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What Have We Learned About Quantitative Easing: A Critical Review

Monografia

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I declare that this work is my own and that I did not use any form of external help to carry it out, except when authorized by the advisor.

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ABSTRACT

The paper provides a comprehensive analysis of Quantitative Easing (QE), focusing on its implications, mechanisms, and outcomes. The Introduction sets the stage by highlighting the significance of QE as a monetary policy tool, particularly its adoption post-global financial crisis. The section on Transmission Channels elucidates how QE operates through various mechanisms, mainly the Portfolio one, impacting financial markets, interest rates, and lending behavior. Macroeconomic Consequences explore the broader effects of QE on economic indicators like GDP growth and inflation rates. It presents empirical evidence that showed the effectiveness of this monetary policy tool. Moreover, it discusses the challenges in assessing the precise impact of QE on these variables. The Risks section outlines the potential downsides associated with QE, including concerns about Central Bank Independence, Redistributive Issues and International Spillovers. Finally, Exiting QE discusses the challenges and strategies involved in phasing out QE policies. It addresses concerns about the timing, pace, and communication strategies necessary for a smooth transition. Overall, the paper provides a detailed examination of Quantitative Easing, offering insights into its functioning and consequences through the collective body of evidence that has been produced.

KEYWORDS

Quantitative Easing; Monetary Policy, Financial Markets, Central Bank, Channels, Consequences.

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1 INTRODUCTION

In the realm of monetary policy, central banks employ various tools to stimulate economic growth, stabilize financial markets, and combat the effects of economic downturns. One such tool that has gained prominence in recent years is quantitative easing (QE). This unconventional monetary policy has been adopted by several central banks around the world, shaping the economic landscape and sparking debates on its efficacy, risks, and long-term consequences.

Quantitative easing can be described as a process in which a central bank (CB) purchases long-term financial assets, typically government bonds, from commercial banks and other financial institutions. The primary objective of QE is to boost liquidity in the financial system. By doing so, central banks aim to lower interest rates, stimulate borrowing and lending, and encourage economic activity.

The origins of quantitative easing can be traced back to the early 2000s, primarily as a response to Japan's prolonged period of deflation and stagnation. The Bank of Japan embarked on an extensive QE program, paving the way for other central banks to consider this unconventional tool during the global financial crisis of 2008-2009. The U.S. Federal Reserve, the European Central Bank, and the Bank of England are among the major central banks that have utilized quantitative easing in their policy arsenal.

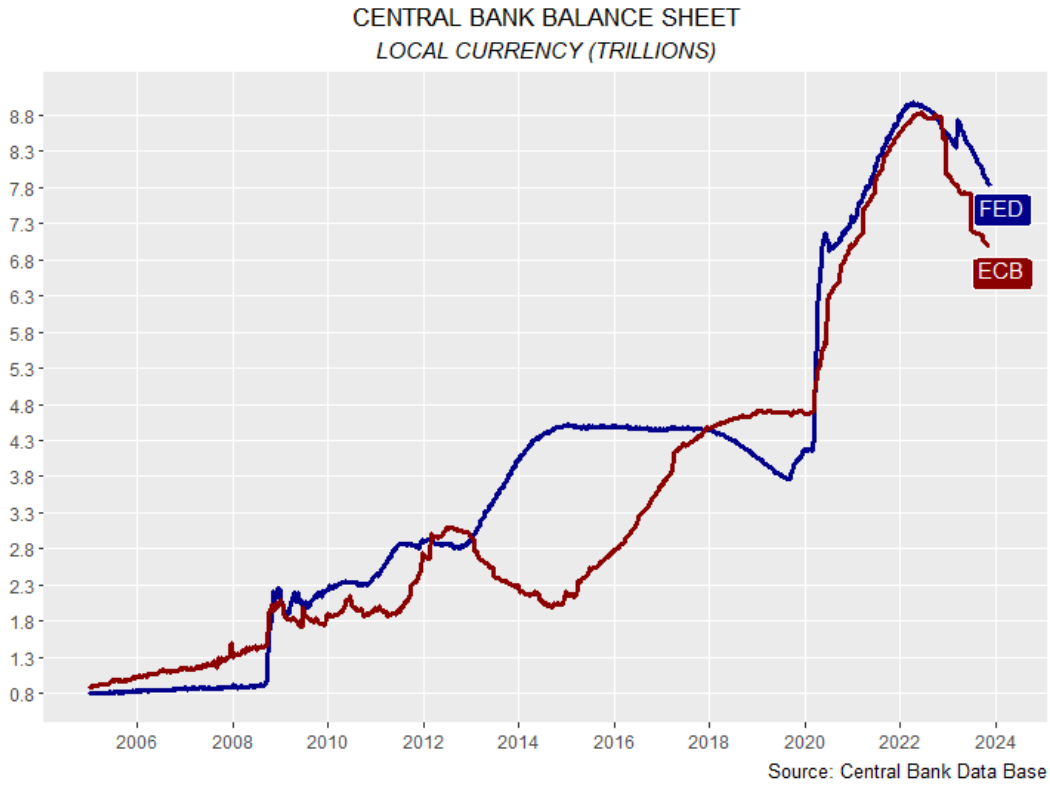
QE is often employed when traditional monetary policy tools, such as lowering the policy interest rate, have become ineffective or are insufficient to address economic challenges. During the global financial crisis, for instance, interest rates had already been cut to the zero-lower bound, leaving central banks with limited room for further reductions. Thus, quantitative easing offered an alternative approach to injecting liquidity into the financial system.

The study of quantitative easing (QE) holds significant importance in understanding its role and impact on the aftermath of financial crises and, more recently, the global pandemic. As a non-conventional monetary policy tool, QE has been widely implemented by central banks around the world to address economic challenges and promote stability. By delving into the motivations behind studying QE, we can uncover its effectiveness, risks, and implications for policymakers, economists, and market participants.

After the global financial crisis of 2008-2009, the study of quantitative easing became imperative due to its significant use by major central banks. The unprecedented collapse of financial institutions, credit crunch, and economic recession led central banks to employ unconventional measures to stimulate growth and prevent further economic turmoil. QE emerged as a pivotal tool, aiming to inject liquidity into the financial system, lower interest rates, and revive economic activity.

The outbreak of the COVID-19 pandemic in 2020 sparked renewed interest in studying quantitative easing. Governments and central banks responded swiftly to the crisis with massive fiscal stimulus packages and extensive monetary policy measures, including the utilization of QE. For instance, the Federal Reserve (FED) and the European Central Bank (ECB) drastically increased their Balance Sheets during the lockdown period, as depicted in the graphic below. The pandemic-induced economic shock necessitated a deeper understanding of QE's role in mitigating the crisis impact and aiding the recovery process.

Figure 01



Therefore, it's an opportune moment to pause and inquire whether the unconventional measures employed by the Federal Reserve and other central banks yielded the desired outcomes. This contemplation naturally extends to the question of whether central banks should consider employing such measures again in subsequent times.

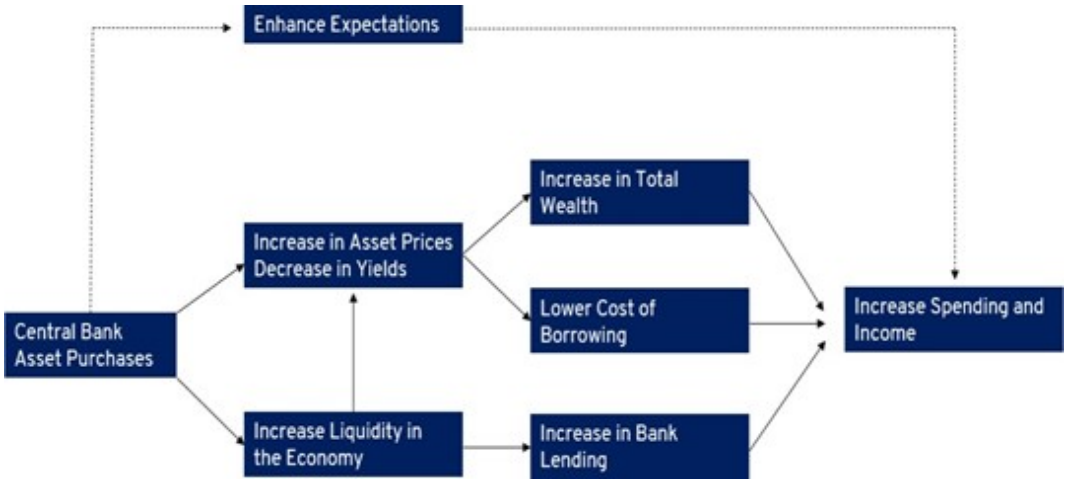
The purpose of this paper is to assess the knowledge gained regarding unconventional monetary policy over recent years and highlight certain unresolved inquiries. The paper begins by discussing the transmission channels into financial markets, institutions, and the broader economy related to QE. It then delves into its effectiveness by examining empirical studies concerning the financial and economic consequences of these policies. Following this, it addresses potential risks associated with QE, exploring the relationship between the Central Bank and the Treasury Department, as well as international spillovers. Additionally, it analyzes the process of exiting Quantitative Easing. Finally, the paper concludes by summarizing the main takeaways and offering insights into the potential trajectory of unconventional monetary policy moving forward, along with research gaps that need addressing in the future.

2 TRANSMISSION CHANNELS

As the new decade unfolded after the global financial crisis, it became apparent that low inflation wasn't an unqualified benefit. The convergence of historically low real interest rates, influenced by demographic shifts and technological progress, resulted in the sustained presence of low nominal interest rates. Within this altered landscape, the chronic persistence of low borrowing costs poses a significant challenge to the conventional approach in monetary policymaking. Hence, there's a crucial need to reevaluate the emergence of Quantitative Easing (QE), a toolkit that gained prominence when developed economies encountered the zero-lower bound.

QE entails the expansion of a Central Bank's balance sheet to influence long-term interest rates and those in the private sector. This intricate process operates through three interrelated mechanisms, each contributing to the broader goal of shaping economic conditions.

Figure 02



2.1 PORTFOLIO CHANNEL

To start, former Federal Reserve chair Ben Bernanke (2014) once remarked that QE works in practice but not in theory. His argument is rooted in a theoretical framework lacking financial market frictions, where investors seamlessly move across asset categories. In such a scenario, central bank acquisitions of government bonds would theoretically have no impact on bond yields, as financial markets and arbitrageurs would swiftly rebalance their portfolios to counteract these purchases.

However, real-world financial markets differ significantly. These markets exhibit segmentation, driven by investors' preferences for specific securities or limitations in short selling the bonds targeted by the central bank. In this context, central bank purchases, by reducing the net availability of government bonds in circulation, drive bond prices upward and subsequently depress yields associated with those bonds. Notably, for this mechanism to extend its effects beyond government bond markets, the segmentation level must not be excessively high.

Agents relinquishing government bonds to the central bank are expected to adjust their investment portfolios by acquiring alternative securities, such as corporate bonds, equities, or real estate-backed securities. This strategic shift serves to elevate the prices of these assets, thereby reducing their yields. These dynamics have a dual impact: stimulating both consumer spending and investment activities.

Additionally, Krishnamurthy and Vissing-Jorgensen (2011) found that QE affects a given interest rate through various channels. One such channel is the reduction of a bond's risk premium. Under this channel, quantitative easing influences the supply and demand dynamics of longer-term bonds, thereby reducing duration risk in the market. QE exerts upward pressure on bond prices, lowering their yields and flattening the yield curve. Consequently, the difference in yields between short-term and long-term bonds diminishes, reducing price volatility or duration risk associated with longer-term bonds.

Furthermore, QE can alter the stochastic discount factor (SDF) inherent in a market. By signaling the central bank's commitment to supporting the economy and maintaining accommodative monetary policy, QE influences investors' beliefs about future economic conditions and associated risks. These revised expectations and risk perceptions can impact the SDF, affecting investors' willingness to bear risk and the prices they are willing to pay for different assets. Changes in the SDF,

in turn, can impact asset prices and returns.

Moreover, considering the Modigliani-Miller Theorem (1958), which primarily pertains to corporate finance, there's a parallel drawn to the efficacy of quantitative easing in monetary policy. In a scenario without market segmentation, an adaptation of this theorem suggests that the Federal Reserve's ability to adjust interest rates through bond purchases becomes restricted. Essentially, the representative agent gains insight into the Fed's actions. As the overall economy's aggregate portfolio remains unchanged, pricing dynamics remain unaffected, and households effectively counterbalance the adjustments made by the Fed.

However, it's essential to note that the real-world economy and financial markets do not align with the frictionless and perfect assumptions of Modigliani-Miller. Imperfections, informational asymmetries, and behavioral factors lead to imperfect substitutability among assets. Imperfect asset substitutability can stem from two primary sources. Firstly, inherent in long-maturity bond prices is a higher sensitivity to interest rate fluctuations compared to shorter-maturity counterparts. Investors averse to interest rate risk inherently demand a higher expected return from long-term bonds, known as a 'term premium.' Reducing the supply of long-term bonds through asset purchases decreases their yields by narrowing the term premium.

In this context, each distinct asset class exhibits its own demand curve, allowing alterations in the relative availability of assets to influence both prices and yields. Moreover, market segmentation can contribute to imperfect asset substitutability. This phenomenon may arise from investors' preferences for particular asset types, akin to the 'preferred habitats' theory. Alternatively, it could result from incentives driving investors, like pension funds, to maintain specific proportions of their portfolios in certain forms, such as default risk-free securities. This interplay of supply and demand mechanisms underlies the portfolio balance effects.

In segmented markets, QE's effectiveness may deviate from the strict assumptions of the Modigliani-Miller Theorem. By influencing liquidity, risk premia, investor confidence, and market functioning, QE can address market frictions, mitigate constraints, and stimulate economic activity, positioning it as a valuable tool for central banks in economic management.

Additionally, Curdia and Woodford (2010) differentiate between 'quantitative easing' in its strict interpretation and targeted asset purchases by a central bank. Their model suggests that while the former approach may prove ineffective irrespective of circumstances, the latter holds potential efficacy, especially during significant

disruptions in financial markets. Neither approach, however, stands as an ideal replacement for conventional interest rate policies. Their findings emphasize that acquiring illiquid assets may enhance overall welfare, particularly when the zero-lower bound on the policy rate constrains traditional monetary policies.

Their household representative theory suggests that QE does not reduce risk but rather restructures it. Lower earnings on the central bank's portfolio during crises could lead to decreased earnings distributed to the treasury, potentially resulting in higher taxes for the private sector. Hence, the representative household's after-tax income remains as dependent on risk as before.

However, this viewpoint doesn't reflect a consensus across the literature. Relying solely on a household representative model may not adequately analyze the effects of QE due to real-world economic and financial market complexities. Household representative models assume uniform preferences, income, and access to financial assets among households, whereas reality showcases diverse characteristics, income levels, and financial holdings. QE's impact could significantly differ among households based on their existing portfolios, risk appetites, and consumption patterns. Ignoring this heterogeneity might lead to an incomplete understanding of how QE affects various segments of the population.

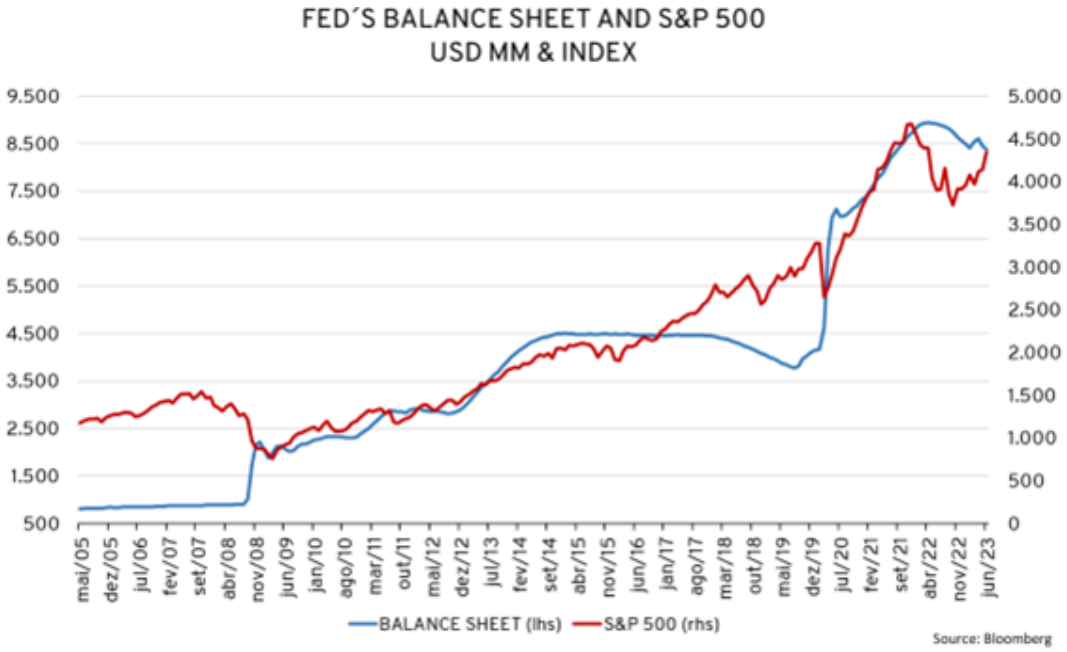
Secondly, household representative models typically assume rational behavior without considering the behavioral responses of individuals to policy changes. QE's influence on investor sentiment, risk perceptions, and spending decisions isn't fully captured in standard representative models, despite their significant implications for how QE affects consumption, savings, and investment. When the central bank purchases bonds from the market, it reduces the net supply of these bonds, driving up their prices and lowering yields. This decline in bond yields makes them less appealing to investors seeking higher coupons, prompting them to search for alternative assets and rebalance their portfolios. As a result, QE can bring spillover effects through household sentiment and impact firms' financial positions.

Lastly, the effects of QE on wealth and income distribution aren't fully accounted for by household representative models. QE's impact on asset prices can lead to varied outcomes for asset holders and non-holders. The effects on savers, retirees, borrowers, and different socioeconomic groups can be intricate, necessitating a more nuanced analysis of distributional consequences. This monetary policy tool can redistribute wealth to sectors with impaired balance sheets. During the Global Financial Crisis (GFC), implemented monetary policy shifted wealth towards

Mortgage-Backed Securities (MBS) holders, while during the COVID-19 pandemic, it increased wealth within corporate bondholders. Additionally, QE can inflate the prices of other financial assets, such as stocks. As asset prices rise, holders of these assets—typically wealthier individuals and institutional investors—experience increased wealth.

For instance, Figure 3 depicts a positive and robust correlation between the size of the Fed's balance sheet (liquidity) and the stock market's performance. Through its asset increase, the Fed may have contributed to shifting wealth towards stockholders. Thus, further research is necessary to comprehend the relationship between the quantity, type, and flow of securities purchased and the consequences of quantitative easing for households.

Figure 03



All in all, to comprehensively analyze QE's effects, it's important to use more sophisticated models that incorporate heterogeneity among households, capture the dynamics of financial markets, consider behavioral responses, account for credit market interactions, and address distributional and market imperfections. Integrating these factors provides a more accurate and nuanced understanding of how QE influences economic outcomes, financial markets, and different segments of the population.

2.2 CREDIT CHANNEL

The effects of unconventional monetary policy and the mechanisms of its transmission have become significant areas of interest, particularly in the aftermath of the Great Recession and in response to a series of robust liquidity measures implemented by the Federal Reserve. Additionally, the European Central Bank introduced its own 'expanded asset purchase program,' marking a significant shift in policy. It's worth noting that banks occupy a central position within the monetary system and the broader economy. Shocks to the banking sector can generate tangible repercussions, including decreased firm borrowing and employment levels.

Within this framework, Rodnyansky and Darmouni (2016) found that banks with relatively larger holdings of MBS expanded lending after the first and third rounds of quantitative easing (QE1 and QE3). Indeed, large-scale asset purchases by the Federal Reserve can have a broad stimulating effect, particularly in terms of encouraging lending through the enhancement of balance sheets at banks that hold the specific assets being targeted.

One key channel through which quantitative easing can bolster bank balance sheets is the 'net worth channel.' When the central bank's asset purchases exert substantial influence on the prices of the targeted securities, this policy action effectively raises the value of the securities held by banks. Consequently, it augments the mark-to-market valuation of the banks' equity. This increase in the value of bank assets, in conjunction with a potential boost in equity prices, fortifies the financial position of banks.

The bolstering of bank balance sheets through the net worth channel has several important implications. It improves lending capacity since banks with strengthened balance sheets are better positioned to absorb losses and are more willing to extend credit to households and businesses. This can lead to increased lending activity, which is vital for economic growth. Moreover, it can increase risk appetite. Banks with healthier balance sheets may be more inclined to take on additional risk, including making loans to riskier borrowers or investing in riskier assets, potentially supporting higher-yielding but riskier investments.

Another avenue through which QE can enhance bank balance sheets is by augmenting their liquidity, achieved by the direct acquisition of Mortgage-Backed Securities (MBS) from these banks, even in the absence of substantial price effects. In

this context, the liquidity channel operates by facilitating a reshuffling of assets on banks' balance sheets. When central banks purchase MBS directly from banks, it increases the liquidity of these assets. Enhanced liquidity means that these securities can be more easily converted into cash or reserves, and this can happen without causing a significant decline in their market value.

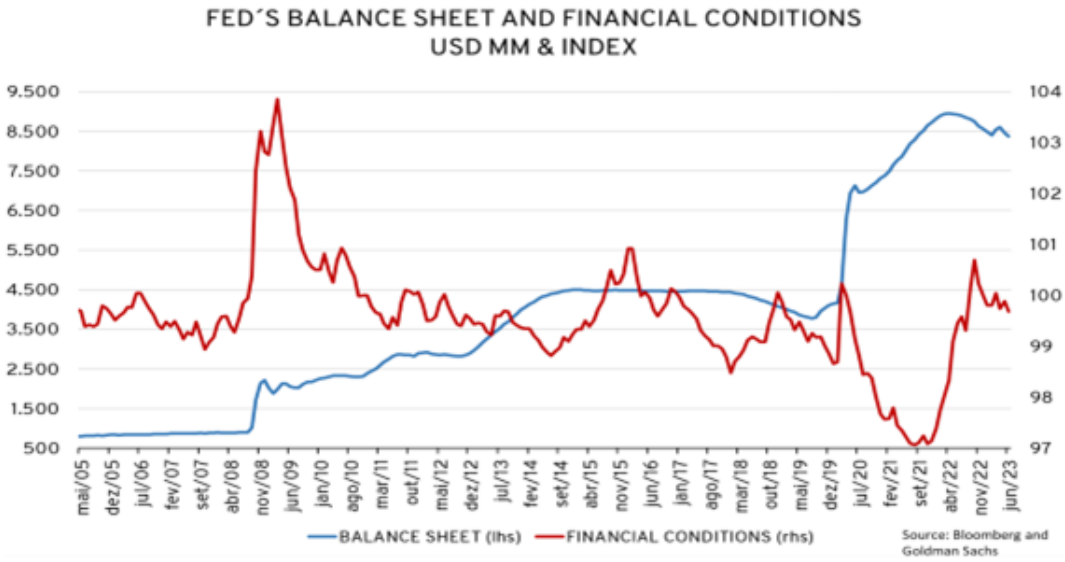
The critical step in this process is when banks decide to swap these more liquid MBS for reserves, which they hold at the central bank. This swap operation effectively boosts the quantity of reserves available to banks. With more reserves on hand, banks have the capacity to expand their lending activities without the need to significantly increase the total assets on their balance sheets. In simpler terms, they can issue more loans while maintaining a relatively stable asset base.

An interesting point regarding QE and bank lending is that this monetary policy tool is usually implemented alongside credit easing programs. These programs are designed to improve the flow of credit to specific sectors, such as small businesses or households. A Central Bank can target support, directly benefiting the sectors most in need, potentially spurring lending to these groups.

During the financial crisis, for instance, the Federal Reserve implemented the Term Asset-Backed Securities Loan Facility (TALF), which provided loans to investors to purchase specific asset-backed securities, such as auto loans, credit card loans, and small business loans. The aim was to support lending to consumers and businesses. Thus, TALF successfully revived the ABS market by restoring investor confidence, encouraging the issuance of new ABS, and reducing the cost of borrowing for consumers and businesses, particularly for auto loans and credit card debt. Consequently, credit flowed more freely in these sectors, contributing to economic recovery.

Furthermore, the ECB introduced Targeted Longer-Term Refinancing Operations (TLTROs) in response to the Eurozone debt crisis and the need to support economic recovery in the Eurozone. TLTROs aimed to encourage banks to lend to the real economy by allowing them to borrow from the ECB at favorable rates if they met specific lending benchmarks.

Figure 04



In summary, through various mechanisms, such as providing low-cost funding, incentivizing lending, and boosting market confidence, QE successfully facilitated access to credit for households, businesses, and other borrowers, ultimately contributing to economic recovery and stability. Therefore, it may have helped amend financial conditions, as we can see through figure 4.

2.3 SIGNALING CHANNEL

The financial landscape operates within a realm where perception and expectation significantly influence market dynamics and economic trajectories. In the sphere of monetary policy, this psychological underpinning is particularly evident through what economists and financial analysts term the 'signaling channel.'

Essentially, the signaling channel serves as the conduit through which central banks communicate their intentions, policies, and commitment to the market and the broader public. This communication is pivotal, shaping expectations, market behavior, and subsequently, economic outcomes.

At the core of the signaling channel's function lies effective communication by central banks. This communication could take the form of speeches, policy announcements, or official statements, often initiated during the launch or implementation of significant monetary policies such as quantitative easing (QE). The objective is to convey the central bank's objectives, strategies, and anticipated outcomes to market participants and the public.

Bauer and Rudebusch (2014) discovered that bond purchases made by the Federal Reserve had significant signaling effects that lowered expected future short-term interest rates, as evidenced by model-free analysis and dynamic term structure models. These approaches decompose declines in yields following Federal Reserve announcements into changes in risk premia and expected short rates. Their findings suggest that through announcing and implementing LSAPs, the FOMC signaled to market participants an intent to maintain an accommodative monetary policy stance for a longer duration than previously anticipated.

Given this framework, we can attempt to analyze changes in swaps yields to infer potential impacts originating from the signaling channel.

Figure 05

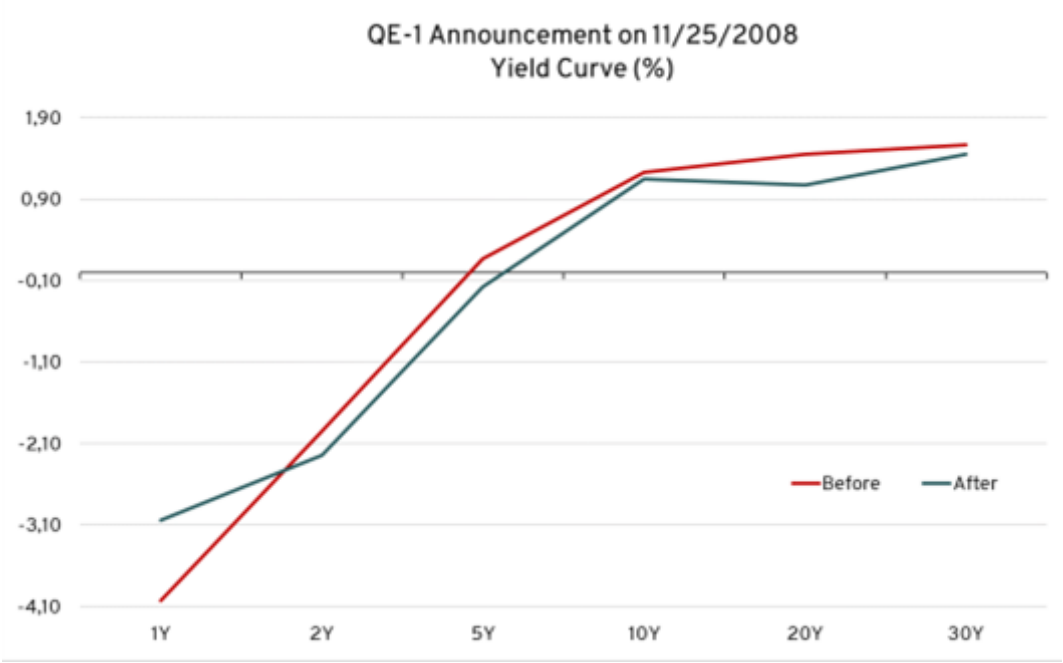
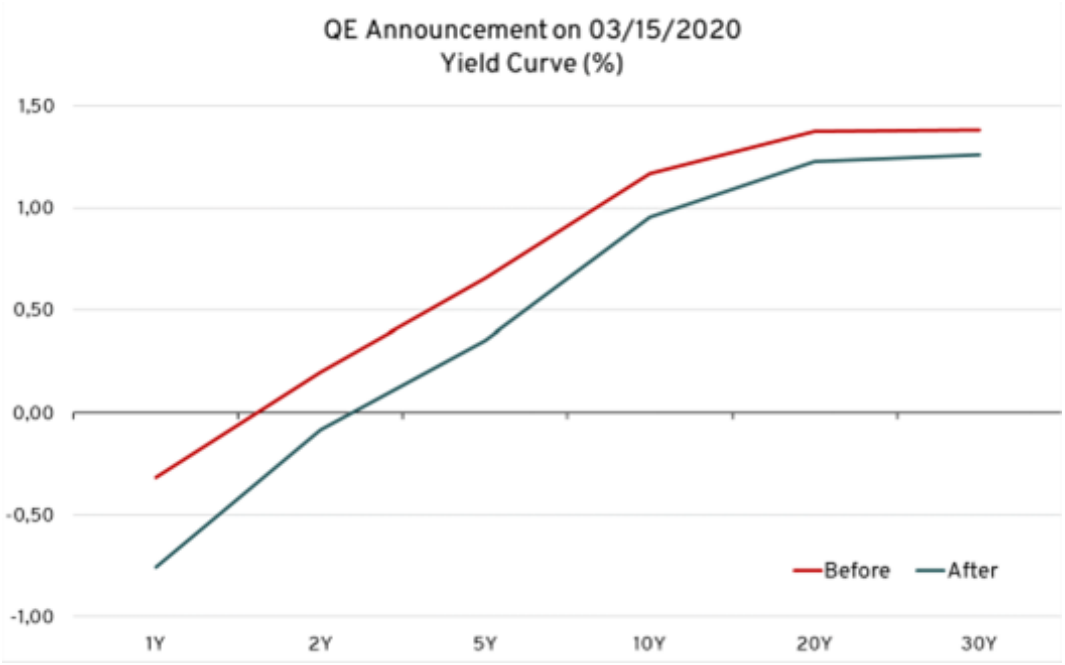


Figure 06



Notes: The figure shows policy paths before and after around key LSAP announcements that are implied by market rates of Swaps.

LSAP (Large-Scale Asset Purchase) announcements have potentially influenced the slope, levels, and curvature of the Yield Curve, driving down borrowing costs for individuals and businesses. This action aims to encourage borrowing, stimulate spending, and enhance refinancing conditions. However, further research is necessary to accurately isolate the impact of these announcements and correctly discern the implications of the signaling channel.

In essence, QE publications serve as a means of communication that provides vital insights to market participants regarding shifts in the central bank's perspectives on current or future economic conditions. Alternatively, these announcements might be perceived as conveying information about alterations in the monetary policy reaction function or policy objectives.

In response to such signals, investors are likely to adjust their expectations concerning the future trajectory of the policy rate. For instance, they might project an extended duration of near-zero short-term interest rates and might engage in additional risk-taking. This adjustment reflects the belief that the central bank's policies will persistently prioritize accommodative measures over an extended period.

3 MACROECONOMIC CONSEQUENCES

The primary goal of implementing quantitative easing is to influence crucial macroeconomic variables, such as Gross Domestic Product (GDP), the unemployment rate, and the inflation rate. Understanding the impact of QE on these measures is crucial for evaluating the effectiveness of such unconventional monetary policy.

Indeed, pinpointing and isolating the specific impacts of unconventional monetary policies amid the broader macroeconomic landscape pose a formidable challenge. One of the primary challenges arises from the fact that these policies unfold within a context teeming with various policy initiatives and simultaneous economic events.

Adding to the complexity is the continuously changing economic and market backdrop. Economic conditions fluctuate, and financial markets respond to an array of factors, including global economic trends, geopolitical shifts, and alterations in fiscal policies. This dynamic environment further complicates the task of isolating the effects of a specific policy amidst the myriad influences at play. Moreover, monetary policies do not operate in isolation; they interact with regulatory changes and other economic decisions, resulting in spillover effects that make it challenging to attribute outcomes solely to QE.

Dell'Ariccia et al. (2018) suggest that researchers often overcome the identification challenge by turning to high-frequency data and narrowing their focus to a short timeframe surrounding policy changes. This approach, known as the 'event study' methodology, involves analyzing the immediate reaction of financial variables—such as government and corporate yields, and stock prices—that are readily available at high frequency, often within minutes or hours of a policy announcement.

By concentrating on this critical period surrounding the policy change, researchers can capture swift market responses and better discern the effects of the policy in question. The high-frequency nature of the data allows for a detailed examination of how financial markets adjust and react in the immediate aftermath of a policy announcement. This focused analysis can provide valuable insights into the direct impact of the policy on various financial indicators.

Various research papers, as summarized in Table 1, have employed event studies to quantify the influence of quantitative easing on yields. This analytical method involves examining the reactions of bond yields immediately following Central Banks announcements regarding new asset purchases.

Table 01: Estimated effects of QE in yields and on term premiums

Study	*Asset*	*Event*	*Size ($BN)*	*Δ Yield*	*Yield / Size*	*Δ 10 Year Term Premium*	*Term Premium / Size*
Gagnon, Raskin, Remache and Sack (2011)	MBS	QE1	1.250	-91	-0,07	-38	-0,03
Krishnamurthy and Vissing-Jorgensen (2011)	Agency	QE1	175	-200	-1,14		
Hamilton & Wu (2011)	Treasury Securities	MEP	400			-27	-0,07
Ehlers (2012)	Treasury Securities	QE2	600	-40	-0,07		
D'Amico, English, López-Salido & Nelson (2012)	Treasury Securities	QE1	300			-35	-0,12
Ihrig, Klee, Li, Schulte & Wei	Treasury Securities	QE2	600			-40	-0,07
Joyce and Tong (2012)	Treasury Securities	QE1	300	-100	-0,33		
Christensen and Rudebusch (2012)	Treasury Securities	QE1	300	-47	-0,16		
Bridges and Thomas (2012)	Treasury Securities	QE1	300	-150	-0,5		
Bauer and Neely (2014)	Treasury Securities	QE1	300	-123	-0,41		

Notes: QE1 and QE2 are two consecutive rounds of quantitative easing. MEP is the Maturity Extension Program.
Changes are in Basis Points (BPS).
Fields in blank have not been calculeted by the authors.

Table 1 illustrates a consistent directional influence of QE on yields and risk premiums across diverse assets. It's essential to note that different researchers, employing distinct strategies at various times, arrived at the same conclusion: QE is capable of reducing yields and risk premiums on its targeted assets. This consistency in the effects of QE on yields and risk premiums signifies a recurring pattern observed across various assets. This aligns with the overarching goal of Quantitative Easing, which aims to decrease borrowing costs, stimulate investment, and encourage investors to consider riskier assets.

However, the magnitude of QE's influence varies among different assets and sometimes within the same asset class. Several factors contribute to this variability. Market dynamics, the specific characteristics of different assets, and the timing or scale of QE implementation all play pivotal roles in determining the extent of the impact. For instance, government bonds, corporate bonds, or mortgage-backed securities might exhibit varying responses to QE due to their unique market structures and inherent features.

Despite this variability, the recurring theme of QE's effectiveness in reducing yields and risk premiums underscores its role in shaping financial markets and influencing investment behavior, ultimately fostering economic activity.

Throughout this research, a recurring question surfaced: whether the impact on yields diminished across subsequent quantitative easing announcements. The literature lacks consensus on this topic. However, the decline in effects doesn't necessarily imply diminishing returns with larger volumes of quantitative easing. Instead, it could suggest that market participants began anticipating future rounds of QE based on the inflation and growth outlook. Consequently, these participants may have adjusted their expectations, already factoring in the potential for additional rounds of easing. Hence, it's possible that the anticipation of these policy measures influenced market behaviors, mitigating the immediate impact observed during earlier phases.

Looking ahead, other studies summarized in table 2 aimed to analyze the effects of QE on macroeconomic variables like inflation and GDP.

Table 02: Estimated effects of QE in GDP and Inflation

Study	*Country*	*Real GDP*	*Inflation*
Chen, Cúrdia, and Ferrero (2011)	US	+0,4%	+0,05%
Altavilla, Gianonne, and Lenz (2014)	EZ	+1,5%	+1,2%
Darracq-Paries and De Santis (2015)	EZ	+0,8%	+0,3%
Cova, Pagano, and Pisani (2015)	EZ	+1,4%	+0,8%
Bridges and Thomas (2012)	UK	+2%	+1%
Kapetenios, Mumtaz, Stevens, and Theodoridis (2012)	UK	+1,5%	+1,25%
Baumeister and Benati (2013)	UK	+3%	+2%
Churm, Joyce, Kapetenios, and Theodoridis (2015)	UK	+0,65%	+0,6%
Weale and Wieladek (2016)	UK	+0,25%	+0,32%
Hausman and Wieland (2014)	JP	+1%	-
De Michelis and Iacoviello (2016)	JP	-	+0,8%
Michaelis and Watzka	JP	Not Significant	+0,2%

The findings outlined in the table consistently demonstrate a positive impact on both inflation and GDP. It's intriguing to observe that despite utilizing different econometric models and diverse identification strategies, most of the studies revealed a positive effect on these crucial macroeconomic variables. The positive relationship between QE and inflation suggests that the implementation of these monetary stimulus measures has effectively countered deflationary pressures or low inflation, thereby aiding in stimulating the economy. Similarly, concerning GDP, QE has positively influenced growth across all the regions depicted in table 2.

The uniformity of these positive effects across various countries highlights the effectiveness of QE as a tool to stimulate economic growth and enhance inflation. However, it's crucial to acknowledge that the extent of this impact might differ among regions due to variations in their economic structures, policy implementation, and the overall economic climate. Consequently, these findings imply that during economic downturns, Central Banks can employ QE as a policy tool to bolster economic recovery and combat low inflationary pressures.

4 RISK BEHIND QE

4.1 CENTRAL BANK INDEPENDENCE

There exists a widespread consensus within the economic and policy community regarding the pivotal role of central bank independence in ensuring macroeconomic performance. Central bank independence implies granting the institution autonomy to make monetary policy decisions devoid of undue influence from the government or external parties. This autonomy enables central banks to base decisions on economic fundamentals rather than short-term political considerations. Additionally, it bolsters credibility, reinforcing public trust in the central bank's capacity to uphold price stability.

Numerous studies and empirical evidence consistently validate that an independent central bank can effectively steer monetary policies towards long-term economic stability and growth. It enables adept management of inflation and the stabilization of business cycles. Notably, Alesina and Summers (1993) conducted a prominent study highlighting the correlation between the level of independence and the variance of the inflation rate.

Figure 07: Reproduced from Alesina and Summers

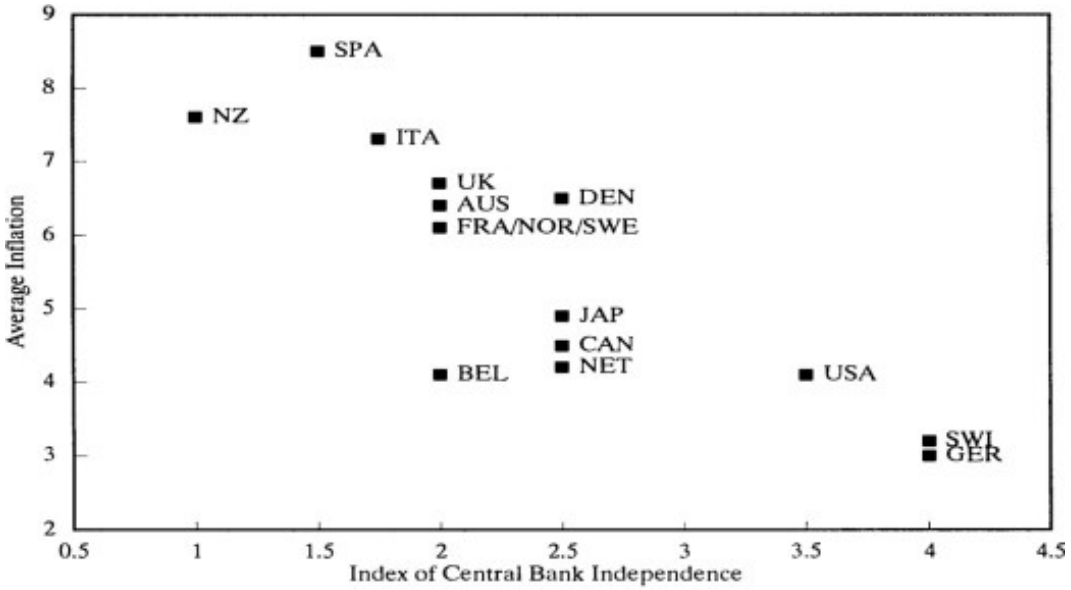


FIG. 1a. Average Inflation

When Central Banks engage in large-scale asset purchases, it becomes imperative to actively assess potential exposure to rising interest rates and establish risk-sharing arrangements with the Treasury. The anticipation of future rate hikes introduces a critical risk factor, necessitating a strategic evaluation of financial vulnerabilities. This scenario often leads to a complex interplay between the monetary authority and the Treasury.

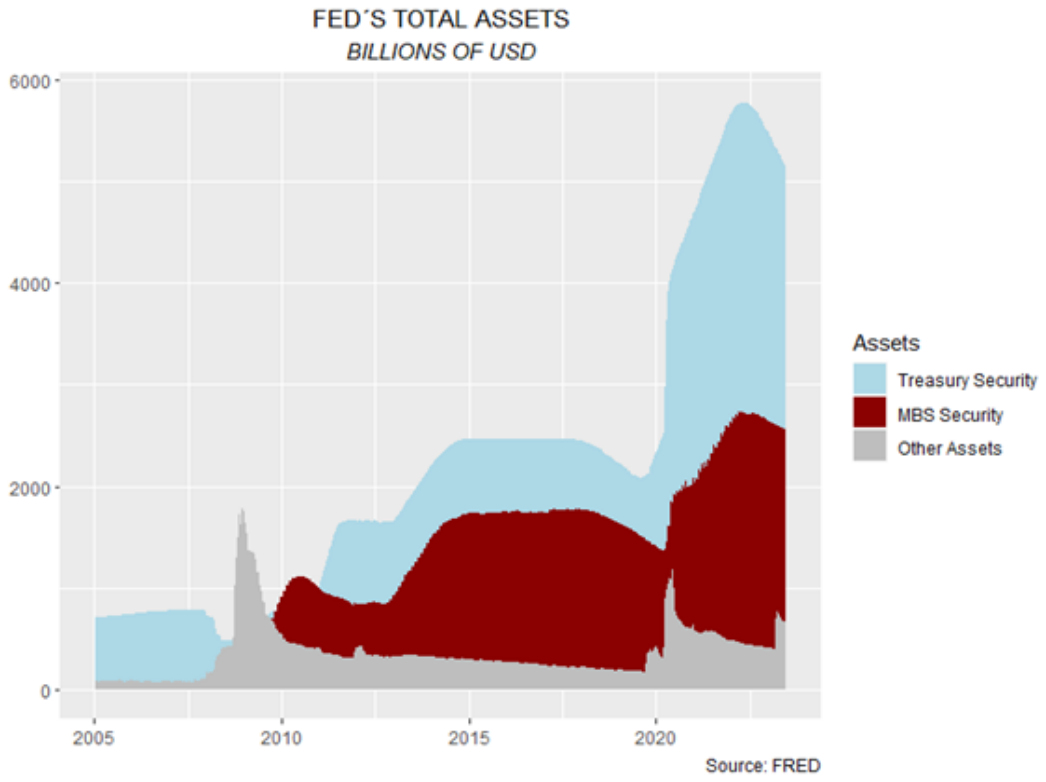
Heavy reliance by a Central Bank on the Treasury for recapitalization exposes it to potential political influence or policy mandates aligned with short-term government interests. This dependency could compromise the Central Bank's ability to exclusively pursue long-term economic stability, including controlling inflation and implementing prudent monetary measures. Succumbing to government pressures might erode the Central Bank's independence, leading to suboptimal policy decisions and adverse economic consequences.

This raises questions about the Central Bank's ability to independently absorb losses or if collaborative agreements with the Treasury for recapitalization would become necessary. To address these challenges, a prudent risk management approach and transparent communication between these entities are crucial. It's essential to strike a delicate balance between ensuring financial stability and upholding Central Bank independence. Risk-sharing arrangements and transparent communication are pivotal to mitigate such risks, ensuring that monetary policy decisions remain impartial and firmly rooted in economic principles.

4.2 DISTRIBUTIVE CONSEQUENCES

Studying QE brings another type of question. When buying assets, which are the best assets for the Central Bank to purchase? Should it consider the redistributive effects that QE can produce? Through figure 9 it´s possible to see that the FED has mainly bought treasuries and mortgage-backed securities after the global financial crisis.

Figure 08



From this viewpoint, an important consideration arises: Does Quantitative Easing (QE) have redistributive effects? In a lecture titled 'QE: What have we learned?' (2022, Princeton Bendheim Center for Finance), Brunnermeier highlighted that this monetary policy tool has the potential to redistribute wealth towards sectors with compromised balance sheets. Notably, during the Global Financial Crisis (GFC), the implemented monetary policy directed wealth towards Mortgage-Backed Securities (MBS) holders. Similarly, during the COVID-19 pandemic, the monetary policy contributed to an increase in wealth among corporate bondholders.

Moreover, QE can trigger an upsurge in the valuation of other financial assets like stocks. Consequently, holders of these assets, often wealthier individuals and institutional investors, experience a notable increase in their wealth. This trend potentially amplifies economic inequality as those with substantial asset holdings benefit the most from the resultant capital gains.

Lee's study (2021, FED New York) delved into identifying these effects. It observed that while the quantitative easing program notably stimulated economic activity, its impact was not uniformly distributed, revealing non-linear distributional effects.

On one hand, the QE initiative widened the income and consumption gap between the top 10 percent. However, there remains a lack of consensus concerning the precise distributive impact of quantitative easing. While some analyses suggest that QE contributed to diminishing overall wealth and income inequality, particularly by alleviating disparities within the lower percentiles of wealth distribution, others emphasize its exacerbating effect on the gap between the affluent and the rest of the population.

This divergence in findings underscores the necessity for further comprehensive research to bridge this gap in the literature. More nuanced studies should explore the distributional effects of QE across diverse economic strata and demographic segments. Such research could illuminate the varied mechanisms through which QE influences income, wealth, and consumption patterns, thereby empowering policymakers to design more targeted interventions.

4.3 INTERNATIONAL SPILLOVERS

While much of the discourse around the effects of quantitative easing (QE) has centered on its impact within the U.S. economy, policymakers in other nations have voiced concerns and critiques regarding the Federal Reserve's policies. They argue that these actions have led to a surplus of global liquidity. Brazil's former president, Dilma Rousseff, once characterized these expansionary policies as reckless, resulting in a monetary tsunami that led to an unwelcome currency appreciation, adversely affecting the country's industry. Therefore, it's imperative to comprehend the potential spillover effects QE may have on other economies.

Several studies have examined how the Federal Reserve's unconventional policies influenced emerging market economies. Fratzscher, Lo Duca, and Straub (2018) conducted research to gauge the impact of quantitative easing on capital flows. Their findings highlighted a varied response in capital movements following different QE phases. QE1, inclusive of announcements and operations, prompted a significant redirection of capital towards the United States, notably into U.S. equities. In contrast, QE2 and QE3 policies initiated a different trend, resulting in capital reallocation away from the United States.

These observations suggest that QE contributed to increased pro-cyclicality in flows outside the U.S., particularly directing investments into emerging market equities. Additionally, the study suggests that the variations in responses to different QE rounds were influenced by fluctuations in macro-financial uncertainty. During periods marked by low macroeconomic uncertainty and a positive economic outlook in the United States, QE announcements had a more pronounced impact on portfolio flows outside the U.S. This indicates that the influence of QE policies on international capital flows is contingent on broader economic and financial conditions, with periods of optimism and low uncertainty amplifying their effects.

Additionally, a compelling study conducted by Bowman, Londono, and Sapriza (2015) utilized an event-study methodology similar to the one examining bond yields. Their research shed light on the impact of quantitative easing (QE) on emerging market economies (EMEs). The findings indicated that the initial QE round, QE1, effectively reduced sovereign bond yields in EMEs, echoing its impact in the United States. However, subsequent large-scale asset purchase programs displayed a different pattern of effects. Regarding exchange rates, the study highlighted that the exchange rate index for emerging market economies did not exhibit any statistically

significant response to any of the large-scale asset purchase programs.

The concerns articulated by policymakers in emerging market economies about the pro-cyclical effects of quantitative easing policies indeed hold significance and warrant further scrutiny. While QE has tended to channel capital into EMEs during periods when capital is relatively abundant, it has also resulted in capital outflows from EMEs during times when capital is already scarce, exacerbating economic challenges in these regions. However, interpreting these events solely as EMEs being passive bystanders in this process might be hasty. Future research could delve deeper into whether EMEs possess the ability to insulate their countries from fluctuations in international capital flows and the impacts of international monetary policies.

This exploration would necessitate an assessment of the effectiveness of domestic policies and institutions in mitigating the effects of global financial dynamics. Such an analysis could offer invaluable insights into the resilience and adaptability of EMEs when facing external economic shocks. This understanding would assist policymakers and researchers in comprehending the interplay between international monetary policies and the domestic measures taken by EMEs to ensure their economic stability and growth prospects. Ultimately, it would contribute to a more comprehensive understanding of the challenges and opportunities faced by emerging markets within an interconnected global financial landscape.

5 EXITING QE

Exiting from a period of quantitative easing (QE) demands a meticulous and cautious approach from central banks to avert potential economic disruptions. As such, several crucial considerations and steps must be taken into account.

Primarily, effective communication is paramount. Central banks must adeptly convey their intention to gradually taper and eventually halt QE measures. A notable instance illustrating the impact of communication—or its absence—during the tapering phase was initiated by Ben Bernanke, the former chairman of the Federal Reserve. In May 2013, Bernanke hinted at the Federal Reserve scaling back its quantitative easing program, catching markets off guard. This revelation led to a swift and substantial market reaction. Bond yields surged, stock markets oscillated, and increased volatility permeated various asset classes.

The market's response to Bernanke's comments underscored the necessity for central banks to meticulously craft their messaging when planning to taper or exit unconventional monetary policies. It underscored that effective communication is not solely about the policy itself but also about the manner in which that policy shift is conveyed to the public and markets. Therefore, clarity in communication is instrumental in managing market expectations, diminishing uncertainty, and mitigating volatility in financial markets.

Following this event, central banks globally adopted a more cautious and deliberate approach in their communication strategies concerning policy changes, aiming to sidestep similar disruptions.

Additionally, the timing and pace of QE exit should align with the health and stability of the economy. If economic conditions unexpectedly deteriorate, maintaining flexibility in the exit strategy becomes paramount. This flexibility allows for potential adjustments or pauses in the tapering process to accommodate evolving economic circumstances.

When the Federal Reserve undertakes Quantitative Tightening (QT), essentially reducing its holdings of Treasury securities, it directly impacts the supply and demand dynamics within the Treasury market. Consequently, this influence can extend to yields on these securities. Typically, entities other than the Fed are more sensitive to the yields on these treasuries. Therefore, they might demand a higher

risk premium to continue purchasing these assets. If, for instance, mutual funds, money market funds, or foreign investors do not increase their purchases, the surplus of securities can drive prices down and yields up, resulting in a more pronounced tightening. This concept is illustrated in a study conducted by JPMorgan Chase Co.

Table 03

NET PURCHASES OF TREASURIES

Purchases are tilting to price-sensitive buyers

Buyer	2022	2023 Estimates
Federal Reserve	$-213B	$-720B
Foreign Investors	376	275
Commercial Banks	-83	-170
Pension Funds	-41	150
Broker Dealers	72	0
Mutual Funds	20	275
Money Market Funds	-751	600

Source: JP Morgan

Moreover, research carried out by the Federal Reserve Bank of St. Louis (2014) shed light on three pivotal facets of the Federal Reserve's exit strategy crucial for maximizing gains in aggregate output and employment during QE. These critical aspects involve the timing of the exit from QE, the pace at which the exit is executed, and the significance of the private sector's expectations regarding the Fed's methods and timeline for exiting QE.

The study suggests that when initiating the exit strategy, expediting the process rather than adopting a gradual approach tends to yield more favorable outcomes. Therefore, it becomes imperative for the Fed to refrain from prematurely pre-announcing or discussing the timing of the exit from QE shortly after its implementation. Such premature announcements could inadvertently curtail the anticipated effective duration of QE in the eyes of the public. By avoiding premature declarations, the central bank can preserve the intended impact and duration of QE, preventing premature adjustments in market behaviors and expectations that might diminish its effectiveness.

In conclusion, the approach to exiting quantitative easing policies remains a notable gap in economic literature and central bank strategies. While substantial attention has been dedicated to implementing and understanding the effects of QE, a distinct lack of consensus or well-defined frameworks exists regarding the optimal exit strategy. This absence of a clear roadmap or unified guidance on the most effective means of unwinding QE initiatives poses a significant challenge for policy-makers.

Critical questions surrounding the timing, pace, sequencing of the exit, and the associated communication strategies lack definitive answers, leaving a notable gap in understanding the most prudent and effective methods to conclude QE measures without unsettling financial markets or compromising economic stability. Addressing this gap in knowledge is crucial for central banks navigating the intricate process of withdrawing from QE policies while mitigating potential disruptions and ensuring a smooth transition in monetary policy.

6 CONCLUSION

While no single study on the effects of unconventional monetary policy stands as definitive, examining the collective body of evidence reveals a prevailing trend: Quantitative Easing initiatives have proven effective in driving down long-term interest rates. Various studies utilizing micro-level data substantiate tangible impacts of QE on firms and financial intermediaries. Additionally, macroeconomic models reinforce the notion that reductions in interest rates likely had meaningful effects on the broader economy.

Despite concerns about potential adverse side effects, empirical observations suggest these repercussions have been relatively mild compared to the costs associated with a more prolonged recession — an outcome that might have unfolded in the absence of these unconventional policies. Overall, the prevailing consensus leans towards the benefits of unconventional policies outweighing their associated costs. The documented positive outcomes, from interest rate reductions to tangible impacts on economic actors, coupled with the probable prevention of a prolonged recession, collectively suggest that these unconventional policies have been, on balance, advantageous for the economy.

Regarding transmission channels, current literature suggests that Quantitative Easing primarily operates by mitigating duration risk within the market. One approach involves reallocating assets within a central bank's fixed-size portfolio, strategically adjusting the composition to influence interest rates and market dynamics. Another method involves expanding the balance sheet by introducing additional assets into the portfolio. Both serve as mechanisms for the central bank to steer market behavior towards desired policy outcomes by effectively managing duration risk. Moreover, the selection of assets for central bank purchase depends on specific circumstances and needs. For instance, during QE1, the decision to purchase mortgage-backed securities was strategic, aimed at enhancing the functionality of that particular market and addressing vulnerabilities during that period.

Secondly, regarding macroeconomic consequences, a prevailing consensus emerges across numerous studies and analyses. A convergence of findings highlights the beneficial impact of QE in stimulating GDP growth and influencing inflationary pressures. QE measures, particularly through their influence on interest rates and financial conditions, have demonstrated an ability to bolster economic activity, re-

sulting in improvements in GDP indicators. Furthermore, the infusion of liquidity into financial markets via QE initiatives has commonly been associated with upward pressure on inflation, contributing to central banks' efforts to achieve target inflation rates. This alignment of evidence pointing towards QE's positive effects on both GDP and inflation underscores its vital role as a policy tool.

Third, when a central bank engages in substantial asset purchases, it assumes considerable exposure if interest rates increase. This exposure can also be interpreted positively. The potential risk associated with interest rate fluctuations could compel the central bank, such as the Fed, to commit to a more extensive or prolonged phase of monetary expansion. However, it may jeopardize Central Bank independence since the monetary authority may suffer losses, being forced to make arrangements with the Treasury.

Lastly, a notable gap exists in our understanding of how to navigate the exit strategy from quantitative easing policies. Policymakers are still surrounded by uncertainties around determining the appropriate timing, pace, sequencing, and communication strategies for the exit. Addressing and resolving this gap is crucial for central banks, especially in an environment where interest rates are kept higher for longer periods.

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