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**FED vs ECB: The Impact of Different Central Banks' Monetary Policy on  
The Financial Markets**

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**ABSTRACT:**

This thesis examines how differences in policy frameworks between the Federal Reserve (Fed) and the European Central Bank (ECB) affect financial markets during periods of quantitative easing (QE). The thesis' analysis will primarily be focused on asset pricing, risk-taking behavior, and institutional balance sheet changes during a greater level of economic uncertainty. The study provides a walkthrough on how monetary policy transmission is affected by uncertainty, how QE impacts asset prices and financial stability as well as the co-operation between central bank communication, forward guidance, and these institutional variables.

The research is conducted as a literature review and is supported by a theoretical framework which includes the monetary transmission mechanism, portfolio balance theory, the risk-taking channel, and expectations-based approaches to policy communication. Additionally, balance sheets are examined on a firm-level, extracted from financial institutions to provide evidence of responses to accommodative policy measures.

The findings suggest that in addition to QE influencing the financial markets through traditional channels such as interest rates, it also influences markets through cross-asset portfolio rebalancing and shifts in risk premia. These transmission mechanisms may support liquidity and asset valuations in the short term but can also create incentives for risk-taking and adjustments in balance sheets that increase vulnerabilities in the future. Furthermore, forward guidance and central bank communication hold a key role in shaping expectations and thus influencing the effectiveness of unconventional policy measures, particularly during periods during which the effective use of conventional tools is limited.

The results find that considering uncertainty and institutional behavior are highly important when assessing the market implications monetary policy has throughout different regulatory and institutional frameworks.

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**KEYWORDS:** Monetary Policy, Central Banks, Quantitative Easing, Financial Markets, Risk-taking, Asset Pricing, Monetary Policy Transmission

**Laskentatoimen ja rahoituksen akateeminen yksikkö**

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**TIIVISTELMÄ:**

Tämä tutkielma tarkastelee eroja Federal Reserven (Fed) ja Euroopan keskuspankin (EKP) rahapoliittisten toimintakehysten välillä ja sitä, miten erot vaikuttavat rahoitusmarkkinoihin määrällisen elvytyksen (quantitative easing, QE) aikana. Tutkielmassa painotetaan erityisesti omaisuuserien hinnoittelua, riskinottoa sekä sitä, miten instituutiot sopeuttavat taseitaan vastaamaan kohonneen epävarmuuden ympäristöä. Tutkimuksessa tarkastellaan epävarmuuden vaikutusta rahapolitiikan välittymismekanismiin, määrällisen elvytyksen (QE) vaikutusta omaisuuserien hintoihin ja rahoituksen vakauteen, sekä keskuspankkien viestinnän ja ennakoivan ohjauksen (forward guidance) roolia vuorovaikuttajana muutosten kanssa.

Tutkimus johdetaan kirjallisuuskatsauksena, jota tuetaan teoreettisella viitekehyksellä, sisältäen rahapolitiikan välittymismekanismien, riskinottokanavan, porfoliotasapainoteorian sekä odotuksiin perustuvat lähestymistavat liittyen rahapolitiikan viestintään. Pankkien taseita tarkastellaan yritystasolla, jotta voidaan muodostaa konkreettisia havaintoja instituutioiden reaktioista elvyttävään rahapolitiikkaan.

Tulokset viittaavat siihen, että QE vaikuttaa rahoitusmarkkinoihin perinteisten kanavien, kuten korkojen, lisäksi myös omaisuusluokkoittaisen portfolioiden uudelleenallokoinnin ja riskipreemioiden muutosten kautta. Kyseisten välittymismekanismien voidaan havaita lyhyellä aikavälillä toimivan likviditeetin sekä omaisuuserien arvostusten tukijoina, mutta samanaikaisesti kannustimina riskinottoon ja taseiden muutoksiin, jotka voivat altistaa riskeille tulevaisuudessa. Ennakoivan ohjauksen ja keskuspankkien viestinnän voidaan huomata olevan tärkeissä rooleissa odotusten muodostamisesta ajatellen ja näin ollen myös keskeisiä tekijöitä rahapoliittisten toimenpiteiden tehokkuutta ajatellen.

Tutkielman tulokset korostavat epävarmuuden ja instituutioiden toiminnan merkitystä, kun rahapolitiikan laajempia vaikutuksia tulkitaan rahoitusmarkkinoihin erilaisissa sääntely- ja toimintaympäristöissä.

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**KEYWORDS:** Rahapolitiikka, määrällinen elvytys, keskuspankit, rahoitusmarkkinat, riskinotto, rahapolitiikan välittymismekanismi, omaisuuserien hinnoittelu

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# 1 Introduction

Monetary policy has a key role in shaping conditions within financial markets. Policy decisions made by the central banks influence developments throughout the macroeconomic environments. As the global financial system is more interconnected than ever, asset prices and institutions have become highly sensitive to changes in macroeconomic conditions such as liquidity along with signals regarding future policy operations. In a more traditional manner, central banks have implemented policies through changes in short-term interest rates in order to stimulate demand, inflation, and borrowing. Regardless, conventional monetary policy may lose its effectiveness during times in which the level of financial stress is elevated, or policy rates approach the lower limit still effective. Situations like this require central banks such as the Federal Reserve and the European Central Bank to implement unconventional measures to ensure market stability. These measures include quantitative easing and forward guidance.

In this thesis, insight is provided on how differences between the monetary policies implemented by the Fed and the ECB are reflected on the market regions of each central bank and more specifically, the thesis focuses on the transmission of quantitative easing. The effects and transmission are examined through several channels including portfolio rebalancing, risk-taking incentives, and cross-asset spillovers. Banks from both the Fed's and the ECB's regime are examined. Changes in their balance sheet structures are used to gather findings on how the effect of different mechanisms is reflected in institutions of different sizes across the examined monetary areas.

Conducted from literature on monetary policy transmission, investor behavior, and uncertainty, this thesis combines frameworks based on expectations with firm-level evidence gathered from balance sheets. The main objective is to present comprehensive evidence and form conclusions on how unconventional policy measures affect various asset classes and institutions along with their portfolios as well as defining how differences in the Fed's and the ECB's policy operations may affect market outcomes within each regime. By linking policy actions on the macro-level to institutional firm-level adjustments, the study contributes to the discussion on the effectiveness of monetary policy, investor behavior, and financial stability during periods of unconventional policy operations.

## 1.1 Background

Over the past decades, the conduction of monetary policy by the Fed and the ECB has evolved considerably. More traditionally, central banks relied primarily on adjusting short-term policy interest rates to stabilize inflation and economic activity. However, the financial crisis of 2008 can be considered a turning point in the implementation of monetary policy, as interest rates approached the most effective lower limit and conventional tools lost their effectiveness. As a response, central banks introduced a selection of unconventional tools such as quantitative easing and forward guidance, bringing fundamental change to channels through which policies are transmitted into financial markets.

Recent research highlights that the effects of said unconventional measures extend beyond short-term interest rate adjustments and operate through a variety of transmission mechanisms. QE programs implemented by the Fed and the ECB have had considerable effects on asset prices, risk premia, and institutional investment behavior through portfolio rebalancing effects, changes in expectations, and spillovers. Simultaneously, accommodative environments may prompt increased risk-taking for institutions, therefore influencing allocations of credits and the composition of balance sheets. Moreover, the effectiveness of these operations does not depend solely on their implementation, but also on the macro-financial environment and the level of uncertainty that investors and firms face (Baker et al., 2016; Choi & Yoon, 2022).

## 1.2 Research Questions and Structure

Reflecting on the background, this thesis examines how differences in monetary policy operations by the Fed and the ECB affect financial markets through different transmission channels. The analysis is founded on several relevant research questions. The following list includes relevant research questions this thesis aims to review: How does economic uncertainty influence the effectiveness of monetary policy transmission mechanisms? How do QE measures and subsequent asset purchase programs affect asset prices and risk-taking behavior throughout financial markets. How largely can central bank communication and forward guidance stabilize expectations and thereby shape financial market dynamics?

To address the research questions, this thesis begins by outlining a theoretical framework identifying the main transmission channels. These channels include expectations, portfolio balance

effects, and risk-taking mechanisms. Further research is conducted on the effects of cross-asset spillovers on institutional balance sheets during QE examined with the objective of gathering quantitative evidence in support of other findings. The analysis also explains how central bank communication and forward guidance affect expectations during times of elevated uncertainty. Finally, the implications for investors and policymakers are examined to form a cohesive entirety of the various perspectives discussed. The walkthrough of different findings creates a foundation for thorough analysis and thus understanding on how unconventional monetary policy measures implemented by the Fed and the ECB influence the affect markets and investor behavior.

## 2 Theoretical Framework

To form an understanding on the influence monetary policy has on the financial markets, a clear theoretical framework is needed to support the findings from the literature. The theoretical foundation can also be used to form important connections between central bank operations, asset pricing, investor behavior, and financial stability. More orthodox macroeconomic theory focuses primarily on how short-term interest rates are set to control demand and inflation, while modern economic theories highlight the channels through which policy effects are transmitted through various channels which directly affect the pricing of assets such as bonds, credit instruments, and equities (Borio & Zhu, 2012). These channels have become increasingly important during the most recent decades. Being among the most influential central banks, the Federal Reserve and the European Central Bank have both used asset purchasing programs, forward guidance and other unconventional measures to complement the more conventional policy tools (Gagnon et al., 2011; Andrade et al., 2016).

This section aims to outline the key theoretical mechanisms through which monetary policy is transmitted to the financial markets and its counterparts. First, the general monetary policy transmission framework is presented as a foundation for the analysis, followed by theories related to the term structure of interest rates, which are used to explain how expectations regarding future policies affect the prices in bond markets (Christensen & Rudebusch, 2012). After a solid foundation has been established, the Portfolio Balance Theory can be utilized to provide a very key explanation for the effect which quantitative easing has on various asset classes (Krishnamurthy & Vissing-Jorgensen, 2011). Additionally, the risk-taking channels along with bank lending channels are discussed with the aim of establishing a connection between accommodative policy measures and financial stability and institutional behavior (Borio & Zhu, 2012; Dell’Ariccia et al., 2014). Finally, uncertainty and communication theories are presented to explain why the effectiveness of policy depends heavily on expectations and information (Campbell et al., 2012; Hubert & Labondance, 2021). These theories along with their perspectives are used to form a theoretical framework which can be applied in analyzing the impact of Fed’s and ECB’s policies on financial markets.

### 2.1 Monetary Policy Transmission Mechanism

Analyzing monetary policy and its effects can be started by understanding the Monetary Policy Transmission Mechanism. The core of this theory is to describe how central bank operations influence financial variables (Borio & Zhu, 2012). When the theory is presented in a simple form, it states that interest rates are the channel through which monetary policy is transmitted. When short-term policy is changed, central banks adjust interest rates higher, which influences the cost of borrowing for firms and households, affecting spending power and therefore consumption, output and the degree of investment. Conversely, policy change resulting in lowered interest rates to reduce financing costs, stimulate credit demand and increase asset valuations as discount rates are lower (Christensen & Rudebusch, 2012). Opposed to this, higher rates tighten financial conditions and create a restraint on economic activity.

Although might find be easy to conclude that this theory only concerns the consumer and the central banks, financial markets play a highly crucial role in this process. Changes in interest rates significantly affect the pricing of different assets such as bonds, equities and other securities with the policy change and adjustment of rates being priced in almost instantly, often before the effects of rate adjustments realize into economies (Gagnon et al., 2011). The macro-effect of policy change is amplified as asset prices, risk perceptions, values of collaterals, and levels of wealth are affected (Dell'Ariccia et al., 2014).

Therefore, modern policy frameworks emphasize that policy does not work through a single channel. On the contrary, expectations, credit supply, balance sheet effects and investor behavior form a multidimensional structure for the policy transmission channels (Borio & Zhu, 2012). These channels' importance is emphasized when rate policy approaches its lower limit of effectiveness, as the direct influence of short-term rates is limited. In such environments, unconventional tools such asset purchases and forward guidance are used to directly influence longer-term financial conditions (Krishnamurthy & Vissing-Jorgensen, 2011; Campbell et al., 2012; Bernanke, 2020). This broader perspective of policy transmission forms the foundation for analyzing conventional and unconventional operations by the Fed and the ECB.

## 2.2 Expectations and the term structure of interest rates

According to the expectations hypothesis of the term structure, long-term interest rates reflect market expectations of future short-term policy rates combined with a risk premium (Christensen & Rudebusch, 2012). Due to this, anticipated changes in monetary policy can influence interest rates with all maturities regardless of the timing related to the policies' execution. When investors expect interest rates to remain low for an extended period of time, long-term yields decline.

This theory supports the effect central bank communication and policy guidance can immediately have on bond markets. Anticipated future policy operations affect the discount factors which are used to price securities (Campbell et al., 2012). The shift in discount factors influences both corporate borrowing costs as well as sovereign bond yields. As bond yields serve as benchmarks for a variety of financial instruments, changes in expectations are reflected in prices throughout different asset classes (Hubert & Labondance, 2021).

In terms of this thesis, the framework is particularly important in understanding differences between the Fed and the ECB. Different kinds of expectations regarding the direction of future policies may be the cause for differences in yield curves, capital flow, and exchange rates across countries (Fratzscher et al., 2018). As a result, and in addition to realized policy actions, perceived future policy stances affect the outcomes observed in the financial markets. Therefore, understanding the expectations channel is highly important when analyzing how monetary policy affects asset valuation and market behavior.

## 2.3 Portfolio Balance Theory and Quantitative Easing

The theory regarding expectations explains the changes in yields that are influenced by anticipated policy operations. However, it does not consider the effects of large-scale asset purchases. The portfolio balance theory provides an explanation to complement the expectation channel and has thus become an important factor in understanding quantitative easing.

The theoretical support provided by the Portfolio Balance Theory states that financial assets are imperfect substitutes, with investors' main concerns being risk, duration, and liquidity characteristics. Therefore, investors demand compensation to hold less attractive securities. When

a central bank purchases a significant amount of government bonds or other assets, it reduces the supply of the bought securities available to private investors. This change in availability causes investors to rebalance their investments towards alternative assets such as equities or corporate bonds. When demand changes, risk premia decline, and prices surge across multiple markets. (Gagnon et al., 2011; Joyce et al., 2011).

This implies that in addition to affecting the targeted assets, quantitative easing can also influence a wider range of securities. Decline in government bonds is directly correlated to being affected by the decreased supply, whereas equity prices rise when investors search for alternative options to balance their portfolios. Therefore, the impact is transmitted through portfolio reallocations across different asset classes, rather than only through expectations regarding future short-term rates (Krishnamurthy & Vissing-Jorgensen, 2011; Christensen & Rudebusch, 2012).

The portfolio balance theory provides the key theoretical frame, which can be used to analyze the asset-class response to QE in this thesis. The theory explains why both Fed and ECB asset purchase programs have been associated with declining sovereign yields and higher equity valuations. Furthermore, the theory highlights that the significance of the effects depends on variables such as investor preferences and the scale of purchases. These factors hold a significant position when comparing the transmission of unconventional policy across different institutions. (Gagnon et al., 2011; Andrade et al., 2016).

## 2.4 Risk-Taking and The Bank Lending Channel

Although accommodative monetary policy may stabilize markets and stimulate the economy, it may also create unanticipated and unintended consequences for financial stability. The risk-taking channel of monetary policy provides a theoretical foundation linking a prolonged level of low interest rates to an increased level of risk exposure among financial intermediaries (Borio & Zhu, 2012).

When safe yields decline, banks, asset managers, and other investors are pressured to maintain adequate returns. This may increase a search for yield, leading institutions to increase leverage, or take on riskier assets. This can cause credit standards to weaken and thus cause balance

sheets to be more sensitive to catalysts. Therefore, we can observe that in addition to monetary policy affecting the quantity of credits, it also influences its composition and risk elements (Dell’Ariccia et al., 2014; Jiménez et al., 2014).

Transmission channels like bank lending and the balance sheet channel are also closely related. These channels focus on the way banks’ capital allocation and funding capacity are affected by policy changes. Bank profitability and collateral values are positively affected by low interest rates, which reflects on the lending capacities of banks. On the other hand, a tightened policy environment may restrict credit supply. These mechanisms directly connect central bank actions to institutional financing and market conditions (Maddaloni & Peydró, 2011; Bruno & Shin, 2015).

Risk-taking and bank lending channels work as a foundation for analyzing the influence QE has on investor behavior and institutional balance sheets. The basis for analyzing how banks and asset managers adjust their portfolios during accommodative policy is enabled through the theories on transmission channels. Understanding why unconventional policy may stabilize economies in the short term but can increase financial risks over a longer period can also be understood through the transmission channels. When these channels are applied into the research, a more thorough evaluation of the broader impacts of monetary policy can be conducted (Borio & Zhu, 2012).

## 2.5 Uncertainty and the State-Dependent Effectiveness of Policy

The economic environment is in a key position when the effectiveness of policy operations is examined. The level of uncertainty which investors and institutions face is particularly important. The theory of uncertainty shocks and real options of behavior suggests that as uncertainty rises, economic agents postpone decisions which are not reversible. Investments and recruiting are delayed, and risk premia increase (Bloom, 2009; Baker et al., 2016).

Policy transmission may weaken under these kinds of circumstances, as institutions may be reluctant to invest due to the future of policy operations being unclear regardless of current low rates. Market volatility may increase and destabilize the relationship between policy rates and asset prices. As a result, the effects of same policy decisions can vary depending on the current level of uncertainty (Bloom, 2009).

When crisis periods such as the pandemic shock are examined, the importance of this view is clear as it suggests that unconventional measures may be more effective when they reduce uncertainty or directly target market disruptions. Therefore, implementing uncertainty into the theoretical framework helps explain why effectiveness of the Fed's and the ECB's policies may vary across different conditions (Baker et al., 2016; Husted et al., 2017).

## 2.6 Communication and Forward Guidance

Central bank communication has presented itself as important policy tool to complement policy adjustments. Forward guidance theories suggest that asset prices may be influenced by credible statements regarding future policy operations alone, without concrete policy changes being a prerequisite. (Campbell et al., 2012).

When central banks commit to keeping rates low for a prolonged period or signal future actions, it shapes the markets' beliefs regarding the future path of monetary policy and the direction in which the economy will develop. Asset valuations rely heavily on expected risk conditions and future rates, which is why communication can be a catalyst for significant market reactions. Regardless, the effectiveness of communication relies on its clarity and credibility. Inconsistencies or ambiguity in communication may increase uncertainty and therefore reduce the impact of applied policy measures. (Hubert & Labondance, 2021; Coibion et al., 2018).

When short-term rates are near the lowest limit they are effective at, the importance of managing expectations increases, as forward guidance becomes an increasingly influential tool for steering financial conditions. Therefore, forward guidance works together with asset purchases and conventional policy in influencing financial markets (Andrade & Ferroni, 2021; Campbell et al., 2012).

## 2.7 Theoretical Framework: In Summary

The theories support the findings and offer important insight into the ways financial markets are affected by monetary policy. The transmission mechanism outlines the main channels through which policy affects the economy and markets. Bond yields and policy decisions are connected by

the expectations theory, while the effects of quantitative easing on asset allocations in different asset classes are explained by the portfolio balance theory. (Krishnamurthy & Vissing-Jorgensen, 2011).

Accommodative policy, financial stability, and institutional behavior can be connected through risk-taking and lending channels (Borio & Zhu, 2012). Theories on uncertainty emphasize the dependency policy effectiveness has on current economic conditions, while communication frameworks present how central banks use forward guidance as a tool to manage expectations (Bloom, 2009; Campbell et al., 2012).

This framework provides a foundation for analyzing policy operations implemented by the Federal Reserve and the European Central Bank and the influence of policy measures affecting institutional behavior and financial markets. The theories clearly outline the mechanisms which allow monetary operations to influence prices of assets, financial stability, and investor behavior. Therefore, these theories create a basis for understanding the literature which is reviewed in the subsequent sections.

## 3 Literature Review

### 3.1 Comparing Quantitative Easing Transmission Mechanisms

The reviewed studies consistently support the view according to which quantitative easing and other unconventional measures affect financial markets. Regardless, the estimated extent of the effects and the channels which are deemed most dominant differ across studies. The variance of the results is partly due to results being dependent on the studied policy instrument, the market segment, and the institutional setting and time frame in which the policy is implemented (Gagnon et al., 2011; Joyce et al., 2011; Andrade et al., 2016; Christensen & Rudebusch, 2012).

A significant difference concerns whether studies interpret QE mainly through expectations and signaling or portfolio balance. Market reaction and yield curve analysis show that asset purchases are generally associated with long-term yields, although studies explain this effect differently. Some evidence emphasizes the reduction of long-term interest rate risk in private portfolios and the effects of declined bond supply, which are consistent with portfolio balance and compressed risk premia, whereas other studies consider signaling the direction of future policy operations and the formation of expectations more significant (Gagnon et al., 2011; Krishnamurthy & Vissing-Jorgensen, 2011; Christensen & Rudebusch, 2012). In the Euro area context, the ECB's programs are also examined in an environment where regulatory frameworks, financial fragmentation, and financial market structure can affect policy transmission as well as empirical identification. This can result in differences when comparing Euro area findings to United States findings, regardless of the overall direction of the effects being similar (Andrade et al., 2016).

Further significant contrasts include some studies suggesting more significant effects through asset prices and risk premia than through bank lending volumes, while other studies document clear responses in credit volumes and risk-taking. The portfolio balance view suggests that a decline in the supply of safe long-term bonds is a catalyst for portfolio reallocation and asset repricing. In addition to affecting the purchased assets, this can affect broader market conditions through cross-asset effects (Krishnamurthy & Vissing-Jorgensen, 2011; Joyce et al., 2011; Gagnon et al., 2011). Simultaneously, findings in literature concerning risk-taking and bank lending argue that accommodative policy can affect the composition and risk profile of financial intermediation

through changes in collateral values, leverage dynamics and creating incentives for additional risk. Consequently, in a situation where total volume of lending does not grow, banks' risk exposure and decisions affecting the balance sheet may still shift (Borio & Zhu, 2012; Dell'Ariccia et al., 2014; Jiménez et al., 2014; Maddaloni & Peydró, 2011). These perspectives do not contradict each other, they suggest that the same accommodative environment may affect asset prices in some periods and settings, while in others it may most significantly influence the risk-taking of intermediaries, depending on demand and the broader macro-environment (Bruno & Shin, 2015; Dell'Ariccia et al., 2017).

Moreover, uncertainty and communication help in explaining why studies' findings are different across time periods and samples. When uncertainty is high, companies may delay investments, and monetary policy transmission can weaken or become more dependent on macro-conditions. This can affect the measured impact of policy as well as the significance of unconventional operations (Bloom, 2009; Baker et al., 2016; Choi & Yoon, 2022; Husted et al., 2017). Additionally, forward guidance and communication can either perform as stabilizers or create risks if interpretation and credibility are variables. As a result, some differences in between the studies can be attributed to the variation within the information environment and in how policy signaling is interpreted (Campbell et al., 2012; Coibion et al., 2018; Andrade & Ferroni, 2021; Hubert & Labondance, 2021).

In conclusion, the studies' findings align on the direction of effects, as QE affects yields, incentives, and risk premia. Regardless of the consistencies between the studies, the findings differ in what ways and how strongly these effects appear. This aligns with this thesis' focus on institutional settings, firm-level responses, and uncertainty in terms of comparing outcomes of QE between the Fed and the ECB (Gagnon et al., 2011; Andrade et al., 2016; Borio & Zhu, 2012).

### 3.2 Monetary Policy, Uncertainty and Financial Markets

Economic uncertainty plays a key role in shaping macroeconomic developments and the effectiveness of monetary policy. In addition to directly reducing economic activity, uncertainty also affects the channels through which monetary policy influences the real economy.

Bloom (2009) provides the theoretical foundation for understanding uncertainty as an independent catalyst concerning the macroeconomic environment. Using a model with firm-level decision-making, Bloom finds increases in uncertainty raising the option values of waiting. Because investment and hiring decisions are partly irreversible, firms may postpone them when the direction of future conditions and returns are uncertain. Behavior of this nature generates a temporary decline in investments, employment, and output (Bloom, 2009). From a monetary policy perspective, this finding suggests that a higher level of uncertainty can weaken the timing of investments and the related channel. Even when interest rates fall or liquidity increases, institutions may delay capital expenditures if the economic forecast remains uncertain.

Baker et al. (2016) develop the Economic Policy Uncertainty (EPU) index to measure policy-related uncertainty. The index is based on newspaper coverage, tax regulations and forecast disagreement. The aim is to draw attention to monetary, fiscal, and administrative policy. Their results show that higher policy uncertainty is linked to lower investment, employment, and output (Baker et al., 2016). Increased policy uncertainty usually tightens financial conditions and reduces risk-taking. This weakens the impact of expectations and the credit channel on the transmission of monetary policy. When firms and investors are unsure about upcoming policy changes, they respond more cautiously to central bank actions.

Davis (2016) extends the analysis to an international context using comparable uncertainty indices. The study suggests that policy uncertainty creates significant cross-border spillovers. These spillovers are stronger for large economies such as the United States. Uncertainty shocks often move together across countries and effect both production and financial markets (Davis, 2016). This shows that monetary policy affects not just the domestic economy but also the international economy.

Husted et al. (2017) focus on the uncertainty surrounding monetary policy. Uncertainty is measured by forecasters disagreements. With this measure, they show that higher policy uncertainty weakens the impact of the employment and production. When it's unclear how interest rates will move in the future, forward guidance become less effective and financial markets adjust more cautiously (Husted et al., 2017). This shows that uncertainty weakens transmission channels such as risk-taking, lending and expectations.

This framework is a key part of the foundation of this thesis. Quantitative easing works better when uncertainty is low but becomes less effective when uncertainty is high. In addition, international uncertainty shows that monetary policy works differently in the Federal Reserve and the European Central Bank.

### 3.3 Risk-Taking and Financial Stability

The risk-taking channel is a very crucial part of research on expansionary monetary policy. This theory points out that easing monetary policy affects more than just liquidity and credit levels. The risk-taking channel highlights how low interest rates and unconventional policy operations prompt banks and investors to add even more risk when searching for yield. When rates remain low for extended periods, banks and investors tend to increase leverage, easing loan requirements. It is also common to reallocating portfolios toward higher-return assets. In this context, monetary policy works partly affecting risk appetite and balance sheet decisions. This can stabilize markets in the short term but raise vulnerabilities in the medium term (Borio & Zhu, 2012).

The risk-taking channel is based on how asset prices influence banks' portfolio decisions. Accommodative policy rates lower yields on safe assets so it reduces returns on low-risk investments. As a result, financial institutions and investors often move toward assets with higher expected returns, which also involve greater rate or credit risk. Borio and Zhu (2012) can formalize this mechanism through presenting that monetary policy can affect perceived risk, collateral values, and leverage dynamics, thereby influencing the risk exposure of assets held by banks as well as funding conditions. These effects may become clear during periods of unconventional policy such as QE, when central bank asset purchases reduce the availability of safe securities to private investors and constrict term premia across financial markets (Krishnamurthy & Vissing-Jorgensen, 2011; Gagnon et al., 2011).

In regards of QE transmission, this mechanism is connected to the portfolio balance channel. Central banks lower yields on government bonds and related securities by conducting purchasing programs at large-scale which creates an incentive for investors and financial institutions to adjust their

portfolios towards assets with higher risk or longer maturity (Gagnon et al., 2011). For banks, this rebalancing process may present increased amounts of holdings in securities or shifts towards fixed-income investments with longer maturities. This can improve short-term profitability but increase vulnerability to interest rate changes during post-QE periods, where normalizing measures are implemented. Therefore, the risk-taking channel provides an important link between accommodative monetary policy and balance sheet adjustments within the banking sector.

Empirical banking evidence supports the argument according to which accommodative policy affects bank risk and leverage. Dell’Ariccia, Laeven and Marquez (2014) document that lower real interest rates are associated with higher leverage and greater bank risk taking, also consistent with a shift in banks’ decisions in portfolios and lending. Foremost, the findings emphasize that the implications accommodative policy has on risk are not limited to expansion of credit volume, but also affect how credit is allocated across lenders and how banks select assets depending on the risk of said assets. This is highly important when interpreting balance sheet development during quantitative easing periods. Even when lending growth is not dominant, banks may in pursuit of yield, still alter their risk profile through rebalancing their portfolios or maturity exposure.

Further micro-level evidence strengthens the risk-taking channel. Using loan data from Spanish banks, Jiménez et al. (2014) present that lower policy rates increase risk-taking by lowering lending standards and encouraging borrowing to riskier lenders. Furthermore, Maddaloni and Peydró (2011) provide evidence which states that prolonged periods of low interest rates are associated with more lenient lending standards and increased risk-taking by banks in Europe and the United States. These findings support the view that accommodative policy can influence financial stability through incentives which shape risk-taking and portfolio composition, rather than only through changes in credit supply.

The risk-taking channel also operates internationally through financial markets. Bruno and Shin (2015) highlight the role of international capital flow and global liquidity conditions in affecting the cross-border transmission of accommodative policy measures. Their findings emphasize that financial intermediaries’ balance sheet constraints and funding conditions may amplify the cross-border spillover. As a result, this contributes to similar risk-taking behavior in different financial systems which operate internationally. This perspective is relevant when comparing the Fed and the

ECB as differences in policy timing and the structure of institutions has considerable influence on how global liquidity conditions affect banks that operate within their monetary regimes (Andrade et al., 2016).

The implications for financial stability are dualistic. On one hand, unconventional policy measures with easing purposes can stabilize financial markets by restoring liquidity and lowering the cost of borrowing, thus supporting financial intervention during high-stress periods in the economy. On the other hand, prolonged periods of declined yields may contribute to the accumulation of risk through increased leverage and exposure to interest rate and duration risk. These phenomena can remain unapparent but may realize once normalizing measures are applied.

The risk-taking channel provides a theoretical framework for interpreting the firm-level adjustments in bank balance sheets observed during periods of quantitative easing. It is particularly helpful in explaining why banks may increase their securities holdings or shift towards assets with longer maturities as a response to conditions brought on through accommodative policies. These portfolio adjustments align with the literature on QE transmission, which highlights the link between term premia, effects on asset supply and financial intermediary behavior (Krishnamurthy & Vissing-Jorgensen, 2011; Gagnon et al., 2011). Tightened policy measures may cause the accumulated exposure to affect banks' sensitivity to rate changes and the strength of their balance sheets, thereby linking incentives brought on by QE to potential post-QE exposure.

Collectively, the risk-taking channel complements mechanisms regarding portfolio balance and bank balance sheets through emphasizing how accommodative policy measures shape financial stability through risk choices in banks' investment and lending decisions. By highlighting interaction between policy rates, asset pricing and portfolio allocation, this channel provides a key theory for balance sheet interpretation examined in the subsequent sections.

### **3.4 Cross-Asset Spillovers of Quantitative Easing**

Quantitative easing is understood to influence financial conditions in asset classes which are directly targeted in central bank purchase programs as well as across a broad set of markets through cross-

asset spillovers. In this thesis the concept of cross-asset spillover is used to refer to the transmission of QE induced phenomena from the financial markets such as sovereign bond markets to other asset classes. These other asset classes include equities, corporate credits and banks' balance sheets, which will be examined through a set of examples. Through this section, examination is conducted to complement discussion and findings on the risk-taking channel and financial stability as well as the firm-level evidence of QE on balance sheets.

#### 3.4.1 Cross-asset Spillovers in The Core of QE Transmission

A core hypothesis in the QE literature is that large-scale asset purchases cause yields to decline on targeted assets - most typically government bonds, but also affect other assets through changes in returns and risk premia. This idea closely connects to the portfolio balance channel which presents the following: by removing duration from the market and reducing the supply of safe assets available to private investors, QE changes the relative pricing of assets and prompts portfolio reallocation (Krishnamurthy & Vissing-Jorgensen, 2011). Moreover, this implies that the consequences of QE should not be limited to the purchased assets. Alternatively, spillovers to other markets are expected as investors rebalance into close substitutes such as corporate bonds and eventually into riskier assets such as equities when yields on safe assets decline (Gagnon et al. 2011; Joyce et al., 2011).

Evidence from periods of QE supports the cross-asset point of view. Studies on the Fed's purchase programs document crucial effects on Treasury yields, Mortgage-Backed Securities yields, corporate spreads and broader financial market conditions (Gagnon et al., 2011). Additionally, research on QE in the United Kingdom finds effects that reach beyond gilt markets. This is consistent with portfolio rebalancing and spillovers to private asset pricing (Joyce et al., 2011). In the context of this thesis, these findings support the view according to which banks' balance sheets respond to QE-driven changes in asset prices. As yield curves shift and risk premia decline, banks' may be prompted to hold certain securities as well as change the specific types of credits they provide.

#### 3.4.2 International Cross-Asset Spillovers in a Fed vs ECB Frame

Cross-asset spillovers are highly relevant when comparing the Fed and the ECB as monetary policy shocks in a large regime can work as catalysts with their effects transmitting internationally through

global asset markets, capital flows and exchange rates. Fratzscher, Lo Duca and Straub (2018) provide direct evidence on the international spillover of U.S. QE, highlighting that U.S. asset purchases affected capital flows globally as well as asset prices beyond U.S. markets. This is a critical point when comparing the effects of two major central banks: QE implemented in one regime can influence asset pricing and market conditions elsewhere, potentially affecting banks, markets and institutions within the Euro area even when the catalyst originates in the United States.

The international dimension is crucial for two main reasons. Firstly, it complicates the source identification slightly as changes in European asset prices and bank balance sheets may reflect ECB programs and spillovers from Fed policy, especially when both central banks have applied accommodative measures but not simultaneously. Furthermore, the international dimension supports the need for cross-regime analysis because if spillovers are significant, then differences between the ECB and the Fed should be viewed through the result of their interaction in global financial markets, rather than separate policy regimes operating in isolation. This perspective also supports a balance sheet analysis, where bank behavior is assessed across significant policy periods and institutional settings and where changes in securities holdings and liquidity are perceived in relation to broader asset repricing.

### **3.4.3 Mechanisms: Bond Purchases and Cross-Asset Repricing**

Cross-asset spillovers are a result of multiple mechanisms working together. An initial mechanism is the duration removal and term premium channel, where QE constricts long-term yields and term premia, therefore lowering discount rates used across asset classes. (Krishnamurthy & Vissing-Jorgensen, 2011). If safe long-term yields fall, the present value of future cash flows rises, which can support valuations in riskier assets such as equities and lower returns across credit markets. Empirical work on interest rate responses to QE supports this perception, presenting clear impacts on long-term yields that are not fully explained by changes in expectations alone (Christensen & Rudebusch, 2012). This mechanism is highly important for banks as lower yields affect the relative appeal of holding government securities and other interest instruments and can therefore influence balance sheet composition (Krishnamurthy & Vissing-Jorgensen, 2011).

A second mechanism is portfolio rebalancing across asset classes, which is central to the portfolio balance view. As central banks' asset purchases reduce the supply of government bonds, they are not available to investors who would otherwise hold these assets, therefore they must substitute into alternative holdings. These alternatives may include other fixed income assets such as corporate bonds but rebalancing and adjustments can also extend into equities or cross-border assets when domestic low-risk yields become constricted (Krishnamurthy & Vissing-Jorgensen, 2011; Joyce et al., 2011). This mechanism forms a link between QE to the balance sheet patterns observed in banks, as changes the supply of assets may lead banks, private- and institutional investors to adjust their portfolios.

The third significant mechanism involves risk-taking. When yields on safer assets are low for a prolonged period of time, intermediaries may take on additional risk, including lower quality credit or higher leverage. This mechanism is consistent with the risk-taking channel (Borio & ZHU, 2012) and is supported by evidence according to which lower rates are associated with an increase in risk-taking in banks' leverage and lending behavior (Dell'Ariccia et al. 2014; Jiménez et al., 2014; Maddaloni & Peydró, 2011). Cross-asset spillovers are highly relevant here because risk-taking is rarely limited to a single asset class, as investors looking for yield may shift into securities with longer durations while credit spreads become tighter and equity valuations rise.

#### 3.4.4 Connecting Cross-Asset Spillovers and Balance Sheets

The cross-asset spillover framework helps in explaining how banks may respond to QE through adjustments in their balance sheet compositions. During QE periods, banks operate in an environment where yields on safe assets decline, spreads tighten, and asset prices shift across markets. Under these conditions, changes in liquidity buffers, securities holdings, and lending composition can be anticipated as financial institutions respond according to changing financial incentives.

Banks may increase their holdings in higher yielding securities during QE, supported by theory on cross-asset spillovers. Higher yielding securities can be seen to increase in banks' balance sheets during times when government bond yields decline, while investors are simultaneously prompted

to seek alternative investments. This behavior is consistent with effects of portfolio balancing and spillovers which spread from targeted bond markets into broader fixed income markets (Gagnon et al., 2011; Krishnamurthy & Vissing-Jorgensen, 2011). Changes in different securities and the growing importance of duration during quantitative easing are interpreted through this framework. The analysis is institutional and is conducted on the balance sheets of banks which represent various sizes from both monetary regimes.

Liquidity accumulation in a macro-financial setting is also further explained by cross-asset spillovers. Reserve creation during QE is a key factor driving liquidity growth. Asset prices reflect the increased capital and the allocation of excess liquidity may be affected by risk premia. Capital is typically allocated into lending, securities investments or liquidity buffers. Banks' risk preferences, regulatory limits, and market opportunities determine the possible capital allocations. In addition to liquidity increases being seen as a mechanical balance sheet effect, this suggests that they should also be considered as greater factors affecting banks' decisions regarding portfolio adjustments.

Additionally, trade-offs in financial stability are directly linked to cross-asset spillovers. Banks tend to increase investments in high-yield securities when quantitative easing leads to a decrease in risk premia. This observation supports the risk-taking channel, as long periods of accommodative policy may increase leverage and risk accumulation (Borio & Zhu, 2012). Loosening credit standards and increased risk in lending are found to be common characteristics of low-rate environments (Jiménez et al., 2014; Maddaloni & Peydró, 2011). Linking theoretical transmission mechanisms to adjustments in institutional balance sheets.

#### 3.4.5 Implications for the Fed vs ECB Comparison

Cross-asset spillovers work as a strong foundation for comparing policy transmission between the Fed and the ECB. There are clear differences in the composition and implementation of the QE programs between the regimes. ECB programs such as the Asset Purchase Program (APP) have been found to significantly affect financial conditions and yields within the Euro area (Andrade et al., 2016). Simultaneously, the international spillovers documented in relation to Fed's QE suggest that Euro area financial conditions may be shaped by both direct effects from ECB policy as well as global

spillovers from the Fed (Fratzscher et al., 2018). This highlights the importance of examining institutional balance sheet shifts in a global asset pricing environment.

In summary, cross-asset spillovers represent a key mechanism through which QE affects institutions and financial markets. QE influences long-term yields and term premia, with these changes spreading across asset classes through portfolio rebalancing, changes in valuation, and shifts in risk-taking incentives (Gagnon et al., 2011; Krishnamurthy & Vissing-Jorgensen, 2011; Christensen & Rudebusch, 2012; Joyce et al., 2011). The international spillovers of Fed QE documented by Fratzscher et al. (2018) further highlight the effects QE has beyond domestic markets, which is particularly relevant when comparing the Fed and the ECB. By combining the cross-asset perspective with the risk-taking channel and including a firm-level approach, interpretations can be made from changes in liquidity and securities. These changes can be observed in accounting practices as well as responses to large-scale changes in asset supplies, risk premia, and global financial conditions.

### 3.5 Fed vs ECB: Structural Differences

Although empirical evidence gathered through studies agrees on the direction of the effects of QE, a more precise comparison between the central banks requires the examination of structural differences between the two monetary systems. The structural differences are significant in shaping transmission mechanisms, asset prices, and institutional behavior.

#### 3.5.1 Financial System Structure

The United States operate through a heavily market-based financial system where financial markets hold a crucial role in financing companies and households. On the contrary, the Euro area is considered to be more bank-based. A system where the credit intermediation is more reliant on commercial banks (Demirgüç-Kunt & Levine, 2001).

The observed structural difference suggests that portfolio balance and asset price transmission effects may operate more directly through capital markets in the United States. Opposed to this, transmission within the Euro area may be more dependent on the balance sheet adjustments and lending operations the banks conduct. Findings by Borio and Zhu (2012) and Dell’Ariccia et al. (2014)

regarding bank-based transmission and institutional risk-taking support the validity of this difference between the monetary regimes.

### 3.5.2 Structures: Sovereign and Fragmented

Furthermore, a significant difference concerns the structures of the monetary regimes. The United States have a single issuer of government debt, whereas the Euro area consists of multiple sovereign issuers within a broader monetary area (Lane, P. R., 2012).

This contrast in structures creates differences in yields and financial fragmentation across member states. A difference of this nature may affect policy transmission and also how the effects of asset purchases are identified. Empirical evidence on ECB programs presents that country-specific differences and transmission through the banking sector play a crucial role in shaping outcomes within the Euro area (Andrade et al., 2016).

### 3.5.3 Composition of Asset Purchases

The asset purchases are also structured differently between the Fed and the ECB. The purchase programs conducted by the Fed include significant purchases of U.S. Treasury treasury securities and Mortgage-Backed Securities (MBS), outlining a clear structure of the Fed's purchase programs (Gagnon et al., 2011). Meanwhile, the ECB's asset purchasing programs focused primarily on sovereign and public sector bonds issued by the states belonging to the Euro area, along with other asset classes within the monetary regime (Andrade et al., 2016).

Differences in the structures of purchase programs influence the amount of long-term risk removed from private markets and which sectors are most directly affected. This determines the declination of risk premia and how portfolios are reallocated (Gagnon et al., 2011; Krishnamurthy & Vissing-Jorgensen, 2011; Andrade et al., 2016).

### 3.5.4 Implications for the Comparison

Collectively, the discussed structural differences imply that regardless of the consistencies between the effect of QE on yields and risk premia when comparing the Fed and the ECB, the transmission

channels through which the effects are transmitted may differ. This reinforces the use of insitutional settings, firm-level responses, and uncertainty when comparing the final outcomes between the Fed and the ECB (Gagnon et al., 2011; Andrade et al., 2016; Borio & Zhu, 2012).

## 4 Balance Sheet Effects of Quantitative Easing: Firm-Based Evidence

This section provides a detailed analysis conducted on three different banks to investigate how quantitative easing and subsequent monetary policy normalization is reflected in the balance sheets. The analysis aims to directly address the research questions which concern 1) the effect QE has on banks' asset allocation, risk exposure and liquidity, and 2) whether the effects of QE are different across bank characteristics and the monetary regimes of the Fed and the ECB. The analysis is founded upon in monetary transmission theories, such as the bank balance sheet channel, the portfolio balance channel and the risk-taking channel of monetary policy.

The analysis focuses on the following banks: JPMorgan, Commerzbank and U.S. Bancorp. These banks were chosen to represent three different size categories and monetary regimes. Balance sheets through years 2019-2023 are examined in order to form a perspective as extensive and coherent as possible and cover the pre-QE environment, the initial QE shock, peak QE, and the post-QE tightening period. Original balance sheet screenshots are provided in appendix A and used as points of reference to illustrate points throughout the analysis.

### 4.1 Liquidity and the Bank Balance Sheet Channel

A central implication of QE is that large-scale asset purchases expand liquidity and increase the balances of banks' reserves which thereby affects banks' funding capabilities and balance sheet capacity. This prediction aligns with the bank balance sheet channel and complements the evidence stating that QE concretely eased financial conditions through liquidity and duration removal (Gagnon et al., 2011; Joyce et al., 2011). The balance sheets point out that this phenomenon is particularly clear for JPMorgan, whose balance sheet shows a significant increase in liquidity during the peak of the QE phase. Specifically, JPMorgan's deposits with banks rose from \$502,735m (2020) to \$714,396m (2021) (Table 1; Appendix A; JPMorgan Chase & Co. 2022), showing 2021 vs 2020 selected balance sheet data.

Although more gradual, a similar reaction affecting liquidity adjustment is visible in the European Central Bank regime for Commerzbank, whose cash in hand and cash on demand increases from

46,507m€ (2021) to 75,233m€ (2022) (Table 2; Appendix B), Commerzbank balance sheet. The direction of change is consistent with the interpretation according to which unconventional policy and subsequent liquidity conditions alter bank liquidity shields. The figures also present, that timing and intensity may differ between Fed's and ECB's regimes. These observations provide a bank-level balance sheet perception equivalent to the market evidence in QE studies which present strong policy effects on yields and liquidity premia (Christensen & Rudebusch, 2012; Gagnon et al., 2011).

## 4.2 Securities and Portfolio Balance Effects

Throughout the examined balance sheets, the most consistent and theoretically relevant QE-related adjustment is the increase in investment securities during periods of QE, which aligns with the portfolio balance channel. In this theoretical approach, central bank purchases reduce the supply of safe long-duration assets available to private investors. This prompts adjustments through which investors seek to rebalance portfolios as well as constrict term- and risk premia across markets (Krishnamurthy & Vissing-Jorgensen, 2011). Sequentially, banks may expand holdings in securities during QE due to yields declining and relative asset supplies shifting, which is a well-documented pattern for the Fed and other central banks (Gagnon et al, 2011; Joyce et al., 2011).

The balance sheets present evidence according to which JPMorgan's securities investments rise from \$589,999m (2020) to \$672,232m (2021) (Table 1; Appendix A). Moreover, the composition also indicates a greater exposure to duration as held-to-maturity (HTM) securities increase from \$201,821m (2020) to \$363,707m (2021). Meanwhile, the volume of available-for-sale (AFS) securities decline from \$388,718m (2020) to \$308,525m (2021). This change is relevant for further interpretation regarding risk exposure when rates are hiked. This connects the QE regime to post-QE balance sheet risk.

In the Euro area, evidence from Commerzbank's balance sheet supports QE-related shifts in securities, although International Financial Reporting Standards (IFRS) affect its format in reporting. Although the balance sheets focus on classification by measurement basis, the comparison between 2022 and 2023 still presents a substantial structure in liquidity and financial assets that can be interpreted considering ECB's purchase programs (Andrade et al., 2016). Collectively, the observed

expansion in securities aligns with the theory of QE affecting bank balance sheets not only through liquidity, but also through shaping asset supplies and incentives to hold fixed-income securities (Krishnamurthy & Vissing Jorgensen, 2011; Joyce et al., 2011).

### 4.3 Bank Lending Channel and Loan Development

Loan volumes play a crucial role in evaluating whether QE translates into the growth of credit supply through the bank lending channel. While QE can cause a decline in funding costs and improve capacity for financing, literature consistently states that rather than operating mechanically, the strength of response in lending depends on risk appetite, demand conditions and possible constraints within the balance sheet (Krishnamurthy & Vissing-Jorgensen, 2011; Andrade et al., 2016). The banks' balance sheets suggest that increases in lending are present, but in a more restrained manner than securities and liquidity changes during the QE period.

In JPMorgan's instance, loans increase from \$1,012,853m (2020) to \$1,077,714m (2021) (Table 1; Appendix A). However, in comparison to the increase in securities and liquidity changes during the same period, growth in loan volume appears more moderate. This supports an interpretation where balance sheet expansion during QE-periods is significantly driven by liquidity growth and securities holdings, channels which are consistent with QE transmission through longer-term rates and asset prices (Gagnon et al., 2011; Christensen & Rudebusch, 2012).

For U.S. Bancorp, the structure of their balance sheet represents a more traditional bank as it is more loan focused. Regardless, the balance sheet presents that loan volumes increase, but at a moderate pace in comparison to the considerable changes in liquid and securities categories. Net loans are \$381,277m in 2022 compared to \$306,304m in 2021 (Table 3; appendix C), U.S. Bancorp 2022 consolidated balance sheet. This supports the view according to which QE may cause significant shifts in financial conditions, presenting themselves in the form of changes in term premia, spreads and bond yields, without necessarily prompting major expansions in credit volumes, especially in later QE phases when demand and risk deliberation becomes crucial (Krishnamurthy & Vissing-Jorgensen, 2011; Andrade et al., 2016).

#### 4.4 Deposit Growth and Liability Adjustments

Observations from the liability sides present growth in deposits. This provides further evidence of liquidity conditions and the macro environments in which banks operated during quantitative easing. QE studies emphasize that large-scale purchases and accommodative policies support liquidity, thus easing financial conditions and affecting balance sheets and deposit operations within the private sector (Gagnon et al., 2011; Joyce et al., 2011). The bank balance sheets present strong deposit growth particularly in the case of U.S. banks.

From JPMorgan's balance sheet, deposits can be seen to increase from \$2,145,678m in 2020 to \$2,462,271m in 2021 (Table 1; appendix A). This increase correlates with a liquidity rich environment and the larger expansion of balance sheets during QE. For U.S. Bancorp, deposits also constitute a significant source of funding. According to Bancorp's balance sheet, their deposits increased from \$411,698m in 2021 to \$414,001m in 2022 (Table 3; Appendix C), while the overall liability structure holds deposits in its center. Growing deposits support the view that QE is associated with deposit inflows and expanded bank balance sheets. Both of these being elements which can strengthen banks' capacity to hold securities and maintain liquidity hedges.

#### 4.5 Post-QE Tightening and Interest Rate Risk Exposure

When long-term implications quantitative easing has on bank balance sheets are examined, the transition from operational QE peak to a normalized policy environment is important. QE is found to compress term premia and suppress yields during the asset purchase period (Christensen & Rudebusch, 2012; Gagnon et al., 2011), suggesting that banks which have expanded their securities holdings during QE may be face exposure to valuation or duration risk later when rates eventually rise. Therefore, the expansion of institutional balance sheets is a channel which allows accommodative policy to create potential interest rate risk.

A clear increase of securities can be observed in JPMorgan's balance sheet. Particularly held-until-maturity (HTM) securities such as bonds are found to increase during the during the peak of QE in 2021, with the observation providing a basis for understanding implied interest rate risks in post-QE normalization. This increase is most evident in JPMorgan's balance sheet, where the volume of

JPMorgan's HTM securities grew from \$201,821m (2020) to \$363,707m (2021) (Table 1; Appendix A). These kinds of balance sheet adjustments are consistent with higher exposure to duration and restricted flexibility to sell assets without realizing losses (Christensen & Rudebusch, 2012; Krishnamurthy & Vissing-Jorgensen, 2011).

The period of tightening is highly relevant as simpler balance sheets often have less capacity for extensive hedging. This argument is supported by findings made from U.S. Bancorp's balance sheet. Being the smaller institution, Bancorp's balance sheet from 2022 presents a significant reduction in available-for-sale (AFS) securities like debt securities. Bancorp's AFS securities decreased from \$132,963m in 2021 to \$72,910m in 2022. (Table 3; Appendix C). Offloading available-for-sale securities aligns with typical changes during post-QE periods. The presented behavior reflects institutional responses to higher rates and market valuation pressures.

#### **4.6 Cross-Bank and Cross-Regime Comparison: Fed vs ECB and heterogeneity**

In this thesis, an important objective is to compare the monetary environment of the Federal Reserve and European Central Bank. Another central discussion regards the differences in QE-related effects on institutional balance sheets between different sized banks and their monetary regimes. Studies provide strong justification for expecting heterogeneity. Quantitative easing affects long-term yields and risk premia, but the transmission of policy to bank balance sheets and the effect on their compositions depends on regulatory framework, the structure of financial intervention and purchase programs (Andrade et al., 2016; Krishnamurthy & Vissing-Jorgensen, 2011). The comparison between the three banks supports this perspective of heterogeneity.

JPMorgan being large and diversified shows clear balance sheet expansion in both liquidity and securities during QE. Meanwhile, U.S. Bancorp, being the smaller and more traditional counterpart of the compared U.S. institutions, exhibits clear changes in securities categories (Table 3) and remains loan and deposit driven by structure. Commerzbank provides insight from the Euro area where changes in liquidity and asset structure (Table 2; Appendix B) can be interpreted through the policy framework set by the European Central Bank. This includes environments during Asset Purchase Programs (APP) and the Pandemic Emergency Purchase Program (PEPP) and the timing of normalization measures in comparison to the U.S. (Andrade et al., 2016).

## 4.7 Quantitative Analysis: Balance Sheet Adjustments

Ratio comparisons can be used to quantify the strength in which banks' balance sheets adjust towards securities in comparison to lending, and how exposure to long-term interest rate risk changes through the share of held-to-maturity (HTM) securities. These comparisons connect the observed changes in the balance sheets directly to the portfolio balance channel, bank lending channel, and post-QE interest rate risk implications (Gagnon et al., 2011; Joyce et al., 2011; Krishnamurthy & Vissing-Jorgensen, 2011; Christensen & Rudebusch, 2012; Borio & Zhu, 2012).

### 4.7.1 Federal Reserve's Regime: JPMorgan and U.S. Bancorp

In the case of JPMorgan, the share of securities remains stable, but duration exposure rises. Measured as *Investment securities / total assets*, JPMorgan's share of securities remains relatively stable throughout the examination years, starting at 17,4% (2020), 18,0% (2021), and 17,2% (2022) (Table A1-A3; Appendix A). Opposed to this, the composition of said securities clearly shift towards hold-to-maturity. The HTM share measured as *HTM / Investment securities*, increases from 34,21% in 2020 to 54,10% in 2021, and further to 67,38% in 2022. The examination period presents a clear increasing pattern in which the HTM share of securities increased by 33,17% in total. This pattern aligns with the perception of QE and low-yield environments encouraging a larger emphasis on holdings with longer durations and adjusting balance sheets towards less immediate liquidity. This is consistent with portfolio balance mechanisms and risk-taking incentives when safe yields decline (Krishnamurthy & Vissing-Jorgensen, 2011; Borio & Zhu, 2012). The post-QE implication is that a higher HTM share can increase sensitivity to rate hikes as long-term interest rate exposure becomes more fixed in balance sheets as flexibility to sell without realizing losses is reduced. This is a direct link to repricing risks during normalization periods (Christensen & Rudebusch, 2012).

JPMorgan's lending volume remains moderate relative to the size of its balance sheet and does not expand proportionally in comparison to securities. The ratio *Loans / Total assets* is 29,91% in 2020, 28,79% in 2021, and 30,98% in 2022 (Table A1–A3; Appendix A). The evidence support the view according to which QE is associated with strong asset price effects and lower term premia but

nevertheless, bank balance sheet expansion may be more clearly reflected in securities holdings and the portfolio composition rather than in a substantial surge in lending (Gagnon et al., 2011; Joyce et al., 2011; Krishnamurthy & Vissing-Jorgensen, 2011).

In the case of U.S. Bancorp, a smaller bank within the Fed's regime, lending volumes are found to dominantly increase while securities volume falls. Simultaneously, the share of HTM securities increases sharply. When compared to JPMorgan, Bancorp's lending intensity is clearly higher. The consolidated balance sheet presents that *Loans / Total assets* rise from 54,43% (2021) to 57,54% (2022) (Table C1–C2; Appendix C). This ratio aligns with a more traditional bank balance sheet structure which is focused on loans. Also, the ratio *Investment securities / Total assets* decline from 30,49% in 2021 to 23,96% in 2022. This suggests that the relative role of securities declines during the same period. Even though the overall smaller role of securities, the composition of remaining securities shifts towards HTM instruments. The share of HTM securities increases from 23,94% (2021) to 54,89% (2022), which is a 30,95% increase. These changes indicate that even loan-focused banks may alter their exposure to interest rate risks through selecting securities and maturities. This becomes relevant when post-QE normalization begins, since rising interest rates can reduce balance sheet flexibility and create valuation pressures (Christensen & Rudebusch, 2012). This finding is also consistent with the risk-taking logic according to which accommodative periods may lead intermediaries to adjust portfolios towards solutions which seem attractive during low yields but present exposure to risks during normalization (Borio & Zhu, 2012).

#### 4.7.2 European Central Bank's Regime: Commerzbank

For Commerzbank, liquidity increases, whereas the balance sheet reports broad IFRS financial asset categories rather than a single line with total loans included as seen in the U.S. banks. Thus, a *Loans / Total assets* ratio cannot be presented exactly in the same as in the case of the U.S. counterparts. Regardless, the high share of amortized cost assets imply that lending remains a key part of Commerzbank's balance sheet. We can form a ratio of Commerzbank's *Cash on hand and cash on demand to Total assets*. This increases from 15,75% In 2022 to 18,0% in 2023 (Table B1–B2; Appendix B). This supports the interpretation according to which liquidity buffers increase also in the ECB during QE. Regardless, timing and intensity are different when compared to the U.S. cases,

which is consistent with the institution and regime-based differences highlighted in the comparison between the Fed and the ECB (Gagnon et al., 2011; Joyce et al., 2011; Andrade et al., 2016).

#### 4.8 Theoretical Implications

Overall, the evidence from the balance sheets provide evidence at a firm-level and is consistent with important QE transmission mechanisms documented in the literature. Both the qualitative and the quantitative analysis present a same outcome. Firstly, QE is associated with substantial accumulation of liquidity and an increase in the amount of total assets. This is consistent with the bank balance sheet channel (Gagnon et al., 2011; Joyce et al., 2011). The increase in liquidity reflects overall balance sheet growth and stronger funding capability during the peak of QE.

Furthermore, the amount of securities holdings significantly increased during QE, and the ratio between securities and total assets rises especially in 2020-2021 across the examined banks. Additionally, the growing proportion of held-to-maturity securities within the portfolios support the portfolio balance channel. The growth of the HTM share was particularly evident in the U.S. banks. As per this view, asset purchases cause term premia to decline and encourage duration rebalancing (Krishnamurthy & Vissing-Jorgensen, 2011; Christensen & Rudebusch, 2012). The adjustment towards HTM securities in a low-yield environment implies that banks increased their long-term interest rate risks when long-term rates were compressed.

Regardless of loan volumes increasing in several cases, the ratio between the loans and total assets remains relatively stable or rise significantly less than the share of securities during the peak of QE. The presented pattern suggests that the transmission of QE operates more heavily through asset pricing and portfolio reallocation than through loan expansion, aligning with Andrade et al. (2016) and Krishnamurthy and Vissing-Jorgensen (2011). Therefore, the importance of securities holdings in comparison to loans provides a clear and measurable reflection of this mechanism, visible in the balance sheets.

Finally, the declining share of securities holdings adjustments in available-for-sale portfolios in 2022-2023 reflect the effects of normalizing measures. These adjustments present how securities

accumulation driven by accommodative policy measures becomes central when evaluating post-QE interest rate risk, especially for banks with simpler balance sheet structures (Christensen & Rudebusch, 2012). The ratios presented through the quantitative analysis support this conclusion by presenting a connection where asset allocation decisions increased balance sheet sensitivity to rising interest rates.

The findings also substantiate heterogeneity across banks and monetary regimes. Regardless of institutions under both the Fed and the ECB presenting an increase in liquidity and heightened securities exposure during QE, the size and composition of these shifts differ. This highlights the importance institutional structures and balance sheet elements have on monetary policy transmission (Andrade et al., 2016).

## 5 Central Bank Communication, Forward Guidance and Uncertainty

The effect quantitative easing has on financial conditions is clearly presented in the balance sheet data. Significant changes in banks' liquidity positions can be observed from the balance sheets, accompanied by changes in securities holdings and their risk exposure. Although these changes are clear, it is important to recognize that asset purchases and direct balance sheet changes are not the only channels unconventional policy is transmitted through. Central bank communication and forward guidance become important instruments of policy transmission when the effectiveness of low interest rates shrinks.

Central banks can use communication and forward guidance as tools to manage yields, risk premia, and broader market conditions as expectations are highly important in affecting different market variables. By reinforcing or weakening the channels through which asset purchases affect pricing and institutional behavior, communication works as a complementary tool to QE. Therefore, the relevance of communication is linked to the balance sheet findings, as when banks respond to declined yields and changes in term premia, they are ultimately responding to the current policy environment as well as to the expectations regarding the continuation of the accommodative setting.

### 5.1 Communication as a Transmission Mechanism

Forward guidance can be interpreted as a policy tool that influences the financial markets by setting and changing expectations regarding future policy. When interest rates are close to the lowest effective level, central bank communication and forward guidance become highly important tools in shaping expectations and thus influencing yields, risk premia, and broader financial conditions. Campbell et al., (2012) provide a perspective of how forward guidance can affect the macro-environment through affecting expectations and thereby influencing long-term rates and economic outcomes. Their analysis emphasizes that in addition to forward guidance being seen as a communication tool, it should be viewed as a mechanism that can influence the transmission of monetary policy by shaping how private counterparts form expectations about the macro-environment and future policy (Campbell et al., 2012)

The role of an expectation manager is relevant in a Fed versus ECB frame, as QE causes yields to decline through changes in asset supplies, but communication influences the expected persistence of lowered rates and accommodative conditions, which is important regarding discount rates and term premia. In practice, if investors consider guidance as trustworthy and long-lasting, its effects on long-term yields and asset pricing may be stronger. If guidance is perceived as temporary or uncertain, markets may change in a more cautious manner. Therefore, communication interacts with the pricing channels by influencing the information environment through which asset prices, spreads, and risk premia are determined (Hubert & Labondance, 2021).

## 5.2 Delphic vs. Odyssean Guidance and the Content of Policy Signals

A key issue in the literature regarding central bank communication is that forward guidance may work through different mechanisms depending on whether it provides information or signals commitment regarding policy. Andrade and Ferroni (2021) provide a useful framework by distinguishing forms of policy shocks: Odyssean and Delphic. In this framework, Delphic guidance provides information on a central bank's outlook on the state of the economy, while Odyssean guidance signals commitment through shaping expectations regarding a planned policy path which may be followed even if the environment changes. This distinction is relevant as similar communication can affect financial markets through different channels by, for example, reforming beliefs regarding economic fundamentals or by influencing expectations regarding policy reactions and persistence (Andrade & Ferroni, 2021).

In the context of this thesis, the distinction of Delphic and Odyssean policy shocks provides a logical way to perceive the effect of communication on the markets and balance sheets which respond to QE. If guidance is fundamentally Delphic, it may alter the behavior of banks and investors through shifting expectations regarding growth, inflation, and credit conditions. If the guidance is primarily Odyssean, it may increase the incentives to rebalance portfolios towards assets with longer maturities through increasing the perceived persistence of policies. In both cases, communication may assist in explaining why phases of quantitative easing are associated with wider price-adjustment effects and why banks' balance sheet contents such as liquidity, securities allocation,

and maturity exposure can be sensitive to the informational content and credibility of central bank messages (Andrade & Ferroni, 2021).

### 5.3 Financial Market Expectations and Communication

The effectiveness of forward guidance depends on how communication is received and incorporated into the market expectations. Hubert and Labondance (2021) emphasize the role of central bank communication in the shaping of financial market expectations, highlighting the effect communication has on the formation of beliefs in asset markets. According to this view, policy statements and communication events do not only accompany monetary policy decisions, but actively shape financial conditions by influencing expectations and pricing across markets (Hubert & Labondance, 2021).

This point of view supports discussion regarding cross-asset spillover. If communication changes the expected directions of policy operations, it may affect yield curves, credit spreads, and equity valuations through changes in risk premia and discount rates. These adjustments happening on a market-level affect the banks in two main ways. Firstly, changes in yields and spreads affect the attractiveness of securities and lending opportunities. Secondly, changes in volatility and risk premia influence how much banks are tempted to take risk along with other choices regarding risk management. As a result, central bank communication can be viewed as a central mechanism shaping the environment in which banks allocate assets and manage balance sheet risks (Hubert & Labondance, 2021).

### 5.4 Private Expectations, Credibility, and Uncertainty

Communication and its effects are not only limited to counterparts within the financial markets: they can also influence private agents such as households and firms. Coibion et al., (2018) analyze the effect of monetary policy communication on household inflation expectations. They highlight that communication may shape beliefs and expectations beyond professional analysts and financial institutions. This is relevant regarding uncertainty because if communication reduces ambiguity concerning policy objectives and future operations, it may have a stabilizing effect on expectations,

simultaneously supporting monetary transmission. On the contrary, unclear or inconsistent communication may increase differences in expectations, elevate uncertainty and thus weaken transmission (Coibion et al., 2018).

In the context of linking different monetary regimes to financial market outcomes, these dynamics are important because the formation of expectations at the most common private level can influence macro-environments through which financial intermediations such as credit demand and consumption decisions are also affected. In essence, central bank communication can affect the broader economic environment in which banks operate and this way indirectly affect the contents and compositions of their balance sheets. This connection is particularly relevant during periods of elevated stress-levels and high uncertainty. Communication can either stabilize expectations or increase volatility (Coibion et al., 2018).

## 5.5 Forward Guidance as a Stabilizer and a Source of Risk

Although forward guidance can improve the transmission of policy, it also poses potential risks. One risk is that guidance may become overly inflexible. If economic conditions change unexpectedly and the central banks deviate from their communicated policy operations, credibility may be altered negatively, leading to increased uncertainty (Campbell et al., 2012). Another risk arises when the communication is interpreted as a stronger commitment than intended. In cases as such, counterparts within the markets may increase the risk they take based on expectations of extended periods of accommodative policies with later changes in guidance being potential catalysts for abrupt price changes (Andrade & Ferroni, 2021).

This exchange is directly connected to discussion on risk-taking and financial stability. If credible guidance strengthens expectations regarding low interest rates, it may cause yields to decline and prompt risk-taking behavior by strengthening incentives for maturity transformation and yield-seeking behavior (Borio & Zhu, 2012). Additionally, the observation is consistent with the risk-taking channel. Simultaneously, guidance which acts as a stabilizer for expectations can support efficient market functioning during crises as well as reduce volatility (Hubert & Labondance, 2021). Therefore, forward guidance holds a place not only as a transmission tool but also as a potential

amplifier of financial cycle elements depending on its credibility, clarity and the existing macro-financial environment.

## 5.6 Fed vs. ECB perspective

In the context of comparing the Fed and the ECB, communication and forward guidance complement the comparison between the two central banks. Both central banks have heavily relied on communication during periods when accommodative measures and QE programs were used to stabilize market conditions and ensure efficient market functioning. Regardless, the effects of communication are not identical between different monetary regimes due to differences in institutional settings, market structures, and policies which can affect how guidance is transmitted. Therefore, the comparison between the Fed and the ECB benefits from treating communication as a fundamental part of unconventional policy operations rather than as a separate topic. This perspective helps in linking the discussion in its entirety because cross-asset spillovers and balance sheet adjustments occur in an environment which is shaped by asset purchases and communication-influenced expectations.

Additionally, the Delphic and Odyssean distinction provides a way to integrate communication into the broader framework of this thesis. When guidance is more Delphic, communication influences markets through providing information regarding economic fundamentals and the central bank's stance. When guidance is more Odyssean, it influences markets by shaping expectations regarding how long accommodative policy will last and how the central bank is likely to respond to economic conditions. In both instances, these mechanisms support the view according to which balance sheet behavior during QE should be examined through a broader framework which includes expectations, as in addition to banks' portfolio decisions responding to current yields, they also react to anticipated future conditions which are influenced by central bank communication (Andrade & Ferroni, 2021).

## 5.7 Theoretical Implications

Overall, forward guidance and central bank communication hold a key role in the transmission of unconventional policy through shaping expectations when the use of conventional tools is limited. Forward guidance can affect market outcomes by influencing expected policy paths and the information environment in which asset pricing and risk premia are determined (Campbell et al., 2012; Hubert & Labondance, 2021). The difference between Delphic and Odyssean guidance provides a useful tool for understanding how communication can affect markets through information and commitment channels (Andrade & Ferroni, 2021). Additionally, communication affects expectations on a private level, in example within households, showing that credibility and clarity hold significance for market pricing and the broader uncertainty environment which can reinforce or weaken policy transmission (Coibion et al., 2018)

In the context of this thesis, these mechanisms complement discussion and arguments by explaining how expectation management interacts with changes in asset pricing, firm-level balance sheet adjustments and cross-asset spillovers. Therefore, communication has a function as a powerful yet potentially frail instrument that can stabilize expectations and support the transmission of policy while also creating and shaping incentives that influence risk-taking behavior and stability outcomes for the financial markets.

## 6 Implications: Investors & Policymakers

The findings and discussion of this thesis, which cover QE transmission, cross-asset spillover, risk-taking incentive, and firm-level balance sheet adjustments of banks under the Fed and ECB jurisdictions, have direct implications for investors as well as policymakers. The main point is that unconventional monetary policy affects the financial markets through a variety of channels. In addition to these channels influencing asset prices and yields, they also affect decisions regarding balance sheets and their contents as well as risk exposure of financial institutions. Quantitative Easing should therefore be perceived as a tool that has a large altering effect on relative returns, risk premia, and expectations rather than as a small-scale intervention in the bond markets (Gagnon et al., 2011; Krishnamurthy & Vissing-Jorgensen, 2011).

### 6.1 Investors

For investors, the findings present that periods of QE are most often associated with risk repricing through portfolio balance effects and the decline of term premiums, prompting a rise in valuations across different asset classes as well as a decline in yields and spreads (Christensen & Rudebusch, 2012; Joyce et al., 2011). As per this finding, investors should be meticulous regarding duration exposure and discount rate sensitivity when assembling portfolios as a keyway in which QE works is by lowering long-term yields and term premia (Krishnamurthy & Vissing-Jorgensen, 2011). When normalizing measures are implemented, the same mechanisms may reverse, causing sensitivity to rises in interest rates, thus creating valuation pressures across fixed income and other assets which are sensitive to rates (Christensen & Rudebusch, 2012). Banks' balance sheets present this mechanism because shifts towards larger holdings in securities and longer maturities during QE may improve short-term income while increasing interest rate risk during tightening phases. This is highly important for investors when they evaluate banks' equity and credit risk.

Further implications for investors regard cross-border and cross-asset spillovers. QE implemented by central banks can be transmitted internationally through capital flows and broader financial conditions, meaning that investors cannot treat the Fed and the ECB as completely independent environments (Fratzscher et al., 2018; Bruno & Shin, 2015). This supports a more global view of policy risk as changes in one central bank's outlook may affect risk premia, exchange rates and

capital flows elsewhere, which affects asset returns and how different asset prices move together. For investors, this highlights the importance of paying attention to global liquidity conditions and differences in policies when forming forecasts regarding volatility, changes in risk appetite, and how effective cross-asset hedging may be (Fratzcher et al., 2018).

Thirdly, literature regarding the risk-taking channel suggests that extended periods of low interest rates may alter banks' behavior in ways that are not entirely reflected in the total credit growth. Evidence indicating that accommodative policy has a positive correlation with greater bank risk-taking, leverage, and looser lending standards indicates that investors should conduct analysis beyond growth figures and rather assess the composition of risk, such as if banks' portfolios shift towards riskier lenders, securities with longer maturities, or a greater reliance on valuation-sensitive assets.

## 6.2 Policymakers

In terms of policymakers, the results demonstrate that QE involves a balance between short-term stabilization and medium-term risk accumulation. Quantitative easing can be effective in easing financial conditions and compressing long-term yields, which supports macro-level stabilization during periods of stress (Gagnon et al., 2011; Krishnamurthy & Vissing-Jorgensen, 2011). Regardless, the risk-taking channel suggests that continuous accommodation may cause financial intermediaries to increase risk exposure when seeking yield and thus contribute to future vulnerabilities (Borio & Zhu, 2012; Dell'Ariccia et al., 2014). This implies that policy evaluation should consider outcomes on a macro-level along with market-level indicators and firm-level balance sheet responses. Changes in securities holdings, maturities, and liquidity shields are all among changes that are visible in the balance sheets.

Differences between the monetary regimes and their institutions are important variables policymakers must note. QE environments vary between the compared central banks, with policy frameworks and institutional environments being very different. Evidence shows that asset purchase programs affect both market pricing and bank lending channels, and that these measures are implemented at different times and in different ways between the compared jurisdictions (Andrade et al., 2016). When comparing the Fed and the ECB, this supports the view that policy

assessment should consider institutional structure. The same mechanisms, such as portfolio balance and term premium compression may be present, but implications regarding their balance sheets and financial stability can differ across banking systems. This emphasizes the importance of monitoring and stress testing interest rate related risks and sensitivities to securities valuation, especially when normalizing measures are applied and adjustments occur in previously compressed term premia (Christensen & Rudebusch, 2012).

Furthermore, the thesis presents that communication and forward guidance are key components of unconventional policy measures. Forward guidance shapes expectations regarding how long accommodative policy will last and thus affects long-term yields and broader financial conditions (Campbell et al., 2012). Comparison between Delphic and Odyssean guidance presents the influence communication can have on markets either by providing information or by giving signals of commitment towards certain policy operations, which affects how private market participants form expectations and take risk (Andrade & Ferroni, 2021). Due to credibility and clarity being key influencers on how markets and households interpret communication regarding policies, communication can reduce uncertainty and stabilize expectations or increase volatility if guidance is perceived as untrustworthy or inconsistent, or in the case of guidance being abruptly reversed (Hubert & Labondance, 2021; Coibion et al., 2018). This suggests that central banks should treat communication as a primary policy tool, especially in normalizing post-QE environments where repricing risks are elevated.

In conclusion, these implications connect the transmission mechanisms of QE to real market outcomes. Investors operate in policy-driven environments where discount rates, term premia and spillovers influence valuations and the way asset prices move together, and policymakers must balance stabilization targets with the potential for risk build-up in financial intermediation. The literature and empirical evidence suggest that an effective interpretation of quantitative easing requires a framework that includes market pricing channels, management of expectations, and firm-level balance sheet responses (Gagnon et al., 2011; Krishnamurthy & Vissing Jorgensen, 2011; Borio & Zhu, 2012).

## 7 Conclusion

This thesis has examined how differences in the monetary policy frameworks of the Fed and the ECB influence financial markets through both conventional and unconventional policy operations. The analysis combines theoretical policy transmission perspectives with balance sheet evidence gathered during periods of unconventional policy. This allows for an assessment on the significance of expectations, uncertainty, and institutional behavior in shaping the effectiveness of QE and related policy tools.

The reviewed literature and observations identify uncertainty as an important determinant of policy transmission. Elevated uncertainty reduces the responsiveness of households and firms to interest rates changes and contributes to increases in market volatility. This is observed to weaken the effectiveness of conventional policy measures. In these situations, tools like quantitative easing and forward guidance become more important for stabilizing markets and supporting liquidity.

Evidence shows that large-scale asset purchases by the Federal Reserve and the European Central Bank lower yields and lead investors to shift their portfolios. These actions affect asset prices not only in the assets they target, but also in other markets through spillovers effects. When returns on safe assets decline, investors move their money into riskier assets, which affects stock prices, credit spreads, and general risk premiums

At the same time, studies do not find the same strength of effects or the same main transmission channels in both cases. Some studies focus on portfolio balance and long-term yield effects, while others look more at expectations, bank lending, or risk-taking behavior.

Firm-level balance sheet analysis supports these mechanisms. During QE, low yields and tight spreads reduce the appeal of lending and securities investments. Balance sheet changes then reflect both funding conditions and expectations about future policy. In conclusion, monetary policy affects the volume of credit while also affecting the allocation of credit and its risk elements.

The more ratio specific balance sheet analysis further strengthens this interpretation. Changes in ratios between *securities / assets* along with *loan / assets*, together with changes in the share of held-to-maturity securities, indicate that in addition to QE influencing balance sheet sizes, it also affected the composition of balance sheets along with exposure to long-term interest rates. Increases in securities holdings and HTM shares during peak QE periods suggest greater interest rate sensitivity in subsequent tightening phases, while loan growth remained moderate in comparison. This quantitative evidence supports the portfolio balance and risk-taking interpretations identified in the literature.

Central bank communication and forward guidance further support these mechanisms by shaping expectations when conventional policy tools are limited. Divergence between institutional frameworks between the Fed and the ECB influence how communication is perceived and interpreted throughout markets and affect differences in market outcomes within different regimes. By shaping future policy directions, communication becomes a key tool when executing unconventional policy measures.

The comparison between the Fed and the ECB further demonstrates that institutional structure is important in terms of policy transmission. The market-based U.S. financial system and single sovereign issuer differ from the more bank-based and fragmented structure of the Euro area. This influences how portfolio balance effects, shifts in bank lending, and risk reallocation take place between the regimes. Therefore, differences in outcomes are not only driven by policies, but also influenced by structural differences.

In conclusion, the findings impose that in addition to depending on the scale of asset purchases, the effectiveness of monetary policy also depends on the information environment in which policy measures are executed. Different institutions and communication styles can affect how QE influences financial markets and intermediaries. Therefore, it is important to understand how asset purchases, institutional behavior, and communication work together when evaluating the broader effects of unconventional policy on financial markets. These differences are partly due to the period studied, institutional setup, and overall economic conditions. This shows why it is important to consider the context when comparing findings.

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# Appendices

## Appendix A: JPMorgan Chase Consolidated Balance Sheets

### Table A1. JPMorgan Chase Consolidated Balance sheet (2020)

Source: JPMorgan Chase & Co. Annual Report (Form10-K), 2020.

#### Consolidated balance sheets

December 31, (in millions, except share data)	2020	2019
<b>Assets</b>		
Cash and due from banks	\$ 24,874	\$ 21,704
Deposits with banks	503,735	241,927
Federal funds sold and securities purchased under resale agreements (included \$28,215 and \$14,561 at fair value)	296,284	249,157
Securities borrowed (included \$52,863 and \$5,237 at fair value)	180,635	139,758
Trading assets (included assets pledged of \$139,640 and \$111,522) <sup>(a)</sup>	503,126	389,687
Available-for-sale securities (amortized cost of \$39,729 and \$45,306; included assets pledged of \$32,227 and \$10,325)	288,179	300,699
Held-to-maturity securities, net of allowance for credit losses of \$78	21,261	47,540
Investment securities, net of allowance for credit losses	589,990	398,229
Loans (included \$44,474 and \$44,955 at fair value) <sup>(b)</sup>	1,812,853	997,620
Allowance for loan losses	(28,328)	(13,123)
Loans, net of allowance for loan losses	884,525	884,497
Accrued interest and accounts receivable	90,503	72,861
Premises and equipment	27,109	25,813
Goodwill, intangible and other intangible assets	24,218	23,341
Other assets (included \$17,827 and \$12,679 at fair value and assets pledged of \$2,729 and \$3,349) <sup>(c)</sup>	122,853	120,265
<b>Total assets<sup>(d)</sup></b>	<b>\$ 3,366,071</b>	<b>\$ 2,887,379</b>
<b>Liabilities</b>		
Deposits (included \$14,484 and \$28,569 at fair value)	\$ 2,144,257	\$ 1,562,431
Federal funds purchased and securities loaned or sold under repurchase agreements (included \$158,728 and \$548 at fair value)	215,209	183,875
Short-term borrowings (included \$16,893 and \$5,920 at fair value)	45,208	40,820
Trading liabilities	170,181	119,277
Accounts payable and other liabilities (included \$3,478 and \$3,729 at fair value)	232,999	210,407
Beneficial interests issued by consolidated VIEs (included \$81 and \$26 at fair value)	17,878	17,841
Long-term debt (included \$79,817 and \$75,745 at fair value)	281,685	291,488
<b>Total liabilities<sup>(e)</sup></b>	<b>3,106,717</b>	<b>2,426,049</b>
Commitments and contingencies (refer to Notes 28, 29 and 30)		
Stockholders' equity		
Preferred stock (\$1 per value; authorized 200,000,000 shares; issued 3,006,250 and 2,699,220 shares)	30,063	26,993
Common stock (\$1 per value; authorized 9,000,000,000 shares; issued 4,104,933,895 shares)	4,105	4,105
Additional paid-in capital	86,394	86,522
Retained earnings	236,990	223,211
Accumulated other comprehensive income	7,986	1,569
Shares held in restricted stock units ("RSU") trust, at cost (zero and 472,953 shares)	—	(21)
Treasury stock, at cost (1,485,498,428 and 1,020,912,567 shares)	(88,184)	(83,048)
<b>Total stockholders' equity</b>	<b>279,354</b>	<b>201,320</b>
<b>Total liabilities and stockholders' equity</b>	<b>\$ 3,366,071</b>	<b>\$ 2,887,379</b>

Effective January 1, 2020, the Firm adopted the CECL accounting guidance. Refer to Note 1 for further information.

(a) In the third quarter of 2020, the Firm reassessed certain fair value option elected lending-related positions from trading assets to loans and other assets. Prior period amounts have been revised to conform with the current presentation.

(b) The following table presents information on assets and liabilities related to VIEs that are consolidated by the Firm at December 31, 2020 and 2019. The assets of the consolidated VIEs are used to settle the liabilities of those entities. The holders of the beneficial interests do not have recourse to the general credit of JPMorgan Chase. The assets and liabilities in the table below include third-party assets and liabilities of consolidated VIEs and exclude intercompany balances that eliminate in consolidation. Refer to Note 14 for a further discussion.

December 31, (in millions)	2020	2019
<b>Assets</b>		
Trading assets	\$ 1,839	\$ 2,633
Loans	37,619	42,351
All other assets	681	681
<b>Total assets</b>	<b>\$ 40,139</b>	<b>\$ 45,665</b>
<b>Liabilities</b>		
Beneficial interests issued by consolidated VIEs	\$ 17,878	\$ 17,841
All other liabilities	233	447
<b>Total liabilities</b>	<b>\$ 17,811</b>	<b>\$ 18,288</b>

## Table A2. JPMorgan Chase Consolidated Balance Sheet (2021)

Source: JPMorgan Chase & Co. Annual Report (Form 10-K), 2021

### CONSOLIDATED BALANCE SHEETS AND CASH FLOWS ANALYSIS

#### Consolidated balance sheets analysis

The following is a discussion of the significant changes between December 31, 2021 and 2020.

#### Selected Consolidated balance sheets data

December 31, (in millions)	2021	2020	Change
<b>Assets</b>			
Cash and due from banks	\$ 26,438	\$ 24,874	6 %
Deposits with banks	714,396	502,735	42
Federal funds sold and securities purchased under resale agreements	261,698	296,284	(12)
Securities borrowed	206,071	160,635	28
Trading assets	433,575	503,126	(14)
Available-for-sale securities	308,525	388,178	(21)
Held-to-maturity securities, net of allowance for credit losses	363,707	201,821	80
<b>Investment securities, net of allowance for credit losses</b>	<b>672,232</b>	<b>589,999</b>	<b>14</b>
Loans	1,077,714	1,012,853	6
Allowance for loan losses	(16,386)	(28,328)	(42)
<b>Loans, net of allowance for loan losses</b>	<b>1,061,328</b>	<b>984,525</b>	<b>8</b>
Accrued interest and accounts receivable	102,570	90,503	13
Premises and equipment	27,070	27,109	–
Goodwill, MSRs and other intangible assets	56,691	53,428	6
Other assets <sup>(a)</sup>	181,498	151,539	20
<b>Total assets</b>	<b>\$ 3,743,567</b>	<b>\$ 3,384,757</b>	<b>11 %</b>

(a) Prior-period amount has been revised to conform with the current presentation. Refer to Note 25 for further information.

#### Selected Consolidated balance sheets data

December 31, (in millions)	2021	2020	Change
<b>Liabilities</b>			
Deposits	\$ 2,462,303	\$ 2,144,257	15
Federal funds purchased and securities loaned or sold under repurchase agreements	194,340	215,209	(10)
Short-term borrowings	53,594	45,208	19
Trading liabilities	164,693	170,181	(3)
Accounts payable and other liabilities <sup>(a)</sup>	262,755	231,285	14
Beneficial interests issued by consolidated variable interest entities ("VIEs")	10,750	17,578	(39)
Long-term debt	301,005	281,685	7
<b>Total liabilities</b>	<b>3,449,440</b>	<b>3,105,403</b>	<b>11</b>
Stockholders' equity	294,127	279,354	5
<b>Total liabilities and stockholders' equity</b>	<b>\$ 3,743,567</b>	<b>\$ 3,384,757</b>	<b>11 %</b>

(a) Prior-period amount has been revised to conform with the current presentation. Refer to Note 25 for further information.

## Table A3. JPMorgan Chase Consolidated Balance Sheet (2022)

Source: JPMorgan Chase & Co. Annual Reoprt (Form 10-K), 2022

### JPMorgan Chase & Co. Consolidated balance sheets

December 31, (in millions, except share data)	2022	2021
<b>Assets</b>		
Cash and due from banks	\$ 27,897	\$ 26,438
Deposits with banks	538,537	714,396
Federal funds sold and securities purchased under resale agreements (included \$311,883 and \$252,720 at fair value)	315,592	261,698
Securities borrowed (included \$70,041 and \$81,463 at fair value)	185,369	206,071
Trading assets (included assets pledged of \$93,687 and \$102,710)	453,799	433,575
Available-for-sale securities (amortized cost of \$216,188 and \$308,254; included assets pledged of \$9,158 and \$18,268)	206,857	308,525
Held-to-maturity securities	425,305	363,707
<b>Investment securities, net of allowance for credit losses</b>	<b>631,162</b>	<b>672,232</b>
Loans (included \$42,079 and \$58,820 at fair value)	1,135,647	1,077,714
Allowance for loan losses	(19,726)	(16,386)
<b>Loans, net of allowance for loan losses</b>	<b>1,115,921</b>	<b>1,061,328</b>
Accrued interest and accounts receivable	125,189	102,570
Premises and equipment	27,734	27,070
Goodwill, MSRs and other intangible assets	60,859	56,691
Other assets (included \$14,921 and \$14,753 at fair value and assets pledged of \$7,998 and \$5,298)	182,884	181,498
<b>Total assets<sup>(1)</sup></b>	<b>\$ 3,665,743</b>	<b>\$ 3,743,567</b>
<b>Liabilities</b>		
Deposits (included \$28,620 and \$11,333 at fair value)	\$ 2,340,179	\$ 2,482,303
Federal funds purchased and securities loaned or sold under repurchase agreements (included \$151,999 and \$126,435 at fair value)	202,813	194,340
Short-term borrowings (included \$15,792 and \$20,015 at fair value)	44,027	53,594
Trading liabilities	177,976	164,693
Accounts payable and other liabilities (included \$7,038 and \$5,651 at fair value)	300,141	262,755
Beneficial interests issued by consolidated VIEs (included \$5 and \$12 at fair value)	12,610	10,750
Long-term debt (included \$72,281 and \$74,934 at fair value)	295,865	301,005
<b>Total liabilities<sup>(2)</sup></b>	<b>3,373,411</b>	<b>3,449,440</b>
Commitments and contingencies (refer to Notes 28, 29 and 30)		
<b>Stockholders' equity</b>		
Preferred stock (\$1 par value; authorized 200,000,000 shares; issued 2,740,375 and 3,483,750 shares)	27,404	34,838
Common stock (\$1 par value; authorized 9,000,000,000 shares; issued 4,104,933,895 shares)	4,105	4,105

## Appendix B: Commerzbank Consolidated Financial Statements

### Table B1. Commerzbank Consolidated Balance Sheet (2022)

Source: Commerzbank Annual Report, 2022

Balance sheet				
Assets   €m	Notes	31.12.2022	31.12.2021 <sup>1</sup>	Change in %
Cash on hand and cash on demand	(69)	75,233	49,507	52.0
Financial assets – Amortised cost	(24)	296,192	299,181	-1.0
of which pledged as collateral		3,282	873	.
Financial assets – Fair value OCI	(26)	34,887	40,115	-13.0
of which pledged as collateral		5,335	3,645	46.4
Financial assets – Mandatorily fair value P&L	(28)	29,912	28,432	5.2
of which pledged as collateral		-	-	.
Financial assets – Held for trading	(29)	33,573	38,155	-12.0
of which pledged as collateral		1,325	802	65.2
Value adjustment on portfolio fair value hedges		-3,935	508	.
Positive fair values of derivative hedging instruments	(42)	1,729	844	.
Holdings in companies accounted for using the equity method	(43)	182	175	4.1
Intangible assets	(44)	1,289	1,243	3.7
Fixed assets	(45)	2,426	2,881	-15.8
Investment properties	(46)	57	41	39.9
Non-current assets held for sale and disposal groups	(47)	156	830	-81.2
Current tax assets	(49)	178	222	-19.9
Deferred tax assets	(49)	3,123	3,130	-0.2
Other assets	(51)	2,436	2,143	13.6
<b>Total</b>		<b>477,438</b>	<b>467,409</b>	<b>2.1</b>
<sup>1</sup> Prior year figures adjusted due to restatements (see Note 4).				
Liabilities and equity   €m	Notes	31.12.2022	31.12.2021 <sup>1</sup>	Change in %
Financial liabilities – Amortised cost	(25)	390,385	373,976	4.4
Financial liabilities – Fair value option	(27)	25,018	19,735	26.8
Financial liabilities – Held for trading	(30)	24,759	27,323	-9.4
Value adjustment on portfolio fair value hedges		-4,840	209	.
Negative fair values of derivative hedging instruments	(42)	3,113	6,816	-54.3
Provisions	(55, 56)	3,517	3,752	-6.3
Current tax liabilities	(50)	826	549	50.4
Deferred tax liabilities	(50)	6	13	-52.2
Liabilities of disposal groups	(48)	-	730	.
Other liabilities	(52)	3,749	4,478	-16.3
<b>Equity</b>	(59)	<b>30,905</b>	<b>27,827</b>	<b>3.6</b>
Subscribed capital		1,252	1,252	-
Capital reserve		10,075	10,075	-
Retained earnings		16,466	14,979	9.9
Other reserves (with recycling)		-891	-569	56.5
Equity attributable to Commerzbank shareholders		26,903	25,738	4.5
Additional equity components		3,114	3,114	-
Non-controlling interests		888	975	-8.9
<b>Total</b>		<b>477,438</b>	<b>467,409</b>	<b>2.1</b>
<sup>1</sup> Prior year figures adjusted due to restatements (see Note 4).				

## Table B2. Commerzbank Consolidated Balance Sheet (2023)

Source: Commerzbank Annual Report, 2024

Balance sheet				
Assets   €m	Notes	31.12.2023	31.12.2022 <sup>1</sup>	Change in %
Cash on hand and cash on demand	(58)	93,126	75,233	23.8
Financial assets – Amortised cost	(24)	296,689	296,192	0.8
of which pledged as collateral		3,791	3,262	15.5
Financial assets – Fair value (OCI)	(26)	40,143	34,887	15.1
of which pledged as collateral		9,651	5,335	80.9
Financial assets – Mandatorily fair value P&L	(28)	48,359	29,912	61.7
of which pledged as collateral		–	–	–
Financial assets – Held for trading	(29)	28,334	33,573	– 15.6
of which pledged as collateral		1,618	1,325	22.1
Value adjustment on portfolio fair value hedges		– 2,305	– 3,935	– 41.4
Positive fair values of derivative hedging instruments	(42)	1,497	1,729	– 13.4
Holdings in companies accounted for using the equity method	(43)	142	182	– 22.1
Intangible assets	(44)	1,394	1,289	8.2
Fixed assets	(45)	2,352	2,426	– 3.1
Investment properties	(46)	53	57	– 7.9
Non-current assets held for sale	(47)	42	156	– 60.5
Current tax assets	(48)	138	178	– 22.3
Deferred tax assets	(48)	2,505	3,113	– 19.5
Other assets	(50)	2,677	2,436	9.9
<b>Total</b>		<b>517,166</b>	<b>477,428</b>	<b>8.3</b>
<sup>1</sup> Prior-year figures adjusted due to restatements (see Note 4).				
Liabilities and equity   €m	Notes	31.12.2023	31.12.2022 <sup>1</sup>	Change in %
Financial liabilities – Amortised cost	(25)	419,809	390,385	7.5
Financial liabilities – Fair value option	(27)	36,941	25,018	47.7
Financial liabilities – Held for trading	(30)	18,927	24,759	– 23.6
Value adjustment on portfolio fair value hedges		– 3,311	– 4,840	– 31.6
Negative fair values of derivative hedging instruments	(42)	3,100	3,113	– 0.4
Provisions	(54, 55)	3,553	3,479	2.1
Current tax liabilities	(49)	535	826	– 35.2
Deferred tax liabilities	(49)	3	6	– 48.3
Liabilities of disposal groups		–	–	–
Other liabilities	(51)	4,599	3,749	22.7
Equity	(59)	33,009	30,934	6.7
Subscribed capital		1,240	1,252	– 1.0
Capital reserve		10,087	10,075	0.1
Retained earnings		18,026	16,495	9.3
Other reserves (with recycling)		– 475	– 891	– 46.7
Equity attributable to Commerzbank shareholders		28,878	26,931	7.2
Additional equity components		3,114	3,114	–
Non-controlling interests		1,016	898	14.4
<b>Total</b>		<b>517,166</b>	<b>477,428</b>	<b>8.3</b>
<sup>1</sup> Prior-year figures adjusted due to restatements (see Note 4).				

## Appendix C: U.S. Bancorp Consolidated Balance Sheets

### Table C1. U.S. Bancorp Consolidated Balance Sheet (2021)

Source: U.S. Bancorp Annual Report (Form 10-K), 2021

#### U.S. Bancorp Consolidated Balance Sheet

At December 31 (Dollars in Millions)	2021	2020
<b>Assets</b>		
Cash and due from banks	\$ 28,905	\$ 62,580
Investment securities		
Held-to-maturity (2021 fair value \$41.812)	41,858	—
Available-for-sale (\$557 and \$402 pledged as collateral, respectively) <sup>(a)</sup>	132,963	136,840
Loans held for sale (including \$6,623 and \$8,524 of mortgage loans carried at fair value, respectively)	7,775	8,761
Loans		
Commercial	112,023	102,871
Commercial real estate	39,053	39,311
Residential mortgages	76,493	76,155
Credit card	22,500	22,346
Other retail	61,959	57,024
Total loans	312,028	297,707
Less allowance for loan losses	(5,724)	(7,314)
Net loans	306,304	290,393
Premises and equipment	3,305	3,468
Goodwill	10,262	9,918
Other intangible assets	3,738	2,864
Other assets (including \$1,193 and \$1,255 of trading securities at fair value pledged as collateral, respectively) <sup>(a)</sup>	38,174	39,081
Total assets	<u>\$573,284</u>	<u>\$553,905</u>
<b>Liabilities and Shareholders' Equity</b>		
Deposits		
Noninterest-bearing	\$134,901	\$118,089
Interest-bearing	321,182	311,681
Total deposits	456,083	429,770
Short-term borrowings	11,796	11,766
Long-term debt	32,125	41,297
Other liabilities	17,893	17,347
Total liabilities	517,897	500,180
Shareholders' equity		
Preferred stock	6,371	5,983
Common stock, par value \$0.01 a share — authorized: 4,000,000,000 shares; issued: 2021 and 2020 — 2,125,725,742 shares	21	21
Capital surplus	8,539	8,511
Retained earnings	69,201	64,188
Less cost of common stock in treasury: 2021 — 642,223,571 shares; 2020 — 618,618,084 shares	(27,271)	(25,930)
Accumulated other comprehensive income (loss)	(1,943)	322
Total U.S. Bancorp shareholders' equity	54,918	53,095
Noncontrolling interests	469	630
Total equity	55,387	53,725
Total liabilities and equity	<u>\$573,284</u>	<u>\$553,905</u>

<sup>(a)</sup> Includes only collateral pledged by the Company where counterparties have the right to sell or pledge the collateral. See Notes to Consolidated Financial Statements.

## Table C2. U.S. Bancorp Consolidated Balance Sheet (2022)

Source: U.S. Bancorp Annual Report (Form 10-K), 2023

### U.S. Bancorp Consolidated Balance Sheet

At December 31 (Dollars in Millions)	2022	2021
<b>Assets</b>		
Cash and due from banks	\$ 53,542	\$ 28,905
Investment securities		
Held-to-maturity (fair value \$77,874 and \$41,812, respectively)	88,740	41,858
Available-for-sale (\$858 and \$557 pledged as collateral, respectively) <sup>(a)</sup>	72,910	132,983
Loans held for sale (including \$1,849 and \$6,623 of mortgage loans carried at fair value, respectively)	2,200	7,775
Loans		
Commercial	135,690	112,023
Commercial real estate	55,487	39,053
Residential mortgages	115,845	76,493
Credit card	26,295	22,500
Other retail	54,896	61,959
Total loans	386,213	312,028
Less allowance for loan losses	(6,936)	(5,234)
Net loans	381,277	306,304
Premises and equipment	3,858	3,305
Goodwill	12,373	10,262
Other intangible assets	7,155	3,738
Other assets (including \$702 and \$1,193 of trading securities at fair value pledged as collateral, respectively) <sup>(a)</sup>	52,750	38,174
<b>Total assets</b>	<b>\$674,805</b>	<b>\$573,284</b>
<b>Liabilities and Shareholders' Equity</b>		
Deposits		
Noninterest-bearing	\$137,743	\$134,901
Interest-bearing	387,233	321,182
Total deposits	524,976	456,083
Short-term borrowings	31,216	11,796
Long-term debt	39,629	32,125
Other liabilities	27,552	17,893
Total liabilities	623,573	517,897
Shareholders' equity		
Preferred stock	6,808	6,371
Common stock, par value \$0.01 a share — authorized: 4,000,000,000 shares; issued: 2022 and 2021—2,125,725,742 shares	21	21
Capital surplus	8,712	8,539
Retained earnings	71,901	69,201
Less cost of common stock in treasury: 2022 — 594,747,484 shares; 2021 — 642,223,571 shares	(25,269)	(27,271)
Accumulated other comprehensive income (loss)	(11,407)	(1,943)
Total U.S. Bancorp shareholders' equity	50,766	54,918
Noncontrolling interests	466	469
Total equity	51,232	55,387
<b>Total liabilities and equity</b>	<b>\$674,805</b>	<b>\$573,284</b>

(a) Includes only collateral pledged by the Company where counterparties have the right to sell or pledge the collateral.