellow star represents pandemic conditions began), Source: *DAX Historical Rates (GDAXI) - Investing.com*, 2023



Appendix 1.6 CAC 40 Index (France) response according to ECB interest rate hikes and cuts between 1999-2023 (green circle is interest hikes and red circle is interest cuts, yellow star represents pandemic conditions began), Source: Investing.com; *CAC 40 Historical Rates (FCHI) - Investing.com*, 2023.

Appendix 1.7 IBEX 35 Index (Spain) response according to ECB interest rate hikes and cuts between 1999-2023 (green circle is interest hikes and red circle is interest cuts, yellow star represents pandemic conditions began), Source: *IBEX 35 Historical Rates (IBEX) - Investing.com*, 2023.

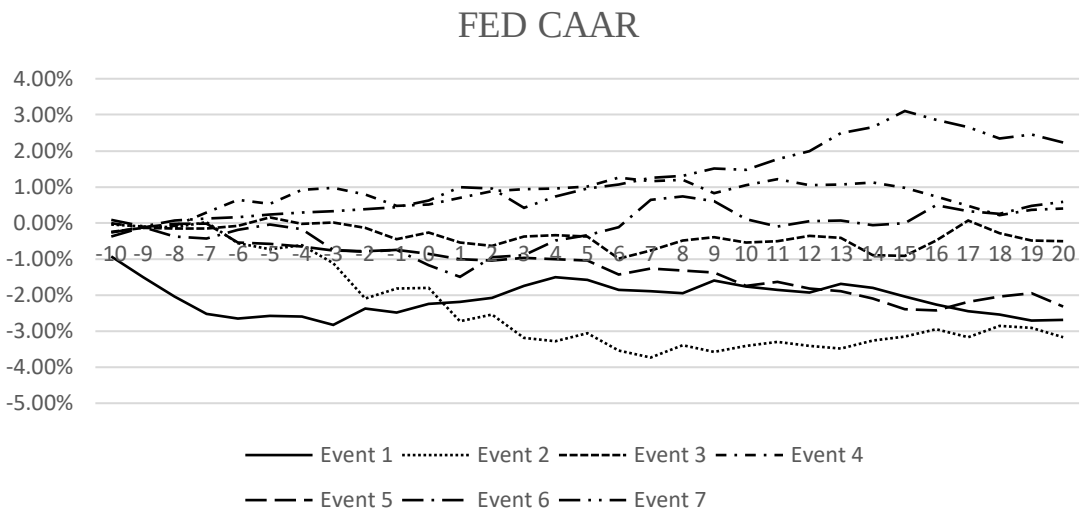
Appendix 1.8 AEX Index (Amsterdam) response according to ECB interest rate hikes and cuts between 1999-2023 (green circle is interest hikes and red circle is interest cuts, yellow star represents pandemic conditions began), Source: *AEX Historical Rates (AEX) - Investing.com*, 2023.

App. 1b FED AND ECB MONETARY POLICY ANNOUNCEMENT DATES

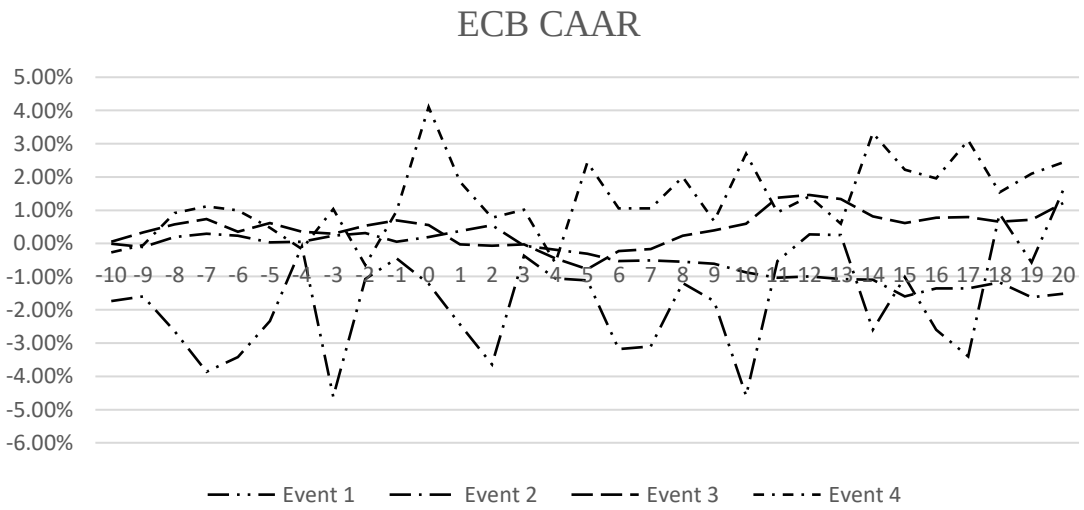
Announcements		
Date	Institution	Decision (base point)
16 March 2022	FED	25
04 May 2022	FED	50
15 June 2022	FED	75
21 July 2022	ECB	50
27 July 2022	FED	75
08 September 2022	ECB	75
21 September 2022	FED	75
27 October 2022	ECB	75
02 November 2022	FED	75
14 December 2022	FED	50
15 December 2022	ECB	50

Appendix 1.9 Announcements date and monetary policy decision taken by central banks, Source: Meeting Calendars and Information, 2023; European Central Bank, 2023

App. 1c DAX INDEX CAAR RETURNS ACCORDING TO FED AND ECB AROUND THE PERIODS OF EVENTS



Appendix 1.10 DAX Index changes of cumulative average abnormal return for all Fed events



Appendix 1.11 DAX Index changes of cumulative average abnormal return for all ECB events

App. 1d ANALYSIS OUTPUTS

Standard Deviation (Std.)						
FED						
Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Event 7
0,00996	0,00891	0,01249	0,01348	0,01346	0,01445	0,01456

Appendix 1.12 Standard Deviation of estimation period CAAR for each FOMC events

Standard Deviation (Std.)			
ECB			
Event 1	Event 2	Event 3	Event 4
0,01308	0,01345	0,01560	0,01765

Appendix 1.13 Standard Deviation of CAAR for each ECB events

Abnormal Return (AR)	FOMC Event 1																													
	Event Window																													
Company	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	**0**	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Adidas	-,001	-,001	-,018	-,032	,047	,053	-,030	,021	-,012	-,010	**,010**	,007	,011	-,007	,005	-,008	-,005	,009	-,006	-,005	,010	-,006	-,010	,008	-,006	-,013	,012	,005	-,017	,006	-,018
Airbus Group	,044	-,012	-,016	-,004	,000	-,015	,007	,016	-,021	-,013	**-,018**	,007	-,013	,000	,012	,007	,003	-,002	-,009	,014	-,003	,010	,002	-,015	-,035	,012	-,011	-,008	,019	,007	-,019
Allianz	,002	,013	,000	-,011	,026	,003	,008	,017	,008	-,001	**,000**	-,008	-,009	,007	,004	,002	,000	,001	,000	-,007	,002	,013	,005	-,010	,002	,010	-,002	,004	,016	,004	-,005
BASF	,026	-,019	-,025	-,028	,022	,024	,000	,000	-,006	-,014	**-,008**	-,009	-,011	,013	-,006	-,011	-,016	-,011	,009	,019	-,017	-,015	,006	-,009	-,007	,003	,007	,007	,008	,016	-,008
Bayer	,035	,009	-,013	,005	-,003	,006	,022	,020	-,009	,004	**-,009**	,018	,001	,016	,001	,014	,002	,017	-,001	-,003	,009	,013	,013	,029	,005	,018	,007	,010	,018	-,001	,004
Beiersdorf AG	-,020	-,027	-,026	-,034	-,015	,043	-,023	,004	,014	-,008	**,020**	,008	,033	-,035	,040	,011	-,003	,011	,006	,006	,010	-,005	,009	,013	,021	-,008	-,001	-,015	-,028	,000	,000
BMW ST	-,032	-,012	-,004	-,012	,007	-,023	-,020	-,011	,001	,013	**-,005**	-,018	-,012	,027	,008	,005	,003	-,010	-,005	,022	-,012	-,005	,002	,004	-,013	-,002	-,002	,000	-,006	,007	,006
Brenntag AG	-,016	-,001	-,010	-,012	-,003	,007	-,030	,004	,018	-,001	**,002**	,009	,021	,006	-,005	,022	-,020	,001	-,003	-,012	-,014	,002	-,013	-,002	-,002	-,013	,002	,009	-,003	,016	,026
Commerzbank	,011	-,006	-,054	-,031	,038	,019	-,005	-,023	,036	-,019	**,044**	-,016	,003	,014	,023	-,003	-,007	-,002	,004	,024	-,030	-,041	,032	-,012	-,002	-,011	-,011	,010	,015	-,081	,007
Continental AG	-,017	-,022	,017	,001	,022	-,043	-,004	-,018	-,001	-,002	**,027**	-,023	,009	,004	-,003	-,011	-,003	-,007	,000	,065	-,046	-,012	,008	,016	-,026	,000	,006	,002	,006	,011	,002
Covestro	-,005	-,007	-,004	-,007	,019	,003	,024	-,008	,002	-,016	**-,009**	,003	-,002	,013	-,004	,007	-,002	-,029	,009	,006	-,021	-,009	-,006	,004	-,005	-,010	-,006	-,007	-,007	,011	-,012
Daimler Truck Holding	-,045	-,035	,015	,013	-,007	-,019	-,003	-,026	,010	,023	**,004**	-,016	-,024	,017	,000	,002	-,003	-,002	,001	,012	-,006	-,009	-,008	,005	-,013	,010	,006	-,003	-,006	,007	,009
Deutsche Bank AG	,010	-,007	-,016	-,005	,006	-,015	,015	-,025	-,005	,002	**-,010**	,001	-,016	,015	,005	,011	-,005	,017	,009	-,017	,008	,009	-,038	,004	-,002	,006	-,017	,004	,016	,027	,029
Deutsche Boerse	-,011	,001	-,036	-,002	,025	-,030	,032	-,034	,050	-,002	**,022**	-,011	,009	,012	,042	,008	-,004	,007	-,010	-,011	-,009	,006	,024	-,008	,005	-,007	,007	,019	,015	-,088	,012
Deutsche Post	-,012	,006	-,012	,006	-,026	,019	,009	,006	,035	,013	**,031**	-,017	,010	,001	,013	-,020	-,004	,020	,004	-,009	,011	-,007	,008	-,012	,034	-,005	-,001	,010	-,004	-,003	-,002
Deutsche Telekom AG	,001	,017	-,010	-,021	,009	,040	-,020	-,004	,004	,008	**,007**	,001	-,004	-,004	-,010	-,007	-,008	-,010	,013	-,011	-,023	-,003	-,027	-,009	-,019	-,023	,024	-,008	-,002	,011	,006
E.ON SE	,026	,004	,009	,011	-,010	-,005	,009	,005	,005	,009	**-,019**	,010	-,014	-,001	-,003	,006	,009	,009	,002	-,010	,007	-,005	,017	,003	,019	,017	,002	-,037	,006	-,001	,017
Fresenius SE	-,086	,002	-,025	-,026	-,030	,037	-,025	-,009	,028	,016	**-,025**	,000	-,007	,000	,005	-,031	-,007	,007	,000	,011	-,003	-,009	-,015	-,003	-,007	-,001	-,010	,023	-,004	-,017	-,013
Hannover Rueckversicherung SE	,000	-,001	-,018	,009	-,011	,031	,025	-,005	,017	,002	**-,002**	,010	,015	-,011	-,001	,002	,006	,016	-,001	-,012	-,003	,029	-,005	-,008	,007	,014	,010	,036	-,011	-,009	,000
Heidelbergcement	-,011	-,005	-,028	-,009	,035	-,018	-,029	,017	,007	,002	**-,030**	-,016	-,047	,046	,010	,004	-,002	-,002	-,007	-,001	,007	,017	-,015	-,020	,005	,008	-,014	,019	,004	,000	-,024
Henkel VZO	,004	-,008	-,012	,010	,013	,005	,012	,004	,012	-,017	**,001**	,008	-,025	-,002	-,001	-,017	-,042	-,022	,016	,022	-,027	-,019	,007	,000	-,025	-,002	,001	,009	,018	,004	,014
Infineon	-,038	-,018	,012	,013	-,002	-,009	-,002	-,003	,008	-,018	**-,019**	,000	-,029	,001	,003	,015	-,023	-,013	,002	,001	-,008	-,001	-,005	-,002	-,017	,023	,006	,023	-,020	-,004	-,002
Mercedes Benz Group	,002	,029	-,006	-,009	-,005	-,034	,004	-,009	-,023	,010	**,028**	-,017	,013	,005	,004	-,004	,019	,020	-,015	,005	-,008	,000	-,012	-,013	-,033	-,010	-,013	-,021	-,013	,006	,011
Merck	-,003	,024	,020	-,040	-,028	,056	-,026	-,003	,028	-,003	**,023**	,008	,000	-,010	-,016	-,008	-,004	-,011	,014	,041	-,001	-,007	,000	-,015	,014	,017	,006	-,037	-,005	-,007	,018
MTU Aero	,044	-,021	,009	,023	-,007	-,049	,010	-,006	,007	,003	**-,006**	,006	-,015	,020	-,006	,003	-,002	,012	-,036	-,018	-,002	,023	-,016	-,008	-,045	,012	-,028	-,025	,013	,008	-,008
Munich Re Group	,001	-,002	-,010	-,025	,053	,013	,005	-,004	-,004	-,006	**-,032**	-,020	-,009	,014	,009	,009	-,006	,004	-,003	,002	,004	,008	-,003	-,014	,004	,008	-,005	,011	,018	,002	-,010
Porsche	-,045	,010	-,017	-,022	-,028	-,005	,005	-,017	,018	,009	**,001**	,009	-,006	,015	,002	,014	-,005	,003	-,007	,022	,007	,014	,000	,000	,000	-,018	-,001	-,025	-,007	,000	,006
Qiagen	-,031	-,001	-,027	-,031	-,049	,041	-,017	,014	,019	-,005	**,031**	,020	,027	-,008	,008	-,007	-,019	-,001	,012	,009	,004	-,007	,000	,011	,019	-,017	-,001	,001	-,011	-,018	-,007
Rheinmetall AG	-,036	-,015	,014	,049	-,031	-,081	,065	,013	-,036	,018	**-,006**	,041	,036	,091	-,044	,012	,086	,027	-,044	-,056	,030	,008	,000	,058	,017	-,026	-,030	-,018	,039	,029	,009
RWE AG ST	-,045	-,070	,082	-,027	,008	,020	,023	-,029	-,022	,009	**-,037**	,010	,006	-,004	,008	-,008	,005	-,005	,010	-,016	,018	,032	-,011	,003	,031	,025	-,008	,013	-,005	-,016	,001
SAP	,014	,003	,016	,023	-,009	-,021	-,006	,003	-,004	-,006	**-,012**	,012	-,002	-,012	-,004	-,006	-,002	,002	-,006	-,002	,000	,003	-,016	,014	,007	,007	-,004	-,007	-,005	-,006	-,012
Sartorius AG VZO	,005	-,017	-,003	-,012	-,059	,009	-,023	,002	,001	-,008	**,065**	,006	,020	-,018	,005	-,006	-,008	,010	,019	,023	-,004	-,012	-,014	,015	-,005	,007	,014	-,047	,006	-,010	,012
Siemens AG	,018	,013	-,007	,033	,016	-,006	,005	,015	-,016	-,005	**,008**	-,007	,009	-,013	-,013	,002	-,006	-,016	-,005	,001	-,012	-,015	,005	-,015	-,020	-,006	-,010	-,002	-,007	,011	,002
Siemens Energy AG	-,030	-,012	,026	,055	,061	-,088	,018	,031	-,017	-,012	**-,027**	-,020	,031	,002	-,006	-,002	,009	-,031	-,008	-,016	,006	,021	,008	-,004	,018	-,045	-,025	,009	-,002	,004	-,016
Siemens Healthineers	-,014	-,013	-,001	-,013	-,040	,029	-,023	,004	,011	-,005	**,019**	-,008	,004	-,008	,000	-,012	-,026	-,005	,003	,000	,034	-,002	-,003	-,008	,015	-,002	,011	-,002	-,024	-,006	,006
Symrise AG	-,036	,005	,012	-,017	-,073	-,006	,007	-,019	,012	-,002	**,014**	,025	,032	-,013	-,003	,006	,003	,003	,006	,006	-,004	,004	-,004	,022	,011	,003	,025	-,018	-,023	,002	-,016
Volkswagen VZO	-,037	,005	-,002	-,023	-,005	-,012	,002	-,021	,011	,009	**-,025**	,005	-,012	,009	-,006	,006	-,003	-,008	-,007	,010	,020	,008	,001	,001	-,002	,000	-,007	,000	,002	,004	,007
Vonovia	,007	-,011	-,002	,009	-,020	,019	-,011	-,002	,001	-,002	**-,008**	,022	-,034	-,041	,002	-,017	-,002	-,004	,001	-,003	,003	-,014	,020	,005	,002	-,027	-,021	,002	,001	-,022	-,021
Zalando SE	-,042	-,019	-,041	,001	,008	,028	-,017	-,009	-,007	-,022	**,042**	-,019	,046	-,029	,012	-,015	-,020	-,016	,010	,025	-,004	-,052	,029	,064	,008	-,050	-,013	-,016	-,046	,030	-,005

Cumulative Abnormal Return (CAR)	FOMC Event 1																													
	Event Window																													
Company	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	**0**	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Adidas	-,001	-,002	-,020	-,052	-,006	,047	,017	,039	,026	,017	**,026**	,034	,044	,038	,042	,035	,030	,038	,033	,027	,037	,032	,022	,029	,023	,010	,023	,027	,010	,016	-,002
Airbus Group	,044	,032	,017	,013	,013	-,002	,004	,020	,000	-,013	**-,031**	-,024	-,037	-,037	-,024	-,017	-,014	-,017	-,026	-,012	-,015	-,005	-,003	-,018	-,054	-,042	-,053	-,061	-,042	-,035	-,054
Allianz	,002	,015	,015	,004	,030	,034	,042	,059	,067	,066	**,066**	,058	,050	,057	,061	,062	,062	,063	,063	,057	,059	,072	,077	,067	,070	,080	,078	,082	,099	,103	,098
BASF	,026	,007	-,018	-,045	-,024	,000	,001	,000	-,006	-,020	**-,028**	-,038	-,049	-,035	-,042	-,052	-,069	-,079	-,070	-,051	-,068	-,084	-,078	-,087	-,095	-,092	-,085	-,079	-,071	-,055	-,063
Bayer	,035	,043	,031	,036	,032	,038	,060	,079	,070	,074	**,065**	,083	,084	,100	,101	,115	,117	,133	,132	,129	,138	,152	,165	,193	,198	,216	,223	,232	,250	,249	,253
Beiersdorf AG	-,020	-,047	-,073	-,106	-,122	-,078	-,102	-,098	-,084	-,091	**-,071**	-,063	-,031	-,066	-,026	-,015	-,019	-,008	-,002	,004	,014	,010	,018	,031	,052	,044	,044	,029	,001	,001	,002
BMW ST	-,032	-,044	-,048	-,060	-,052	-,076	-,096	-,107	-,106	-,093	**-,098**	-,116	-,129	-,101	-,093	-,088	-,084	-,095	-,100	-,078	-,089	-,094	-,092	-,088	-,101	-,103	-,105	-,105	-,111	-,104	-,098
Brenntag AG	-,016	-,017	-,027	-,039	-,042	-,036	-,066	-,062	-,044	-,044	**-,042**	-,032	-,011	-,005	-,010	,012	-,008	-,007	-,010	-,022	-,037	-,035	-,048	-,050	-,053	-,066	-,063	-,054	-,057	-,042	-,015
Commerzbank	,011	,006	-,048	-,078	-,040	-,021	-,026	-,048	-,013	-,032	**,012**	-,004	-,001	,013	,036	,033	,025	,023	,027	,051	,021	-,021	,011	-,001	-,002	-,013	-,024	-,014	,000	-,080	-,074
Continental AG	-,017	-,039	-,022	-,022	,000	-,043	-,047	-,065	-,067	-,069	**-,041**	-,064	-,055	-,052	-,055	-,066	-,069	-,076	-,076	-,011	-,057	-,069	-,061	-,044	-,070	-,070	-,063	-,062	-,056	-,045	-,043
Covestro	-,005	-,012	-,016	-,024	-,005	-,002	,021	,014	,016	,000	**-,008**	-,005	-,007	,006	,002	,008	,006	-,022	-,013	-,007	-,028	-,036	-,042	-,038	-,042	-,053	-,059	-,066	-,072	-,061	-,073
Daimler Truck Holding	-,045	-,080	-,064	-,052	-,059	-,078	-,081	-,107	-,097	-,074	**-,069**	-,085	-,109	-,092	-,091	-,090	-,093	-,095	-,094	-,082	-,088	-,096	-,105	-,099	-,112	-,102	-,096	-,099	-,105	-,098	-,089
Deutsche Bank AG	,010	,003	-,012	-,017	-,011	-,026	-,011	-,035	-,040	-,038	**-,049**	-,048	-,063	-,048	-,042	-,031	-,036	-,019	-,010	-,027	-,019	-,010	-,048	-,044	-,045	-,039	-,056	-,052	-,036	-,009	,020
Deutsche Boerse	-,011	-,011	-,047	-,049	-,024	-,054	-,023	-,057	-,007	-,009	**,013**	,002	,011	,023	,065	,073	,069	,076	,065	,054	,045	,051	,075	,066	,071	,064	,071	,090	,105	,017	,029
Deutsche Post	-,012	-,006	-,018	-,012	-,038	-,019	-,010	-,004	,031	,044	**,075**	,058	,068	,069	,081	,061	,058	,077	,082	,073	,084	,077	,085	,074	,107	,102	,102	,111	,108	,105	,103
Deutsche Telekom AG	,001	,017	,007	-,013	-,005	,035	,015	,011	,015	,023	**,030**	,032	,028	,024	,014	,007	-,001	-,011	,002	-,009	-,032	-,035	-,061	-,071	-,089	-,113	-,089	-,097	-,099	-,088	-,081
E.ON SE	,026	,030	,038	,050	,039	,035	,043	,048	,053	,062	**,043**	,053	,039	,038	,035	,041	,050	,059	,062	,051	,058	,053	,070	,073	,091	,109	,111	,073	,080	,079	,096
Fresenius SE	-,086	-,083	-,108	-,135	-,165	-,127	-,152	-,161	-,134	-,118	**-,143**	-,143	-,150	-,150	-,145	-,176	-,183	-,176	-,175	-,165	-,168	-,177	-,192	-,195	-,202	-,203	-,213	-,190	-,194	-,211	-,225
Hannover Rueckversicherung SE	,000	-,001	-,019	-,010	-,021	,011	,036	,030	,047	,049	**,048**	,058	,073	,062	,061	,063	,069	,085	,084	,072	,070	,099	,094	,087	,094	,108	,119	,155	,144	,135	,135
Heidelbergcement	-,011	-,017	-,044	-,054	-,018	-,036	-,065	-,047	-,040	-,039	**-,068**	-,084	-,131	-,086	-,075	-,071	-,073	-,075	-,082	-,083	-,076	-,060	-,075	-,095	-,089	-,081	-,095	-,075	-,072	-,071	-,095
Henkel VZO	,004	-,004	-,016	-,006	,007	,012	,024	,029	,041	,023	**,025**	,032	,007	,006	,004	-,013	-,055	-,077	-,061	-,039	-,066	-,086	-,079	-,078	-,103	-,105	-,104	-,094	-,077	-,073	-,059
Infineon	-,038	-,056	-,044	-,031	-,033	-,042	-,044	-,048	-,040	-,058	**-,077**	-,077	-,106	-,106	-,103	-,088	-,112	-,125	-,123	-,121	-,129	-,130	-,135	-,137	-,154	-,131	-,125	-,102	-,122	-,126	-,128
Mercedes Benz Group	,002	,031	,025	,016	,011	-,023	-,019	-,029	-,052	-,042	**-,014**	-,031	-,018	-,013	-,010	-,014	,005	,026	,010	,015	,007	,007	-,005	-,018	-,050	-,061	-,074	-,095	-,108	-,103	-,092
Merck	-,003	,020	,041	,001	-,027	,029	,003	,000	,027	,025	**,048**	,056	,056	,046	,030	,022	,018	,007	,022	,062	,061	,054	,053	,039	,052	,069	,076	,039	,034	,027	,045
MTU Aero	,044	,024	,033	,055	,049	,000	,010	,003	,010	,013	**,007**	,013	-,002	,018	,012	,015	,014	,026	-,010	-,028	-,030	-,007	-,023	-,031	-,076	-,064	-,092	-,117	-,104	-,096	-,103
Munich Re Group	,001	-,001	-,010	-,035	,018	,031	,037	,032	,029	,023	**-,009**	-,028	-,037	-,022	-,014	-,005	-,012	-,008	-,011	-,009	-,005	,004	,000	-,014	-,010	-,002	-,007	,004	,022	,024	,015
Porsche	-,045	-,034	-,051	-,073	-,101	-,106	-,101	-,118	-,100	-,092	**-,091**	-,081	-,087	-,072	-,071	-,057	-,061	-,058	-,065	-,043	-,036	-,022	-,022	-,022	-,022	-,039	-,040	-,065	-,072	-,072	-,066
Qiagen	-,031	-,032	-,059	-,091	-,139	-,098	-,115	-,101	-,082	-,086	**-,055**	-,035	-,008	-,016	-,007	-,015	-,033	-,034	-,022	-,013	-,009	-,016	-,016	-,006	,013	-,004	-,005	-,004	-,015	-,033	-,040
Rheinmetall AG	-,036	-,051	-,037	,012	-,019	-,100	-,035	-,022	-,058	-,040	**-,046**	-,005	,032	,122	,078	,091	,177	,204	,160	,104	,133	,141	,141	,199	,215	,189	,159	,141	,180	,208	,218
RWE AG ST	-,045	-,115	-,033	-,060	-,052	-,033	-,009	-,039	-,061	-,051	**-,088**	-,078	-,073	-,077	-,069	-,077	-,072	-,077	-,067	-,083	-,065	-,033	-,043	-,040	-,009	,016	,008	,021	,016	,000	,000
SAP	,014	,017	,033	,057	,048	,027	,020	,023	,019	,013	**,001**	,013	,011	-,001	-,005	-,010	-,012	-,010	-,016	-,018	-,018	-,015	-,031	-,017	-,010	-,003	-,007	-,014	-,019	-,025	-,037
Sartorius AG VZO	,005	-,013	-,016	-,028	-,087	-,078	-,101	-,098	-,097	-,105	**-,040**	-,035	-,015	-,033	-,028	-,034	-,042	-,032	-,013	,009	,005	-,007	-,022	-,006	-,012	-,005	,009	-,038	-,032	-,042	-,030
Siemens AG	,018	,031	,025	,058	,073	,067	,072	,087	,071	,066	**,074**	,067	,076	,062	,049	,051	,046	,029	,025	,026	,014	-,001	,004	-,011	-,031	-,037	-,047	-,049	-,056	-,045	-,043
Siemens Energy AG	-,030	-,042	-,016	,039	,100	,012	,030	,061	,044	,032	**,005**	-,015	,015	,018	,011	,009	,019	-,012	-,020	-,036	-,030	-,010	-,001	-,005	,013	-,032	-,057	-,048	-,049	-,046	-,062
Siemens Healthineers	-,014	-,027	-,028	-,041	-,081	-,052	-,075	-,071	-,060	-,065	**-,046**	-,054	-,050	-,058	-,059	-,071	-,096	-,101	-,098	-,098	-,064	-,066	-,069	-,077	-,063	-,064	-,053	-,055	-,079	-,085	-,078
Symrise AG	-,036	-,031	-,019	-,036	-,109	-,115	-,108	-,127	-,115	-,117	**-,103**	-,078	-,047	-,060	-,062	-,057	-,054	-,052	-,046	-,040	-,044	-,040	-,043	-,021	-,011	-,008	,018	,000	-,023	-,022	-,037
Volkswagen VZO	-,037	-,032	-,035	-,058	-,063	-,075	-,074	-,094	-,083	-,074	**-,099**	-,094	-,106	-,097	-,103	-,098	-,100	-,108	-,115	-,106	-,086	-,078	-,077	-,076	-,078	-,078	-,084	-,084	-,082	-,078	-,071
Vonovia	,007	-,004	-,005	,003	-,016	,002	-,009	-,010	-,009	-,011	**-,020**	,002	-,032	-,073	-,071	-,088	-,090	-,094	-,093	-,095	-,092	-,106	-,086	-,081	-,079	-,106	-,127	-,124	-,123	-,145	-,166
Zalando SE	-,042	-,061	-,102	-,101	-,092	-,065	-,081	-,090	-,097	-,119	**-,077**	-,096	-,050	-,078	-,067	-,081	-,102	-,118	-,108	-,083	-,087	-,139	-,110	-,045	-,037	-,088	-,101	-,117	-,162	-,132	-,136

Abnormal Return (AR)	FOMC Event 2 Event Window																													
Company	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	**0**	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Adidas	,004	-,014	-,007	-,017	-,004	-,025	,006	,020	,017	-,018	**,015**	-,022	-,015	-,016	-,014	,023	,001	-,022	,001	-,001	-,024	-,011	-,003	-,001	-,001	-,002	,008	-,001	,018	,015	-,006
Airbus Group	-,006	,012	-,004	,007	,005	-,004	-,008	,009	,000	,013	**-,029**	,067	,007	-,003	-,008	-,007	-,019	-,012	,000	,000	,014	-,001	-,009	-,017	-,017	,010	,018	,003	-,008	-,016	-,001
Allianz	-,003	,001	,007	-,017	,013	-,008	-,002	,001	,004	,003	**-,012**	-,061	-,006	-,002	,000	,040	-,028	-,008	-,004	,003	,004	-,023	-,003	,007	,008	-,008	-,008	-,008	-,010	-,012	-,003
BASF	-,001	,003	,004	,007	-,009	-,006	-,005	-,016	-,046	-,006	**,039**	-,024	,016	,017	,018	-,001	-,003	-,016	,004	,012	-,002	-,009	-,007	,004	,001	,008	,010	-,011	-,001	,012	,013
Bayer	-,032	,011	,015	-,017	,001	-,023	-,022	,008	-,036	,010	**,002**	-,007	-,001	-,005	,045	-,079	,044	,003	,029	,002	,003	-,001	-,001	,000	-,007	,002	,021	-,002	-,008	,009	,004
Beiersdorf AG	,014	-,002	,017	,014	,003	-,001	-,009	-,009	-,010	-,012	**,003**	,000	-,014	-,014	,012	,020	,002	,009	,008	-,007	-,001	-,017	,004	,010	,008	-,006	-,011	-,003	,005	,010	-,011
BMW ST	-,003	-,001	,010	,005	-,001	,000	,000	-,001	,002	,021	**-,001**	-,012	,033	,007	-,006	,025	-,071	-,001	,005	-,007	,007	,008	-,014	-,007	,016	,002	,002	-,013	-,001	,005	,025
Brenntag AG	-,001	,011	,004	-,007	-,008	-,001	,011	-,005	-,013	-,008	**,008**	-,012	-,019	-,028	,010	,003	,016	,009	-,010	-,006	-,007	-,002	,009	,010	-,008	-,001	,007	,005	,003	-,015	,000
Commerzbank	,005	,013	,021	-,047	-,057	,007	,021	,000	,003	,022	**-,010**	-,014	,011	,018	-,003	-,012	,010	-,009	,015	,025	,048	,040	-,010	,044	,018	,004	,008	-,019	,006	-,002	-,003
Continental AG	-,011	,015	-,004	,017	-,023	,010	-,001	,015	-,038	,022	**-,008**	-,036	,035	,015	,009	,009	,028	-,009	-,019	-,003	,010	,021	,006	-,015	,010	,009	,023	-,011	,005	,017	,015
Covestro	,002	,009	-,077	,006	-,008	,000	,009	-,007	,016	-,056	**,026**	-,030	,010	,001	,012	-,006	,005	-,007	,006	,013	-,002	-,001	,003	,010	,003	,013	,005	-,010	,005	,009	,018
Daimler Truck Holding	-,001	-,004	,011	,003	-,001	,012	,025	-,002	-,060	,002	**-,004**	-,016	,036	,000	-,005	,019	,001	-,016	-,004	,006	,008	-,013	-,009	,003	,007	-,003	-,001	-,007	-,006	,013	,020
Deutsche Bank AG	-,009	-,012	,018	,024	-,006	-,011	-,005	-,002	,020	-,023	**-,001**	-,004	,010	-,011	,013	-,006	-,013	-,007	,007	-,032	,000	,001	,008	-,001	,001	-,001	-,001	-,001	-,001	,000	,000
Deutsche Boerse	-,001	-,001	,003	-,037	-,010	-,060	-,012	-,012	-,001	,030	**,002**	-,031	,007	-,010	,000	-,007	-,011	-,006	-,008	,013	,010	,014	-,024	,051	,031	,008	-,007	-,025	,013	-,009	-,004
Deutsche Post	,001	-,019	,009	,014	,014	-,015	-,008	,011	,007	-,004	**,001**	-,015	-,006	-,005	,009	-,008	,002	-,008	-,003	,003	,006	-,027	,015	-,007	,029	-,020	-,007	-,010	-,029	-,017	-,011
Deutsche Telekom AG	-,004	-,001	,015	,006	-,008	,001	-,007	-,006	,000	-,011	**,023**	-,016	-,004	-,044	,016	-,013	,012	,002	-,007	,004	-,001	-,020	-,009	,001	-,004	,004	-,009	-,013	,013	,005	-,027
E.ON SE	-,003	,002	-,001	,014	,012	,019	-,003	-,015	-,007	-,001	**,012**	,007	-,004	,008	-,002	-,005	,030	,003	-,010	-,011	,008	,006	,007	-,003	,020	,007	-,008	-,006	-,007	,012	,002
Fresenius SE	-,003	-,001	,009	,020	-,015	-,015	,011	-,021	,001	-,009	**-,001**	-,001	,001	,022	,003	,026	-,024	-,017	,006	-,011	,023	-,007	,005	-,002	-,022	,011	-,014	-,033	-,008	-,006	,005
Hannover Rueckversicherung	,008	-,007	-,002	-,007	,002	,006	-,001	-,010	-,002	,014	**,035**	,002	-,015	,014	-,031	,010	-,017	,008	-,021	-,011	-,004	-,023	,012	-,018	,002	,004	-,002	-,001	-,016	,001	-,007
Heidelbergcement	,016	,001	,000	,003	,021	,001	,014	-,022	-,010	-,001	**,012**	-,065	,023	,011	,013	,004	,007	-,020	,009	-,004	-,001	,000	-,038	,001	,000	,001	-,006	,004	-,003	-,002	-,024
Henkel VZO	,006	,004	,036	,018	,004	,007	-,010	,013	,004	,002	**,010**	-,016	,013	,022	-,004	-,012	-,038	-,022	,004	-,007	,002	,014	-,010	,001	,019	,017	-,013	-,011	-,003	,009	-,001
Infineon	,029	-,006	,015	,029	,003	,011	,014	-,033	-,005	,005	**,001**	-,014	,043	,017	,024	-,012	-,003	-,010	,014	-,007	-,001	-,013	,000	,006	-,001	,002	,003	-,026	,019	,020	-,011
Mercedes Benz Group	,003	-,006	,012	,020	-,016	-,010	,001	-,007	-,010	,015	**,002**	,009	,021	-,031	-,011	,009	,040	,007	-,006	-,003	-,019	,016	-,014	-,007	-,011	-,016	,011	,024	,009	-,004	,003
Merck	-,005	-,004	-,015	-,016	,003	-,006	,008	,012	-,015	,000	**-,033**	,013	-,020	,006	,001	,011	-,053	-,016	,008	,010	,004	,028	,022	,009	,007	,002	-,018	,003	,003	-,019	-,016
MTU Aero	-,002	,022	,011	-,020	,018	-,008	,015	-,013	-,018	,041	**-,019**	-,007	,011	-,027	-,039	,009	-,009	-,004	,001	,005	,019	-,006	-,005	-,021	-,008	,006	,016	,007	-,004	-,018	,004
Munich Re Group	,003	-,007	-,010	-,014	,039	,003	,011	-,066	-,004	-,001	**-,001**	-,018	,006	,008	,004	,026	,004	-,017	-,003	-,005	-,003	-,003	-,014	-,007	,013	-,003	-,006	-,002	,002	,000	-,022
Porsche	-,008	-,010	,021	-,015	-,020	,000	,001	,002	-,009	,015	**-,009**	,000	,014	,002	-,048	,018	,013	-,015	-,026	-,053	,004	-,003	-,002	,002	,012	,002	-,017	-,024	-,002	,045	,045
Qiagen	-,005	-,008	-,017	,003	-,008	,034	,005	,011	,002	-,002	**-,015**	,017	-,013	-,004	-,022	,004	,000	,032	,002	-,010	-,033	,000	,008	-,002	,005	-,003	-,010	,029	,000	-,027	-,013
Rheinmetall AG	,006	-,002	-,006	-,014	-,003	-,005	-,007	-,002	-,019	,047	**-,046**	-,014	-,020	-,104	-,031	,024	-,044	,022	,019	,009	-,006	-,010	,010	-,022	,017	,001	,002	-,006	,012	-,048	,016
RWE AG ST	,008	-,028	,002	,021	-,004	,006	,000	-,028	-,013	,000	**,040**	-,005	,018	-,002	-,022	,008	-,036	,012	,034	-,010	,038	,003	,009	-,006	-,034	,016	-,026	-,041	-,003	,017	-,004
SAP	,002	,003	,001	-,006	-,002	,002	,009	,002	-,001	-,019	**-,014**	,023	-,024	,009	,001	-,002	,009	,000	-,014	-,005	-,015	-,006	,014	,000	,004	-,019	-,002	,013	,006	-,013	,009
Sartorius AG VZO	,009	,032	-,041	-,008	-,062	-,002	,023	,015	-,032	,011	**-,034**	,005	-,012	-,034	,002	,027	-,049	,063	,023	,003	-,027	,017	,004	-,001	-,004	,005	-,004	,050	,027	,011	-,056
Siemens AG	,002	,014	-,004	,003	-,009	,006	,000	,002	-,007	-,015	**,018**	,014	,006	,005	,011	-,012	-,016	-,010	-,015	,004	-,007	,003	,014	-,005	,004	-,003	,010	,006	,014	-,001	,006
Siemens Energy AG	-,025	-,011	-,004	,013	-,020	,004	-,017	,010	-,059	,035	**,001**	-,022	,001	-,013	-,007	-,041	-,032	,039	,011	,004	,023	,011	-,013	-,016	,039	-,022	,024	-,004	,013	,009	-,002
Siemens Healthineers	,012	-,004	-,054	,023	-,001	-,031	-,018	-,014	-,014	-,002	**,033**	,023	-,028	-,012	,014	,000	,025	,016	,022	,001	-,001	-,016	-,004	-,009	,007	-,019	-,009	,033	,009	-,014	-,016
Symrise AG	-,003	,009	,001	,011	-,025	,056	,002	,002	-,005	-,026	**,000**	-,001	-,058	-,032	,012	,003	,005	,002	,007	,017	-,017	-,013	,006	,001	-,004	-,010	,002	,020	,017	-,029	-,004
Volkswagen VZO	-,007	-,003	,009	,000	-,006	-,003	-,006	,000	,005	,011	**-,003**	-,001	,015	,010	-,015	-,003	,008	-,045	,011	-,014	,019	,009	-,007	-,004	,010	,008	,002	-,017	,001	,024	,026
Vonovia	,003	-,001	,000	,018	,000	,008	-,004	-,045	-,046	,003	**-,022**	,022	-,033	-,029	-,004	,026	-,026	-,012	,013	-,007	,002	,020	,001	,006	-,016	,007	-,005	,033	-,004	,006	-,010
Zalando SE	-,014	-,035	-,015	-,003	-,041	-,024	,006	,013	,013	,003	**-,016**	-,098	,027	-,019	,009	-,034	,038	,009	,023	,011	-,015	,054	-,004	-,021	-,069	,036	,086	-,009	,036	-,015	-,060

Cumulative Abnormal Return (CAR)	FOMC Event 2 Event Window																													
Company	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	**0**	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Adidas	,004	-,010	-,017	-,034	-,038	-,063	-,057	-,037	-,020	-,038	**-,023**	-,045	-,061	-,077	-,091	-,068	-,067	-,089	-,088	-,089	-,112	-,124	-,126	-,127	-,129	-,130	-,122	-,123	-,105	-,090	-,096
Airbus Group	-,006	,006	,002	,009	,015	,010	,002	,011	,011	,024	**-,005**	,062	,069	,066	,058	,052	,032	,020	,020	,020	,034	,033	,025	,008	-,009	,001	,019	,022	,014	-,002	-,003
Allianz	-,003	-,002	,004	-,012	,001	-,007	-,009	-,008	-,004	-,002	**-,014**	-,075	-,081	-,083	-,083	-,043	-,071	-,080	-,084	-,081	-,077	-,100	-,103	-,096	-,088	-,096	-,103	-,111	-,121	-,133	-,137
BASF	-,001	,002	,006	,012	,003	-,003	-,008	-,024	-,070	-,075	**-,037**	-,061	-,045	-,028	-,009	-,010	-,013	-,029	-,025	-,013	-,015	-,024	-,032	-,028	-,027	-,019	-,009	-,019	-,021	-,009	,004
Bayer	-,032	-,021	-,006	-,023	-,022	-,046	-,068	-,060	-,097	-,087	**-,085**	-,092	-,093	-,097	-,053	-,132	-,088	-,085	-,056	-,054	-,051	-,052	-,053	-,053	-,059	-,057	-,036	-,039	-,047	-,038	-,034
Beiersdorf AG	,014	,011	,028	,042	,045	,045	,035	,027	,017	,005	**,007**	,007	-,007	-,020	-,008	,012	,014	,024	,031	,024	,023	,006	,011	,020	,028	,022	,010	,007	,012	,022	,011
BMW ST	-,003	-,004	,006	,011	,010	,010	,010	,009	,011	,032	**,032**	,019	,052	,059	,053	,078	,007	,006	,011	,004	,012	,020	,006	,000	,015	,017	,019	,006	,005	,010	,035
Brenntag AG	-,001	,010	,015	,008	,000	-,001	,010	,005	-,008	-,016	**-,008**	-,019	-,038	-,066	-,056	-,052	-,036	-,027	-,037	-,043	-,049	-,051	-,041	-,031	-,039	-,040	-,034	-,029	-,026	-,041	-,041
Commerzbank	,005	,018	,039	-,008	-,065	-,058	-,037	-,037	-,034	-,013	**-,023**	-,037	-,025	-,007	-,010	-,022	-,012	-,021	-,006	,019	,066	,106	,097	,141	,159	,163	,172	,153	,160	,158	,155
Continental AG	-,011	,004	-,001	,016	-,007	,003	,001	,017	-,021	,000	**-,008**	-,044	-,009	,006	,015	,024	,052	,043	,024	,022	,032	,053	,059	,044	,054	,063	,087	,076	,080	,097	,112
Covestro	,002	,011	-,066	-,060	-,068	-,068	-,059	-,066	-,050	-,106	**-,080**	-,110	-,100	-,099	-,087	-,093	-,088	-,095	-,090	-,077	-,079	-,080	-,077	-,068	-,065	-,052	-,047	-,057	-,052	-,043	-,025
Daimler Truck Holding	-,001	-,006	,006	,009	,008	,019	,044	,043	-,018	-,016	**-,020**	-,036	,000	,000	-,005	,014	,015	-,001	-,005	,001	,009	-,004	-,013	-,010	-,002	-,006	-,006	-,013	-,019	-,006	,013
Deutsche Bank AG	-,009	-,021	-,003	,021	,015	,004	-,001	-,003	,016	-,007	**-,008**	-,012	-,002	-,012	,001	-,005	-,017	-,024	-,017	-,049	-,049	-,048	-,040	-,041	-,041	-,041	-,042	-,044	-,044	-,044	-,044
Deutsche Boerse	-,001	-,002	,002	-,035	-,046	-,106	-,118	-,129	-,130	-,100	**-,098**	-,129	-,122	-,132	-,131	-,138	-,149	-,155	-,163	-,150	-,141	-,127	-,151	-,100	-,070	-,062	-,068	-,093	-,080	-,088	-,093
Deutsche Post	,001	-,017	-,008	,007	,021	,006	-,002	,010	,017	,013	**,014**	-,001	-,007	-,012	-,003	-,011	-,009	-,016	-,019	-,016	-,010	-,036	-,021	-,028	,001	-,019	-,026	-,036	-,064	-,081	-,092
Deutsche Telekom AG	-,004	-,005	,010	,016	,009	,009	,002	-,004	-,005	-,016	**,006**	-,010	-,014	-,058	-,042	-,054	-,043	-,041	-,048	-,044	-,045	-,065	-,074	-,073	-,077	-,073	-,082	-,095	-,082	-,077	-,105
E.ON SE	-,003	-,001	-,002	,012	,024	,042	,040	,024	,017	,016	**,028**	,036	,032	,040	,038	,033	,063	,066	,056	,045	,054	,059	,066	,064	,084	,091	,083	,077	,070	,082	,084
Fresenius SE	-,003	-,004	,004	,024	,010	-,005	,006	-,015	-,014	-,024	**-,025**	-,025	-,025	-,003	,000	,026	,002	-,016	-,010	-,021	,003	-,004	,001	-,001	-,023	-,012	-,026	-,058	-,067	-,073	-,068
Hannover Rueckversicherung	,008	,001	,000	-,007	-,004	,002	,000	-,010	-,012	,002	**,037**	,039	,025	,039	,008	,017	,000	,008	-,013	-,024	-,028	-,051	-,040	-,058	-,056	-,053	-,055	-,056	-,072	-,071	-,078
Heidelbergcement	,016	,017	,017	,020	,041	,041	,055	,034	,024	,023	**,035**	-,030	-,007	,004	,018	,022	,028	,008	,017	,013	,012	,012	-,026	-,025	-,024	-,024	-,030	-,026	-,030	-,031	-,056
Henkel VZO	,006	,010	,046	,064	,069	,076	,066	,079	,083	,085	**,095**	,079	,092	,114	,110	,098	,060	,038	,042	,035	,037	,051	,041	,042	,061	,078	,064	,054	,050	,059	,058
Infineon	,029	,023	,039	,068	,071	,082	,096	,063	,058	,063	**,064**	,050	,094	,110	,134	,122	,119	,110	,123	,116	,116	,102	,103	,109	,107	,109	,112	,087	,106	,126	,115
Mercedes Benz Group	,003	-,003	,010	,030	,014	,004	,005	-,003	-,012	,003	**,005**	,013	,034	,003	-,008	,001	,041	,049	,043	,040	,021	,037	,023	,016	,005	-,011	,000	,024	,033	,029	,032
Merck	-,005	-,009	-,025	-,041	-,038	-,044	-,036	-,024	-,039	-,040	**-,073**	-,060	-,079	-,074	-,073	-,062	-,115	-,131	-,123	-,113	-,110	-,082	-,060	-,051	-,044	-,042	-,060	-,057	-,054	-,074	-,089
MTU Aero	-,002	,021	,031	,012	,029	,021	,036	,023	,005	,046	**,027**	,020	,031	,004	-,036	-,027	-,036	-,040	-,038	-,033	-,015	-,021	-,025	-,047	-,055	-,049	-,033	-,026	-,030	-,048	-,044
Munich Re Group	,003	-,004	-,014	-,029	,010	,012	,023	-,043	-,047	-,048	**-,049**	-,067	-,061	-,053	-,050	-,023	-,019	-,036	-,039	-,044	-,047	-,050	-,064	-,071	-,058	-,061	-,066	-,069	-,067	-,067	-,089
Porsche	-,008	-,018	,003	-,012	-,032	-,032	-,031	-,029	-,037	-,022	**-,031**	-,030	-,016	-,014	-,062	-,044	-,031	-,046	-,072	-,125	-,121	-,124	-,126	-,128	-,116	-,114	-,131	-,156	-,157	-,112	-,067
Qiagen	-,005	-,013	-,031	-,028	-,035	-,002	,003	,015	,017	,015	**,000**	,017	,005	,001	-,021	-,018	-,017	,015	,017	,007	-,027	-,027	-,019	-,022	-,017	-,020	-,030	-,002	-,002	-,029	-,042
Rheinmetall AG	,006	,004	-,002	-,016	-,020	-,024	-,031	-,033	-,052	-,005	**-,051**	-,065	-,085	-,189	-,220	-,197	-,241	-,219	-,200	-,191	-,196	-,206	-,197	-,219	-,201	-,200	-,198	-,205	-,193	-,241	-,225
RWE AG ST	,008	-,019	-,018	,003	-,001	,005	,005	-,023	-,035	-,035	**,005**	,000	,018	,015	-,007	,001	-,035	-,022	,012	,001	,040	,042	,052	,046	,013	,029	,003	-,039	-,041	-,025	-,029
SAP	,002	,005	,006	,001	-,001	,001	,009	,011	,010	-,009	**-,023**	,000	-,023	-,014	-,014	-,016	-,006	-,007	-,021	-,026	-,041	-,047	-,033	-,033	-,029	-,048	-,050	-,037	-,031	-,045	-,036
Sartorius AG VZO	,009	,041	,000	-,007	-,069	-,071	-,048	-,033	-,065	-,054	**-,088**	-,084	-,095	-,130	-,128	-,100	-,149	-,087	-,064	-,061	-,088	-,071	-,067	-,068	-,072	-,067	-,071	-,021	,006	,018	-,039
Siemens AG	,002	,016	,012	,015	,006	,012	,013	,014	,008	-,007	**,011**	,025	,031	,036	,047	,036	,020	,010	-,005	-,001	-,008	-,005	,008	,003	,007	,004	,015	,021	,034	,033	,039
Siemens Energy AG	-,025	-,036	-,040	-,027	-,048	-,044	-,061	-,051	-,110	-,075	**-,074**	-,096	-,094	-,107	-,115	-,156	-,188	-,149	-,138	-,134	-,111	-,101	-,114	-,130	-,091	-,113	-,089	-,093	-,080	-,070	-,072
Siemens Healthineers	,012	,008	-,046	-,023	-,024	-,054	-,072	-,087	-,100	-,102	**-,069**	-,045	-,073	-,086	-,071	-,071	-,046	-,031	-,009	-,008	-,008	-,024	-,028	-,036	-,029	-,048	-,057	-,025	-,016	-,030	-,046
Symrise AG	-,003	,006	,007	,018	-,007	,049	,051	,053	,047	,022	**,021**	,020	-,038	-,071	-,059	-,056	-,050	-,048	-,042	-,025	-,041	-,055	-,048	-,048	-,052	-,061	-,060	-,040	-,023	-,053	-,057
Volkswagen VZO	-,007	-,009	,000	,000	-,006	-,009	-,015	-,016	-,010	,000	**-,003**	-,005	,011	,021	,005	,002	,010	-,034	-,024	-,038	-,018	-,009	-,016	-,021	-,010	-,003	-,001	-,017	-,017	,007	,033
Vonovia	,003	,002	,001	,020	,020	,027	,024	-,021	-,067	-,064	**-,086**	-,064	-,097	-,127	-,130	-,105	-,130	-,142	-,130	-,136	-,135	-,114	-,113	-,108	-,123	-,116	-,121	-,088	-,092	-,086	-,097
Zalando SE	-,014	-,049	-,064	-,067	-,108	-,132	-,126	-,113	-,101	-,098	**-,115**	-,213	-,186	-,205	-,196	-,229	-,191	-,182	-,158	-,147	-,162	-,108	-,112	-,133	-,203	-,167	-,081	-,089	-,053	-,068	-,128

Abnormal Return (AR)	FOMC Event 3 Event Window																													
Company	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	**0**	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Adidas	-,005	,011	,006	-,010	-,003	,016	-,006	,010	-,002	-,017	**-,005**	,017	,017	-,009	-,004	,009	,037	,001	,004	-,012	,022	,016	-,008	,005	,030	-,029	,005	-,021	-,013	-,021	,018
Airbus Group	,000	-,006	-,004	,006	,000	-,009	-,003	,010	-,009	,000	**-,017**	,009	,001	,016	-,013	-,017	,001	-,003	,000	,011	-,006	,026	,026	-,015	-,004	,016	-,006	-,006	,026	,033	,022
Allianz	-,003	-,005	,004	,004	-,005	-,016	,004	-,008	,019	,008	**,012**	,014	-,006	,005	-,007	,003	-,010	-,002	-,005	,008	,019	,007	-,003	,008	-,016	-,012	-,001	-,002	,002	,001	-,008
BASF	,013	,006	-,008	-,004	,001	,019	,004	-,009	,016	-,003	**-,001**	-,032	-,015	-,001	,006	-,045	-,025	,002	,009	,002	-,014	,018	-,008	,019	-,028	-,006	,018	,025	-,022	,025	-,012
Bayer	,003	-,027	,009	-,002	-,008	,003	,003	-,008	,014	,007	**-,012**	-,007	,007	,004	-,023	-,015	-,025	-,025	,023	,010	-,033	-,005	,008	-,001	-,011	,000	-,008	,012	-,021	,000	,002
Beiersdorf AG	-,011	,002	,000	,003	-,007	-,007	,050	,003	,012	-,040	**-,002**	-,009	-,018	,037	,005	,018	,024	,005	,004	-,010	,016	-,002	,007	,011	,011	,011	-,024	-,011	-,001	-,003	,013
BMW ST	,025	,006	-,008	-,008	-,004	,020	,010	,011	-,003	,006	**,009**	,010	-,002	,002	,010	-,005	-,021	-,018	,004	,006	-,005	,006	,002	-,009	,017	-,020	,025	,001	-,013	,002	-,012
Brenntag AG	,001	,001	,001	-,005	-,002	-,001	-,001	-,003	,054	,009	**,008**	-,015	-,025	-,032	-,010	-,032	-,032	,000	,011	,015	,003	,015	-,005	,010	-,012	-,007	,007	-,001	-,006	-,009	-,008
Commerzbank	-,003	-,007	,008	,019	-,006	-,002	,014	-,013	,008	,011	**,019**	,019	,021	,028	,021	,004	-,094	-,027	-,017	-,020	,001	-,023	-,051	-,028	,001	-,047	-,007	,057	-,021	-,029	,009
Continental AG	,015	-,007	-,008	,025	,012	,019	,027	,019	-,003	,008	**,018**	-,008	-,002	,025	,003	-,007	-,024	-,031	,020	,022	,005	-,008	-,003	,005	-,018	-,005	,012	,016	-,017	,003	,006
Covestro	,018	,012	-,003	-,008	-,007	,019	,010	-,006	,009	-,018	**-,015**	-,049	-,018	-,015	,014	-,042	-,010	,024	-,011	,000	-,021	,020	-,015	,002	-,018	-,010	,019	,023	-,027	,002	,007
Daimler Truck Holding	,020	-,005	-,005	-,003	,000	,011	,005	,004	-,015	,012	**,002**	,010	-,004	,004	,016	-,015	-,042	-,019	,005	-,010	-,003	-,022	-,007	-,025	-,012	-,026	,041	,022	-,025	,001	-,033
Deutsche Bank AG	-,001	-,001	,001	-,001	-,001	-,001	-,001	-,001	-,001	-,001	**-,001**	,000	-,001	-,001	-,001	-,001	-,001	-,001	-,001	-,001	-,001	-,001	-,001	-,001	-,001	-,001	-,001	-,001	-,001	-,001	-,001
Deutsche Boerse	-,004	-,021	,001	,007	-,002	-,009	,011	-,016	,014	,013	**,007**	,029	-,002	,013	,002	,014	-,098	,026	-,010	-,008	-,009	-,006	-,035	,009	-,001	-,031	,011	,009	-,021	-,003	,000
Deutsche Post	-,011	,001	,000	-,002	-,013	-,016	,006	,025	,000	,016	**,008**	,016	-,006	-,002	-,002	,013	,010	-,002	,007	-,009	,019	,008	-,034	,015	,006	,025	-,023	,000	,013	,019	,009
Deutsche Telekom AG	-,027	,001	,004	,010	-,001	-,026	-,008	,011	,014	,022	**,006**	,016	,016	-,022	,009	,019	,011	,008	,012	-,015	,017	,017	,001	-,001	,028	-,018	,005	-,014	,002	,002	,012
E.ON SE	,002	-,010	,004	-,006	-,001	-,019	,006	,001	-,001	,007	**-,001**	,014	,011	,015	-,011	,025	,012	-,001	-,007	,009	,011	,008	,012	,004	,001	-,005	-,006	-,010	,010	-,001	,002
Fresenius SE	,005	-,010	,022	-,010	,006	,002	,002	,012	-,007	-,020	**-,007**	-,048	,023	,000	-,006	,020	-,002	-,026	-,013	,009	-,018	-,034	,023	-,002	-,015	-,016	,011	,011	-,001	-,009	,005
Hannover Rueckversicheru	-,007	-,021	,005	-,006	,007	,004	-,013	,011	,015	-,002	**-,005**	,004	-,011	,004	-,049	-,019	,034	,009	,020	,007	,019	,005	,008	,009	-,005	-,003	-,018	,002	-,009	-,008	-,019
Heidelbergcement	-,025	-,003	,028	-,007	,010	-,015	,023	-,008	,031	,016	**,015**	,012	-,028	,005	-,015	-,004	-,016	,026	-,009	,004	,013	,027	,009	,022	-,049	,008	,018	-,020	-,005	,001	,006
Henkel VZO	-,002	-,004	-,006	,003	,009	,003	,012	-,014	,000	,001	**,015**	,009	-,006	-,019	,003	,003	-,012	,004	,002	-,004	-,008	-,015	,000	,015	-,028	-,014	,014	,035	-,006	,018	-,011
Infineon	-,011	-,002	-,004	,003	-,010	-,003	,006	-,002	,011	-,008	**,003**	-,009	,010	,030	-,004	,005	,006	,005	,007	-,007	,000	-,005	,010	,013	,021	,007	-,009	,007	,004	-,007	,015
Mercedes Benz Group	,003	,008	-,016	-,009	-,013	,005	-,011	,011	-,034	-,010	**,011**	-,017	,004	,000	,010	-,001	-,003	,008	,011	-,012	,006	-,011	-,038	-,023	,012	,023	,006	,003	-,001	-,006	,013
Merck	-,015	,007	-,010	,002	-,006	,018	-,005	-,004	,010	-,019	**-,008**	,018	-,037	-,012	,004	-,002	,005	,043	-,003	-,012	-,006	,012	,026	-,001	,035	,011	-,006	,000	,018	-,011	-,001
MTU Aero	,004	-,003	-,004	,011	,001	,004	-,015	,009	-,016	,010	**,010**	,019	,000	,041	-,018	-,008	-,001	,002	-,013	,031	-,012	,022	,018	-,017	-,047	,018	,003	,019	,002	,034	,004
Munich Re Group	-,022	-,004	,012	,002	,004	-,014	,022	,003	,023	,011	**,017**	,009	-,016	,006	-,013	,006	,008	,010	-,014	,021	,004	,020	,015	,015	-,036	,000	,002	-,014	-,001	,004	,004
Porsche	,046	-,015	-,014	-,024	-,002	,007	,010	,016	-,014	,006	**-,006**	,037	-,025	-,018	,014	,007	-,008	-,033	,013	,022	-,004	-,015	-,006	-,014	,000	-,008	,036	,042	-,003	-,009	,006
Qiagen	-,013	,004	-,004	,006	,008	,015	-,001	-,015	,005	-,030	**,030**	-,006	-,007	-,033	,018	,017	,021	,025	,023	-,004	,003	,013	,016	,019	,018	,009	,003	-,014	,008	-,025	-,005
Rheinmetall AG	,017	,026	,050	-,015	,025	,019	-,043	-,025	-,002	,015	**,013**	-,022	,022	,028	,024	-,031	-,058	,001	,037	,031	,001	-,014	-,039	-,015	-,106	-,013	,038	-,002	-,032	,005	-,026
RWE AG ST	-,004	-,012	-,002	,003	,021	-,007	,001	,008	-,030	-,017	**,001**	-,020	,002	,030	,003	-,011	,015	-,042	-,021	,016	-,005	-,044	,050	-,008	-,015	-,009	-,008	-,006	,025	-,005	-,003
SAP	,009	-,002	-,001	,001	,003	-,002	,001	-,010	-,002	,008	**,012**	,015	,009	-,006	,001	,011	,013	,020	-,004	-,014	,003	-,021	-,004	-,011	,025	,016	-,004	-,003	-,001	-,020	-,008
Sartorius AG VZO	-,057	,044	-,003	-,011	,016	,028	-,027	-,006	-,057	-,042	**,005**	-,030	,013	-,024	,013	,013	,032	,029	,015	-,012	-,005	,036	,027	,010	,044	,028	-,010	,015	,042	-,023	,000
Siemens AG	,006	,008	-,007	-,004	,002	,004	,003	-,012	,003	-,009	**-,021**	-,016	,003	-,016	-,007	,000	,002	,012	,007	-,005	-,003	-,019	-,015	,018	,003	,003	-,010	,003	-,011	,001	,000
Siemens Energy AG	-,002	,025	-,004	,012	,012	-,012	-,055	-,001	-,035	-,016	**,006**	-,008	-,006	,018	,005	-,002	-,013	,022	-,006	-,005	-,051	-,031	,016	-,006	-,032	,023	,031	,023	-,017	,002	-,006
Siemens Healthineers	-,016	,002	-,001	-,008	,010	,011	-,014	-,017	-,023	-,011	**-,076**	-,003	-,014	-,020	-,005	,011	,015	,036	,017	-,006	,004	,035	-,010	,007	,008	,019	-,035	,007	-,005	-,016	,001
Symrise AG	-,003	,012	-,005	,000	-,001	,000	-,010	,008	-,005	-,034	**,009**	-,005	,018	,030	,001	,015	,008	,036	-,002	-,014	,001	,003	,016	,017	,012	,015	-,020	-,009	,021	-,033	,005
Volkswagen VZO	,026	-,005	-,011	-,005	,004	,025	,008	,012	-,012	,007	**,003**	,017	-,016	,002	,017	,002	-,012	-,020	-,008	,010	-,020	-,028	-,002	,002	-,008	-,021	,027	,042	-,011	-,004	-,001
Vonovia	-,010	,012	-,004	,005	,007	-,002	-,035	-,009	-,038	,033	**-,010**	-,015	,028	-,013	,020	,004	-,005	,014	-,017	,002	-,010	-,025	,003	-,046	,015	,020	-,003	-,028	-,004	,005	,011
Zalando SE	-,059	,026	-,032	,026	-,037	,003	-,061	,014	-,009	-,048	**,015**	-,082	,027	-,003	-,015	,024	,018	-,032	,020	-,021	,004	,033	,048	-,031	-,016	,042	,037	,006	-,019	,005	-,023

Cumulative Abnormal Return (CAR)	FOMC Event 3 Event Window																													
Company	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	**0**	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Adidas	-,005	,006	,012	,003	,000	,016	,010	,020	,018	,001	**-,004**	,013	,031	,021	,018	,027	,063	,064	,067	,055	,077	,093	,084	,090	,120	,091	,096	,075	,063	,042	,060
Airbus Group	,000	-,006	-,010	-,004	-,005	-,013	-,016	-,006	-,015	-,016	**-,032**	-,023	-,022	-,007	-,020	-,037	-,036	-,039	-,038	-,027	-,033	-,007	,019	,005	,001	,016	,010	,004	,030	,063	,085
Allianz	-,003	-,007	-,003	,001	-,004	-,021	-,017	-,025	-,006	,003	**,015**	,029	,023	,028	,021	,024	,014	,012	,006	,014	,034	,040	,037	,046	,030	,017	,017	,015	,016	,018	,009
BASF	,013	,019	,011	,007	,008	,027	,031	,022	,038	,035	**,034**	,002	-,012	-,013	-,008	-,053	-,078	-,076	-,067	-,065	-,079	-,061	-,069	-,050	-,079	-,084	-,066	-,041	-,063	-,038	-,050
Bayer	,003	-,023	-,014	-,016	-,024	-,021	-,017	-,026	-,012	-,004	**-,016**	-,023	-,016	-,011	-,034	-,049	-,075	-,100	-,076	-,066	-,099	-,104	-,096	-,097	-,108	-,108	-,115	-,104	-,125	-,124	-,123
Beiersdorf AG	-,011	-,009	-,009	-,006	-,013	-,020	,030	,034	,045	,005	**,003**	-,006	-,024	,013	,018	,036	,060	,065	,069	,059	,076	,073	,081	,091	,102	,114	,089	,079	,078	,074	,087
BMW ST	,025	,031	,023	,015	,011	,032	,042	,053	,050	,057	**,066**	,075	,073	,075	,085	,080	,059	,041	,045	,051	,046	,052	,054	,045	,062	,042	,066	,067	,054	,056	,044
Brenntag AG	,001	,002	,003	-,002	-,004	-,005	-,006	-,009	,045	,054	**,063**	,048	,023	-,009	-,019	-,051	-,083	-,082	-,071	-,056	-,053	-,038	-,042	-,032	-,044	-,051	-,044	-,045	-,051	-,060	-,067
Commerzbank	-,003	-,010	-,002	,016	,011	,009	,023	,011	,019	,030	**,049**	,069	,089	,117	,138	,142	,048	,021	,004	-,016	-,015	-,038	-,088	-,116	-,115	-,162	-,169	-,111	-,132	-,161	-,152
Continental AG	,015	,008	,000	,025	,037	,056	,083	,101	,098	,106	**,124**	,116	,115	,140	,142	,135	,111	,080	,099	,121	,126	,118	,115	,119	,101	,096	,108	,124	,107	,110	,116
Covestro	,018	,030	,027	,019	,012	,030	,040	,034	,042	,025	**,010**	-,039	-,058	-,073	-,059	-,101	-,111	-,086	-,098	-,098	-,118	-,099	-,114	-,112	-,130	-,140	-,121	-,098	-,125	-,123	-,116
Daimler Truck Holding	,020	,015	,010	,007	,008	,019	,023	,028	,013	,025	**,028**	,038	,033	,038	,054	,039	-,003	-,022	-,017	-,026	-,030	-,052	-,059	-,084	-,096	-,123	-,082	-,060	-,086	-,085	-,118
Deutsche Bank AG	-,001	-,002	-,003	-,005	-,006	-,006	-,007	-,008	-,008	-,009	**-,011**	-,011	-,012	-,014	-,015	-,016	-,016	-,018	-,019	-,020	-,021	-,021	-,023	-,024	-,024	-,025	-,027	-,028	-,029	-,030	-,031
Deutsche Boerse	-,004	-,025	-,024	-,017	-,020	-,028	-,017	-,033	-,019	-,006	**,001**	,030	,027	,041	,043	,057	-,041	-,015	-,026	-,033	-,043	-,049	-,084	-,075	-,076	-,107	-,095	-,087	-,108	-,111	-,111
Deutsche Post	-,011	-,010	-,010	-,012	-,025	-,042	-,036	-,011	-,011	,005	**,013**	,030	,023	,022	,020	,033	,043	,041	,048	,039	,058	,066	,031	,046	,052	,077	,055	,054	,067	,086	,095
Deutsche Telekom AG	-,027	-,025	-,022	-,012	-,013	-,040	-,048	-,037	-,023	,000	**,006**	,022	,038	,016	,025	,044	,055	,063	,075	,060	,077	,094	,095	,095	,123	,104	,109	,095	,097	,099	,111
E.ON SE	,002	-,008	-,004	-,010	-,011	-,030	-,024	-,024	-,024	-,018	**-,019**	-,005	,006	,021	,009	,034	,047	,046	,039	,048	,058	,066	,078	,082	,083	,079	,073	,062	,073	,072	,074
Fresenius SE	,005	-,006	,016	,006	,012	,014	,017	,028	,022	,001	**-,005**	-,053	-,030	-,031	-,037	-,017	-,018	-,044	-,057	-,048	-,066	-,100	-,077	-,079	-,094	-,110	-,099	-,088	-,089	-,098	-,093
Hannover Rueckversicheru	-,007	-,027	-,022	-,028	-,021	-,017	-,030	-,019	-,005	-,007	**-,012**	-,008	-,019	-,014	-,064	-,083	-,049	-,039	-,020	-,013	,006	,011	,019	,029	,024	,021	,003	,005	-,003	-,011	-,030
Heidelbergcement	-,025	-,027	,001	-,006	,005	-,011	,012	,004	,035	,051	**,065**	,077	,049	,055	,040	,036	,019	,045	,037	,041	,054	,081	,090	,112	,062	,071	,089	,069	,063	,065	,071
Henkel VZO	-,002	-,005	-,012	-,008	,001	,004	,016	,002	,002	,003	**,018**	,027	,021	,002	,005	,008	-,004	,001	,002	-,002	-,010	-,025	-,026	-,010	-,038	-,052	-,038	-,003	-,009	,009	-,002
Infineon	-,011	-,013	-,017	-,014	-,024	-,027	-,020	-,022	-,011	-,019	**-,016**	-,025	-,016	,015	,010	,015	,022	,027	,034	,027	,022	,032	,045	,065	,072	,063	,069	,074	,067	,082	
Mercedes Benz Group	,003	,011	-,005	-,014	-,027	-,021	-,032	-,021	-,055	-,065	**-,055**	-,071	-,068	-,067	-,057	-,058	-,061	-,053	-,042	-,054	-,047	-,058	-,096	-,119	-,107	-,084	-,078	-,075	-,076	-,081	-,068
Merck	-,015	-,008	-,017	-,015	-,021	-,003	-,009	-,013	-,002	-,022	**-,029**	-,011	-,048	-,059	-,056	-,058	-,053	-,010	-,013	-,025	-,031	-,019	,007	,007	,042	,052	,046	,046	,064	,052	,051
MTU Aero	,004	,001	-,004	,007	,008	,012	-,002	,006	-,009	,000	**,011**	,030	,029	,071	,053	,045	,044	,046	,033	,065	,053	,075	,094	,077	,030	,048	,051	,070	,073	,106	,110
Munich Re Group	-,022	-,026	-,014	-,012	-,008	-,022	,001	,003	,026	,038	**,055**	,064	,048	,054	,041	,047	,054	,064	,051	,072	,075	,096	,111	,126	,090	,091	,092	,078	,077	,081	,085
Porsche	,046	,031	,016	-,008	-,009	-,003	,008	,024	,010	,016	**,010**	,047	,022	,004	,018	,025	,017	-,016	-,003	,019	,015	,000	-,006	-,020	-,020	-,028	,008	,050	,047	,038	,044
Qiagen	-,013	-,009	-,013	-,006	,002	,017	,016	,001	,005	-,025	**,005**	-,001	-,008	-,041	-,023	-,006	,015	,040	,063	,059	,061	,074	,090	,108	,126	,135	,137	,123	,131	,106	,102
Rheinmetall AG	,017	,043	,093	,078	,103	,122	,079	,054	,052	,067	**,080**	,058	,080	,108	,132	,101	,042	,043	,079	,110	,111	,097	,058	,043	-,062	-,076	-,038	-,039	-,071	-,066	-,092
RWE AG ST	-,004	-,017	-,019	-,017	,004	-,002	-,001	,007	-,023	-,040	**-,039**	-,059	-,057	-,027	-,024	-,035	-,020	-,062	-,083	-,067	-,071	-,115	-,066	-,074	-,089	-,098	-,106	-,112	-,087	-,092	-,096
SAP	,009	,007	,006	,007	,011	,009	,010	,000	-,001	,007	**,019**	,033	,042	,037	,038	,049	,062	,082	,078	,064	,068	,047	,043	,031	,056	,072	,068	,065	,064	,043	,036
Sartorius AG VZO	-,057	-,012	-,015	-,026	-,010	,018	-,009	-,015	-,072	-,114	**-,109**	-,139	-,126	-,150	-,137	-,124	-,092	-,063	-,048	-,060	-,066	-,029	-,002	,008	,052	,080	,070	,085	,127	,104	,104
Siemens AG	,006	,013	,006	,002	,004	,008	,011	-,001	,002	-,006	**-,028**	-,043	-,040	-,055	-,062	-,062	-,061	-,049	-,042	-,047	-,049	-,068	-,083	-,065	-,062	-,059	-,069	-,066	-,077	-,076	-,076
Siemens Energy AG	-,002	,023	,019	,031	,043	,031	-,024	-,025	-,060	-,076	**-,070**	-,078	-,084	-,066	-,060	-,062	-,075	-,053	-,059	-,064	-,115	-,146	-,130	-,136	-,168	-,144	-,113	-,090	-,108	-,105	-,111
Siemens Healthineers	-,016	-,014	-,015	-,023	-,013	-,003	-,017	-,034	-,057	-,068	**-,145**	-,147	-,161	-,181	-,186	-,175	-,160	-,124	-,107	-,113	-,109	-,074	-,084	-,077	-,069	-,050	-,084	-,077	-,083	-,099	-,098
Symrise AG	-,003	,009	,004	,004	,003	,004	-,006	,002	-,003	-,037	**-,028**	-,033	-,015	,015	,016	,031	,039	,074	,073	,059	,060	,063	,079	,096	,108	,123	,103	,095	,115	,082	,087
Volkswagen VZO	,026	,021	,010	,005	,009	,034	,042	,054	,042	,048	**,051**	,068	,052	,054	,071	,073	,061	,042	,033	,044	,023	-,005	-,006	-,005	-,013	-,034	-,008	,034	,023	,019	,019
Vonovia	-,010	,002	-,002	,003	,009	,008	-,027	-,036	-,074	-,042	**-,052**	-,067	-,039	-,052	-,032	-,028	-,033	-,019	-,037	-,035	-,045	-,070	-,067	-,113	-,097	-,077	-,081	-,109	-,113	-,108	-,097
Zalando SE	-,059	-,033	-,065	-,039	-,077	-,074	-,135	-,121	-,130	-,178	**-,163**	-,245	-,218	-,221	-,235	-,211	-,193	-,225	-,205	-,225	-,222	-,188	-,140	-,172	-,188	-,146	-,109	-,103	-,122	-,117	-,140

Abnormal Return (AR)	FOMC Event 4																													
	Event Window																													
Company	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	**0**	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Adidas	,018	-,016	,010	,019	,034	-,007	,012	,010	,002	-,024	**-,056**	,024	-,008	,021	-,018	,013	,020	-,011	,012	-,019	,012	-,005	-,001	-,002	-,004	,002	-,014	,004	-,022	,001	,015
Airbus Group	,021	,007	,005	-,006	-,024	-,009	,003	,007	,005	,004	**,002**	-,042	-,002	-,024	,005	-,002	-,011	,017	,000	,018	-,007	,001	-,004	,001	,007	,005	-,006	-,004	,003	,001	,000
Allianz	-,009	-,018	-,006	-,003	-,012	-,002	-,002	-,002	,005	,003	**-,004**	-,010	,009	,006	-,009	,008	-,003	-,010	-,001	,014	-,011	,003	,005	-,014	,000	,005	,001	-,004	,006	,003	-,007
BASF	-,011	-,003	-,005	,023	,016	,003	-,018	-,012	,005	-,011	**-,019**	,013	,004	-,001	,013	-,008	,003	,004	,009	-,004	-,003	-,021	,009	-,003	,009	-,022	,013	,005	-,015	,019	-,006
Bayer	,002	-,019	,002	-,010	,028	,014	-,024	-,012	,017	,005	**-,016**	-,008	-,012	-,006	,023	,005	-,030	-,066	-,013	-,008	-,015	-,005	,042	-,013	,008	-,004	,008	,013	-,003	,002	-,003
Beiersdorf AG	,012	,000	-,013	,004	,003	-,015	,007	,005	,000	,015	**-,006**	-,005	-,006	,015	-,001	-,003	,019	-,022	,004	-,002	-,002	-,006	-,004	,004	,003	,006	-,001	,011	,009	-,013	,024
BMW ST	-,013	,018	,008	,003	-,003	-,006	-,006	,002	,015	-,015	**,000**	,014	-,005	,005	,017	-,068	-,011	,012	,009	,000	-,003	-,003	,002	-,008	,006	-,002	,001	-,014	-,011	,023	-,008
Brenntag AG	-,007	,002	,011	,019	-,004	-,001	,036	,002	-,005	,000	**-,002**	,015	,010	,009	-,007	-,010	,006	-,004	-,007	-,001	,022	,007	-,003	,003	,002	,010	,004	-,005	-,007	,003	-,004
Commerzbank	,009	-,017	-,008	,027	,022	,002	,012	-,049	,011	-,004	**,011**	-,001	,001	,006	,004	,007	,016	,029	-,044	-,007	-,020	,004	,020	-,005	-,009	,010	-,013	-,025	-,016	-,008	-,001
Continental AG	,006	-,012	,014	,026	,003	,010	,011	-,017	,010	-,013	**-,036**	,001	,001	-,008	-,018	,042	-,028	-,008	,010	-,050	,018	-,019	,011	-,024	,018	-,020	,008	-,013	-,008	,007	-,011
Covestro	,008	,009	-,012	,014	,028	,000	-,016	-,015	-,003	-,017	**-,001**	,000	,002	-,004	,018	-,002	-,025	,009	-,007	-,009	,005	-,033	,016	-,009	,015	-,028	,015	,003	-,040	,027	-,005
Daimler Truck Holding	-,033	,005	,010	,011	,013	-,017	-,003	-,008	,017	-,012	**,030**	-,002	-,010	,004	,008	,003	,000	,003	,016	-,001	,000	,000	-,003	-,008	,002	,005	-,003	-,025	-,011	,017	-,019
Deutsche Bank AG	-,001	-,001	-,001	-,001	-,001	-,001	-,001	-,001	-,001	-,001	**-,001**	-,001	-,001	-,001	-,001	-,001	-,001	-,001	-,001	-,001	-,001	-,001	-,001	-,001	-,001	-,001	-,001	-,001	-,001	-,001	-,001
Deutsche Boerse	,000	,012	-,022	,024	,007	-,001	,011	-,024	,015	-,008	**-,024**	,023	,001	-,014	,004	,004	-,001	,024	-,007	,007	-,006	,005	,012	-,015	-,007	,016	-,006	-,026	,019	-,002	,000
Deutsche Post	,009	-,022	-,018	,004	-,004	,007	,010	-,025	,003	,003	**,020**	,016	,003	,014	-,004	,007	-,007	,003	-,001	,005	-,019	-,016	-,037	,025	-,009	,011	,010	,004	,011	-,011	,011
Deutsche Telekom AG	,011	,013	-,010	,002	-,006	,022	,007	-,011	-,001	-,010	**-,006**	,011	,016	,014	-,010	,006	,005	,054	-,036	-,007	,005	,003	-,021	,007	,005	,005	-,006	,001	-,007	-,010	-,005
E.ON SE	,001	-,010	-,003	-,014	-,013	-,011	-,006	-,032	,003	,002	**,016**	-,013	-,005	,007	,012	-,019	-,007	,013	-,007	,018	-,016	,004	-,020	,002	,013	,001	-,008	,012	,021	-,010	-,004
Fresenius SE	,006	-,002	-,003	-,004	,027	,006	-,035	,042	-,001	,002	**,009**	-,001	,019	-,002	,020	-,021	,000	,005	,023	,022	-,030	,031	,016	-,005	,012	-,016	-,010	,011	-,015	,006	-,028
Hannover Rueckversicheru	-,019	-,003	,005	-,017	,008	-,017	-,011	,015	,009	,019	**-,021**	-,086	-,012	-,005	-,026	-,006	,004	,019	-,006	,007	,001	,002	-,009	,003	,008	-,012	,011	,011	,053	,004	-,017
Heidelbergcement	,006	-,008	,001	,006	-,013	-,019	-,008	,013	-,003	,008	**-,007**	-,020	,002	,001	,004	,010	,016	-,001	-,001	,028	-,020	,009	,012	,002	-,006	-,005	,002	,003	,012	,001	,002
Henkel VZO	-,010	,002	,002	,015	,013	-,012	-,006	,002	,004	-,017	**,010**	-,009	,020	-,015	-,002	,020	,016	,006	-,006	-,001	,008	-,005	-,007	,008	-,001	-,018	-,005	-,004	-,011	,002	-,028
Infineon	,014	-,009	-,004	-,001	-,002	-,012	,010	-,005	,003	,016	**-,008**	-,005	,004	,006	,004	,008	,005	,001	,010	,007	-,005	-,004	,002	,005	,008	,024	,001	,005	,009	,000	-,001
Mercedes Benz Group	,014	,020	-,013	,009	-,012	,019	,026	-,016	,004	-,006	**,030**	,003	,014	,007	-,006	,035	,020	-,025	-,012	-,035	,018	,011	-,006	-,002	-,008	-,025	,020	-,004	-,005	,007	-,003
Merck	-,001	-,004	-,003	-,057	,011	,001	,060	-,015	,014	,003	**,001**	,013	-,005	-,005	-,011	-,003	,006	-,003	,002	-,004	,011	-,004	-,025	,011	-,016	,008	-,009	,007	,004	-,014	,009
MTU Aero	,004	,004	,010	,006	-,009	,005	,003	,009	-,004	,017	**-,034**	,000	-,025	,009	-,004	-,009	-,014	-,004	,006	,011	-,008	,014	-,011	,020	,000	,011	-,011	-,007	,005	,006	-,006
Munich Re Group	,003	-,013	-,005	-,003	-,012	-,011	-,008	,000	,007	,008	**-,005**	-,019	-,001	-,003	,002	,005	-,008	,011	,006	,027	-,001	,000	,008	-,002	-,003	,001	-,004	,001	,014	,003	,003
Porsche	,005	,006	,016	,013	-,020	-,007	-,011	,004	-,008	,000	**-,008**	,022	-,011	,000	,009	,008	-,009	,010	-,001	-,007	-,005	-,013	-,028	-,004	,016	,004	-,007	-,015	-,011	,024	,004
Qiagen	-,005	-,008	,007	-,019	-,006	-,004	,039	-,013	-,010	,004	**,006**	,029	,003	-,008	,000	,005	-,007	-,006	,000	-,016	,004	,011	-,008	,001	-,020	-,002	-,009	,002	,014	-,012	,020
Rheinmetall AG	-,025	-,039	,033	,008	,008	-,022	-,049	,001	-,014	-,011	**,027**	-,005	-,033	,046	,026	,005	-,037	-,121	,001	-,020	-,016	,021	-,007	,013	,032	-,010	-,026	-,018	-,027	,004	-,018
RWE AG ST	-,004	-,007	,018	,002	,023	-,009	-,026	,005	,009	,012	**,022**	,010	-,001	,002	-,004	-,011	,004	,021	,015	,013	-,005	-,007	,001	-,006	,021	,000	-,008	,009	,003	,009	,009
SAP	-,008	,011	,004	,000	,003	,012	-,026	,045	-,019	-,001	**-,008**	,005	-,003	,012	-,020	,016	,007	-,001	,003	-,003	,007	-,005	-,003	,002	-,013	,004	-,001	,008	-,003	-,011	,002
Sartorius AG VZO	,001	-,003	-,001	-,036	-,004	,015	,080	,013	-,043	,008	**,013**	,020	,029	,006	-,005	-,016	-,011	-,031	,012	-,012	,016	,046	-,013	,013	-,011	,033	-,002	,003	,008	-,029	,040
Siemens AG	,001	,024	,005	,001	,007	,013	,006	-,017	-,005	-,003	**,009**	,003	,002	-,014	-,003	-,004	,008	,004	-,005	-,010	,008	,008	,007	,001	-,011	-,001	,008	-,003	-,009	-,001	,013
Siemens Energy AG	-,005	,005	-,019	,021	,004	,011	,002	,021	-,017	-,029	**,030**	,058	,011	-,040	-,012	,003	,038	,034	-,016	-,024	,047	-,007	-,017	,009	-,006	,006	,002	-,018	-,025	,008	,005
Siemens Healthineers	,001	-,004	,016	-,019	,002	-,018	,042	-,013	-,019	,022	**-,001**	-,003	,003	,007	-,013	-,018	,033	,010	,004	-,009	,006	,013	-,017	-,014	-,003	,008	-,015	,001	-,013	-,009	,014
Symrise AG	,005	-,016	,002	,003	,003	-,003	,027	,013	-,017	,009	**,004**	,007	,013	-,005	,014	-,045	,016	-,028	,008	-,016	,019	,011	,001	,019	-,014	,012	,009	-,005	,003	-,015	,014
Volkswagen VZO	-,001	,010	,011	,019	,003	-,008	-,022	-,011	-,007	-,004	**-,003**	,026	-,007	,011	,025	,008	-,013	,008	,005	-,004	,006	,008	,000	,010	-,004	,004	,007	-,005	-,012	,023	-,006
Vonovia	,013	-,003	-,003	,012	,008	,007	,018	,067	-,029	-,017	**,030**	,026	,004	-,025	,001	-,001	-,048	,011	,016	-,007	,016	-,010	,018	-,005	,009	-,033	,005	-,026	,002	,010	,002
Zalando SE	-,020	,037	-,024	,045	,005	,023	,009	,046	-,023	-,083	**,012**	-,035	,049	-,009	-,025	,048	,127	,000	,008	-,040	,049	,024	-,004	-,016	-,027	-,045	-,050	,001	-,025	-,002	,005

Cumulative Abnormal Return (CAR)	FOMC Event 4																													
	Event Window																													
Company	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	**0**	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Adidas	,018	,002	,012	,030	,064	,057	,068	,078	,080	,057	**,001**	,025	,016	,037	,019	,031	,051	,040	,052	,032	,044	,039	,038	,037	,032	,034	,020	,024	,002	,003	,018
Airbus Group	,021	,028	,033	,027	,004	-,005	-,002	,004	,009	,014	**,016**	-,026	-,029	-,053	-,048	-,050	-,061	-,044	-,043	-,025	-,033	-,032	-,036	-,035	-,029	-,024	-,030	-,035	-,032	-,031	-,031
Allianz	-,009	-,027	-,033	-,036	-,048	-,050	-,052	-,054	-,049	-,046	**-,050**	-,060	-,051	-,045	-,055	-,047	-,051	-,061	-,061	-,048	-,059	-,056	-,051	-,065	-,064	-,060	-,059	-,063	-,057	-,054	-,061
BASF	-,011	-,014	-,019	,004	,020	,022	,004	-,008	-,003	-,014	**-,033**	-,020	-,017	-,017	-,004	-,012	-,010	-,006	,003	-,001	-,004	-,026	-,017	-,020	-,011	-,033	-,020	-,016	-,031	-,012	-,018
Bayer	,002	-,017	-,015	-,025	,003	,017	-,007	-,019	-,002	,003	**-,013**	-,021	-,032	-,038	-,015	-,010	-,040	-,106	-,119	-,127	-,142	-,147	-,105	-,118	-,110	-,114	-,106	-,092	-,095	-,093	-,096
Beiersdorf AG	,012	,012	-,001	,004	,007	-,009	-,002	,003	,003	,017	**,011**	,006	,000	,015	,014	,011	,030	,008	,012	,010	,008	,002	-,003	,001	,004	,010	,009	,020	,030	,016	,040
BMW ST	-,013	,004	,012	,015	,012	,006	,000	,002	,017	,002	**,002**	,016	,011	,016	,033	-,035	-,045	-,034	-,024	-,025	-,028	-,031	-,029	-,037	-,031	-,032	-,031	-,045	-,056	-,033	-,040
Brenntag AG	-,007	-,005	,005	,024	,020	,019	,054	,057	,052	,052	**,050**	,065	,075	,084	,077	,067	,072	,068	,061	,059	,082	,089	,085	,088	,090	,100	,103	,099	,091	,094	,091
Commerzbank	,009	-,008	-,016	,011	,034	,036	,048	-,002	,009	,005	**,016**	,015	,016	,021	,026	,033	,049	,078	,035	,028	,007	,011	,032	,026	,017	,027	,014	-,011	-,027	-,035	-,036
Continental AG	,006	-,007	,008	,033	,037	,046	,057	,040	,050	,037	**,001**	,002	,003	-,005	-,023	,019	-,009	-,017	-,008	-,057	-,039	-,058	-,047	-,071	-,054	-,074	-,066	-,079	-,087	-,080	-,091
Covestro	,008	,017	,005	,019	,048	,048	,032	,017	,014	-,003	**-,005**	-,004	-,003	-,006	,011	,010	-,015	-,006	-,013	-,023	-,018	-,051	-,035	-,044	-,029	-,058	-,042	-,040	-,080	-,053	-,059
Daimler Truck Holding	-,033	-,028	-,018	-,006	,007	-,010	-,013	-,021	-,004	-,015	**,014**	,012	,002	,006	,014	,017	,017	,020	,036	,035	,035	,035	,032	,024	,026	,031	,028	,004	-,007	,010	-,009
Deutsche Bank AG	-,001	-,002	-,003	-,004	-,005	-,006	-,006	-,007	-,008	-,009	**-,010**	-,011	-,012	-,013	-,014	-,015	-,016	-,017	-,018	-,019	-,020	-,021	-,021	-,022	-,023	-,024	-,025	-,026	-,027	-,028	-,029
Deutsche Boerse	,000	,012	-,010	,014	,021	,020	,031	,007	,022	,015	**-,009**	,014	,015	,001	,005	,008	,008	,032	,025	,032	,027	,031	,043	,028	,021	,037	,031	,004	,024	,021	,021
Deutsche Post	,009	-,014	-,032	-,027	-,031	-,025	-,015	-,040	-,037	-,034	**-,014**	,001	,004	,018	,015	,021	,014	,017	,016	,022	,002	-,014	-,051	-,025	-,034	-,023	-,013	-,009	,002	-,008	,003
Deutsche Telekom AG	,011	,024	,014	,016	,010	,032	,040	,029	,028	,018	**,011**	,023	,038	,052	,042	,048	,053	,107	,071	,065	,069	,073	,051	,059	,063	,069	,062	,064	,057	,047	,042
E.ON SE	,001	-,009	-,012	-,026	-,038	-,049	-,055	-,086	-,084	-,081	**-,066**	-,079	-,084	-,077	-,065	-,084	-,091	-,078	-,085	-,067	-,083	-,080	-,099	-,097	-,084	-,083	-,091	-,079	-,058	-,069	-,073
Fresenius SE	,006	,004	,001	-,002	,025	,030	-,005	,038	,037	,039	**,048**	,047	,066	,064	,085	,064	,063	,068	,091	,112	,082	,113	,129	,124	,136	,120	,110	,120	,105	,111	,083
Hannover Rueckversicheru	-,019	-,022	-,017	-,034	-,026	-,043	-,054	-,040	-,031	-,012	**-,033**	-,120	-,132	-,136	-,162	-,168	-,164	-,146	-,151	-,144	-,143	-,141	-,150	-,147	-,139	-,151	-,139	-,128	-,075	-,071	-,088
Heidelbergcement	,006	-,003	-,002	,004	-,009	-,028	-,036	-,023	-,026	-,018	**-,025**	-,045	-,042	-,041	-,038	-,028	-,012	-,013	-,014	,014	-,006	,003	,014	,017	,011	,005	,008	,010	,023	,023	,025
Henkel VZO	-,010	-,008	-,007	,008	,021	,009	,004	,006	,010	-,007	**,002**	-,006	,013	-,001	-,003	,017	,032	,039	,033	,032	,040	,034	,028	,036	,035	,017	,012	,008	-,003	-,001	-,029
Infineon	,014	,005	,001	,000	-,002	-,014	-,004	-,009	-,006	,010	**,002**	-,003	,001	,008	,012	,020	,025	,026	,036	,044	,038	,034	,036	,041	,049	,072	,073	,078	,087	,087	,086
Mercedes Benz Group	,014	,034	,022	,031	,019	,038	,064	,047	,051	,045	**,075**	,078	,092	,099	,093	,128	,147	,123	,111	,075	,094	,105	,099	,097	,089	,064	,085	,081	,076	,084	,080
Merck	-,001	-,005	-,008	-,065	-,054	-,053	,007	-,008	,006	,009	**,010**	,023	,018	,013	,002	-,001	,005	,003	,004	,000	,011	,007	-,018	-,007	-,023	-,015	-,025	-,018	-,013	-,027	-,018
MTU Aero	,004	,008	,018	,024	,015	,021	,024	,033	,029	,046	**,012**	,013	-,012	-,003	-,007	-,016	-,029	-,033	-,027	-,015	-,023	-,010	-,021	-,001	,000	,011	,000	-,007	-,002	,004	-,003
Munich Re Group	,003	-,010	-,015	-,017	-,029	-,040	-,048	-,048	-,041	-,034	**-,039**	-,058	-,059	-,062	-,059	-,054	-,062	-,051	-,045	-,017	-,018	-,018	-,010	-,012	-,015	-,014	-,018	-,017	-,003	-,001	,003
Porsche	,005	,011	,028	,041	,021	,014	,003	,007	,000	,000	**-,008**	,015	,004	,004	,013	,021	,012	,022	,021	,014	,009	-,004	-,032	-,036	-,020	-,016	-,023	-,038	-,049	-,025	-,021
Qiagen	-,005	-,013	-,005	-,024	-,030	-,034	,005	-,008	-,018	-,015	**-,009**	,020	,023	,015	,015	,020	,013	,006	,006	-,010	-,006	,005	-,003	-,002	-,022	-,024	-,033	-,031	-,017	-,029	-,009
Rheinmetall AG	-,025	-,064	-,031	-,023	-,015	-,037	-,085	-,084	-,099	-,110	**-,083**	-,088	-,121	-,076	-,049	-,044	-,081	-,202	-,201	-,221	-,237	-,216	-,223	-,210	-,178	-,189	-,214	-,232	-,259	-,255	-,273
RWE AG ST	-,004	-,011	,007	,009	,032	,023	-,003	,002	,011	,023	**,045**	,055	,054	,056	,052	,041	,045	,065	,080	,094	,089	,082	,083	,077	,099	,099	,091	,100	,103	,112	,121
SAP	-,008	,003	,008	,008	,010	,022	-,004	,041	,022	,021	**,013**	,018	,015	,027	,007	,023	,030	,029	,032	,029	,036	,031	,028	,030	,017	,021	,019	,027	,024	,013	,015
Sartorius AG VZO	,001	-,002	-,003	-,039	-,042	-,027	,053	,066	,023	,030	**,044**	,064	,093	,099	,094	,078	,067	,036	,048	,037	,053	,098	,086	,098	,087	,120	,118	,121	,129	,099	,139
Siemens AG	,001	,025	,030	,030	,038	,051	,057	,040	,036	,033	**,042**	,044	,046	,032	,030	,026	,034	,038	,033	,023	,030	,038	,045	,046	,035	,034	,041	,038	,030	,029	,042
Siemens Energy AG	-,005	,000	-,019	,002	,006	,016	,019	,040	,023	-,006	**,023**	,081	,092	,053	,041	,044	,082	,116	,100	,076	,123	,116	,099	,108	,102	,108	,109	,091	,066	,074	,080
Siemens Healthineers	,001	-,003	,013	-,006	-,004	-,022	,020	,008	-,011	,011	**,010**	,007	,010	,017	,003	-,015	,018	,028	,032	,023	,029	,042	,025	,011	,009	,017	,002	,003	-,010	-,018	-,004
Symrise AG	,005	-,010	-,008	-,005	-,002	-,005	,022	,036	,019	,027	**,032**	,039	,052	,047	,061	,016	,032	,003	,011	-,004	,015	,026	,027	,046	,032	,045	,053	,049	,051	,037	,050
Volkswagen VZO	-,001	,009	,019	,038	,042	,034	,012	,000	-,007	-,011	**-,015**	,011	,004	,014	,039	,047	,034	,043	,048	,044	,050	,059	,059	,069	,065	,069	,076	,071	,059	,082	,076
Vonovia	,013	,010	,007	,019	,027	,034	,052	,118	,089	,073	**,102**	,129	,133	,107	,108	,107	,059	,070	,086	,079	,095	,084	,103	,097	,107	,074	,079	,053	,055	,065	,067
Zalando SE	-,020	,017	-,007	,038	,043	,067	,076	,121	,098	,016	**,028**	-,008	,041	,032	,007	,055	,183	,182	,191	,151	,200	,224	,220	,204	,177	,133	,083	,084	,059	,057	,062

Abnormal Return (AR)	FOMC Event 5 Event Window																													
Company	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	**0**	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Adidas	-,020	,004	,007	,003	-,027	,008	-,035	,006	,007	,003	**-,002**	-,004	,001	-,002	-,014	,020	-,031	-,053	-,007	,023	-,015	-,004	-,036	-,011	,012	-,024	-,004	,002	,019	-,008	-,020
Airbus Group	-,015	,004	-,016	,014	-,007	-,009	,001	-,018	,015	-,008	**,010**	,007	,016	-,001	-,012	-,010	,006	-,003	-,004	,024	-,002	,001	,007	,008	,013	-,003	,028	-,013	,010	,002	,008
Allianz	-,020	,008	-,008	,022	,005	-,001	,014	,020	-,005	-,003	**-,008**	,021	-,001	-,013	-,005	-,022	,010	,002	-,010	-,003	,006	-,003	,012	,003	,003	,002	-,002	-,001	,000	-,009	,014
BASF	,018	-,010	,009	,009	,000	-,020	-,007	-,004	,020	-,009	**-,005**	,002	-,010	,005	-,001	-,006	,003	,008	,026	-,005	,003	-,012	,002	,061	-,036	,020	,005	,002	,001	,010	,005
Bayer	-,012	,018	,004	-,001	,012	,010	-,006	,001	-,002	,004	**-,006**	,006	-,018	-,020	,005	-,005	,007	-,018	,004	-,023	,012	-,016	,010	,002	,023	,020	-,003	-,023	,008	-,019	,002
Beiersdorf AG	,000	-,011	,004	,002	,009	,008	,006	,003	-,011	,019	**-,003**	-,020	,021	,022	,012	-,006	,007	-,004	-,033	-,013	,014	,007	,013	-,011	,012	,003	-,027	,002	-,019	-,006	-,006
BMW ST	,014	-,014	-,007	,007	,004	,009	,006	,013	,013	,002	**-,005**	,004	-,018	,016	,002	-,006	-,017	,001	,003	-,008	-,007	,011	,012	,005	,009	,015	-,001	,004	,003	,005	,002
Brenntag AG	-,012	,002	,006	,011	,003	,000	-,020	-,019	,023	,004	**-,013**	-,002	-,007	-,006	-,016	,020	,005	,010	,009	,000	-,003	-,010	-,013	,015	-,083	-,026	-,004	-,012	,009	,006	,009
Commerzbank	-,027	,055	,025	,009	-,004	,032	,031	,013	,008	,016	**-,019**	,040	-,019	-,010	-,018	-,041	,003	,012	-,014	,010	-,026	,003	,020	,002	-,027	,016	,032	,002	-,002	,011	-,003
Continental AG	,013	-,024	,014	,008	-,022	,000	-,003	,024	-,007	-,002	**-,020**	-,009	-,071	-,012	,010	-,001	-,049	,015	,019	,001	-,044	,019	,036	,001	,002	-,026	,029	-,006	,015	-,008	-,006
Covestro	,020	,003	,015	-,005	-,010	-,026	-,013	-,003	,029	,000	**-,001**	,012	-,008	,014	,004	-,002	,005	,012	,025	,011	-,003	-,003	-,003	,082	-,031	,020	,017	-,009	-,007	,012	,020
Daimler Truck Holding	,012	-,018	,010	,028	-,001	,003	,002	,007	,004	,001	**-,002**	-,003	-,019	,021	,003	-,005	-,020	-,013	,004	,000	-,024	,019	-,007	-,011	,020	,002	,001	-,002	,009	,025	,008
Deutsche Bank AG	-,004	,001	-,014	-,024	,016	,012	,006	,017	-,005	,010	**-,008**	,018	,020	,005	,007	-,004	,017	-,012	-,008	-,038	,012	,004	,016	,000	,004	,004	-,015	-,007	-,017	-,009	,002
Deutsche Boerse	-,023	,056	,018	,008	-,005	,012	,029	-,001	-,002	-,002	**-,026**	,043	-,025	-,012	-,036	-,037	-,016	-,005	-,010	,020	-,005	-,005	,010	,018	-,019	,005	,058	,023	-,015	,017	,006
Deutsche Post	,006	,006	-,012	-,013	,014	,017	,005	,006	,003	-,001	**-,004**	,004	,006	,006	,011	-,001	,023	-,010	-,001	-,026	,025	-,013	-,003	-,006	,002	-,015	-,016	-,008	-,013	,001	-,007
Deutsche Telekom AG	-,006	-,008	,012	,009	-,002	-,009	-,003	-,049	,000	-,003	**-,027**	-,015	-,020	-,001	,019	,011	,007	,010	,008	-,001	-,011	,005	-,021	,048	,004	,010	-,007	,009	-,006	,013	,001
E.ON SE	,000	-,003	,024	-,033	,009	,002	,007	,005	,001	-,003	**-,010**	,013	,006	-,022	,006	,000	,003	-,020	,013	-,007	-,013	-,013	,013	,006	,004	,005	-,024	,009	-,003	-,010	,011
Fresenius SE	,007	-,007	,008	-,016	,012	-,010	-,019	,004	-,012	-,024	**,011**	,016	-,001	-,011	-,024	,009	,017	-,015	,020	-,022	-,010	-,025	,006	,009	-,023	-,021	,013	,026	,003	-,003	-,001
Hannover Rueckversicherı	-,009	-,019	,025	,010	,007	-,018	,014	,007	-,030	-,019	**-,030**	-,017	-,011	,013	-,013	-,001	-,003	,023	-,014	-,004	-,024	,000	-,019	-,023	,011	-,021	-,007	-,016	,007	-,001	,047
Heidelbergcement	,002	,022	-,001	,005	,020	-,008	,015	,010	-,007	-,013	**,012**	,000	,007	-,016	-,001	-,014	,047	-,004	-,011	-,006	,018	-,017	,005	-,010	,000	,014	-,021	,005	-,013	-,011	,009
Henkel VZO	,006	,007	-,008	,016	-,025	-,007	,012	,001	-,003	-,035	**-,006**	-,018	-,010	,017	,003	-,010	-,011	,020	,008	,005	-,016	-,008	-,004	,040	-,020	-,023	,005	-,007	,005	,029	,010
Infineon	-,008	-,012	,002	-,013	,020	,003	,000	,018	-,008	-,002	**-,006**	,017	,012	-,003	,001	,004	,012	-,001	-,006	-,017	,006	-,006	,007	,010	,012	-,006	-,015	,005	-,004	,000	-,003
Mercedes Benz Group	,005	,009	,015	-,004	-,034	,008	,003	,003	,004	,007	**,019**	-,027	-,015	,006	,017	-,010	-,017	,007	,009	,033	,043	,008	-,021	-,025	-,026	,010	,014	-,020	,010	,004	,003
Merck	-,005	,001	-,005	-,011	-,005	,005	,012	-,022	,011	-,008	**-,002**	-,010	,000	,002	,009	,020	,024	,008	-,001	-,004	,008	-,012	,000	-,017	,007	-,006	-,011	,020	-,008	-,002	-,043
MTU Aero	-,012	-,001	-,012	,001	-,034	-,003	-,008	-,025	,019	-,015	**,012**	,014	-,004	,025	-,005	-,003	,007	-,005	-,008	,007	,004	-,008	,013	,005	,016	-,017	,030	-,006	,011	,012	,009
Munich Re Group	,012	,021	-,017	,013	,022	-,011	,010	,008	-,015	-,006	**,004**	,010	,006	-,015	-,010	-,009	,041	-,004	-,012	,002	,018	-,022	,015	-,021	-,016	,001	-,005	,007	-,014	-,006	,019
Porsche	-,009	-,017	-,027	,013	-,011	,016	-,005	,015	,030	,049	**-,006**	,023	-,010	,001	-,013	-,014	-,092	-,050	-,022	,014	,001	,030	-,001	-,040	-,014	,014	-,016	-,010	,010	-,008	-,012
Qiagen	-,008	,011	-,014	-,026	-,002	,003	,003	-,017	-,010	,010	**-,002**	-,007	,021	-,001	,017	-,001	,003	,007	-,007	-,016	,011	,024	-,008	-,043	,064	,002	-,004	-,005	-,005	-,006	-,039
Rheinmetall AG	-,026	,010	-,013	-,003	-,017	-,020	-,014	,015	,032	,015	**,066**	-,022	,065	-,011	,013	,007	-,007	,009	-,053	-,044	-,003	,027	-,030	,001	,007	,021	-,049	,038	-,011	-,026	,059
RWE AG ST	,068	,005	-,008	-,021	,045	-,019	-,011	,016	,000	-,002	**,007**	,011	,006	-,029	-,007	,011	-,002	-,020	,011	-,007	,023	-,022	,016	-,039	-,015	,005	,021	,005	-,011	-,013	-,018
SAP	-,006	,003	-,001	-,010	,003	,004	-,006	,001	-,008	,009	**,007**	-,005	,003	,027	,002	,006	,002	,016	,000	,006	-,002	,014	,000	-,005	,001	-,005	-,006	,015	-,007	,007	-,009
Sartorius AG VZO	-,006	,020	-,003	-,013	-,011	,021	-,019	-,060	-,033	-,007	**,017**	-,047	,034	,007	-,008	,008	-,013	,016	,046	,039	-,022	,026	-,032	-,024	-,023	,006	-,002	,009	-,008	,021	-,183
Siemens AG	,006	-,012	,004	,001	-,012	-,005	-,001	-,002	,004	-,006	**,008**	,000	,015	,001	,004	,012	,005	,018	-,011	,016	-,008	,012	-,008	,012	-,003	-,003	,012	-,017	,011	,003	-,001
Siemens Energy AG	-,037	,013	-,003	,005	-,034	-,002	-,029	-,039	-,016	,009	**,008**	-,010	-,026	,026	,018	-,002	-,026	-,006	,008	,017	-,044	-,011	-,033	,013	-,022	-,024	,031	-,001	,012	,006	-,002
Siemens Healthineers	-,008	,010	-,007	-,021	-,023	-,005	-,011	-,020	-,010	-,002	**-,017**	-,030	,017	,017	-,003	,009	,020	,042	,006	-,003	-,007	,002	,001	-,002	,010	-,044	-,013	,009	-,001	,012	-,007
Symrise AG	,002	-,008	-,001	-,010	-,012	-,008	-,011	,007	,000	,018	**,016**	-,015	,042	,001	-,001	-,003	-,008	,018	-,014	-,010	,015	-,006	-,002	-,003	-,027	,011	-,046	,010	,003	-,004	,007
Volkswagen VZO	-,004	-,017	-,008	,010	-,006	,023	-,001	-,009	,006	,010	**-,001**	,015	-,029	-,009	-,004	,005	-,051	-,028	-,008	,001	-,001	,025	,000	-,045	-,005	,002	-,006	-,006	,011	,011	-,002
Vonovia	-,003	-,030	,001	-,001	-,034	-,019	-,006	,021	-,025	-,018	**-,006**	-,025	,006	-,020	-,011	,033	-,020	,045	,016	-,037	-,035	-,009	-,022	-,032	,023	-,051	-,027	,058	,036	-,017	-,018
Zalando SE	-,017	-,020	,017	,027	-,067	-,009	,018	,005	-,021	,013	**-,009**	-,045	-,003	,013	,028	,025	-,045	,030	,000	,045	-,040	,036	-,029	,002	,051	-,012	,026	,000	,028	-,003	-,015

Cumulative Abnormal Return (CAR)	FOMC Event 5 Event Window																													
Company	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	**0**	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Adidas	-,020	-,016	-,010	-,007	-,034	-,026	-,060	-,054	-,048	-,044	**-,046**	-,050	-,049	-,051	-,065	-,046	-,077	-,130	-,137	-,114	-,129	-,133	-,168	-,180	-,168	-,192	-,196	-,194	-,175	-,184	-,204
Airbus Group	-,015	-,011	-,028	-,013	-,020	-,030	-,029	-,046	-,032	-,039	**-,029**	-,023	-,007	-,008	-,020	-,030	-,024	-,027	-,031	-,007	-,009	-,009	-,001	,006	,019	,017	,045	,032	,041	,043	,051
Allianz	-,020	-,012	-,020	,002	,007	,006	,020	,040	,035	,032	**,024**	,045	,045	,031	,026	,004	,015	,017	,007	,005	,010	,007	,019	,022	,025	,027	,025	,024	,024	,015	,029
BASF	,018	,008	,017	,026	,026	,006	-,001	-,005	,015	,006	**,001**	,003	-,007	-,002	-,003	-,008	-,005	,002	,028	,024	,027	,015	,017	,078	,043	,063	,067	,069	,069	,080	,084
Bayer	-,012	,005	,010	,009	,020	,030	,024	,025	,023	,027	**,020**	,026	,008	-,011	-,007	-,011	-,004	-,022	-,019	-,042	-,030	-,046	-,036	-,033	-,010	,010	,007	-,016	-,008	-,027	-,025
Beiersdorf AG	,000	-,011	-,007	-,006	,003	,012	,017	,020	,010	,028	**,025**	,005	,026	,048	,060	,054	,061	,057	,024	,011	,024	,031	,044	,033	,045	,048	,021	,023	,004	-,001	-,007
BMW ST	,014	-,001	-,007	,000	,004	,013	,019	,032	,044	,046	**,041**	,045	,027	,043	,044	,038	,021	,022	,025	,017	,010	,021	,033	,038	,047	,062	,061	,065	,068	,073	,075
Brenntag AG	-,012	-,010	-,004	,007	,011	,010	-,010	-,028	-,005	-,001	**-,014**	-,016	-,023	-,029	-,045	-,025	-,019	-,009	-,001	,000	-,004	-,014	-,027	-,012	-,096	-,122	-,126	-,138	-,129	-,122	-,113
Commerzbank	-,027	,029	,054	,063	,060	,092	,123	,135	,143	,159	**,140**	,181	,161	,152	,133	,093	,096	,108	,093	,104	,077	,081	,101	,103	,075	,091	,123	,125	,124	,135	,132
Continental AG	,013	-,011	,003	,012	-,010	-,010	-,013	,011	,005	,003	**-,017**	-,026	-,096	-,108	-,098	-,099	-,149	-,134	-,115	-,113	-,157	-,138	-,102	-,101	-,099	-,125	-,096	-,102	-,088	-,096	-,101
Covestro	,020	,023	,037	,032	,022	-,004	-,017	-,021	,009	,009	**,008**	,020	,012	,026	,030	,028	,032	,045	,070	,081	,078	,075	,072	,155	,124	,143	,160	,151	,144	,156	,176
Daimler Truck Holding	,012	-,006	,004	,032	,030	,034	,036	,043	,047	,048	**,047**	,043	,024	,045	,047	,042	,022	,009	,014	,014	-,010	,009	,002	-,008	,011	,014	,015	,012	,021	,046	,054
Deutsche Bank AG	-,004	-,003	-,017	-,041	-,025	-,013	-,007	,009	,004	,015	**,007**	,026	,045	,050	,057	,053	,071	,059	,051	,013	,025	,029	,045	,045	,049	,053	,038	,031	,014	,005	,007
Deutsche Boerse	-,023	,033	,052	,060	,055	,066	,095	,094	,092	,090	**,065**	,107	,083	,071	,035	-,002	-,018	-,023	-,033	-,013	-,018	-,023	-,012	,006	-,013	-,008	,050	,074	,059	,075	,081
Deutsche Post	,006	,012	,000	-,013	,000	,017	,022	,027	,030	,030	**,026**	,030	,036	,042	,052	,051	,074	,065	,064	,038	,063	,050	,047	,041	,042	,027	,011	,003	-,010	-,009	-,016
Deutsche Telekom AG	-,006	-,015	-,002	,007	,005	-,004	-,007	-,056	-,056	-,059	**-,086**	-,101	-,120	-,121	-,102	-,092	-,085	-,075	-,068	-,069	-,080	-,075	-,096	-,048	-,044	-,035	-,042	-,033	-,039	-,026	-,025
E.ON SE	,000	-,003	,022	-,011	-,002	,000	,007	,013	,014	,011	**,001**	,013	,019	-,003	,003	,003	,007	-,013	,000	-,007	-,020	-,033	-,020	-,014	-,010	-,004	-,029	-,020	-,022	-,033	-,022
Fresenius SE	,007	,000	,007	-,009	,004	-,006	-,025	-,021	-,033	-,057	**-,047**	-,031	-,032	-,043	-,066	-,057	-,040	-,055	-,035	-,057	-,067	-,093	-,087	-,078	-,101	-,122	-,109	-,083	-,080	-,083	-,084
Hannover Rueckversicherı	-,009	-,028	-,003	,007	,014	-,004	,010	,017	-,013	-,032	**-,062**	-,078	-,090	-,076	-,089	-,090	-,093	-,070	-,084	-,088	-,112	-,112	-,131	-,154	-,143	-,164	-,171	-,186	-,179	-,180	-,133
Heidelbergcement	,002	,024	,023	,028	,048	,040	,055	,065	,059	,046	**,058**	,058	,065	,048	,047	,033	,080	,076	,066	,060	,077	,060	,065	,055	,055	,069	,048	,053	,040	,028	,037
Henkel VZO	,006	,013	,006	,022	-,003	-,010	,002	,003	,000	-,035	**-,041**	-,059	-,069	-,051	-,049	-,058	-,069	-,049	-,041	-,036	-,052	-,060	-,064	-,024	-,044	-,067	-,063	-,069	-,064	-,035	-,026
Infineon	-,008	-,020	-,019	-,031	-,011	-,008	-,008	,010	,002	,000	**-,006**	,011	,023	,019	,020	,025	,036	,036	,029	,012	,018	,012	,019	,030	,042	,036	,021	,027	,023	,023	,021
Mercedes Benz Group	,005	,013	,028	,024	-,011	-,003	,000	,003	,008	,014	**,033**	,006	-,008	-,002	,015	,005	-,012	-,005	,004	,037	,080	,087	,067	,041	,016	,025	,039	,019	,029	,033	,035
Merck	-,005	-,004	-,009	-,020	-,025	-,019	-,007	-,029	-,018	-,026	**-,028**	-,038	-,037	-,036	-,027	-,007	,017	,025	,024	,021	,029	,017	,017	,000	,007	,001	-,010	,010	,002	,001	-,042
MTU Aero	-,012	-,012	-,024	-,023	-,057	-,059	-,067	-,092	-,072	-,088	**-,076**	-,061	-,065	-,041	-,045	-,048	-,041	-,045	-,054	-,046	-,042	-,050	-,037	-,031	-,015	-,032	-,002	-,008	,004	,015	,024
Munich Re Group	,012	,033	,016	,029	,051	,040	,050	,058	,043	,036	**,041**	,051	,057	,042	,032	,023	,064	,061	,049	,051	,069	,047	,062	,041	,025	,026	,021	,028	,014	,008	,027
Porsche	-,009	-,026	-,053	-,040	-,051	-,035	-,040	-,025	,005	,054	**,048**	,071	,062	,063	,050	,037	-,056	-,106	-,128	-,114	-,113	-,084	-,085	-,125	-,139	-,125	-,141	-,151	-,141	-,148	-,161
Qiagen	-,008	,003	-,010	-,036	-,038	-,036	-,032	-,049	-,059	-,049	**-,050**	-,057	-,036	-,037	-,019	-,020	-,017	-,010	-,018	-,034	-,023	,001	-,006	-,049	,015	,017	,013	,008	,003	-,003	-,042
Rheinmetall AG	-,026	-,017	-,030	-,033	-,050	-,069	-,083	-,069	-,037	-,022	**,044**	,022	,087	,076	,089	,096	,089	,099	,046	,002	-,001	,026	-,004	-,002	,005	,026	-,023	,015	,004	-,023	,037
RWE AG ST	,068	,073	,065	,044	,089	,070	,058	,074	,074	,072	**,079**	,089	,096	,067	,060	,071	,069	,050	,061	,054	,077	,054	,071	,031	,017	,022	,043	,047	,036	,023	,006
SAP	-,006	-,003	-,004	-,014	-,011	-,007	-,013	-,012	-,020	-,011	**-,005**	-,010	-,007	,020	,021	,027	,028	,044	,045	,050	,048	,062	,062	,057	,058	,054	,047	,062	,055	,062	,052
Sartorius AG VZO	-,006	,014	,011	-,002	-,013	,007	-,011	-,072	-,105	-,112	**-,095**	-,142	-,108	-,102	-,110	-,102	-,115	-,099	-,053	-,014	-,036	-,010	-,043	-,067	-,090	-,083	-,086	-,076	-,084	-,064	-,247
Siemens AG	,006	-,006	-,002	-,002	-,014	-,019	-,021	-,023	-,019	-,025	**-,017**	-,017	-,001	,000	,003	,015	,020	,039	,028	,044	,036	,049	,041	,053	,050	,047	,059	,042	,053	,056	,054
Siemens Energy AG	-,037	-,023	-,026	-,021	-,055	-,058	-,086	-,125	-,141	-,132	**-,124**	-,134	-,159	-,134	-,116	-,118	-,144	-,150	-,143	-,126	-,170	-,180	-,213	-,201	-,223	-,247	-,216	-,217	-,205	-,200	-,202
Siemens Healthineers	-,008	,003	-,004	-,025	-,048	-,053	-,064	-,085	-,095	-,097	**-,114**	-,144	-,127	-,111	-,113	-,105	-,085	-,042	-,036	-,039	-,047	-,044	-,044	-,045	-,036	-,079	-,093	-,083	-,084	-,072	-,079
Symrise AG	,002	-,006	-,007	-,017	-,030	-,038	-,049	-,041	-,042	-,024	**-,008**	-,022	,020	,021	,020	,017	,009	,027	,012	,003	,017	,011	,009	,006	-,021	-,011	-,057	-,047	-,044	-,048	-,042
Volkswagen VZO	-,004	-,021	-,029	-,019	-,025	-,002	-,003	-,012	-,006	,003	**,003**	,017	-,012	-,021	-,025	-,020	-,071	-,099	-,106	-,105	-,106	-,081	-,081	-,126	-,131	-,129	-,135	-,141	-,130	-,119	-,121
Vonovia	-,003	-,033	-,032	-,033	-,067	-,086	-,092	-,071	-,095	-,114	**-,119**	-,144	-,138	-,158	-,169	-,136	-,156	-,111	-,096	-,133	-,168	-,176	-,198	-,230	-,207	-,258	-,286	-,227	-,192	-,209	-,226
Zalando SE	-,017	-,037	-,020	,007	-,061	-,069	-,052	-,046	-,067	-,054	**-,063**	-,108	-,111	-,098	-,071	-,046	-,090	-,060	-,059	-,014	-,055	-,019	-,048	-,046	,005	-,007	,019	,019	,047	,044	,029

Abnormal Return (AR)	FOMC Event 6																													
	Event Window																													
Company	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	**0**	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Adidas	-,017	-,008	-,089	-,019	-,042	,003	-,025	-,001	-,003	-,006	**-,011**	-,016	,184	,003	,031	,041	-,015	,055	-,034	-,002	-,003	-,006	-,012	-,031	-,012	,012	,011	-,019	-,006	,002	,009
Airbus Group	,008	,001	-,001	-,007	,001	-,001	,002	,032	-,006	,017	**,001**	,009	-,012	-,009	-,022	,001	-,051	-,009	-,011	,007	,013	-,015	-,003	,000	-,006	-,004	-,016	,004	-,043	,018	-,003
Allianz	,014	,001	,006	,005	-,004	-,007	,011	,006	,004	,006	**,008**	,011	-,007	-,009	-,005	,004	,028	-,002	,001	-,013	,019	-,005	,001	,001	,003	-,002	-,004	,002	,002	,010	-,009
BASF	,005	,007	,018	-,008	-,025	-,023	,010	-,018	,002	-,006	**-,002**	,000	,021	,010	,001	-,013	-,014	,030	,005	-,024	-,002	-,015	,000	-,015	,014	-,005	,003	-,005	-,001	,006	-,014
Bayer	,001	-,001	,005	,008	-,010	,009	,004	,009	,009	,006	**-,005**	,000	-,004	,003	-,057	-,028	-,004	-,029	,017	,037	-,008	-,004	,015	,013	,001	-,003	,012	-,002	,013	,004	-,013
Beiersdorf AG	-,007	,002	-,003	-,001	,009	-,021	-,036	-,005	,006	-,022	**-,012**	,005	,012	-,007	,006	,010	,006	-,031	,005	-,002	,029	,008	-,004	,012	-,003	,004	,009	-,005	,003	-,015	,008
BMW ST	,002	-,004	,001	-,012	-,007	-,002	,004	-,003	-,002	,002	**,006**	-,036	,015	,009	-,020	-,002	-,007	,010	,002	-,004	-,020	-,006	,009	-,003	,002	-,005	-,006	-,001	,005	,017	,015
Brenntag AG	,010	,008	-,008	,009	,003	,001	-,005	-,005	,005	,008	**,002**	-,001	-,002	,012	,000	,020	-,012	,013	-,022	-,007	-,013	-,008	-,003	,003	,018	,005	,010	,000	-,085	-,018	-,012
Commerzbank	-,005	,004	,012	-,009	-,011	-,018	,001	-,009	-,026	,007	**-,005**	,003	-,023	,002	-,030	-,072	-,049	-,020	,013	,018	,010	-,006	-,015	,010	-,014	-,018	,012	-,019	-,003	,016	-,008
Continental AG	-,003	,022	,000	,002	-,015	-,012	,016	-,017	,012	,007	**-,025**	-,022	,060	,011	,006	-,010	,027	,024	-,005	-,025	-,032	-,035	,003	,002	-,001	-,006	,008	,001	,012	,021	-,013
Covestro	,021	,020	,002	-,025	-,048	,008	,002	-,019	-,004	-,022	**-,001**	-,010	,045	,026	-,006	-,035	-,035	,044	-,007	-,023	-,018	-,007	,011	-,030	,043	,006	,026	-,018	,004	,036	-,004
Daimler Truck Holding	,008	-,011	,002	,007	-,014	-,003	-,004	-,014	,006	,001	**-,011**	-,005	,015	-,006	,000	-,011	,013	,016	-,006	-,002	-,050	-,018	,018	-,001	,000	-,002	-,003	-,003	-,001	,019	,026
Deutsche Bank AG	-,001	,000	-,001	,002	,001	,001	,000	,000	,000	,000	**-,002**	-,002	,003	,000	,001	-,001	,005	,000	,000	,000	-,002	,000	,001	-,001	,000	-,001	,001	-,001	-,002	-,001	,000
Deutsche Boerse	,006	,001	,000	,003	,003	-,003	,049	-,007	-,019	-,002	**,015**	,000	-,029	-,004	-,005	-,016	-,020	,017	-,013	,007	-,004	-,007	-,005	,005	-,009	,005	,003	,001	-,003	,002	-,013
Deutsche Post	-,009	-,039	,023	-,001	,000	,012	-,011	,009	-,008	-,020	**,002**	-,011	-,020	,015	-,008	,009	-,013	-,010	-,005	,016	,033	-,004	,000	,006	,002	,011	-,009	-,003	,009	-,008	,017
Deutsche Telekom AG	,002	,006	-,009	-,003	,016	,005	,003	-,022	,008	-,010	**-,009**	-,010	,003	,003	-,001	-,011	,028	,026	-,009	-,012	-,004	-,003	-,005	-,011	-,002	-,002	,000	-,001	,009	-,004	-,003
E.ON SE	,009	-,004	-,007	,003	,005	-,001	,000	,031	-,009	,005	**,011**	,000	-,007	-,003	-,007	,002	-,039	-,033	-,004	,000	,008	-,008	,014	,012	,001	-,003	,001	,002	,002	-,011	-,006
Fresenius SE	-,001	-,005	-,011	,023	,011	-,010	,011	-,013	,025	,004	**,000**	,010	,004	-,016	,008	-,002	-,006	-,015	,017	,003	-,001	-,002	,019	-,001	-,010	-,005	,010	,005	,004	,002	,003
Hannover Rueckversicherı	,049	,015	-,006	-,006	,012	,034	-,005	-,032	,053	-,004	**,008**	-,025	,015	,005	-,003	,000	,007	-,019	,021	,000	,001	-,010	,022	,002	,014	,024	,002	,015	,015	,020	,011
Heidelbergcement	,008	-,012	,029	-,003	-,010	,016	,001	-,001	-,006	-,004	**,007**	,009	-,033	-,002	,013	,010	-,019	,001	-,006	,001	,016	,002	-,007	,008	-,004	,002	-,004	,001	,002	,014	-,001
Henkel VZO	,010	,004	-,004	,002	-,010	,013	,012	,001	,004	,011	**-,016**	,013	,011	,002	-,003	,000	-,003	,020	,000	,001	-,021	-,015	,015	,001	,000	,007	,003	,009	,003	,002	-,010
Infineon	-,003	,005	-,019	-,005	,005	-,017	,004	,009	,005	-,010	**-,001**	-,014	-,004	,010	,002	,015	,001	,006	,005	-,004	-,002	-,001	-,002	,009	,006	-,006	,009	,000	,013	-,005	-,001
Mercedes Benz Group	,004	,020	-,004	-,001	,012	-,020	-,036	-,004	-,023	,009	**-,004**	,009	,011	,014	,055	-,013	,020	-,023	,069	,022	,005	-,008	-,009	-,013	,001	,000	-,006	-,007	-,014	,002	,026
Merck	-,044	-,013	-,012	,014	,014	,017	-,016	-,008	-,019	-,015	**,019**	-,009	-,011	-,006	,024	,012	,013	-,019	,040	-,007	,000	-,028	-,010	-,004	-,017	-,008	,023	,000	,008	-,020	,008
MTU Aero	,008	,001	,003	-,011	-,020	,003	-,003	,035	-,016	-,003	**-,006**	,013	-,013	-,019	-,021	,003	-,045	-,022	-,010	,009	,010	,040	,018	,009	,012	-,002	-,010	,011	,001	,001	,011
Munich Re Group	,018	-,010	,039	,001	-,013	,008	,009	,000	-,011	,005	**,005**	,012	-,022	-,007	,016	,012	-,010	-,016	,006	-,003	,010	-,002	,000	,005	,001	,007	-,014	,008	-,002	,022	-,004
Porsche	-,011	,010	-,012	-,026	-,008	-,007	-,008	-,012	-,008	,007	**,000**	-,002	-,014	,013	-,032	,000	-,022	,012	-,013	,010	-,041	,013	,001	-,007	,000	-,004	-,003	,001	,005	,003	,002
Qiagen	-,041	-,005	-,014	-,005	,011	,011	-,016	,001	-,001	,016	**-,011**	-,005	-,028	-,023	,047	,000	,015	,012	-,006	,008	-,016	,007	-,003	,024	-,011	,006	-,001	,002	,007	-,008	,001
Rheinmetall AG	,055	-,017	,015	,029	,019	-,004	-,007	-,031	,003	-,008	**-,015**	-,053	,014	-,008	,012	,041	-,024	,063	,017	-,003	-,027	,024	,026	,068	-,032	,007	,001	-,026	,006	,002	-,020
RWE AG ST	-,019	-,010	-,020	,029	,013	-,018	,001	-,006	,004	,003	**-,006**	,009	-,018	-,017	-,003	,017	,006	-,025	-,027	,012	,014	,016	,006	-,004	,005	-,008	,008	,018	,004	-,015	,003
SAP	-,009	,006	,021	-,013	,057	,001	-,003	-,004	-,001	-,013	**,005**	-,005	-,013	,002	,007	,000	,041	,005	-,007	,008	,008	,007	-,033	,014	-,008	,000	-,007	,006	-,001	-,015	,012
Sartorius AG VZO	-,183	,036	,007	,012	,037	,011	-,014	-,005	,008	-,042	**-,004**	-,014	-,010	,016	,052	,015	,047	,042	-,015	-,040	-,039	-,014	-,007	-,007	-,018	,000	,012	-,006	-,002	-,036	,006
Siemens AG	-,001	-,004	-,006	,006	-,001	-,005	-,003	-,010	-,009	,006	**-,009**	-,007	,011	,006	,001	-,005	-,006	,008	-,007	-,004	-,003	,066	,006	-,021	,008	-,001	-,009	,008	,011	,014	-,018
Siemens Energy AG	,000	-,021	,001	,007	-,005	,030	,005	,000	,010	,021	**,005**	,004	,004	,011	,035	,002	,053	,021	-,004	,010	,013	-,009	,012	,008	,024	,029	,037	,002	-,015	,002	,008
Siemens Healthineers	-,007	,040	-,013	,000	-,009	,006	-,014	,000	,002	,011	**-,018**	-,024	,002	,002	,014	,041	,033	-,020	,012	-,002	,002	-,005	,008	,005	-,006	-,023	,015	-,006	-,004	-,008	,003
Symrise AG	,006	,012	-,014	,007	,029	,024	-,020	,000	-,010	-,013	**,004**	-,037	,017	-,028	,030	,017	,041	,007	-,003	-,006	-,010	,020	,004	-,018	-,012	,015	,011	-,005	-,001	-,021	,011
Volkswagen VZO	-,001	-,002	,003	-,016	-,005	-,015	-,004	-,022	,008	,014	**,000**	-,010	,007	,018	-,015	-,005	-,019	,019	-,003	-,006	-,028	,006	,008	-,010	-,003	-,019	-,011	-,003	,006	,022	,011
Vonovia	-,015	,031	-,016	,010	,038	-,018	,050	-,049	,020	,022	**-,048**	-,011	,051	-,018	,010	,027	,024	,024	-,011	-,007	-,011	-,014	,007	-,018	-,017	-,006	,053	-,005	-,001	-,003	-,013
Zalando SE	-,011	,016	-,024	-,025	,055	,052	-,019	-,041	-,033	,035	**-,046**	,099	-,022	,009	,030	-,020	,086	,118	,033	-,022	-,035	-,030	-,048	-,014	-,024	,017	,022	-,026	,011	,020	,015

Cumulative Abnormal Return (CAR)	FOMC Event 6																													
	Event Window																													
Company	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	**0**	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Adidas	-,017	-,025	-,115	-,133	-,175	-,172	-,198	-,198	-,201	-,207	**-,218**	-,234	-,050	-,047	-,016	,026	,011	,066	,032	,030	,027	,021	,010	-,021	-,033	-,021	-,010	-,029	-,035	-,033	-,023
Airbus Group	,008	,009	,008	,001	,002	,001	,003	,035	,029	,046	**,047**	,056	,044	,035	,013	,014	-,037	-,046	-,057	-,050	-,038	-,053	-,056	-,056	-,062	-,067	-,083	-,078	-,121	-,103	-,107
Allianz	,014	,015	,021	,026	,021	,015	,025	,031	,034	,040	**,048**	,059	,052	,043	,039	,043	,071	,069	,070	,057	,076	,071	,072	,073	,077	,074	,070	,072	,074	,084	,076
BASF	,005	,012	,030	,022	-,003	-,026	-,016	-,034	-,032	-,038	**-,040**	-,040	-,019	-,008	-,007	-,021	-,034	-,004	,000	-,024	-,027	-,041	-,042	-,056	-,042	-,047	-,044	-,049	-,050	-,044	-,059
Bayer	,001	,000	,005	,012	,002	,011	,015	,025	,033	,040	**,035**	,035	,031	,033	-,024	-,051	-,055	-,084	-,066	-,030	-,038	-,042	-,028	-,015	-,014	-,017	-,005	-,007	,006	,010	-,003
Beiersdorf AG	-,007	-,005	-,008	-,009	,000	-,021	-,057	-,062	-,056	-,078	**-,091**	-,086	-,073	-,081	-,075	-,064	-,059	-,090	-,085	-,087	-,058	-,050	-,054	-,042	-,045	-,041	-,032	-,037	-,034	-,050	-,042
BMW ST	,002	-,002	-,001	-,013	-,020	-,022	-,017	-,020	-,022	-,020	**-,015**	-,051	-,037	-,028	-,048	-,050	-,057	-,047	-,045	-,049	-,069	-,076	-,066	-,069	-,067	-,072	-,078	-,079	-,074	-,056	-,042
Brenntag AG	,010	,018	,011	,020	,022	,024	,019	,013	,018	,026	**,028**	,027	,025	,037	,037	,057	,045	,059	,037	,030	,017	,009	,006	,009	,027	,031	,041	,042	-,044	-,061	-,074
Commerzbank	-,005	-,001	,012	,003	-,008	-,026	-,025	-,034	-,060	-,054	**-,058**	-,056	-,079	-,077	-,107	-,179	-,228	-,249	-,236	-,218	-,208	-,214	-,229	-,219	-,233	-,250	-,239	-,257	-,260	-,245	-,253
Continental AG	-,003	,019	,019	,021	,007	-,006	,010	-,007	,004	,011	**-,013**	-,035	,025	,036	,042	,032	,059	,083	,078	,053	,021	-,014	-,011	-,009	-,010	-,016	-,008	-,007	,005	,025	,012
Covestro	,021	,041	,044	,018	-,030	-,022	-,020	-,039	-,043	-,065	**-,066**	-,076	-,031	-,005	-,011	-,046	-,081	-,037	-,044	-,067	-,085	-,092	-,081	-,111	-,068	-,062	-,036	-,053	-,050	-,014	-,018
Daimler Truck Holding	,008	-,003	-,001	,005	-,009	-,012	-,016	-,030	-,024	-,023	**-,035**	-,040	-,025	-,030	-,031	-,042	-,029	-,013	-,019	-,021	-,071	-,089	-,071	-,072	-,072	-,074	-,077	-,080	-,081	-,062	-,036
Deutsche Bank AG	-,001	-,001	-,002	-,001	,000	,001	,001	,000	,000	,000	**-,001**	-,003	,000	,000	,001	,000	,005	,005	,005	,005	,003	,003	,004	,003	,003	,002	,003	,002	,000	-,001	-,001
Deutsche Boerse	,006	,007	,007	,010	,013	,009	,058	,051	,033	,031	**,045**	,045	,016	,012	,007	-,010	-,030	-,013	-,026	-,019	-,023	-,031	-,036	-,031	-,040	-,036	-,033	-,031	-,035	-,032	-,045
Deutsche Post	-,009	-,048	-,025	-,027	-,026	-,014	-,025	-,016	-,024	-,044	**-,042**	-,053	-,072	-,057	-,065	-,056	-,069	-,080	-,085	-,069	-,036	-,041	-,041	-,034	-,032	-,021	-,030	-,033	-,024	-,032	-,015
Deutsche Telekom AG	,002	,007	-,002	-,004	,012	,017	,020	-,002	,006	-,004	**-,013**	-,023	-,020	-,017	-,018	-,029	-,001	,025	,015	,003	-,001	-,004	-,009	-,020	-,022	-,024	-,024	-,025	-,016	-,020	-,023
E.ON SE	,009	,004	-,002	,001	,005	,004	,004	,035	,026	,031	**,042**	,042	,035	,033	,026	,028	-,011	-,044	-,048	-,047	-,039	-,047	-,033	-,022	-,021	-,024	-,023	-,021	-,018	-,030	-,036
Fresenius SE	-,001	-,006	-,017	,006	,017	,007	,017	,004	,029	,033	**,033**	,043	,047	,032	,040	,038	,032	,017	,034	,037	,036	,034	,053	,053	,042	,037	,048	,053	,056	,058	,061
Hannover Rueckversicherı	,049	,064	,057	,051	,064	,098	,093	,061	,114	,110	**,118**	,092	,108	,113	,109	,110	,117	,097	,118	,118	,119	,109	,130	,133	,146	,170	,172	,187	,202	,222	,233
Heidelbergcement	,008	-,004	,025	,023	,013	,029	,030	,028	,023	,019	**,026**	,035	,002	,001	,013	,024	,005	,005	-,001	,000	,017	,019	,012	,020	,016	,018	,014	,015	,017	,031	,030
Henkel VZO	,010	,015	,011	,013	,003	,016	,027	,028	,032	,044	**,027**	,041	,052	,054	,051	,051	,048	,068	,068	,069	,049	,034	,049	,050	,050	,057	,059	,068	,071	,074	,064
Infineon	-,003	,002	-,017	-,022	-,017	-,035	-,030	-,021	-,016	-,026	**-,028**	-,041	-,045	-,035	-,032	-,018	-,017	-,011	-,005	-,009	-,011	-,012	-,014	-,005	,001	-,005	,004	,004	,017	,011	,011
Mercedes Benz Group	,004	,025	,020	,019	,031	,011	-,026	-,030	-,053	-,044	**-,048**	-,039	-,028	-,014	,041	,027	,048	,025	,094	,116	,121	,112	,103	,090	,091	,092	,086	,079	,065	,066	,093
Merck	-,044	-,056	-,068	-,053	-,039	-,023	-,039	-,046	-,065	-,080	**-,060**	-,070	-,081	-,087	-,063	-,051	-,038	-,057	-,017	-,024	-,024	-,052	-,062	-,067	-,084	-,092	-,069	-,069	-,061	-,081	-,074
MTU Aero	,008	,009	,012	,001	-,019	-,016	-,019	,017	,000	-,003	**-,009**	,005	-,008	-,027	-,048	-,045	-,090	-,112	-,121	-,113	-,102	-,062	-,045	-,035	-,024	-,026	-,036	-,025	-,024	-,023	-,012
Munich Re Group	,018	,007	,046	,047	,034	,042	,051	,050	,039	,045	**,050**	,062	,040	,033	,050	,062	,052	,036	,042	,039	,048	,047	,047	,052	,053	,060	,046	,054	,053	,075	,070
Porsche	-,011	-,001	-,013	-,039	-,048	-,054	-,062	-,074	-,082	-,075	**-,075**	-,077	-,091	-,078	-,111	-,111	-,132	-,121	-,134	-,124	-,165	-,152	-,151	-,158	-,157	-,162	-,165	-,163	-,159	-,156	-,154
Qiagen	-,041	-,046	-,060	-,065	-,053	-,043	-,059	-,058	-,059	-,043	**-,054**	-,059	-,086	-,109	-,062	-,062	-,047	-,034	-,040	-,032	-,048	-,041	-,043	-,020	-,030	-,024	-,025	-,023	-,015	-,023	-,022
Rheinmetall AG	,055	,037	,052	,081	,100	,096	,090	,059	,062	,054	**,040**	-,014	,000	-,008	,004	,045	,021	,084	,101	,098	,072	,096	,121	,190	,158	,164	,165	,139	,145	,147	,127
RWE AG ST	-,019	-,029	-,049	-,020	-,007	-,025	-,024	-,030	-,026	-,023	**-,029**	-,021	-,039	-,055	-,059	-,042	-,035	-,060	-,087	-,075	-,061	-,046	-,040	-,044	-,039	-,047	-,039	-,021	-,017	-,032	-,029
SAP	-,009	-,003	,018	,005	,062	,063	,060	,057	,056	,043	**,048**	,043	,030	,033	,039	,039	,080	,085	,077	,085	,094	,100	,068	,082	,074	,074	,067	,072	,072	,056	,068
Sartorius AG VZO	-,183	-,147	-,140	-,128	-,091	-,081	-,094	-,099	-,091	-,134	**-,137**	-,151	-,161	-,145	-,092	-,077	-,030	,013	-,003	-,043	-,082	-,096	-,103	-,110	-,127	-,128	-,116	-,122	-,124	-,160	-,154
Siemens AG	-,001	-,004	-,010	-,004	-,005	-,010	-,013	-,024	-,032	-,026	**-,036**	-,043	-,032	-,026	-,025	-,030	-,036	-,028	-,035	-,039	-,042	,024	,031	,010	,018	,017	,008	,016	,027	,041	,023
Siemens Energy AG	,000	-,022	-,021	-,014	-,018	,011	,016	,017	,027	,048	**,052**	,056	,060	,071	,105	,107	,160	,181	,177	,186	,200	,191	,202	,211	,235	,264	,300	,303	,287	,289	,297
Siemens Healthineers	-,007	,033	,020	,020	,012	,017	,003	,003	,005	,017	**-,001**	-,025	-,023	-,021	-,008	,033	,066	,046	,058	,056	,059	,053	,061	,067	,060	,037	,053	,046	,042	,035	,037
Symrise AG	,006	,018	,005	,012	,041	,065	,045	,046	,036	,023	**,027**	-,011	,006	-,022	,008	,025	,066	,073	,070	,064	,053	,073	,077	,059	,047	,062	,073	,068	,067	,046	,056
Volkswagen VZO	-,001	-,003	,000	-,017	-,022	-,037	-,041	-,062	-,054	-,040	**-,041**	-,051	-,044	-,026	-,042	-,047	-,066	-,047	-,049	-,056	-,083	-,077	-,069	-,079	-,082	-,100	-,111	-,114	-,109	-,086	-,075
Vonovia	-,015	,016	,000	,010	,048	,030	,081	,032	,052	,074	**,026**	,015	,066	,047	,057	,084	,108	,132	,121	,113	,102	,088	,096	,078	,061	,054	,107	,102	,101	,098	,085
Zalando SE	-,011	,005	-,019	-,044	,011	,063	,044	,004	-,030	,005	**-,041**	,058	,036	,045	,074	,055	,141	,259	,292	,270	,235	,204	,157	,143	,119	,136	,158	,132	,143	,163	,178

Abnormal Return (AR)	FOMC Event 7																													
	Event Window																													
Company	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	**0**	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Adidas	,008	,015	-,008	-,012	-,017	-,007	,000	,004	-,007	,042	**,002**	-,011	,028	-,003	-,020	,052	,004	,004	,000	,001	,010	,003	-,009	,025	,028	,005	,003	-,006	-,010	,020	,006
Airbus Group	-,001	,001	,005	-,001	,011	-,016	,017	,007	,008	-,001	**-,003**	,012	,001	,005	,005	,005	,000	-,003	,006	-,006	-,006	,004	,012	-,002	-,013	-,001	,001	-,004	-,020	-,023	,014
Allianz	-,009	-,009	-,008	,007	,009	,007	,000	-,002	-,004	-,001	**-,005**	,008	,002	,004	,008	,003	,007	-,004	,000	,001	-,003	-,003	,000	,003	,009	-,005	-,001	-,004	,014	-,016	,003
BASF	-,014	-,020	,016	-,010	,006	-,005	-,007	,006	-,017	,005	**-,004**	,003	,006	-,010	,010	,000	-,005	,010	,006	,002	-,006	,003	,024	,011	,021	,017	,011	-,012	-,020	-,003	,010
Bayer	-,013	-,013	-,006	-,026	,003	,004	-,002	-,005	-,006	-,011	**-,005**	,003	-,031	,001	,016	-,023	,004	-,001	-,007	,009	,001	-,008	,014	-,014	-,016	,009	,004	,013	,042	,024	,001
Beiersdorf AG	,007	,010	-,002	-,003	,013	,005	,013	-,015	,019	-,021	**,020**	,011	,011	-,006	-,003	,004	,002	-,002	,005	-,002	-,002	,008	-,011	-,005	-,010	-,005	-,007	-,004	,004	-,019	-,013
BMW ST	,016	-,020	-,001	,013	-,001	-,002	-,019	,012	,003	-,018	**,001**	,020	,005	,009	,001	-,006	,003	,001	-,002	,000	-,004	,005	,019	-,008	,002	,016	-,006	-,008	,007	,002	,008
Brenntag AG	-,013	,004	-,003	,004	,008	,007	-,008	-,010	-,005	-,018	**-,004**	-,003	,002	,009	,013	,010	,010	,004	-,001	,011	-,003	,005	,006	,040	-,016	,012	,001	-,004	-,004	,021	-,018
Commerzbank	-,004	-,042	,001	,015	,014	-,008	-,004	,015	-,009	-,013	**-,004**	,026	,064	,006	,096	-,025	,009	,009	-,004	-,003	-,018	,013	-,003	,032	,001	-,010	,006	-,011	-,008	-,022	-,001
Continental AG	-,013	-,011	,002	,001	-,014	-,010	,016	,017	-,007	,008	**,013**	,017	-,009	-,018	-,002	,011	-,017	,017	,004	-,002	,006	-,010	,045	,002	,010	,012	,011	,000	-,005	,011	,013
Covestro	-,005	-,033	,012	-,014	,006	-,011	-,008	,010	,000	,013	**-,010**	,000	,003	,009	,002	-,002	,013	-,007	,009	,009	-,012	,002	,036	,027	,026	,010	,004	-,001	-,023	-,025	-,025
Daimler Truck Holding	,027	-,010	-,004	,008	,000	-,005	,000	,019	-,007	-,005	**,002**	-,005	,006	,006	-,006	-,002	-,017	,004	,005	-,004	,000	,001	,028	-,004	,007	,012	-,011	,000	,008	-,006	,004
Deutsche Bank AG	-,003	-,007	-,003	,006	,007	,006	,000	-,007	,005	-,013	**,003**	,033	,007	-,004	,004	-,015	,013	-,002	-,004	,005	-,011	,011	-,011	-,008	-,022	,004	-,012	-,013	,001	-,012	-,007
Deutsche Boerse	-,012	-,028	,009	,018	-,001	-,005	,005	,004	-,008	,010	**-,013**	-,004	,027	,000	,062	-,003	,012	,005	-,004	-,003	-,004	,000	,023	,008	,031	-,014	-,003	-,002	-,004	-,008	-,002
Deutsche Post	,017	,007	-,001	-,017	,000	,002	-,005	-,006	-,017	-,013	**,005**	,019	,003	-,011	-,011	,003	,004	-,003	-,008	,002	-,001	-,005	-,008	-,012	-,033	-,008	-,014	,005	,019	-,011	-,011
Deutsche Telekom AG	-,003	,002	,016	-,004	,008	-,003	-,009	,003	-,003	,013	**,001**	-,040	,005	-,037	-,002	,010	-,007	,006	-,001	,004	,000	,002	,013	-,001	-,010	,011	-,011	,011	-,005	-,013	,004
E.ON SE	-,006	,007	-,004	-,001	,001	,004	-,004	-,006	-,005	-,010	**,001**	,019	,004	,002	,001	-,004	,006	-,007	,000	,004	-,002	-,013	,005	-,002	-,012	,020	,001	-,009	,007	-,005	,003
Fresenius SE	,001	-,010	,009	,012	,000	,006	-,006	-,002	,000	-,011	**,017**	,008	-,009	,014	,002	-,001	,005	-,003	,002	,006	,013	,004	,004	,012	,013	-,016	-,004	-,021	,011	-,009	,008
Hannover Rueckversicheru	,008	-,008	,018	-,010	-,009	,015	,016	-,015	-,020	,006	**,008**	,000	-,001	,005	-,002	,002	,006	,009	-,009	,000	,004	,009	-,003	,016	,009	,014	,004	-,024	-,027	,006	,007
Heidelbergcement	-,001	,005	-,007	,007	,020	,003	,005	,002	-,001	-,013	**,006**	,014	-,002	,001	,005	,000	,014	-,002	,006	-,002	-,008	,003	-,021	,007	,012	-,010	-,012	-,017	-,016	-,031	-,009
Henkel VZO	-,010	-,014	,000	-,008	,013	-,005	,001	,015	-,009	-,005	**,015**	,016	,009	,008	,002	,002	,006	,017	,003	-,002	-,005	-,003	,024	,012	,002	,005	,001	,006	-,027	-,001	-,002
Infineon	-,002	-,001	,005	-,007	-,004	,000	,001	-,006	-,017	-,016	**,004**	,022	,011	,005	,006	-,012	,003	-,001	-,005	-,005	-,007	,004	-,007	,002	-,016	,011	-,035	-,009	-,009	-,009	-,014
Mercedes Benz Group	,027	,019	-,010	,004	-,016	-,008	,020	-,013	,000	,032	**-,021**	-,013	-,016	-,012	,002	,000	-,017	-,009	-,011	-,010	,012	,001	-,001	,004	,008	-,002	,012	,011	-,010	-,008	,008
Merck	,007	,009	,002	,002	-,010	,004	,011	,020	,015	,012	**,021**	-,009	,002	-,014	-,009	,001	,005	,004	,000	,010	,000	-,001	-,016	,011	,015	-,022	-,001	,019	-,002	,033	-,031
MTU Aero	,012	-,009	,010	,008	,003	,003	,016	-,006	-,002	-,011	**,001**	,012	,022	,003	,005	,003	-,010	,001	,008	,000	-,013	,000	,011	,006	-,014	,014	,004	-,011	-,001	-,006	,008
Munich Re Group	-,004	,004	-,012	,012	,017	,000	,006	-,002	,001	-,011	**,001**	,007	-,002	,006	,012	-,002	,003	,001	,002	,000	-,004	,004	-,011	,005	,024	-,004	,004	-,013	-,007	-,016	,002
Porsche	,003	-,020	,013	,015	-,003	-,018	-,009	-,005	-,009	-,021	**-,003**	-,010	-,009	-,007	-,012	-,002	-,011	,001	-,001	-,003	,011	,009	,017	-,002	-,006	,016	-,005	,006	,017	-,013	-,016
Qiagen	,000	,001	,000	-,016	-,008	,014	,010	-,006	,016	-,017	**-,002**	,020	-,002	,001	-,001	-,005	,011	-,006	-,003	,014	-,002	,006	-,040	,022	-,015	,002	-,019	-,019	,010	-,015	-,008
Rheinmetall AG	-,019	,018	-,021	,017	-,004	,030	-,003	,005	-,006	-,009	**,012**	,042	-,071	-,031	,039	,008	-,010	,017	,012	,006	-,049	,069	,008	-,016	-,006	,040	,005	-,019	-,015	,011	-,021
RWE AG ST	,003	,009	-,017	-,004	,023	,005	-,009	,004	,000	-,010	**,013**	,018	-,008	-,002	,003	-,007	,014	-,011	-,007	,003	,000	,007	-,011	-,055	-,046	,010	-,006	-,014	,011	,012	,030
SAP	,011	,011	-,001	-,006	-,012	-,002	-,001	-,008	,006	,002	**,000**	-,010	,008	-,009	-,007	,000	-,004	-,004	-,005	-,001	-,001	-,002	,000	,003	,000	,005	,003	,009	,002	,007	-,007
Sartorius AG VZO	,006	,035	-,002	-,003	-,025	,004	-,006	-,015	,031	,014	**,008**	-,008	-,036	-,010	,003	,004	,012	,006	,003	,025	,030	,004	-,079	,003	,016	,027	-,030	,046	,016	,031	-,012
Siemens AG	-,017	,012	,005	,011	-,005	-,001	-,007	,004	,011	-,009	**-,011**	-,009	,003	,004	,002	,001	,003	-,002	,004	-,004	,005	,004	-,009	,001	,011	,001	-,002	,004	,000	,003	,006
Siemens Energy AG	,006	,004	,013	,034	,000	-,006	,007	,018	,007	,032	**-,009**	-,006	-,011	,017	,000	,020	,010	-,003	,017	-,010	,005	,001	-,032	,019	-,001	-,014	,023	-,021	-,027	,042	-,002
Siemens Healthineers	,002	-,006	,015	-,008	-,025	,007	,002	,004	,012	-,001	**,010**	-,023	-,002	-,019	-,040	,001	,005	-,002	,002	,008	,015	,001	-,025	,014	-,008	-,003	-,019	,006	-,009	,028	-,014
Symrise AG	,009	,006	-,017	-,014	-,004	,007	-,010	-,002	,015	,000	**-,003**	,014	,001	-,001	-,006	-,011	-,005	,002	,002	,002	-,006	-,005	-,008	-,002	,003	-,008	-,004	,002	-,003	-,010	-,037
Volkswagen VZO	,012	-,010	-,005	,019	,000	-,010	-,008	-,003	-,004	-,001	**,003**	,002	,029	-,110	-,018	-,011	-,028	,005	-,002	-,003	,000	,013	,021	,009	,010	,014	-,004	-,014	-,005	-,008	,000
Vonovia	-,016	-,014	,027	-,007	-,006	,001	,008	-,011	-,017	,037	**,016**	-,005	-,076	-,005	-,024	,028	,009	,005	-,003	,012	,008	-,007	,030	,010	,032	-,014	,002	,024	-,005	,054	,002
Zalando SE	,014	,036	,016	-,017	,015	,015	-,004	-,008	,055	,050	**-,010**	-,044	,008	-,010	-,011	,044	-,017	,019	,004	,004	,031	-,023	,048	,021	,022	,024	,012	,010	-,029	,029	,025

Cumulative Abnormal Return (CAR)	FOMC Event 7																													
	Event Window																													
Company	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	**0**	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Adidas	,008	,023	,015	,003	-,014	-,021	-,022	-,017	-,025	,017	**,020**	,009	,037	,034	,014	,067	,071	,074	,074	,075	,085	,088	,080	,104	,132	,137	,140	,135	,125	,145	,151
Airbus Group	-,001	,000	,005	,004	,016	-,001	,016	,024	,032	,031	**,028**	,041	,041	,046	,051	,056	,056	,053	,058	,052	,047	,051	,063	,061	,048	,048	,049	,044	,025	,002	,016
Allianz	-,009	-,018	-,027	-,019	-,010	-,003	-,003	-,006	-,010	-,011	**-,015**	-,008	-,006	-,002	,006	,009	,016	,013	,013	,013	,011	,007	,008	,010	,019	,014	,012	,009	,022	,006	,010
BASF	-,014	-,034	-,019	-,029	-,022	-,027	-,034	-,028	-,045	-,041	**-,044**	-,042	-,035	-,045	-,035	-,035	-,039	-,029	-,023	-,021	-,027	-,025	-,001	,010	,031	,048	,059	,047	,026	,024	,034
Bayer	-,013	-,026	-,032	-,059	-,055	-,051	-,053	-,057	-,063	-,074	**-,079**	-,077	-,108	-,107	-,091	-,114	-,110	-,110	-,117	-,108	-,107	-,115	-,102	-,115	-,131	-,122	-,118	-,105	-,063	-,039	-,038
Beiersdorf AG	,007	,017	,015	,012	,025	,030	,043	,028	,047	,025	**,046**	,057	,068	,063	,059	,063	,065	,062	,067	,065	,063	,071	,060	,055	,046	,040	,033	,029	,032	,014	,001
BMW ST	,016	-,005	-,006	,007	,006	,004	-,015	-,003	,000	-,018	**-,018**	,003	,007	,016	,017	,011	,014	,014	,012	,013	,009	,014	,032	,025	,027	,043	,037	,030	,037	,039	,048
Brenntag AG	-,013	-,009	-,012	-,009	-,001	,006	-,002	-,012	-,017	-,035	**-,039**	-,042	-,040	-,032	-,019	-,009	,001	,005	,004	,015	,012	,017	,023	,063	,047	,058	,059	,056	,052	,073	,055
Commerzbank	-,004	-,046	-,045	-,030	-,016	-,023	-,027	-,012	-,022	-,035	**-,039**	-,013	,051	,057	,153	,129	,138	,146	,142	,139	,122	,134	,132	,164	,165	,155	,161	,149	,141	,120	,119
Continental AG	-,013	-,024	-,023	-,022	-,036	-,045	-,030	-,013	-,021	-,012	**,001**	,018	,009	-,009	-,011	,001	-,016	,001	,005	,003	,008	-,001	,044	,046	,056	,068	,079	,080	,075	,086	,098
Covestro	-,005	-,037	-,025	-,039	-,033	-,044	-,052	-,042	-,042	-,029	**-,039**	-,038	-,036	-,027	-,024	-,026	-,013	-,021	-,012	-,003	-,015	-,013	,023	,050	,076	,085	,089	,088	,065	,039	,014
Daimler Truck Holding	,027	,017	,013	,021	,021	,016	,016	,035	,028	,024	**,025**	,020	,026	,032	,026	,024	,008	,012	,016	,012	,013	,014	,042	,038	,045	,057	,046	,046	,054	,048	,051
Deutsche Bank AG	-,003	-,009	-,012	-,007	,001	,006	,006	-,001	,003	-,010	**-,008**	,025	,032	,028	,033	,017	,030	,028	,024	,029	,019	,029	,019	,011	-,011	-,007	-,019	-,032	-,030	-,042	-,050
Deutsche Boerse	-,012	-,039	-,030	-,012	-,012	-,017	-,012	-,007	-,016	-,005	**-,019**	-,023	,004	,004	,065	,063	,075	,080	,076	,074	,070	,070	,093	,100	,131	,117	,114	,112	,108	,100	,098
Deutsche Post	,017	,024	,023	,006	,006	,008	,003	-,003	-,020	-,033	**-,028**	-,009	-,006	-,017	-,028	-,026	-,022	-,024	-,032	-,031	-,031	-,036	-,044	-,056	-,089	-,097	-,111	-,105	-,086	-,098	-,109
Deutsche Telekom AG	-,003	-,001	,015	,011	,019	,016	,007	,010	,007	,020	**,021**	-,019	-,014	-,051	-,053	-,043	-,050	-,044	-,044	-,040	-,040	-,039	-,026	-,027	-,037	-,026	-,037	-,026	-,031	-,044	-,040
E.ON SE	-,006	,001	-,003	-,003	-,002	,002	-,002	-,008	-,014	-,023	**-,023**	-,004	,000	,002	,003	-,001	,004	-,002	-,002	,002	,000	-,013	-,008	-,010	-,022	-,002	-,002	-,010	-,004	-,008	-,006
Fresenius SE	,001	-,009	,000	,012	,012	,018	,012	,009	,009	-,002	**,016**	,024	,015	,029	,032	,031	,036	,033	,034	,040	,053	,058	,061	,073	,086	,071	,067	,046	,056	,047	,055
Hannover Rueckversicheru	,008	,000	,017	,007	-,002	,013	,030	,015	-,005	,001	**,009**	,009	,007	,012	,010	,012	,017	,026	,018	,018	,022	,031	,028	,044	,053	,067	,070	,046	,019	,026	,032
Heidelbergcement	-,001	,004	-,003	,004	,024	,026	,031	,033	,032	,018	**,025**	,038	,036	,037	,042	,042	,056	,053	,060	,058	,051	,054	,033	,040	,052	,042	,029	,012	-,004	-,035	-,044
Henkel VZO	-,010	-,024	-,023	-,032	-,018	-,023	-,023	-,008	-,017	-,021	**-,007**	,009	,018	,027	,028	,030	,037	,054	,057	,054	,049	,046	,070	,082	,084	,089	,090	,096	,070	,069	,067
Infineon	-,002	-,003	,002	-,005	-,008	-,008	-,007	-,012	-,029	-,045	**-,041**	-,019	-,008	-,003	,003	-,010	-,006	-,007	-,012	-,017	-,024	-,020	-,027	-,025	-,041	-,030	-,065	-,074	-,082	-,091	-,105
Mercedes Benz Group	,027	,046	,037	,041	,025	,016	,036	,022	,023	,055	**,034**	,021	,005	-,007	-,005	-,005	-,023	-,031	-,042	-,052	-,040	-,039	-,040	-,036	-,028	-,030	-,018	-,007	-,017	-,025	-,018
Merck	,007	,016	,018	,020	,010	,013	,024	,045	,060	,072	**,093**	,084	,086	,072	,063	,064	,070	,074	,074	,084	,083	,082	,067	,077	,092	,070	,069	,088	,086	,119	,088
MTU Aero	,012	,004	,014	,022	,025	,027	,043	,037	,035	,023	**,024**	,037	,059	,062	,067	,070	,060	,061	,069	,069	,055	,055	,066	,072	,058	,072	,077	,066	,065	,059	,067
Munich Re Group	-,004	,000	-,011	,000	,017	,018	,023	,022	,022	,011	**,012**	,019	,016	,022	,034	,032	,035	,036	,038	,038	,034	,039	,028	,032	,057	,052	,057	,044	,037	,021	,023
Porsche	,003	-,017	-,005	,010	,007	-,010	-,019	-,024	-,033	-,054	**-,057**	-,067	-,076	-,083	-,096	-,098	-,109	-,109	-,109	-,113	-,101	-,092	-,075	-,076	-,082	-,066	-,071	-,064	-,048	-,061	-,076
Qiagen	,000	,001	,001	-,015	-,023	-,009	,001	-,005	,011	-,007	**-,009**	,012	,010	,011	,011	,006	,017	,011	,008	,022	,021	,027	-,013	,009	-,006	-,005	-,023	-,042	-,032	-,046	-,054
Rheinmetall AG	-,019	-,001	-,022	-,005	-,008	,021	,018	,023	,017	,008	**,020**	,062	-,009	-,040	-,002	,006	-,004	,013	,025	,031	-,018	,051	,059	,043	,037	,077	,082	,063	,048	,059	,038
RWE AG ST	,003	,012	-,004	-,009	,014	,019	,010	,013	,013	,004	**,017**	,035	,027	,025	,028	,021	,035	,024	,017	,019	,020	,027	,016	-,039	-,085	-,076	-,081	-,095	-,085	-,072	-,042
SAP	,011	,022	,020	,015	,003	,001	,000	-,008	-,002	,000	**,000**	-,010	-,002	-,012	-,018	-,018	-,023	-,027	-,032	-,033	-,034	-,036	-,036	-,032	-,032	-,027	-,024	-,015	-,012	-,005	-,012
Sartorius AG VZO	,006	,040	,038	,035	,010	,014	,007	-,007	,024	,038	**,045**	,038	,002	-,008	-,004	,000	,011	,017	,020	,045	,075	,079	,000	,003	,019	,046	,016	,062	,078	,109	,097
Siemens AG	-,017	-,005	,000	,011	,006	,006	-,002	,002	,013	,004	**-,007**	-,016	-,013	-,009	-,007	-,005	-,003	-,005	-,001	-,005	,001	,005	-,004	-,003	,008	,008	,006	,010	,009	,012	,019
Siemens Energy AG	,006	,010	,023	,057	,057	,052	,059	,077	,085	,117	**,108**	,102	,091	,108	,108	,127	,137	,134	,152	,142	,147	,148	,116	,135	,134	,120	,143	,123	,096	,137	,136
Siemens Healthineers	,002	-,005	,011	,003	-,022	-,015	-,013	-,010	,002	,002	**,012**	-,011	-,013	-,032	-,072	-,071	-,066	-,068	-,066	-,059	-,044	-,043	-,068	-,054	-,062	-,064	-,083	-,077	-,086	-,058	-,072
Symrise AG	,009	,015	-,002	-,016	-,020	-,013	-,023	-,025	-,010	-,009	**-,012**	,002	,002	,001	-,005	-,016	-,021	-,020	-,018	-,016	-,022	-,027	-,034	-,036	-,034	-,041	-,045	-,044	-,046	-,057	-,093
Volkswagen VZO	,012	,002	-,004	,015	,015	,005	-,003	-,005	-,009	-,010	**-,008**	-,005	,024	-,087	-,105	-,116	-,144	-,139	-,141	-,144	-,144	-,131	-,110	-,102	-,092	-,078	-,082	-,096	-,100	-,108	-,108
Vonovia	-,016	-,030	-,003	-,010	-,016	-,016	-,008	-,019	-,035	,002	**,018**	,013	-,063	-,067	-,091	-,063	-,055	-,050	-,052	-,041	-,032	-,040	-,010	,000	,032	,018	,020	,044	,039	,093	,095
Zalando SE	,014	,050	,066	,049	,064	,079	,074	,067	,122	,172	**,162**	,118	,125	,115	,104	,147	,130	,149	,153	,157	,188	,165	,213	,234	,256	,280	,292	,302	,273	,302	,327

Appendix 1.14 All components of DAX index AR and CAR event window values for each FOMC announcements

FED ANNOUNCEMENT														
Days	Event 1		Event 2		Event 3		Event 4		Event 5		Event 6		Event 7	
	AAR	CAAR	AAR	CAAR	AAR	CAAR	AAR	CAAR	AAR	CAAR	AAR	CAAR	AAR	CAAR
-10	-,009	-,009	,000	,000	-,003	-,003	,000	,000	-,003	-,003	-,004	-,004	,001	,001
-9	-,006	-,015	-,001	-,001	,001	-,001	-,001	-,001	,001	-,001	,003	-,001	-,002	-,001
-8	-,005	-,020	,000	-,001	,000	-,002	,000	-,001	,001	,000	-,003	-,004	,002	,001
-7	-,005	-,025	,001	,000	,000	-,002	,004	,003	,000	,000	,000	-,004	,001	,001
-6	-,001	-,026	-,006	-,006	,001	-,001	,004	,006	-,005	-,005	,002	-,002	,000	,002
-5	,001	-,026	-,002	-,007	,002	,002	-,001	,005	,000	-,006	,001	,000	,001	,002
-4	,000	-,026	,001	-,006	-,002	,000	,004	,009	-,001	-,007	-,001	-,002	,001	,003
-3	-,002	-,028	-,005	-,011	,000	,000	,001	,010	-,001	-,008	-,006	-,007	,000	,003
-2	,005	-,024	-,010	-,021	-,002	-,001	-,002	,008	,000	-,008	-,001	-,008	,001	,004
-1	-,001	-,025	,003	-,018	-,003	-,005	-,003	,005	,000	-,007	,001	-,007	,000	,004
0	**,002**	**-,023**	**,000**	**-,018**	**,002**	**-,003**	**,000**	**,005**	**-,001**	**-,009**	**-,004**	**-,012**	**,002**	**,006**
1	,001	-,022	-,009	-,027	-,003	-,005	,002	,007	-,001	-,010	-,003	-,015	,004	,010
2	,001	-,021	,002	-,025	-,001	-,006	,002	,009	,000	-,010	,006	-,009	-,001	,009
3	,003	-,017	-,007	-,032	,003	-,004	,001	,009	,001	-,010	,001	-,009	-,005	,004
4	,002	-,015	-,001	-,033	,000	-,003	,000	,010	,000	-,010	,004	-,005	,003	,007
5	-,001	-,016	,002	-,031	,000	-,004	,001	,010	,000	-,010	,001	-,003	,002	,010
6	-,003	-,019	-,005	-,035	-,006	-,010	,002	,013	-,004	-,014	,002	-,001	,001	,011
7	,000	-,019	-,002	-,037	,002	-,008	-,001	,012	,002	-,013	,008	,006	,002	,012
8	-,001	-,019	,003	-,034	,003	-,005	,000	,012	,000	-,013	,001	,007	,001	,013
9	,003	-,016	-,002	-,036	,001	-,004	-,004	,008	-,001	-,014	-,001	,006	,002	,015
10	-,002	-,018	,002	-,034	-,002	-,006	,002	,010	-,004	-,017	-,005	,001	,000	,015
11	-,001	-,019	,001	-,033	,000	-,005	,002	,012	,001	-,016	-,002	-,001	,003	,018

12	-,001	-,019	-,001	-,034	,002	-,004	-,002	,011	-,002	-,018	,002	,000	,002	,020
13	,002	-,017	-,001	-,035	,000	-,004	,000	,011	-,001	-,019	,000	,001	,005	,025
14	-,001	-,018	,002	-,033	-,005	-,009	,001	,011	-,002	-,021	-,001	-,001	,002	,027
15	-,002	-,020	,001	-,031	,000	-,009	-,001	,010	-,003	-,024	,001	,000	,004	,031
16	-,002	-,023	,002	-,030	,004	-,005	-,002	,007	,000	-,024	,005	,005	-,002	,029
17	-,002	-,025	-,002	-,032	,006	,001	-,003	,005	,002	-,022	-,002	,003	-,002	,026
18	-,001	-,025	,003	-,029	-,004	-,003	-,003	,002	,001	-,020	-,001	,003	-,003	,023
19	-,002	-,027	,000	-,029	-,002	-,005	,002	,004	,001	-,019	,002	,005	,001	,025
20	,000	-,027	-,003	-,032	,000	-,005	,000	,004	-,004	-,023	,001	,006	-,002	,022

Appendix 1.15 DAX index AAR and CAAR output between event window according to all FOMC events

Abnormal Return (AR)	ECB Event 1 Event Window																													
Company	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	**0**	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Adidas	-,028	,016	-,018	-,008	,007	,003	,025	-,043	,069	-,004	**-,015**	-,007	,029	,044	-,010	-,014	-,005	,017	,017	-,001	-,003	,029	,010	-,029	-,047	,005	-,004	-,024	,068	-,008	,057
Airbus Group	-,029	-,010	-,017	-,009	,000	,021	,015	-,057	,057	,021	**-,026**	-,035	-,008	,044	-,015	,008	-,035	,027	,053	-,023	-,041	,079	-,001	-,016	-,013	,061	-,003	-,003	,070	-,034	,004
Allianz	-,023	-,017	-,005	-,021	,025	,022	,033	-,028	,030	,009	**-,015**	-,009	-,016	,028	-,015	,007	,000	,007	,015	,004	-,040	,028	,003	-,008	-,023	,019	-,024	-,024	,035	-,021	,005
BASF	-,021	,017	-,006	-,024	,023	,013	,024	-,083	,029	,003	**-,004**	-,060	-,033	,039	-,003	,000	-,037	,018	,013	,013	-,057	,043	,023	,018	-,052	,047	-,031	-,012	,047	,001	,039
Bayer	-,022	,002	-,003	-,018	,018	,017	,004	-,039	,034	,007	**-,029**	-,024	-,030	-,002	,016	,009	-,047	-,005	,021	-,005	-,029	,030	-,005	,007	-,040	,013	-,010	-,024	,033	-,024	,041
Beiersdorf AG	-,018	-,007	,046	-,003	,016	-,032	,010	-,034	,003	,039	**,000**	,011	,021	,023	-,002	-,010	,005	-,002	,017	,008	-,003	,035	-,022	-,014	-,015	,007	,004	-,003	,011	-,006	,013
BMW ST	-,020	-,002	-,010	-,015	,061	,024	,029	-,058	,012	-,029	**-,018**	-,044	-,037	,031	,001	,014	-,016	,016	,013	,006	-,036	,034	,011	-,007	-,031	,009	-,024	-,005	,054	-,001	,014
Brenntag AG	-,028	,019	-,001	-,006	,004	,024	,036	-,046	,045	,006	**-,001**	-,021	-,029	,021	-,008	,004	-,030	,006	,024	-,016	-,014	,032	,029	-,007	-,045	,025	-,033	,010	,062	-,021	,019
Commerzbank	-,036	-,004	-,001	-,033	,017	,033	,052	-,050	,079	,033	**,007**	-,016	-,104	,021	-,034	-,024	-,030	-,022	-,023	-,037	-,037	,018	-,001	,047	-,062	,000	-,017	-,028	,061	-,003	,052
Continental AG	-,014	,017	,014	,001	,005	,028	,047	-,069	,050	,030	**-,009**	-,024	-,033	,013	,005	,020	-,022	-,008	,022	-,002	-,052	,053	,017	,007	-,053	,029	-,017	-,021	,076	,000	,030
Covestro	-,029	,017	-,001	-,022	,015	-,001	,010	-,101	,025	-,011	**,004**	-,057	-,017	,061	-,023	-,002	-,044	,020	,006	-,004	-,047	,039	,024	,016	-,057	,024	-,013	,000	,040	-,008	,050
Daimler Truck Holding	-,023	,009	-,007	-,012	-,008	,029	,028	-,044	,041	,009	**,006**	-,030	-,050	,019	-,007	-,012	-,027	-,022	,015	-,032	-,042	,024	,045	,014	-,057	,023	-,053	-,004	,064	-,011	,037
Deutsche Bank AG	-,001	-,001	-,001	-,002	-,002	-,002	-,001	-,001	-,002	-,001	**-,001**	-,001	-,001	-,002	-,001	-,001	-,001	-,002	-,002	-,001	-,001	-,002	-,001	-,001	-,001	-,002	-,001	-,001	-,002	-,001	-,001
Deutsche Boerse	-,030	-,010	-,002	-,035	,023	,033	,038	-,036	,052	,018	**-,010**	-,005	-,107	,072	-,025	-,011	-,038	-,006	-,009	,001	-,037	,030	,017	,000	-,059	,023	-,024	,002	,041	-,003	,034
Deutsche Post	-,023	-,016	,001	,018	,004	,024	,021	-,008	,015	,001	**-,006**	,006	,007	,016	,002	-,009	,008	,008	-,024	,013	-,007	,049	-,020	-,003	-,001	,029	,001	-,025	,006	-,006	,005
Deutsche Telekom AG	-,025	-,027	-,020	-,005	,022	,041	,034	-,040	,064	-,017	**-,001**	,003	,003	,049	-,001	-,017	-,008	,018	,025	-,007	-,004	,037	,010	-,022	-,031	,026	-,009	,006	,045	-,022	,017
E.ON SE	-,016	-,020	-,001	-,010	,004	,018	,017	-,022	,041	,018	**-,018**	,015	,008	,025	-,015	,008	-,005	,008	,027	,000	-,019	,030	-,003	-,015	-,010	,015	-,011	-,014	,031	-,029	,001
Fresenius SE	-,005	,001	-,003	,004	-,003	-,012	,006	-,074	,045	,002	**-,011**	,013	-,006	-,007	-,019	,008	-,030	-,033	,034	-,005	-,029	,009	,013	,008	-,016	,002	-,005	-,007	,024	-,015	,038
Hannover Rueckversicherung SE	-,008	,003	-,020	,001	,020	,009	,011	-,030	,018	,007	**-,055**	-,029	,030	,034	,012	,006	,004	,006	,022	,006	-,024	,030	-,015	-,003	-,028	,006	-,031	-,007	,037	-,032	,021
Heidelbergcement	-,009	-,016	,014	-,021	,037	,030	,036	-,033	,011	,009	**-,023**	-,017	-,023	,058	-,019	,003	-,007	,027	,028	,016	-,074	,051	,022	-,026	-,032	,020	-,011	-,014	,045	-,013	,006
Henkel VZO	-,011	,002	,003	-,028	,006	,016	,038	-,038	,034	-,015	**-,005**	-,010	-,019	,038	-,009	-,006	-,029	-,015	,019	,010	-,054	,030	,019	,029	-,034	,038	-,028	-,005	,048	-,005	,033
Infineon	-,022	-,004	,000	-,010	,015	,000	,017	-,038	,034	,033	**-,009**	-,003	,002	,026	,001	-,009	-,013	-,005	,022	,010	,004	,034	-,007	,003	-,012	,005	,004	-,013	,024	-,013	,010
Mercedes Benz Group	-,040	,004	-,024	-,008	-,025	,011	,043	-,081	,059	,006	**-,002**	-,019	-,012	,055	-,003	-,014	-,023	-,010	-,011	-,030	-,024	,085	,012	-,005	-,039	,022	-,011	,010	,052	-,019	,017
Merck	-,020	,017	-,012	-,014	,016	-,008	,009	-,015	-,008	-,008	**-,002**	-,012	,001	,068	-,011	-,013	-,021	,013	,041	-,004	,016	,044	-,003	-,005	-,002	,003	-,013	-,009	,031	-,072	,025
MTU Aero	-,021	,003	-,025	-,006	-,008	,026	,035	-,032	,043	,046	**-,027**	-,023	-,008	,039	-,024	,029	-,034	,023	,039	-,023	-,075	,067	,007	,012	-,028	,055	-,015	-,004	,062	-,015	,014
Munich Re Group	-,016	-,015	,013	-,011	,029	,026	,040	-,037	,023	,010	**-,022**	-,007	,001	,043	-,024	,019	-,017	,021	,034	,010	-,061	,045	,006	-,020	-,028	,024	-,013	-,019	,040	-,023	,007
Porsche	-,032	,005	-,004	-,005	-,005	,028	,028	-,032	,033	-,012	**,001**	-,013	-,018	,017	-,003	,019	-,035	-,015	,022	-,022	-,039	,058	,042	,033	-,044	,020	-,020	-,003	,084	-,017	,008
Qiagen	,001	,015	-,004	-,019	,008	-,024	,039	-,023	,008	-,031	**,015**	,013	,019	,038	,019	-,004	-,005	,014	,023	,017	,009	,026	,004	-,016	-,002	-,017	-,011	-,011	,025	-,026	,003
Rheinmetall AG	,024	,018	-,044	-,027	-,003	,015	,013	-,025	,023	,027	**,023**	-,033	-,060	,001	,036	,030	-,001	-,015	-,039	-,016	-,108	-,012	,038	-,002	-,034	,005	-,028	-,042	,039	,008	,013
RWE AG ST	,009	-,007	-,005	,000	-,026	-,008	,014	-,047	,025	,032	**-,002**	-,019	,011	-,022	-,027	,015	-,017	-,044	,061	-,011	-,030	,017	-,006	-,010	,009	,006	-,014	-,011	,045	-,010	,034
SAP	-,013	-,003	-,006	-,021	,004	,021	,031	-,024	,043	-,002	**-,006**	,000	,008	,048	-,013	-,015	-,014	-,021	,012	-,016	,003	,053	,000	-,008	-,024	-,004	-,022	,005	,043	-,017	,019
Sartorius AG VZO	,001	,028	-,033	-,015	-,051	-,030	,023	-,065	,045	-,021	**,007**	,004	,028	,055	,007	-,013	-,020	,038	,043	,006	,025	,063	-,007	,010	,022	-,007	-,013	-,009	,037	-,051	,014
Siemens AG	-,026	,002	-,010	-,031	,012	,012	,010	-,080	,059	-,010	**-,019**	-,018	-,007	,058	-,007	-,007	-,031	-,019	,012	,010	-,033	,065	-,005	-,006	-,049	,028	-,024	,013	,070	-,028	,035
Siemens Energy AG	-,001	-,012	-,061	-,010	-,030	-,006	,021	-,038	,020	,021	**,000**	-,010	-,017	,044	-,013	-,006	-,064	-,031	,029	-,009	-,048	,053	,034	,019	-,035	,015	-,017	-,002	,015	,008	,020
Siemens Healthineers	-,004	,010	-,021	-,026	-,018	,000	-,059	-,036	,015	-,017	**-,011**	,002	,011	,061	,010	-,007	-,011	,036	,004	,003	-,010	,052	-,031	,003	-,024	-,002	-,011	-,010	,049	-,034	,016
Symrise AG	-,009	,000	-,013	,003	-,002	-,027	,019	-,024	,034	,032	**-,003**	,010	,005	,050	-,006	-,014	-,007	,003	,025	,015	,002	,034	-,018	-,011	,010	-,025	-,002	-,018	,022	-,005	,012
Volkswagen VZO	-,023	,023	-,005	-,007	-,004	,027	,033	-,047	,038	,007	**,005**	-,016	-,021	,025	-,023	,008	-,049	-,028	,024	-,006	-,044	,039	,032	,033	-,048	,022	-,024	,001	,073	-,009	,029
Vonovia	-,008	-,002	-,042	-,019	-,032	,045	,007	-,051	,059	-,010	**,013**	-,006	-,009	,040	-,026	,000	-,025	-,024	,018	-,050	-,004	,055	,000	-,033	-,025	,020	-,002	-,010	,034	-,004	,024
Zalando SE	-,061	,002	-,072	-,002	,000	-,029	,043	-,137	,076	,002	**-,025**	,009	,011	,009	,007	-,022	-,021	,035	,072	-,037	-,047	,097	,042	-,001	-,052	,030	-,043	,025	,036	,021	,032

Cumulative Abnormal Return (CAR)	ECB Event 1 Event Window																													
Company	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	**0**	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Adidas	-,028	-,012	-,031	-,038	-,031	-,029	-,004	-,046	,023	,019	**,004**	-,003	,026	,070	,060	,046	,041	,058	,075	,073	,071	,100	,110	,082	,034	,039	,035	,011	,079	,072	,129
Airbus Group	-,029	-,039	-,056	-,065	-,065	-,043	-,028	-,085	-,028	-,007	**-,033**	-,068	-,076	-,032	-,048	-,039	-,074	-,048	,006	-,017	-,058	,021	,020	,005	-,009	,052	,049	,047	,116	,082	,086
Allianz	-,023	-,040	-,045	-,066	-,040	-,018	,014	-,014	,015	,024	**,009**	,000	-,016	,012	-,003	,003	,004	,011	,025	,029	-,011	,017	,020	,012	-,011	,008	-,017	-,040	-,006	-,027	-,022
BASF	-,021	-,003	-,010	-,033	-,010	,003	,026	-,056	-,028	-,024	**-,028**	-,088	-,121	-,082	-,085	-,085	-,121	-,103	-,090	-,077	-,134	-,091	-,069	-,050	-,103	-,056	-,087	-,099	-,052	-,051	-,013
Bayer	-,022	-,019	-,023	-,041	-,023	-,005	-,002	-,040	-,006	,001	**-,028**	-,052	-,082	-,085	-,069	-,060	-,107	-,112	-,091	-,095	-,125	-,094	-,099	-,092	-,131	-,118	-,128	-,153	-,119	-,143	-,101
Beiersdorf AG	-,018	-,025	,021	,017	,033	,001	,011	-,023	-,020	,020	**,020**	,031	,052	,075	,073	,062	,068	,066	,083	,091	,089	,124	,102	,087	,072	,079	,083	,080	,091	,085	,098
BMW ST	-,020	-,022	-,032	-,047	,014	,038	,067	,009	,021	-,007	**-,026**	-,069	-,106	-,075	-,074	-,060	-,076	-,060	-,047	-,041	-,077	-,043	-,032	-,039	-,070	-,061	-,084	-,090	-,036	-,037	-,023
Brenntag AG	-,028	-,009	-,010	-,016	-,011	,013	,048	,002	,047	,053	**,053**	,031	,003	,024	,016	,019	-,011	-,004	,020	,004	-,011	,022	,051	,045	-,001	,024	-,009	,001	,063	,043	,062
Commerzbank	-,036	-,039	-,040	-,073	-,055	-,022	,030	-,020	,059	,092	**,099**	,083	-,020	,001	-,033	-,056	-,086	-,109	-,131	-,168	-,205	-,187	-,188	-,141	-,204	-,204	-,221	-,249	-,188	-,191	-,139
Continental AG	-,014	,003	,017	,018	,024	,051	,099	,030	,080	,110	**,101**	,077	,044	,057	,062	,082	,059	,052	,073	,071	,019	,072	,089	,096	,043	,072	,056	,035	,110	,110	,140
Covestro	-,029	-,012	-,014	-,036	-,020	-,022	-,012	-,113	-,088	-,099	**-,095**	-,151	-,169	-,107	-,131	-,132	-,177	-,157	-,151	-,156	-,203	-,164	-,140	-,125	-,182	-,158	-,171	-,171	-,131	-,140	-,089
Daimler Truck Holding	-,023	-,013	-,020	-,032	-,040	-,011	,017	-,026	,014	,023	**,029**	-,001	-,051	-,032	-,039	-,051	-,078	-,100	-,086	-,117	-,160	-,135	-,090	-,076	-,133	-,110	-,163	-,167	-,103	-,114	-,078
Deutsche Bank AG	-,001	-,002	-,004	-,005	-,007	-,009	-,010	-,011	-,013	-,014	**-,015**	-,017	-,018	-,020	-,021	-,022	-,023	-,024	-,026	-,027	-,028	-,030	-,031	-,032	-,033	-,034	-,036	-,037	-,039	-,039	-,040
Deutsche Boerse	-,030	-,041	-,043	-,078	-,056	-,022	,016	-,020	,032	,050	**,040**	,035	-,072	,000	-,026	-,036	-,074	-,080	-,090	-,088	-,125	-,095	-,079	-,079	-,138	-,114	-,139	-,137	-,095	-,099	-,065
Deutsche Post	-,023	-,040	-,039	-,021	-,017	,007	,028	,020	,035	,036	**,030**	,037	,044	,060	,061	,052	,060	,069	,045	,058	,050	,099	,079	,076	,075	,104	,105	,080	,086	,080	,085
Deutsche Telekom AG	-,025	-,053	-,072	-,077	-,055	-,014	,020	-,020	,044	,027	**,026**	,030	,033	,082	,081	,064	,056	,074	,099	,092	,088	,125	,135	,113	,082	,108	,099	,105	,150	,127	,144
E.ON SE	-,016	-,036	-,037	-,047	-,042	-,024	-,008	-,029	,012	,030	**,012**	,027	,034	,059	,045	,052	,047	,055	,082	,082	,063	,093	,090	,075	,065	,079	,068	,054	,085	,056	,058
Fresenius SE	-,005	-,004	-,007	-,003	-,007	-,018	-,012	-,087	-,042	-,040	**-,051**	-,038	-,044	-,050	-,070	-,061	-,092	-,125	-,091	-,097	-,126	-,117	-,104	-,096	-,113	-,111	-,116	-,123	-,099	-,115	-,076
Hannover Rueckversicherung SE	-,008	-,005	-,024	-,023	-,004	,006	,017	-,013	,005	,013	**-,043**	-,071	-,042	-,008	,004	,010	,014	,020	,041	,047	,024	,053	,039	,036	,007	,014	-,018	-,025	,013	-,020	,002
Heidelbergcement	-,009	-,025	-,012	-,033	,004	,034	,070	,037	,047	,057	**,033**	,017	-,006	,052	,033	,036	,029	,056	,084	,100	,026	,077	,099	,073	,041	,061	,051	,036	,081	,068	,073
Henkel VZO	-,011	-,009	-,007	-,035	-,028	-,013	,025	-,013	,021	,006	**,001**	-,009	-,028	,009	,001	-,005	-,034	-,049	-,031	-,021	-,075	-,044	-,026	,003	-,031	,007	-,021	-,026	,022	,017	,050
Infineon	-,022	-,026	-,026	-,036	-,021	-,021	-,004	-,042	-,008	,025	**,015**	,012	,014	,040	,040	,032	,019	,014	,035	,045	,049	,083	,077	,080	,067	,072	,076	,064	,088	,075	,085
Mercedes Benz Group	-,040	-,036	-,060	-,068	-,094	-,082	-,040	-,121	-,062	-,056	**-,058**	-,077	-,088	-,034	-,037	-,051	-,073	-,084	-,095	-,125	-,149	-,064	-,051	-,057	-,095	-,074	-,084	-,074	-,022	-,041	-,024
Merck	-,020	-,003	-,014	-,028	-,012	-,020	-,011	-,026	-,034	-,042	**-,045**	-,056	-,055	,012	,002	-,011	-,032	-,019	,022	,018	,034	,078	,075	,070	,069	,072	,059	,050	,081	,009	,034
MTU Aero	-,021	-,018	-,043	-,049	-,058	-,032	,003	-,029	,014	,060	**,032**	,010	,002	,040	,016	,046	,011	,034	,073	,050	-,025	,042	,049	,062	,034	,089	,074	,070	,132	,117	,131
Munich Re Group	-,016	-,031	-,018	-,029	,001	,027	,067	,030	,053	,063	**,041**	,034	,035	,078	,054	,074	,057	,077	,111	,121	,060	,104	,110	,090	,062	,085	,072	,053	,094	,071	,078
Porsche	-,032	-,027	-,031	-,036	-,041	-,013	,015	-,017	,016	,004	**,005**	-,008	-,026	-,009	-,012	,007	-,028	-,043	-,021	-,043	-,082	-,024	,018	,050	,007	,026	,006	,003	,087	,070	,078
Qiagen	,001	,016	,012	-,008	,000	-,024	,015	-,008	,000	-,031	**-,016**	-,003	,015	,053	,072	,067	,063	,076	,099	,116	,125	,150	,155	,138	,136	,119	,108	,098	,123	,097	,100
Rheinmetall AG	,024	,041	-,003	-,030	-,033	-,019	-,005	-,030	-,007	,020	**,043**	,010	-,050	-,048	-,012	,018	,017	,002	-,037	-,053	-,161	-,173	-,135	-,137	-,171	-,166	-,194	-,235	-,197	-,189	-,176
RWE AG ST	,009	,002	-,003	-,003	-,029	-,037	-,023	-,070	-,045	-,013	**-,014**	-,033	-,022	-,044	-,071	-,056	-,073	-,117	-,056	-,068	-,098	-,081	-,087	-,097	-,087	-,081	-,094	-,106	-,061	-,071	-,036
SAP	-,013	-,016	-,022	-,043	-,040	-,019	,012	-,012	,031	,028	**,023**	,023	,031	,079	,066	,051	,037	,016	,029	,013	,016	,069	,069	,061	,037	,033	,011	,016	,060	,043	,062
Sartorius AG VZO	,001	,030	-,003	-,018	-,069	-,099	-,076	-,140	-,096	-,117	**-,110**	-,106	-,078	-,023	-,016	-,029	-,049	-,011	,032	,038	,064	,126	,120	,130	,152	,145	,132	,123	,160	,109	,123
Siemens AG	-,026	-,023	-,033	-,063	-,051	-,039	-,029	-,109	-,051	-,061	**-,080**	-,098	-,106	-,047	-,055	-,062	-,094	-,112	-,100	-,090	-,123	-,058	-,062	-,068	-,117	-,090	-,113	-,100	-,030	-,058	-,023
Siemens Energy AG	-,001	-,013	-,073	-,083	-,114	-,120	-,099	-,137	-,117	-,096	**-,096**	-,107	-,123	-,080	-,092	-,098	-,163	-,193	-,164	-,174	-,222	-,170	-,136	-,117	-,152	-,137	-,154	-,156	-,141	-,133	-,114
Siemens Healthineers	-,004	,006	-,015	-,041	-,059	-,058	-,118	-,154	-,138	-,155	**-,166**	-,164	-,153	-,092	-,083	-,090	-,100	-,065	-,060	-,057	-,067	-,015	-,046	-,044	-,068	-,070	-,081	-,091	-,042	-,076	-,060
Symrise AG	-,009	-,008	-,022	-,019	-,021	-,048	-,030	-,053	-,019	,013	**,011**	,021	,026	,076	,070	,056	,049	,052	,077	,092	,094	,127	,109	,098	,108	,083	,081	,063	,085	,079	,091
Volkswagen VZO	-,023	,000	-,005	-,013	-,017	,010	,043	-,004	,034	,041	**,046**	,030	,009	,034	,011	,019	-,030	-,059	-,034	-,041	-,084	-,046	-,014	,020	-,029	-,006	-,031	-,030	,043	,034	,064
Vonovia	-,008	-,011	-,052	-,071	-,104	-,059	-,052	-,102	-,043	-,053	**-,040**	-,046	-,055	-,015	-,041	-,041	-,066	-,090	-,072	-,122	-,126	-,071	-,072	-,105	-,130	-,110	-,112	-,122	-,088	-,092	-,069
Zalando SE	-,061	-,059	-,130	-,132	-,132	-,161	-,118	-,255	-,179	-,177	**-,201**	-,193	-,181	-,172	-,165	-,187	-,208	-,173	-,101	-,138	-,185	-,088	-,046	-,048	-,099	-,070	-,112	-,087	-,051	-,030	,002

Abnormal Return (AR)	ECB Event 2																												
	Event Window																												
Company	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	**0**	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Adidas	-,009	-,011	-,012	,017	-,008	,001	-,020	,009	-,015	-,020	**,005**	,004	-,003	-,021	,013	-,032	,012	,007	,008	-,003	,003	,008	,001	-,011	,020	-,025	-,055	-,008	,014	-,010	-,002
Airbus Group	-,001	,012	-,008	-,005	-,014	-,010	-,002	,007	-,009	-,017	**,003**	-,022	,005	-,002	-,006	,002	-,012	,012	-,004	,006	,013	,023	,000	-,010	-,012	,011	-,007	-,008	,009	,002	,002
Allianz	,000	,004	-,002	-,001	-,001	,000	,007	-,002	-,005	-,020	**,008**	-,006	,025	,003	-,003	,013	,018	-,005	-,004	-,007	,018	-,003	-,014	-,006	-,022	,008	,003	-,009	,002	,004	-,004
BASF	,006	,002	,040	-,007	,010	,002	,002	-,013	,009	,018	**-,008**	,007	,005	,004	-,017	-,005	,000	,019	-,006	-,006	,006	-,005	,007	,002	-,005	,007	,006	,025	-,011	,006	-,010
Bayer	,016	,000	-,046	,010	,020	-,017	,003	-,001	-,013	-,013	**,016**	,007	,004	,006	,005	-,009	-,005	-,002	,000	-,006	,000	-,024	-,022	,002	-,005	,001	-,016	,004	-,014	,008	-,018
Beiersdorf AG	-,001	,003	,001	-,024	-,002	-,003	-,001	,002	,005	,002	**-,012**	,010	,014	,000	,002	,002	-,006	-,009	,013	,001	-,030	,010	,019	,008	-,005	-,002	,001	-,029	,006	,007	,005
BMW ST	,001	,005	-,002	-,008	,001	-,004	,011	,024	-,008	-,012	**,003**	,007	,012	,003	,000	-,020	-,019	,024	,004	-,013	-,002	-,007	-,006	-,016	,020	,005	,011	,009	,002	-,004	-,010
Brenntag AG	,000	,007	,012	-,002	,006	,009	-,007	-,011	-,005	,013	**-,015**	-,009	,003	,006	,011	,006	,014	,012	,003	-,007	,006	-,016	,016	,002	-,007	-,015	-,001	,001	-,013	-,006	,011
Commerzbank	-,010	,017	,033	,007	,034	,012	,012	-,005	,030	-,031	**,054**	,015	-,007	,003	,037	,032	,020	,003	,020	-,025	,048	-,010	-,009	-,016	-,045	,010	,003	-,021	-,013	-,022	,003
Continental AG	-,013	-,024	,029	,009	-,001	,006	-,014	-,027	,014	,012	**-,023**	,010	,000	-,015	,005	,000	,031	-,008	,003	-,022	-,001	-,062	-,010	,014	-,002	-,042	,011	,017	-,012	-,038	,021
Covestro	,000	,011	,038	-,005	,010	,003	,010	-,010	,000	,021	**,005**	,013	-,008	-,005	-,021	-,010	,002	,030	,004	-,001	,018	-,002	,016	,007	-,001	,010	,012	,025	,005	,002	,000
Daimler Truck Holding	,003	,003	,028	,003	,000	-,002	,006	-,043	,019	,011	**-,018**	,006	,022	,001	,005	,002	,010	,002	,003	-,004	,000	-,016	,021	,003	-,006	-,017	-,016	,002	-,008	-,022	,019
Deutsche Bank AG	-,001	-,002	-,001	-,001	-,002	-,002	,000	-,002	-,001	-,001	**-,001**	-,001	,000	-,002	-,002	-,001	-,002	-,001	-,002	-,001	-,002	-,002	-,001	-,002	-,001	-,002	-,001	-,001	,000	-,002	-,001
Deutsche Boerse	-,005	,008	,017	,011	,005	-,001	,009	-,015	,010	-,024	**,057**	,013	-,001	,001	,016	,031	,005	-,004	,002	-,029	,050	-,017	-,010	-,033	-,039	-,010	-,009	-,013	,006	,000	-,003
Deutsche Post	,000	-,004	,001	-,010	,004	-,009	,011	-,007	-,006	,007	**,004**	-,005	-,001	,004	,009	,000	-,005	,005	-,007	,000	-,008	-,006	,002	,005	,000	,013	-,004	,002	-,006	,017	-,016
Deutsche Telekom AG	,009	,002	-,004	,009	-,002	-,001	-,010	,000	-,004	-,006	**-,007**	,011	,007	,002	-,006	-,001	-,045	,000	-,001	-,027	-,011	-,015	,001	,021	,011	,010	,009	,008	-,006	-,008	,007
E.ON SE	,004	,004	,008	,000	,003	,005	-,008	,010	-,011	,000	**-,004**	,028	-,026	,003	-,003	,005	-,001	,002	-,007	-,009	,006	-,002	-,024	,003	,001	-,003	-,017	,015	,004	-,017	-,015
Fresenius SE	-,006	-,004	,012	,001	-,006	,011	,018	,025	-,011	,009	**-,007**	,013	-,007	,007	-,014	-,020	-,002	-,009	-,028	,014	,010	-,008	-,012	-,026	,011	,011	-,010	,023	-,008	-,014	-,026
Hannover Rueckversicherung	,002	,002	-,005	-,001	,012	,002	,000	,013	,008	-,006	**-,018**	,032	,020	,002	-,021	,014	,003	-,027	-,021	-,026	-,022	-,017	,013	-,014	,002	-,008	,029	-,009	,011	-,027	,000
Heidelbergcement	,011	,001	,000	-,005	,019	,018	,005	,008	-,002	,002	**,021**	,000	,006	,018	-,009	,014	,009	-,007	-,014	,012	-,001	,005	-,017	-,002	-,014	,046	-,003	-,010	-,004	,016	-,017
Henkel VZO	-,009	-,001	,041	-,003	-,004	,009	,011	-,017	,013	,007	**,008**	-,007	,016	-,023	-,006	,013	,003	-,002	-,034	-,005	-,016	-,008	,018	,004	-,009	-,009	,020	,008	,004	-,015	-,007
Infineon	,003	-,003	,005	,016	-,027	-,005	-,026	,004	-,002	-,006	**-,012**	,008	-,003	,014	-,001	-,002	,011	-,006	-,006	-,002	,010	,004	-,005	-,002	,006	,005	,004	-,003	-,002	,002	-,007
Mercedes Benz Group	,011	,004	-,020	,020	-,009	,001	-,004	,008	-,006	,003	**,010**	,009	-,014	-,027	,014	,005	,011	,003	,012	,016	-,018	-,005	,008	,021	-,011	-,009	,002	,006	,016	,049	,010
Merck	-,005	-,014	-,007	-,005	,005	-,006	,005	,005	,002	-,004	**,000**	-,001	-,004	-,010	,001	,010	-,027	,012	-,011	,000	-,016	-,006	,000	,006	,021	,018	,011	,001	,008	,005	-,014
MTU Aero	-,002	-,004	-,005	-,012	-,011	-,016	-,015	,007	-,006	-,013	**-,001**	-,015	-,002	-,033	-,002	-,008	-,024	,018	-,015	,010	,015	-,003	,024	-,005	-,004	,008	-,007	-,010	,002	,005	-,008
Munich Re Group	,011	,013	,001	-,002	,021	,023	,001	,008	,003	,011	**,020**	-,017	,014	,021	-,012	,009	,006	-,015	-,008	,004	,008	,004	-,016	-,011	-,009	,040	-,003	-,011	,004	,017	-,023
Porsche	,000	,036	,045	,036	-,017	,007	,001	-,014	-,015	-,011	**-,016**	-,033	,002	-,004	,021	-,003	,022	,028	,053	-,010	,031	-,001	,003	-,010	-,015	-,085	-,055	-,026	-,003	,006	,031
Qiagen	,005	-,006	-,023	-,008	-,008	,001	,001	,006	,008	-,007	**,010**	-,006	-,012	-,012	-,005	,000	-,027	-,007	,003	,002	-,018	,009	-,004	,013	,001	-,008	,013	-,003	,006	,003	,022
Rheinmetall AG	,008	,015	-,027	-,019	-,015	-,058	,007	,032	-,007	-,027	**,005**	-,006	,011	-,032	-,033	-,022	-,002	,032	,003	,068	-,040	,046	-,018	,003	,006	-,024	,014	-,050	-,019	-,016	,021
RWE AG ST	-,001	-,051	-,020	-,033	-,019	,016	-,007	,012	-,024	,068	**,002**	-,004	-,014	,037	-,026	-,015	,007	,000	-,008	,008	,002	-,003	-,033	-,012	,011	-,010	-,017	,013	,006	,016	-,025
SAP	-,007	-,009	-,003	-,003	,013	-,007	-,001	,010	,005	-,005	**,003**	,002	-,006	,001	,003	-,006	-,001	-,007	,008	,009	-,007	,000	,027	,001	,007	,000	,018	,002	,012	-,003	,014
Sartorius AG VZO	,002	-,016	-,035	-,005	,006	-,008	,000	,017	,001	-,005	**,020**	,000	-,009	-,014	,019	-,020	-,063	-,032	-,009	,018	-,050	,030	,006	-,010	,009	-,015	,018	,047	,045	-,024	,025
Siemens AG	-,001	,010	,002	,008	-,012	,009	,006	,005	,002	,005	**-,011**	-,002	-,009	-,005	,000	,001	,005	,002	-,001	,005	,008	,024	,003	,007	,011	,012	,014	-,014	,001	-,002	,014
Siemens Energy AG	,000	,015	-,007	,003	-,029	-,033	-,015	,019	-,007	-,035	**,014**	,001	,011	-,037	-,004	-,029	-,042	-,014	,008	,010	-,012	-,029	,025	,017	,000	-,029	-,003	,010	,025	-,046	-,011
Siemens Healthineers	,018	-,009	,001	,000	,013	,006	-,012	,017	-,003	-,007	**,010**	-,002	-,014	-,027	-,008	-,013	-,025	-,009	-,005	-,015	-,035	,011	,015	-,005	,010	,015	,046	,008	,007	-,011	,001
Symrise AG	-,003	-,028	-,014	-,004	-,007	-,013	,008	-,009	,010	,004	**-,009**	,006	,003	-,021	-,015	-,014	-,002	,002	,012	,020	-,025	,032	-,002	-,005	-,001	-,018	,024	-,010	,011	,008	-,008
Volkswagen VZO	-,002	,025	,020	,016	-,012	,004	,022	-,006	,025	-,005	**-,016**	-,013	,002	,000	,028	,001	-,003	,004	,014	-,003	,021	-,022	-,007	-,001	,004	-,045	-,032	-,010	-,013	,004	,027
Vonovia	-,022	-,036	,001	,018	,012	-,011	-,009	,000	,006	-,001	**-,029**	,004	,004	-,034	-,019	-,005	,020	-,022	-,018	-,003	-,025	,006	-,019	-,010	,034	-,020	,047	,018	-,032	-,034	-,008
Zalando SE	-,019	-,010	,017	,015	-,011	-,019	,002	,009	,019	-,014	**-,015**	,015	,020	-,056	,001	,024	,016	-,019	,022	-,008	-,033	,010	,019	,035	,028	-,033	,029	,001	,033	-,031	,041

Cumulative Abnormal Return (CAR)	ECB Event 2																												
	Event Window																												
Company	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	**0**	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Adidas	-,009	-,019	-,032	-,015	-,023	-,022	-,042	-,033	-,048	-,068	**-,062**	-,058	-,061	-,082	-,069	-,100	-,088	-,082	-,074	-,077	-,074	-,066	-,066	-,077	-,057	-,081	-,136	-,144	-,130	-,140	-,142
Airbus Group	-,001	,011	,003	-,002	-,016	-,026	-,028	-,020	-,030	-,047	**-,044**	-,066	-,061	-,063	-,068	-,066	-,078	-,066	-,070	-,064	-,051	-,029	-,028	-,039	-,051	-,040	-,047	-,055	-,046	-,044	-,043
Allianz	,000	,004	,002	,001	,000	,000	,008	,006	,001	-,019	**-,011**	-,018	,007	,010	,007	,020	,038	,033	,029	,022	,040	,037	,023	,017	-,005	,003	,007	-,002	-,001	,003	-,001
BASF	,006	,008	,048	,042	,051	,053	,055	,043	,052	,070	**,062**	,069	,074	,078	,061	,057	,057	,076	,070	,065	,071	,066	,072	,074	,069	,076	,082	,107	,097	,103	,093
Bayer	,016	,016	-,030	-,020	,000	-,016	-,013	-,014	-,028	-,040	**-,024**	-,017	-,013	-,007	-,002	-,010	-,015	-,017	-,018	-,023	-,024	-,048	-,070	-,068	-,074	-,072	-,088	-,084	-,098	-,091	-,109
Beiersdorf AG	-,001	,002	,003	-,021	-,023	-,025	-,026	-,024	-,018	-,017	**-,029**	-,018	-,005	-,004	-,003	,000	-,006	-,015	-,002	-,001	-,031	-,021	-,002	,006	,001	-,001	,000	-,029	-,023	-,016	-,011
BMW ST	,001	,006	,004	-,004	-,003	-,007	,004	,028	,020	,008	**,011**	,017	,029	,032	,032	,012	-,007	,017	,020	,008	,006	-,002	-,008	-,024	-,004	,001	,012	,021	,023	,019	,009
Brenntag AG	,000	,007	,018	,016	,022	,031	,024	,013	,008	,021	**,006**	-,003	,000	,006	,016	,023	,037	,049	,051	,045	,051	,035	,051	,053	,046	,031	,029	,030	,017	,011	,022
Commerzbank	-,010	,007	,040	,047	,081	,093	,105	,100	,130	,100	**,153**	,168	,162	,165	,202	,234	,253	,256	,276	,251	,299	,289	,280	,264	,219	,229	,232	,211	,198	,176	,180
Continental AG	-,013	-,037	-,008	,001	,000	,006	-,008	-,035	-,021	-,009	**-,032**	-,022	-,022	-,037	-,032	-,032	-,001	-,009	-,006	-,027	-,029	-,091	-,101	-,087	-,089	-,131	-,120	-,103	-,115	-,154	-,133
Covestro	,000	,010	,049	,043	,054	,057	,067	,057	,057	,078	**,083**	,096	,088	,082	,061	,051	,053	,082	,087	,086	,103	,101	,118	,125	,124	,134	,146	,171	,176	,177	,177
Daimler Truck Holding	,003	,006	,034	,038	,037	,036	,042	,000	,019	,029	**,011**	,017	,040	,041	,046	,048	,058	,061	,063	,059	,059	,043	,064	,067	,061	,044	,028	,030	,022	-,001	,019
Deutsche Bank AG	-,001	-,003	-,005	-,006	-,007	-,009	-,009	-,011	-,012	-,013	**-,015**	-,015	-,016	-,018	-,019	-,021	-,023	-,024	-,025	-,026	-,028	-,030	-,032	-,033	-,034	-,036	-,037	-,038	-,038	-,040	-,041
Deutsche Boerse	-,005	,003	,020	,031	,036	,035	,043	,028	,038	,013	**,070**	,083	,081	,082	,099	,130	,135	,131	,133	,104	,154	,136	,126	,093	,054	,045	,036	,023	,028	,028	,024
Deutsche Post	,000	-,004	-,003	-,012	-,009	-,018	-,008	-,015	-,021	-,014	**-,010**	-,015	-,016	-,013	-,004	-,004	-,008	-,004	-,011	-,011	-,019	-,025	-,023	-,017	-,018	-,005	-,009	-,007	-,013	,004	-,012
Deutsche Telekom AG	,009	,010	,006	,015	,013	,012	,002	,001	-,003	-,008	**-,015**	-,004	,003	,004	-,002	-,002	-,048	-,048	-,048	-,075	-,086	-,101	-,100	-,079	-,068	-,057	-,048	-,041	-,047	-,055	-,048
E.ON SE	,004	,008	,017	,016	,019	,024	,016	,026	,015	,015	**,012**	,040	,014	,017	,014	,019	,018	,020	,013	,005	,010	,009	-,015	-,013	-,012	-,015	-,032	-,017	-,013	-,030	-,045
Fresenius SE	-,006	-,010	,002	,003	-,002	,009	,027	,051	,040	,049	**,041**	,054	,047	,054	,041	,020	,018	,009	-,019	-,005	,005	-,003	-,015	-,041	-,030	-,019	-,029	-,006	-,014	-,028	-,054
Hannover Rueckversicherung	,002	,003	-,001	-,003	,009	,011	,010	,023	,031	,025	**,007**	,038	,058	,061	,040	,054	,057	,030	,008	-,017	-,039	-,056	-,043	-,057	-,055	-,063	-,034	-,044	-,033	-,060	-,059
Heidelbergcement	,011	,013	,013	,008	,027	,045	,050	,058	,056	,058	**,079**	,079	,086	,104	,095	,109	,118	,111	,097	,109	,108	,113	,096	,094	,080	,125	,122	,112	,108	,124	,107
Henkel VZO	-,009	-,010	,031	,028	,025	,034	,045	,028	,041	,048	**,056**	,048	,064	,041	,035	,048	,051	,049	,015	,009	-,007	-,015	,004	,008	-,001	-,011	,009	,018	,022	,007	,001
Infineon	,003	,000	,005	,021	-,007	-,011	-,037	-,033	-,035	-,041	**-,054**	-,046	-,049	-,035	-,036	-,038	-,027	-,033	-,039	-,041	-,032	-,028	-,033	-,034	-,028	-,023	-,019	-,022	-,023	-,022	-,029
Mercedes Benz Group	,011	,016	-,004	,015	,006	,008	,004	,011	,005	,009	**,018**	,027	,013	-,014	-,001	,005	,016	,018	,030	,046	,028	,022	,031	,051	,041	,032	,034	,040	,056	,105	,115
Merck	-,005	-,019	-,026	-,031	-,025	-,031	-,026	-,021	-,019	-,023	**-,023**	-,023	-,027	-,037	-,036	-,025	-,052	-,040	-,051	-,051	-,067	-,073	-,073	-,067	-,045	-,027	-,016	-,015	-,007	-,002	-,016
MTU Aero	-,002	-,006	-,011	-,022	-,033	-,050	-,065	-,058	-,063	-,076	**-,078**	-,092	-,095	-,127	-,129	-,138	-,161	-,143	-,158	-,148	-,133	-,136	-,112	-,116	-,120	-,112	-,119	-,129	-,127	-,122	-,130
Munich Re Group	,011	,024	,025	,023	,044	,067	,067	,075	,078	,090	**,110**	,093	,108	,128	,116	,125	,131	,116	,108	,112	,121	,125	,109	,098	,088	,128	,125	,113	,118	,134	,111
Porsche	,000	,036	,081	,118	,101	,108	,109	,094	,080	,069	**,052**	,019	,021	,017	,038	,035	,057	,085	,138	,129	,160	,158	,161	,152	,136	,051	-,004	-,030	-,033	-,027	,004
Qiagen	,005	-,001	-,024	-,032	-,039	-,039	-,038	-,032	-,024	-,030	**-,020**	-,026	-,038	-,050	-,055	-,055	-,083	-,090	-,086	-,084	-,102	-,093	-,097	-,084	-,084	-,091	-,078	-,081	-,076	-,073	-,051
Rheinmetall AG	,008	,023	-,004	-,023	-,037	-,095	-,089	-,056	-,063	-,091	**-,085**	-,091	-,080	-,112	-,145	-,167	-,169	-,137	-,134	-,065	-,105	-,059	-,077	-,074	-,067	-,091	-,077	-,127	-,146	-,162	-,141
RWE AG ST	-,001	-,051	-,072	-,105	-,123	-,108	-,114	-,102	-,126	-,058	**-,056**	-,059	-,073	-,036	-,062	-,077	-,070	-,070	-,078	-,070	-,068	-,071	-,104	-,116	-,105	-,115	-,132	-,119	-,114	-,097	-,123
SAP	-,007	-,016	-,019	-,022	-,009	-,016	-,017	-,007	-,002	-,007	**-,004**	-,002	-,007	-,006	-,003	-,009	-,010	-,017	-,009	,000	-,007	-,007	,020	,021	,028	,027	,046	,048	,060	,057	,071
Sartorius AG VZO	,002	-,014	-,049	-,054	-,048	-,056	-,055	-,038	-,037	-,042	**-,022**	-,023	-,032	-,045	-,027	-,046	-,109	-,142	-,150	-,132	-,182	-,152	-,146	-,155	-,146	-,162	-,144	-,096	-,051	-,075	-,050
Siemens AG	-,001	,009	,011	,019	,007	,016	,022	,027	,029	,034	**,023**	,021	,012	,007	,007	,008	,014	,016	,014	,020	,028	,051	,054	,062	,073	,085	,099	,085	,086	,084	,098
Siemens Energy AG	,000	,015	,008	,011	-,018	-,051	-,066	-,047	-,054	-,089	**-,075**	-,075	-,064	-,100	-,104	-,133	-,175	-,189	-,181	-,171	-,183	-,212	-,187	-,170	-,170	-,199	-,202	-,192	-,166	-,212	-,223
Siemens Healthineers	,018	,009	,010	,009	,023	,029	,017	,034	,031	,024	**,034**	,032	,017	-,010	-,018	-,031	-,056	-,064	-,069	-,084	-,119	-,108	-,093	-,097	-,088	-,072	-,027	-,018	-,011	-,021	-,020
Symrise AG	-,003	-,031	-,045	-,049	-,056	-,069	-,061	-,070	-,060	-,056	**-,065**	-,058	-,055	-,077	-,091	-,105	-,107	-,105	-,093	-,072	-,097	-,066	-,067	-,073	-,074	-,092	-,067	-,077	-,067	-,059	-,067
Volkswagen VZO	-,002	,023	,043	,059	,047	,051	,073	,067	,092	,087	**,071**	,057	,059	,059	,087	,088	,085	,089	,102	,099	,121	,099	,092	,091	,095	,050	,018	,008	-,005	-,001	,025
Vonovia	-,022	-,057	-,057	-,039	-,027	-,037	-,047	-,047	-,041	-,042	**-,070**	-,066	-,063	-,097	-,115	-,120	-,100	-,123	-,140	-,144	-,169	-,163	-,183	-,192	-,158	-,178	-,130	-,113	-,144	-,178	-,186
Zalando SE	-,019	-,029	-,012	,003	-,008	-,027	-,025	-,017	,002	-,012	**-,027**	-,012	,008	-,049	-,048	-,024	-,008	-,027	-,005	-,013	-,047	-,037	-,018	,017	,044	,011	,041	,042	,074	,043	,084

Abnormal Return (AR)	ECB Event 3																													
	Event Window																													
Company	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	**0**	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Adidas	-,006	,003	,016	-,009	-,017	-,008	-,089	-,018	-,042	,003	**-,025**	-,001	-,002	-,006	-,011	-,016	,184	,003	,031	,041	-,014	,055	-,034	-,002	-,003	-,006	-,011	-,031	-,012	,012	,011
Airbus Group	,021	-,017	,002	-,003	,008	,001	-,001	-,007	,001	-,001	**,002**	,032	-,006	,017	,001	,008	-,012	-,009	-,022	,001	-,051	-,009	-,011	,007	,012	-,015	-,004	,000	-,006	-,005	-,016
Allianz	,000	,000	,002	-,008	,014	,001	,006	,005	-,005	-,007	**,011**	,005	,004	,006	,008	,011	-,007	-,009	-,005	,004	,028	-,002	,001	-,013	,019	-,005	,001	,001	,003	-,003	-,004
BASF	,001	,000	-,003	,008	,005	,007	,017	-,008	-,025	-,023	**,010**	-,018	,002	-,006	-,002	,000	,021	,010	,001	-,014	-,014	,030	,004	-,025	-,002	-,015	,000	-,015	,014	-,005	,003
Bayer	,000	-,022	,011	-,017	,001	-,001	,005	,007	-,010	,009	**,004**	,009	,008	,006	-,005	,000	-,004	,002	-,057	-,028	-,004	-,029	,017	,037	-,008	-,004	,015	,013	,001	-,003	,012
Beiersdorf AG	-,020	,004	-,011	-,002	-,008	,002	-,004	-,001	,008	-,021	**-,037**	-,006	,006	-,022	-,013	,005	,012	-,008	,006	,010	,005	-,031	,005	-,002	,029	,007	-,004	,012	-,003	,004	,009
BMW ST	-,003	-,012	,010	,006	,010	,008	-,008	,009	,003	,001	**-,005**	-,005	,005	,008	,002	-,001	-,002	,011	,000	,020	-,012	,013	-,022	-,007	-,013	-,008	-,003	,003	,018	,005	,010
Brenntag AG	-,003	,002	,001	,003	,002	-,004	,001	-,012	-,007	-,002	**,004**	-,003	-,002	,002	,006	-,036	,014	,009	-,020	-,002	-,007	,010	,002	-,004	-,020	-,006	,009	-,003	,002	-,005	-,006
Commerzbank	,022	-,004	-,013	,004	-,005	,004	,012	-,009	-,011	-,018	**,001**	-,009	-,026	,007	-,005	,003	-,023	,002	-,030	-,072	-,049	-,020	,013	,018	,010	-,006	-,015	,010	-,014	-,018	,012
Continental AG	,024	-,008	,009	-,011	-,003	,022	,000	,002	-,015	-,012	**,016**	-,017	,012	,007	-,025	-,022	,060	,011	,006	-,010	,027	,024	-,005	-,025	-,032	-,035	,003	,002	-,001	-,006	,008
Covestro	,013	-,010	-,011	,011	,021	,020	,002	-,026	-,048	,008	**,002**	-,020	-,004	-,022	-,001	-,010	,045	,026	-,006	-,035	-,036	,043	-,007	-,023	-,018	-,007	,010	-,030	,042	,006	,026
Daimler Truck Holding	-,003	-,004	,005	,023	,008	-,011	,002	,007	-,014	-,003	**-,004**	-,014	,006	,001	-,011	-,005	,015	-,006	,000	-,011	,013	,016	-,006	-,002	-,050	-,018	,019	-,001	,000	-,002	-,003
Deutsche Bank AG	,001	,000	,001	,000	-,001	-,001	-,001	,001	,000	,001	**-,001**	,000	-,001	,000	-,002	-,002	,003	,000	,001	-,001	,004	,000	,000	,000	-,002	-,001	,001	-,001	,000	-,001	,000
Deutsche Boerse	,053	,021	-,021	,013	,006	,002	,000	,003	,003	-,003	**,049**	-,007	-,018	-,002	,015	,000	-,029	-,004	-,005	-,016	-,020	,018	-,013	,007	-,004	-,007	-,005	,005	-,009	,005	,003
Deutsche Post	-,009	-,005	-,004	,005	-,009	-,039	,023	-,001	,000	,012	**-,011**	,009	-,008	-,020	,002	-,011	-,020	,015	-,008	,009	-,013	-,010	-,005	,016	,033	-,004	,000	,006	,002	,011	-,009
Deutsche Telekom AG	-,009	,008	-,008	,012	,002	,006	-,009	-,002	,016	,005	**,003**	-,022	,008	-,010	-,008	-,010	,003	,003	-,001	-,010	,028	,026	-,009	-,012	-,004	-,003	-,005	-,011	-,002	-,002	,000
E.ON SE	-,020	,010	,003	-,008	,009	-,005	-,007	,003	,005	-,002	**,000**	,031	-,009	,005	,011	,000	-,007	-,003	-,007	,002	-,039	-,033	-,004	,000	,008	-,008	,014	,011	,001	-,003	,001
Fresenius SE	,019	,029	,009	,001	-,001	-,004	-,011	,023	,012	-,010	**,011**	-,013	,025	,004	,000	,010	,005	-,015	,009	-,001	-,005	-,014	,017	,003	-,001	-,002	,020	-,001	-,010	-,005	,010
Hannover Rueckversicheru	,000	-,012	,014	,004	,049	,015	-,007	-,006	,012	,034	**-,005**	-,032	,053	-,004	,007	-,025	,016	,005	-,003	,000	,007	-,020	,020	,000	,001	-,010	,022	,002	,013	,024	,002
Heidelbergcement	-,021	,005	-,013	-,011	,008	-,012	,029	-,003	-,010	,016	**,000**	-,001	-,006	-,004	,007	,009	-,033	-,002	,013	,010	-,019	,001	-,006	,001	,016	,002	-,008	,008	-,004	,002	-,004
Henkel VZO	,004	-,007	,003	,028	,010	,005	-,004	,002	-,010	,013	**,012**	,001	,004	,011	-,016	,013	,011	,002	-,003	,000	-,003	,020	,000	,001	-,021	-,015	,015	,001	,000	,007	,003
Infineon	-,008	,009	,004	,004	-,003	,005	-,019	-,005	,005	-,017	**,004**	,009	,005	-,010	-,001	-,014	-,003	,011	,002	,015	,001	,007	,006	-,003	-,002	,000	-,002	,009	,006	-,005	,009
Mercedes Benz Group	,007	-,022	,003	,000	,004	,020	-,004	-,001	,012	-,020	**-,036**	-,004	-,023	,009	-,004	,009	,011	,014	,055	-,013	,020	-,023	,069	,022	,005	-,008	-,009	-,013	,002	,001	-,005
Merck	-,007	,022	-,003	,001	-,043	-,013	-,011	,015	,015	,017	**-,016**	-,007	-,018	-,014	,020	-,009	-,011	-,006	,024	,012	,014	-,019	,040	-,007	,000	-,028	-,009	-,004	-,017	-,008	,023
MTU Aero	,027	-,007	,008	,009	,008	,001	,003	-,011	-,020	,003	**-,003**	,036	-,016	-,003	-,006	,014	-,012	-,019	-,020	,003	-,045	-,022	-,009	,009	,010	,040	,018	,009	,012	-,002	-,010
Munich Re Group	-,004	,007	-,013	-,005	,018	-,010	,039	,001	-,013	,008	**,009**	,000	-,011	,005	,005	,012	-,022	-,007	,016	,012	-,010	-,016	,006	-,003	,010	-,002	,000	,005	,001	,007	-,014
Porsche	-,022	-,012	,004	-,011	-,012	,009	-,012	-,027	-,009	-,007	**-,008**	-,012	-,009	,006	-,001	-,002	-,015	,012	-,033	-,001	-,023	,011	-,013	,009	-,042	,012	,001	-,007	,000	-,005	-,004
Qiagen	,005	-,002	,005	-,001	-,041	-,005	-,014	-,005	,011	,011	**-,016**	,001	-,001	,016	-,011	-,005	-,028	-,022	,048	,000	,016	,012	-,006	,008	-,015	,007	-,003	,024	-,011	,006	-,001
Rheinmetall AG	-,041	,040	-,002	-,023	,055	-,018	,015	,029	,018	-,004	**-,007**	-,031	,003	-,008	-,015	-,053	,013	-,008	,011	,041	-,025	,062	,017	-,003	-,027	,024	,025	,068	-,032	,007	,001
RWE AG ST	,025	,006	-,006	-,011	-,020	-,010	-,020	,029	,013	-,018	**,001**	-,006	,004	,002	-,006	,008	-,018	-,017	-,003	,017	,006	-,025	-,027	,011	,014	,016	,006	-,004	,004	-,008	,007
SAP	-,003	,017	-,004	,009	-,009	,007	,021	-,013	,058	,001	**-,002**	-,004	-,001	-,012	,005	-,005	-,013	,003	,007	,000	,041	,005	-,007	,008	,009	,007	-,032	,014	-,008	,000	-,007
Sartorius AG VZO	-,001	,011	-,006	,022	-,183	,036	,007	,013	,037	,011	**-,013**	-,005	,008	-,042	-,003	-,014	-,009	,016	,053	,016	,048	,043	-,015	-,040	-,039	-,014	-,007	-,006	-,018	,000	,012
Siemens AG	,006	-,020	,004	-,001	-,001	-,004	-,006	,006	,000	-,005	**-,003**	-,010	-,009	,006	-,009	-,007	,011	,006	,001	-,005	-,006	,008	-,007	-,004	-,003	,066	,006	-,021	,008	-,001	-,009
Siemens Energy AG	,035	,002	,017	,009	,000	-,021	,001	,007	-,005	,030	**,005**	,000	,010	,021	,004	,004	,004	,011	,035	,002	,054	,021	-,004	,010	,013	-,009	,012	,008	,024	,029	,037
Siemens Healthineers	-,009	,011	,004	,015	-,007	,040	-,013	,000	-,008	,006	**-,014**	,000	,002	,012	-,018	-,024	,002	,002	,014	,041	,033	-,020	,012	-,001	,003	-,005	,008	,005	-,006	-,022	,016
Symrise AG	-,038	,013	,011	,000	,006	,012	-,014	,007	,029	,024	**-,020**	,000	-,010	-,013	,004	-,037	,017	-,028	,030	,017	,041	,007	-,003	-,006	-,010	,020	,004	-,018	-,012	,015	,011
Volkswagen VZO	-,012	-,008	,005	,008	-,001	-,002	,002	-,017	-,005	-,016	**-,004**	-,022	,008	,013	-,001	-,011	,006	,017	-,016	-,006	-,020	,019	-,003	-,007	-,028	,006	,008	-,011	-,003	-,019	-,012
Vonovia	-,024	,062	,039	-,014	-,015	,031	-,016	,010	,038	-,018	**,051**	-,048	,020	,022	-,048	-,011	,051	-,018	,010	,027	,025	,024	-,011	-,007	-,011	-,014	,008	-,018	-,016	-,006	,053
Zalando SE	,021	,000	,022	-,005	-,011	,017	-,024	-,025	,055	,052	**-,019**	-,041	-,033	,035	-,046	,099	-,022	,009	,030	-,020	,087	,118	,033	-,022	-,036	-,030	-,047	-,014	-,024	,018	,022

Cumulative Abnormal Return (CAR)	ECB Event 3																													
	Event Window																													
Company	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	**0**	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Adidas	-,006	-,003	,013	,004	-,013	-,021	-,110	-,129	-,170	-,167	**-,192**	-,193	-,195	-,201	-,212	-,228	-,044	-,040	-,009	,033	,018	,073	,040	,038	,035	,029	,018	-,013	-,025	-,012	-,001
Airbus Group	,021	,004	,007	,004	,012	,012	,012	,005	,005	,004	**,006**	,038	,032	,048	,050	,058	,046	,037	,015	,015	-,036	-,045	-,056	-,050	-,037	-,053	-,056	-,056	-,062	-,067	-,083
Allianz	,000	-,001	,001	-,007	,007	,008	,014	,018	,014	,007	**,018**	,023	,027	,032	,040	,051	,044	,035	,030	,034	,062	,060	,061	,048	,067	,062	,063	,064	,067	,064	,060
BASF	,001	,002	-,002	,007	,012	,018	,036	,028	,002	-,021	**-,011**	-,029	-,027	-,033	-,036	-,036	-,015	-,005	-,004	-,017	-,032	-,002	,002	-,022	-,025	-,040	-,040	-,055	-,041	-,046	-,043
Bayer	,000	-,022	-,010	-,028	-,027	-,028	-,023	-,016	-,026	-,017	**-,013**	-,004	,005	,011	,006	,006	,002	,004	-,053	-,080	-,084	-,113	-,096	-,059	-,068	-,072	-,057	-,044	-,043	-,047	-,035
Beiersdorf AG	-,020	-,016	-,027	-,029	-,037	-,035	-,038	-,039	-,031	-,052	**-,089**	-,095	-,089	-,111	-,124	-,119	-,107	-,115	-,109	-,099	-,094	-,126	-,121	-,124	-,095	-,087	-,092	-,080	-,084	-,080	-,071
BMW ST	-,003	-,015	-,006	,001	,011	,019	,011	,020	,023	,024	**,019**	,014	,018	,026	,028	,027	,025	,037	,037	,057	,046	,059	,037	,030	,017	,009	,006	,008	,027	,031	,041
Brenntag AG	-,003	,000	,000	,004	,006	,001	,003	-,009	-,016	-,018	**-,014**	-,017	-,019	-,017	-,011	-,048	-,033	-,025	-,045	-,047	-,054	-,044	-,042	-,046	-,066	-,073	-,063	-,066	-,064	-,069	-,075
Commerzbank	,022	,018	,004	,008	,003	,008	,020	,011	,000	-,018	**-,017**	-,026	-,052	-,045	-,050	-,047	-,071	-,069	-,099	-,171	-,220	-,240	-,228	-,209	-,199	-,206	-,220	-,210	-,224	-,242	-,230
Continental AG	,024	,016	,025	,014	,011	,033	,034	,036	,021	,008	**,024**	,007	,019	,025	,001	-,021	,039	,050	,056	,046	,073	,098	,092	,068	,035	,000	,003	,006	,005	-,001	,006
Covestro	,013	,003	-,007	,003	,024	,044	,046	,020	-,028	-,020	**-,019**	-,038	-,043	-,065	-,066	-,076	-,032	-,006	-,012	-,047	-,083	-,039	-,047	-,070	-,088	-,095	-,084	-,114	-,072	-,066	-,040
Daimler Truck Holding	-,003	-,007	-,002	,020	,028	,017	,019	,026	,012	,009	**,005**	-,008	-,003	-,002	-,013	-,018	-,003	-,008	-,008	-,019	-,006	,010	,004	,002	-,048	-,066	-,047	-,048	-,048	-,050	-,053
Deutsche Bank AG	,001	,001	,003	,003	,002	,002	,000	,002	,002	,003	**,002**	,002	,001	,001	-,001	-,003	,000	,000	,000	-,001	,003	,003	,003	,003	,001	,000	,001	,000	-,001	-,002	-,001
Deutsche Boerse	,053	,073	,052	,065	,071	,072	,072	,075	,078	,075	**,124**	,118	,099	,097	,112	,112	,083	,079	,074	,058	,038	,055	,043	,050	,045	,038	,033	,038	,029	,034	,037
Deutsche Post	-,009	-,014	-,018	-,013	-,022	-,061	-,038	-,040	-,039	-,028	**-,038**	-,029	-,038	-,057	-,055	-,066	-,085	-,070	-,078	-,069	-,082	-,093	-,098	-,082	-,049	-,054	-,054	-,047	-,045	-,034	-,043
Deutsche Telekom AG	-,009	-,001	-,009	,004	,006	,011	,003	,001	,017	,022	**,025**	,003	,012	,002	-,007	-,017	-,014	-,011	-,011	-,022	,006	,032	,023	,011	,008	,005	,000	-,011	-,012	-,015	-,014
E.ON SE	-,020	-,010	-,007	-,015	-,007	-,011	-,018	-,015	-,010	-,012	**-,012**	,019	,010	,015	,026	,026	,019	,016	,009	,011	-,028	-,061	-,065	-,064	-,056	-,064	-,050	-,039	-,038	-,042	-,040
Fresenius SE	,019	,048	,057	,059	,058	,053	,043	,066	,077	,067	**,078**	,066	,091	,096	,096	,105	,110	,095	,104	,102	,097	,083	,100	,103	,103	,101	,120	,120	,110	,105	,116
Hannover Rueckversicheru	,000	-,012	,002	,006	,055	,070	,063	,057	,069	,103	**,098**	,067	,119	,115	,123	,097	,113	,118	,114	,114	,121	,102	,122	,122	,123	,113	,135	,137	,150	,174	,176
Heidelbergcement	-,021	-,015	-,028	-,039	-,031	-,043	-,014	-,017	-,027	-,011	**-,011**	-,012	-,018	-,022	-,015	-,006	-,039	-,041	-,028	-,018	-,038	-,037	-,043	-,042	-,026	-,024	-,031	-,023	-,028	-,026	-,030
Henkel VZO	,004	-,003	,000	,029	,039	,043	,040	,041	,031	,044	**,056**	,057	,061	,073	,056	,070	,081	,083	,080	,080	,077	,097	,098	,099	,078	,064	,078	,079	,079	,086	,089
Infineon	-,008	,000	,004	,009	,006	,011	-,008	-,013	-,007	-,025	**-,020**	-,011	-,006	-,016	-,017	-,031	-,034	-,023	-,021	-,006	-,005	,001	,007	,003	,001	,001	-,001	,008	,014	,008	,017
Mercedes Benz Group	,007	-,015	-,012	-,012	-,008	,013	,009	,007	,019	-,001	**-,037**	-,041	-,064	-,055	-,058	-,049	-,038	-,024	,031	,017	,038	,015	,084	,106	,111	,103	,094	,081	,083	,083	,078
Merck	-,007	,015	,012	,013	-,030	-,043	-,054	-,039	-,025	-,008	**-,024**	-,031	-,050	-,064	-,044	-,053	-,064	-,070	-,046	-,034	-,020	-,039	,001	-,005	-,005	-,033	-,042	-,047	-,063	-,071	-,048
MTU Aero	,027	,020	,028	,037	,046	,047	,050	,039	,019	,022	**,020**	,055	,039	,036	,030	,044	,031	,013	-,008	-,005	-,050	-,071	-,081	-,072	-,061	-,021	-,003	,006	,018	,015	,006
Munich Re Group	-,004	,004	-,009	-,015	,003	-,008	,031	,032	,019	,026	**,035**	,035	,024	,029	,034	,046	,024	,017	,033	,045	,036	,020	,025	,022	,032	,030	,030	,035	,036	,043	,029
Porsche	-,022	-,034	-,030	-,042	-,054	-,044	-,057	-,084	-,093	-,100	**-,109**	-,121	-,130	-,123	-,124	-,126	-,141	-,129	-,162	-,163	-,185	-,174	-,188	-,178	-,220	-,208	-,207	-,215	-,215	-,220	-,223
Qiagen	,005	,003	,008	,006	-,034	-,039	-,053	-,058	-,046	-,035	**-,052**	-,050	-,052	-,035	-,046	-,051	-,078	-,101	-,053	-,053	-,038	-,025	-,031	-,023	-,038	-,031	-,033	-,010	-,020	-,014	-,015
Rheinmetall AG	-,041	-,002	-,003	-,026	,028	,011	,026	,055	,073	,069	**,062**	,031	,034	,026	,011	-,042	-,029	-,037	-,025	,016	-,009	,054	,071	,068	,041	,065	,090	,159	,126	,133	,134
RWE AG ST	,025	,031	,025	,014	-,005	-,015	-,036	-,007	,006	-,012	**-,010**	-,016	-,013	-,010	-,016	-,008	-,026	-,043	-,046	-,030	-,023	-,048	-,075	-,064	-,050	-,034	-,028	-,033	-,028	-,036	-,028
SAP	-,003	,014	,010	,018	,010	,016	,037	,024	,081	,082	**,080**	,076	,076	,063	,068	,063	,051	,053	,060	,060	,101	,106	,099	,107	,115	,122	,090	,104	,096	,096	,089
Sartorius AG VZO	-,001	,010	,004	,026	-,157	-,121	-,113	-,100	-,063	-,052	**-,066**	-,071	-,062	-,104	-,108	-,121	-,130	-,114	-,061	-,045	,002	,045	,030	-,010	-,048	-,062	-,069	-,075	-,092	-,092	-,080
Siemens AG	,006	-,014	-,010	-,011	-,011	-,015	-,021	-,015	-,015	-,021	**-,024**	-,034	-,043	-,037	-,046	-,053	-,042	-,037	-,036	-,040	-,046	-,039	-,045	-,050	-,052	,014	,020	-,001	,007	,007	-,002
Siemens Energy AG	,035	,037	,054	,063	,063	,041	,042	,050	,045	,075	**,080**	,080	,090	,111	,116	,120	,124	,135	,170	,171	,225	,246	,242	,251	,264	,256	,268	,276	,300	,329	,366
Siemens Healthineers	-,009	,003	,007	,022	,015	,055	,043	,043	,034	,041	**,027**	,027	,029	,041	,023	-,001	,001	,003	,018	,059	,092	,072	,084	,083	,085	,080	,089	,094	,088	,065	,081
Symrise AG	-,038	-,025	-,014	-,013	-,007	,005	-,008	-,001	,028	,052	**,032**	,032	,023	,010	,013	-,024	-,007	-,035	-,005	,012	,054	,061	,057	,051	,041	,060	,064	,046	,035	,050	,060
Volkswagen VZO	-,012	-,020	-,015	-,007	-,008	-,011	-,009	-,025	-,031	-,047	**-,051**	-,073	-,065	-,052	-,053	-,063	-,057	-,040	-,056	-,061	-,082	-,063	-,066	-,072	-,100	-,095	-,087	-,098	-,101	-,120	-,132
Vonovia	-,024	,038	,077	,063	,049	,080	,064	,075	,113	,095	**,146**	,098	,118	,140	,092	,081	,133	,115	,125	,152	,177	,201	,190	,183	,172	,158	,166	,148	,132	,125	,178
Zalando SE	,021	,021	,043	,038	,027	,044	,020	-,005	,050	,102	**,083**	,043	,009	,044	-,002	,098	,076	,084	,114	,095	,181	,300	,333	,311	,276	,245	,198	,184	,160	,178	,200

Abnormal Return (AR)	ECB Event 4																													
	Event Window																													
Company	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	**0**	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Adidas	,004	,020	,005	-,006	-,015	-,011	-,008	,020	-,028	,061	**,047**	-,032	,019	,009	-,043	,088	-,009	,002	,013	-,017	,037	-,019	-,007	,005	,057	-,013	,000	,011	-,025	,024	,013
Airbus Group	-,007	,004	,014	,003	,011	-,023	,007	,020	-,014	,015	**,037**	-,012	-,011	,013	-,020	,037	-,016	-,007	,015	-,025	,018	-,020	,011	-,023	,013	-,020	-,004	,009	-,036	-,021	,018
Allianz	-,012	-,006	-,001	,008	,007	,001	-,007	,009	-,021	,015	**,021**	-,020	-,008	,011	-,010	,029	-,008	-,005	,008	-,014	,016	-,023	,003	-,009	,034	-,020	,000	,009	,002	-,011	,009
BASF	-,019	-,016	,025	-,006	,006	-,010	-,016	,019	-,037	,021	**,034**	-,021	-,005	,000	-,012	,032	-,019	,008	,016	-,015	,018	-,020	,025	-,007	,047	-,001	,008	,002	-,036	,000	,016
Bayer	-,016	-,009	-,001	-,028	-,001	-,003	-,008	,005	-,021	,003	**,015**	-,026	-,042	,007	-,001	,001	-,012	-,002	,000	-,005	,018	-,027	,017	-,022	,008	-,005	,006	,026	,031	,030	,006
Beiersdorf AG	,006	,014	,003	-,006	,008	-,001	,009	-,007	,007	-,007	**,033**	-,019	,002	-,001	-,016	,025	-,013	-,003	,010	-,013	,013	-,008	-,005	-,008	,013	-,016	-,002	,008	-,004	-,011	-,007
BMW ST	-,016	,008	,006	,006	,007	,001	-,015	,003	-,023	-,001	**,028**	-,028	-,008	,017	-,007	,040	-,005	,002	,009	-,004	,019	-,017	,008	,026	,010	-,004	,001	,011	-,017	,026	-,012
Brenntag AG	,011	-,017	,007	,015	-,002	-,008	-,027	,024	-,017	-,003	**,034**	-,005	-,007	,016	-,021	,024	-,013	-,002	,007	-,017	,018	-,017	,020	-,024	,028	-,001	-,008	,006	-,007	,005	,013
Commerzbank	-,012	-,041	,010	,018	,014	-,015	-,017	,027	-,036	,003	**,042**	,002	,050	,015	,066	,009	-,009	,003	,006	-,026	,007	-,015	-,006	,005	,027	-,034	-,003	,001	-,029	-,023	,002
Continental AG	-,019	-,007	,014	,007	-,011	-,014	,006	,032	-,031	,027	**,062**	-,004	-,020	-,007	-,028	,048	-,031	,014	,017	-,022	,034	-,035	,045	-,022	,039	-,009	,005	,016	-,022	,013	,018
Covestro	-,009	-,029	,022	-,010	,007	-,016	-,016	,024	-,020	,030	**,029**	-,023	-,008	,019	-,020	,030	-,001	-,010	,019	-,008	,012	-,021	,038	,008	,053	-,008	,001	,013	-,038	-,022	-,020
Daimler Truck Holding	,021	-,007	,006	,012	-,001	-,011	-,010	,032	-,029	,012	**,041**	-,030	-,006	,015	-,030	,030	-,032	,000	,015	-,023	,024	-,023	,028	-,024	,033	-,007	-,015	,014	-,009	-,004	,008
Deutsche Bank AG	-,002	-,002	-,003	-,003	-,003	-,002	-,001	-,003	-,001	-,002	**-,005**	-,003	-,002	-,003	-,001	-,003	-,002	-,002	-,003	-,001	-,003	-,001	-,001	,000	-,003	-,001	-,001	-,002	-,001	-,001	-,002
Deutsche Boerse	-,018	-,025	,019	,022	,000	-,011	-,005	,018	-,031	,027	**,029**	-,028	,015	,009	,036	,030	-,004	,001	,007	-,022	,021	-,025	,022	-,015	,058	-,034	-,009	,011	-,021	-,007	,002
Deutsche Post	,016	,012	,003	-,020	-,006	-,005	-,009	,002	-,028	,000	**,015**	-,012	-,007	-,007	-,022	,022	-,011	-,003	-,003	-,009	,013	-,020	-,002	-,014	-,010	-,018	-,008	,017	,012	-,004	-,005
Deutsche Telekom AG	-,007	,007	,026	,000	,009	-,008	-,017	,017	-,023	,030	**,039**	-,063	-,006	-,027	-,024	,042	-,021	,004	,010	-,013	,024	-,021	,015	-,018	,017	-,006	-,014	,026	-,020	-,009	,010
E.ON SE	-,008	,011	,001	-,003	-,004	-,003	-,009	,003	-,019	,004	**,016**	-,011	-,006	,007	-,013	,018	-,009	-,008	,006	-,008	,013	-,031	,010	-,008	,011	,008	,004	,003	-,002	,002	,008
Fresenius SE	,000	-,005	,016	,013	-,003	,001	-,010	,009	-,013	,005	**,038**	-,019	-,017	,021	-,012	,024	-,008	-,003	,010	-,005	,031	-,013	,010	,006	,038	-,027	,001	-,007	,002	-,002	,015
Hannover Rueckversicheru	,007	-,003	,025	-,010	-,011	,010	,012	-,003	-,033	,022	**,030**	-,027	-,010	,012	-,017	,028	-,008	,009	,000	-,012	,023	-,008	,002	,009	,034	,002	,007	-,010	-,036	,013	,014
Heidelbergcement	-,004	,008	,000	,006	,017	-,004	-,002	,012	-,018	,001	**,031**	-,014	-,013	,007	-,013	,026	-,002	-,005	,014	-,016	,011	-,017	-,018	-,004	,036	-,025	-,012	-,004	-,028	-,026	-,003
Henkel VZO	-,015	-,011	,010	-,005	,013	-,011	-,008	,027	-,029	,012	**,051**	-,009	-,002	,017	-,021	,033	-,009	,014	,013	-,020	,018	-,026	,025	-,005	,028	-,013	-,002	,020	-,042	,002	,004
Infineon	-,003	,004	,010	-,008	-,008	-,006	-,003	,004	-,029	-,002	**,020**	-,007	,002	,010	-,007	,010	-,011	-,001	,002	-,016	,009	-,013	-,001	-,002	,008	,000	-,031	,005	-,017	-,002	-,008
Mercedes Benz Group	,021	,022	,002	,010	-,015	-,014	,009	,001	-,024	,050	**,025**	-,036	-,028	-,002	-,025	,034	-,033	-,012	,001	-,030	,038	-,024	-,002	-,020	,036	-,024	,006	,026	-,028	-,007	,012
Merck	,005	,014	,010	,003	-,012	-,002	,006	,032	,000	,028	**,046**	-,035	-,008	-,006	-,025	,028	-,009	,003	,009	-,003	,020	-,020	-,011	,001	,041	-,035	,001	,033	-,012	,039	-,025
MTU Aero	,007	-,006	,018	,009	,001	-,004	,007	,005	-,022	,004	**,033**	-,014	,011	,010	-,016	,032	-,026	-,003	,016	-,017	,007	-,023	,012	-,010	,011	-,003	,002	,002	-,015	-,003	,012
Munich Re Group	-,008	,007	-,005	,011	,014	-,007	-,001	,009	-,016	,003	**,025**	-,021	-,013	,012	-,006	,023	-,013	-,002	,009	-,015	,015	-,016	-,008	-,007	,048	-,019	,005	-,001	-,019	-,012	,007
Porsche	-,002	-,017	,024	,020	-,002	-,023	-,017	,009	-,030	-,003	**,039**	-,033	-,020	,003	-,036	,032	-,026	-,002	,011	-,022	,037	-,014	,018	-,022	,022	-,003	-,009	,021	,001	-,010	-,010
Qiagen	-,001	,005	,006	-,018	-,012	,008	,006	,004	,004	-,003	**,012**	-,009	-,010	,007	-,013	,017	-,003	-,006	,004	,003	,014	-,010	-,033	,018	,009	-,008	-,013	-,006	,003	-,007	-,002
Rheinmetall AG	-,022	,020	-,021	,009	-,014	,020	-,009	,009	-,018	,001	**,013**	,007	-,083	-,031	,027	,022	-,028	,013	,013	-,005	-,040	,052	,012	-,017	,012	,029	,010	-,010	-,023	,017	-,018
RWE AG ST	,001	,013	-,012	-,007	,018	-,002	-,014	,013	-,014	,004	**,029**	-,012	-,018	,003	-,012	,015	-,001	-,013	-,001	-,010	,016	-,011	-,006	-,062	-,023	-,003	-,002	-,002	,001	,018	,035
SAP	,008	,016	,006	-,005	-,014	-,008	-,006	,004	-,010	,018	**,025**	-,037	-,002	-,002	-,024	,027	-,018	-,005	,003	-,014	,019	-,021	,004	-,007	,026	-,008	,005	,023	-,008	,013	,000
Sartorius AG VZO	,003	,039	,008	,000	-,024	-,001	-,013	-,001	,013	,032	**,042**	-,032	-,045	,000	-,017	,035	-,002	,005	,013	,009	,053	-,017	-,076	-,012	,043	,011	-,030	,061	,003	,035	-,005
Siemens AG	-,023	,015	,016	,015	-,005	-,007	-,017	,017	-,012	,008	**,032**	-,032	-,009	,013	-,023	,035	-,013	-,006	,014	-,023	,030	-,021	-,010	-,022	,038	-,020	-,008	,018	-,018	,004	,011
Siemens Energy AG	,004	,009	,022	,036	-,001	-,011	,001	,031	-,009	,049	**,020**	-,032	-,020	,025	-,018	,048	-,004	-,004	,027	-,024	,027	-,018	-,029	,007	,026	-,029	,024	-,006	-,039	,047	,005
Siemens Healthineers	,000	-,001	,023	-,007	-,027	,002	-,003	,015	-,003	,015	**,035**	-,050	-,010	-,012	-,055	,027	-,008	-,003	,010	-,005	,035	-,017	-,020	,005	,018	-,015	-,016	,021	-,018	,034	-,008
Symrise AG	,009	,011	-,011	-,015	-,007	,002	-,014	,008	,003	,016	**,015**	-,015	-,008	,005	-,019	,013	-,019	,001	,009	-,009	,011	-,021	-,001	-,007	,027	-,018	,001	,015	-,010	-,003	-,030
Volkswagen VZO	,007	-,007	,005	,023	,000	-,016	-,017	,011	-,026	,016	**,044**	-,021	,018	-,101	-,043	,022	-,043	,002	,009	-,021	,025	-,011	,021	-,012	,037	-,006	-,008	,001	-,021	-,006	,005
Vonovia	-,018	-,008	,038	-,003	-,005	-,003	,003	,004	-,033	,056	**,051**	-,029	-,084	,006	-,042	,059	-,004	,005	,009	-,002	,032	-,027	,034	-,003	,061	-,028	,003	,040	-,016	,060	,009
Zalando SE	,008	,040	,031	-,008	,020	,011	-,015	,010	,030	,070	**,047**	-,063	-,003	,003	-,040	,084	-,031	,016	,019	-,017	,062	-,049	,046	-,006	,053	,001	,005	,027	-,048	,030	,032

Cumulative Abnormal Return (CAR)	ECB Event 4																													
	Event Window																													
Company	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	**0**	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Adidas	,004	,025	,029	,024	,009	-,002	-,010	,010	-,018	,043	**,091**	,058	,077	,086	,043	,131	,121	,124	,137	,120	,158	,138	,131	,136	,193	,180	,180	,191	,166	,190	,203
Airbus Group	-,007	-,003	,011	,013	,024	,002	,009	,029	,014	,030	**,066**	,054	,043	,056	,037	,073	,057	,050	,066	,041	,059	,039	,050	,027	,041	,020	,017	,026	-,011	-,031	-,013
Allianz	-,012	-,018	-,018	-,011	-,004	-,003	-,010	-,001	-,022	-,008	**,013**	-,006	-,015	-,004	-,014	,015	,008	,002	,011	-,003	,013	-,010	-,006	-,015	,019	-,001	-,002	,008	,010	-,001	,008
BASF	-,019	-,035	-,010	-,016	-,010	-,020	-,036	-,017	-,054	-,033	**,001**	-,020	-,025	-,025	-,037	-,006	-,025	-,018	-,002	-,017	,001	-,020	,005	-,002	,045	,044	,052	,055	,019	,019	,035
Bayer	-,016	-,025	-,026	-,054	-,055	-,058	-,065	-,060	-,082	-,078	**-,064**	,090	-,132	-,125	-,125	-,124	-,136	-,139	-,144	-,126	-,153	-,136	-,158	-,150	-,155	-,149	-,124	-,093	-,063	-,057	
Beiersdorf AG	,006	,020	,023	,017	,025	,023	,032	,025	,032	,025	**,058**	,039	,041	,040	,024	,049	,036	,032	,042	,029	,042	,034	,028	,020	,033	,017	,015	,023	,018	,007	,000
BMW ST	-,016	-,009	-,002	,004	,011	,013	-,002	,001	-,023	-,024	**,005**	-,024	-,032	-,014	-,021	,018	,014	,016	,024	,020	,039	,023	,031	,057	,067	,063	,063	,074	,057	,083	,070
Brenntag AG	,011	-,006	,001	,016	,014	,006	-,022	,002	-,015	-,017	**,017**	,011	,005	,021	,001	,024	,012	,009	,016	,000	,018	,000	,020	-,004	,023	,022	,014	,020	,013	,018	,031
Commerzbank	-,012	-,054	-,043	-,025	-,011	-,026	-,043	-,015	-,051	-,049	**-,007**	-,006	,045	,059	,126	,135	,126	,129	,135	,109	,116	,101	,095	,100	,127	,093	,090	,091	,062	,039	,041
Continental AG	-,019	-,026	-,013	-,005	-,016	-,031	-,025	,007	-,024	,003	**,065**	,060	,040	,034	,005	,053	,022	,036	,053	,030	,064	,029	,074	,052	,091	,082	,088	,103	,081	,094	,112
Covestro	-,009	-,038	-,015	-,026	-,019	-,035	-,051	-,028	-,048	-,018	**,011**	-,012	-,020	-,001	-,022	,009	,007	-,003	,017	,009	,021	,000	,037	,045	,098	,090	,091	,104	,066	,044	,024
Daimler Truck Holding	,021	,014	,019	,031	,031	,020	,010	,042	,013	,025	**,066**	,036	,030	,045	,015	,045	,013	,013	,028	,005	,029	,006	,034	,010	,043	,036	,020	,034	,026	,022	,030
Deutsche Bank AG	-,002	-,003	-,006	-,009	-,012	-,014	-,015	-,018	-,019	-,021	**-,026**	-,029	-,031	-,033	-,034	-,037	-,039	-,041	-,044	-,045	-,048	-,049	-,051	-,051	-,053	-,054	-,055	-,058	-,059	-,060	-,062
Deutsche Boerse	-,018	-,043	-,024	-,002	-,002	-,013	-,018	-,001	-,032	-,005	**,023**	-,005	,010	,018	,054	,085	,081	,082	,089	,066	,087	,062	,084	,069	,127	,093	,084	,096	,074	,068	,070
Deutsche Post	,016	,028	,031	,010	,005	,000	-,009	-,007	-,035	-,035	**-,020**	-,032	-,039	-,045	-,068	-,045	-,056	-,059	-,062	-,071	-,058	-,078	-,080	-,094	-,104	-,122	-,130	-,112	-,100	-,104	-,109
Deutsche Telekom AG	-,007	-,001	,026	,026	,035	,027	,010	,027	,004	,035	**,074**	,011	,005	-,022	-,046	-,004	-,025	-,020	-,010	-,023	,001	-,020	-,005	-,023	-,006	-,013	-,026	,000	-,020	-,029	-,019
E.ON SE	-,008	,003	,004	,001	-,003	-,005	-,014	-,011	-,030	-,026	**-,010**	-,021	-,026	-,020	-,033	-,015	-,025	-,033	-,027	-,035	-,021	-,052	-,042	-,050	-,039	-,031	-,026	-,023	-,025	-,023	-,016
Fresenius SE	,000	-,004	,012	,024	,022	,022	,012	,021	,008	,013	**,051**	,032	,015	,037	,025	,049	,041	,038	,048	,042	,074	,061	,071	,076	,114	,087	,088	,081	,083	,081	,096
Hannover Rueckversicheru	,007	,004	,029	,019	,008	,018	,030	,026	-,007	,015	**,045**	,018	,008	,020	,003	,031	,023	,031	,031	,019	,042	,034	,036	,045	,080	,082	,089	,079	,043	,057	,070
Heidelbergcement	-,004	,004	,004	,010	,027	,023	,021	,033	,015	,016	**,047**	,033	,021	,028	,014	,040	,039	,034	,048	,031	,042	,025	,008	,004	,040	,015	,003	-,001	-,029	-,056	-,059
Henkel VZO	-,015	-,025	-,015	-,021	-,008	-,019	-,027	,000	-,029	-,017	**,034**	,025	,023	,040	,019	,052	,043	,057	,070	,050	,068	,042	,067	,061	,089	,076	,075	,095	,053	,055	,059
Infineon	-,003	,001	,011	,003	-,004	-,010	-,013	-,009	-,037	-,039	**-,019**	-,026	-,024	-,014	-,020	-,010	-,021	-,023	-,020	-,037	-,028	-,040	-,042	-,044	-,036	-,036	-,066	-,062	-,079	-,080	-,088
Mercedes Benz Group	,021	,042	,044	,054	,039	,025	,034	,035	,011	,060	**,086**	,050	,022	,020	-,004	,030	-,003	-,015	-,015	-,045	-,007	-,031	-,033	-,053	-,017	-,041	-,035	-,010	-,038	-,045	-,033
Merck	,005	,019	,029	,032	,020	,018	,024	,056	,056	,085	**,131**	,096	,088	,082	,057	,085	,076	,080	,089	,085	,105	,085	,074	,075	,116	,081	,082	,115	,103	,142	,117
MTU Aero	,007	,001	,019	,028	,029	,025	,032	,037	,015	,019	**,051**	,037	,048	,058	,041	,073	,047	,045	,061	,043	,051	,028	,039	,029	,040	,037	,039	,041	,026	,023	,035
Munich Re Group	-,008	,000	-,006	,005	,019	,012	,011	,020	,003	,007	**,031**	,010	-,003	,009	,003	,026	,013	,012	,021	,006	,020	,004	-,004	-,011	,037	,018	,023	,022	,004	-,008	-,001
Porsche	-,002	-,018	,005	,025	,023	,000	-,017	-,008	-,039	-,042	**-,003**	-,036	-,056	-,053	-,089	-,058	-,084	-,086	-,075	-,097	-,060	-,074	-,057	-,079	-,056	-,059	-,068	-,047	-,046	-,057	-,067
Qiagen	-,001	,005	,011	-,008	-,020	-,012	-,006	-,002	,002	,000	**,012**	,003	-,008	-,001	-,014	,003	,001	-,006	-,002	,001	,015	,005	-,028	-,010	-,002	-,010	-,023	-,029	-,026	-,033	-,035
Rheinmetall AG	-,022	-,002	-,023	-,014	-,028	-,008	-,017	-,008	-,026	-,025	**-,012**	-,005	-,088	-,119	-,092	-,070	-,097	-,084	-,071	-,076	-,117	-,064	-,052	-,069	-,057	-,027	-,017	-,028	-,051	-,033	-,052
RWE AG ST	,001	,014	,002	-,004	,013	,011	-,004	,009	-,005	-,001	**,029**	,017	-,001	,002	-,010	,005	,004	-,009	-,010	-,020	-,004	-,015	-,021	-,082	-,105	-,108	-,110	-,113	-,111	-,093	-,058
SAP	,008	,024	,031	,025	,011	,004	-,003	,001	-,008	,009	**,035**	-,002	-,004	-,006	-,029	-,003	-,021	-,026	-,023	-,037	-,019	-,040	-,035	-,042	-,016	-,024	-,020	,004	-,005	,008	,008
Sartorius AG VZO	,003	,042	,050	,050	,026	,025	,011	,010	,023	,055	**,097**	,065	,020	,020	,003	,038	,036	,041	,054	,063	,117	,100	,024	,013	,055	,067	,037	,098	,100	,136	,131
Siemens AG	-,023	-,008	,007	,023	,018	,011	-,006	,011	-,001	,007	**,039**	,007	-,002	,011	-,012	,022	,009	,004	,018	-,005	,025	,004	-,005	-,027	,011	-,009	-,017	,001	-,017	-,013	-,002
Siemens Energy AG	,004	,013	,034	,070	,070	,059	,060	,091	,082	,131	**,151**	,120	,100	,125	,107	,155	,151	,147	,174	,150	,177	,158	,130	,137	,163	,134	,158	,152	,114	,161	,166
Siemens Healthineers	,000	-,001	,022	,015	-,012	-,010	-,013	,002	-,001	,014	**,049**	-,001	-,011	-,023	-,079	-,051	-,060	-,063	-,052	-,057	-,023	-,040	-,061	-,056	-,038	-,053	-,070	-,049	-,068	-,033	-,041
Symrise AG	,009	,020	,009	-,006	-,013	-,012	-,025	-,017	-,014	,001	**,016**	,001	-,007	-,002	-,021	-,008	-,027	-,026	-,017	-,026	-,015	-,036	-,037	-,044	-,017	-,035	-,035	-,019	-,030	-,033	-,063
Volkswagen VZO	,007	,000	,005	,028	,028	,013	-,004	,007	-,019	-,003	**,041**	,020	,037	-,063	-,106	-,084	-,127	-,125	-,116	-,138	-,113	-,124	-,103	-,115	-,079	-,084	-,092	-,092	-,113	-,118	-,113
Vonovia	-,018	-,025	,013	,010	,005	,002	,005	,008	-,025	,031	**,082**	,053	-,031	-,025	-,067	-,007	-,011	-,006	,003	,001	,033	,006	,040	,037	,098	,070	,073	,113	,097	,157	,166
Zalando SE	,008	,048	,079	,071	,091	,102	,087	,097	,127	,197	**,244**	,181	,178	,181	,141	,225	,193	,210	,229	,212	,274	,225	,271	,265	,318	,319	,324	,350	,302	,332	,364

Appendix 1.16 All components of DAX index AR and CAR event window values for each ECB announcements

ECB ANNOUNCEMENT								
Days	Event 1		Event 2		Event 3		Event 4	
	AAR	CAAR	AAR	CAAR	AAR	CAAR	AAR	CAAR
-10	-,017	-,017	,000	,000	,001	,001	-,003	-,003
-9	,001	-,016	-,001	-,001	,003	,003	,002	-,001
-8	-,010	-,026	,003	,002	,002	,006	,010	,009
-7	-,012	-,039	,001	,003	,001	,007	,002	,011
-6	,004	-,034	-,001	,002	-,004	,004	-,001	,010
-5	,011	-,023	-,002	,000	,003	,006	-,005	,005
-4	,023	-,001	,000	,000	-,003	,003	-,006	-,002
-3	-,045	-,046	,002	,002	,000	,003	,012	,010
-2	,035	-,011	,001	,003	,002	,005	-,017	-,007
-1	,006	-,005	-,002	,001	,001	,007	,016	,010
0	**-,007**	**-,012**	**,001**	**,002**	**-,001**	**,005**	**,031**	**,041**
1	-,012	-,024	,002	,004	-,006	,000	-,023	,018
2	-,012	-,036	,002	,005	-,001	-,001	-,011	,008
3	,033	-,004	-,006	-,001	,001	,000	,002	,010
4	-,007	-,011	-,001	-,002	-,004	-,005	-,016	-,006
5	-,001	-,011	-,001	-,003	-,003	-,008	,030	,024
6	-,021	-,032	-,002	-,005	,006	-,002	-,014	,011
7	,001	-,031	,000	-,005	,001	-,002	,000	,011
8	,019	-,012	,000	-,005	,004	,002	,009	,020
9	-,005	-,017	-,001	-,006	,001	,004	-,013	,007
10	-,029	-,046	-,003	-,009	,002	,006	,020	,027
11	,041	-,005	-,002	-,010	,008	,014	-,018	,009
12	,008	,003	,000	-,010	,001	,015	,005	,014
13	,000	,003	-,001	-,011	-,001	,013	-,008	,006
14	-,029	-,026	,000	-,011	-,005	,008	,027	,033
15	,016	-,010	-,005	-,016	-,002	,006	-,011	,022
16	-,016	-,026	,002	-,014	,002	,008	-,003	,020
17	-,008	-,034	,000	-,014	,000	,008	,012	,031
18	,043	,009	,002	-,012	-,001	,007	-,016	,015
19	-,015	-,006	-,005	-,016	,001	,007	,006	,021
20	,022	,016	,001	-,015	,005	,012	,003	,024

Appendix 1.17 DAX index AAR and CAAR output between event window according to ECB events

CURRICULUM VITAE

I was born in Bursa in 1997. After completing my high school education in Bursa. In 2015, I started Mechatronics Engineering at Sakarya University. At the same time, I started the second university in 2017 and studied both branches at the same time, in 2020, I received my degree in mechatronics engineering, and in January 2021, I received my degree in international trade and logistics management from Anadolu University. In the following academic year, I started the Turkish-German University Business Management master’s degree with Thesis in September. After successfully completing the year, I continue my master's education at Hochschule Bielefeld with the Double Degree and Erasmus program.