

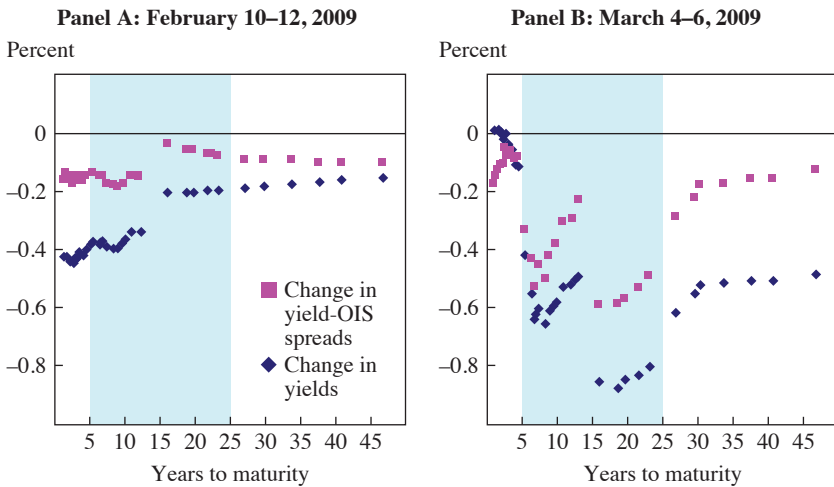
## *Lessons for Policy from Research*

**ABSTRACT** I review lessons from the research on central bank actions over the last decade and draw out implications for expanding the Federal Reserve balance sheet (quantitative easing) and shrinking the balance sheet (quantitative tightening). As I outline, there is already enough evidence in the research to indicate the manner in which the Federal Reserve could update its policy normalization principles and plans.

**F**ormer Federal Reserve chairman Ben Bernanke famously quipped, in a 2014 discussion at the Brookings Institution, that “the problem with QE is that it works in practice, but it doesn’t work in theory.” Academic and policy research on quantitative easing (QE) has come quite far over the last decade, and we are less in the dark about the workings of QE. In this paper, I review the lessons from this research and then draw out implications for expanding the Federal Reserve balance sheet (QE) and shrinking the balance sheet (quantitative tightening, or QT).

There are three principal lessons from the research: (1) QE works differently than conventional monetary policy in that the impacts are highest in the asset market targeted. (2) QE impacts are highest during periods of financial distress, market segmentation, and illiquidity. While this statement is likely also true of conventional policy, the effects are much more dramatic with QE. (3) QE alters the quantity of central bank reserves, and the post-2008 regulatory and economic regime implies substantially higher necessary reserve balances. I review each of these points and then turn to their implications for the formulation of rules governing QE/QT. The Fed

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**Figure 1.** Yield Changes by Maturity from UK QE for UK Gilts and Gilt-OIS Spreads

Source: Joyce and others (2011); copyright Bank of England and the Association of the International Journal of Central Banking; adapted with permission.

currently uses QE in two ways: to provide liquidity to markets during financial illiquidity episodes (“crisis QE”) and to lower financing costs for borrowers at a time when the zero lower bound binds (“easing QE”). I argue that rules for these two types of policies should differ, but that the Fed has blurred the lines between them which has led to policy errors.

## I. Lessons from Research

### I.A. QE Works through Narrow Channels

Joyce and others (2011) present data from an event study around two significant QE news dates in 2009 by the Bank of England. On February 11, 2009, the *Inflation Report* and the subsequent press conference gave a strong indication that the bank would do QE. Markets interpreted this to mean that the bank would purchase bonds out to around fifteen-year maturity. On March 5, 2009, the bank announced that purchases would be in the five- to twenty-five-year range. Figure 1, replicating figure 4 in Joyce and others (2011), shows the changes in gilt yields around the event dates and the changes in the spread between gilt and overnight index swap (OIS) yields around these dates. Panel A shows the market reaction to the

February announcements: yields fall across the board. The pattern is similar to a conventional policy response in that there are larger effects on short-term bonds than longer-term bonds. In the curve showing the yield-OIS spread change, we see unique QE effects. If the policy transmission is akin to conventional monetary policy, there should be no change in these spreads as we would expect that both gilt yields and OIS yields will move in lockstep so that their spread would not change. Panel B shows the market reaction to the March announcement, and here we can really see the unique QE effects. First note that the effect on gilt yields is concentrated in the five- to twenty-five-year range, which the bank indicated as the target of QE purchases, with yields in the fifteen- to twenty-five-year range falling dramatically on the news that these maturities would also be purchased. Second, note that the yield-OIS spread change reflects the same pattern and similar magnitude, indicating that it is particularly gilt yields that are being affected by the announcement.

Following earlier work with Annette Vissing-Jorgensen (Krishnamurthy and Vissing-Jorgensen 2013), I refer to these effects as via a “narrow” channel rather than the “broad” channel of conventional monetary policy. That is, QE policy most affects the prices of the asset targeted in QE (gilts in this case). In contrast, conventional policy moves all asset prices from gilts to OIS rates and even stock prices. We offer much more evidence of these types of effects in examining the response of asset prices to news regarding the Fed’s QE purchases of mortgage-backed securities (MBS). They show narrow effects: the prices of the current coupon MBS, which is the asset purchased by the Fed, move the most relative to other coupon MBS, older MBS, and non-MBS assets (Krishnamurthy and Vissing-Jorgensen 2013).

There is more narrow channel evidence on the impact of QE. Eser and Schwaab (2016) show that the security markets program of the European Central Bank (ECB) lowered the targeted countries’ sovereign bond yields, particularly relative to non-targeted bonds. Grosse-Rueschkamp, Steffen, and Streitz (2019) and Todorov (2020) show that the ECB corporate sector purchase program lowered the bond yields of the eligible corporate bonds, particularly compared to non-eligible bonds’ yields. Moussawi (2022) shows a similar effect for the Fed’s municipal bond liquidity facility introduced during the COVID-19 crisis in 2020. Barbon and Gianinazzi (2019) likewise show that the Bank of Japan’s exchange-traded funds (ETF) purchase program affected eligible stock prices significantly relative to non-eligible ones.

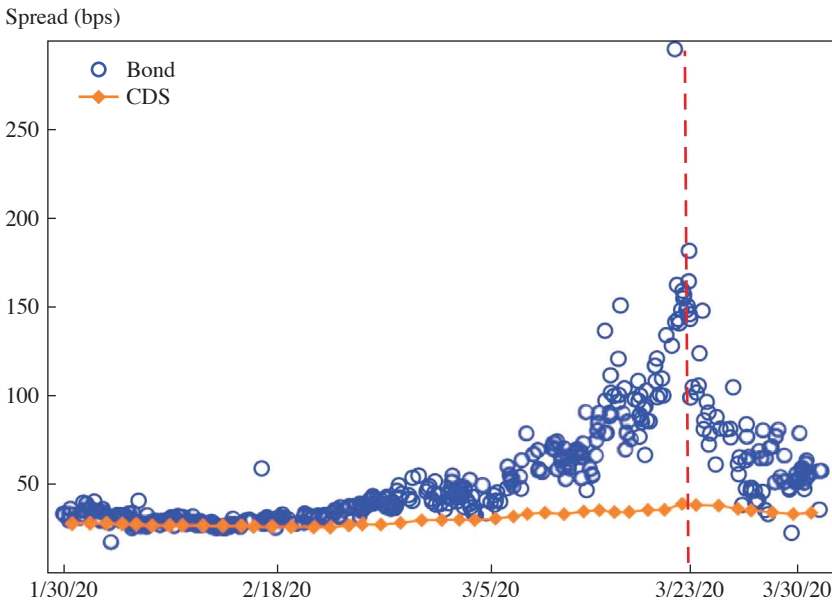
The evidence I have cited concerns the impact of QE on asset prices. Of course it is more important to understand the effect of these asset price changes on decisions of economic agents. Here again, the evidence is most consistent with a narrow channel. Rodnyansky and Darmouni (2017) examine changes in bank lending, contrasting behavior across Fed purchases of MBS and purchases of Treasuries. They show that banks with significant holdings of MBS expand real estate lending after the MBS purchases, but not the Treasury purchases. This evidence is most consistent with a narrow channel impact of QE. Di Maggio, Kermani, and Palmer (2020) show that the Fed's MBS purchases particularly spur conforming, as opposed to jumbo, mortgage originations. This is narrow channel evidence because the Fed purchased conforming mortgages. There is analogous evidence from the behavior of firms in response to ECB corporate bond purchases. Grosse-Rueschkamp, Steffen, and Streititz (2019) show that the eligible firms in the ECB purchase program respond by issuing more bonds and borrowing less from banks, compared to non-eligible firms.

### ***1.B. QE Impacts Are Highest during Periods of Financial Distress***

Figure 2 plots the yield spread on Google's investment-grade six-year bond and the five-year credit default swap (CDS) for Google. The figure replicates figure 1 of Haddad, Moreira, and Muir (2021). We see the dramatic rise in the bond yield, reflecting the financial market dislocation at the start of the COVID-19 recession. The CDS rate does not change, reflecting that there is little change in the fundamental default risk of Google. The Fed announced the introduction of its corporate bond facilities on March 23, 2020, which allowed for purchases of investment-grade bonds. The yield spread declined dramatically with this announcement. It should be apparent that a similar announcement of a corporate bond facility say on February 1, 2020, would have had a very small effect on spreads. That is, the evidence here shows that QE impacts are highest during periods of financial distress. There is similar evidence by Gilchrist and others (2021) studying the Fed's corporate bond facility. Gorodnichenko and Ray (2017) provide related evidence for a longer sample showing that demand shocks in the market for US Treasury bonds have a much larger impact during periods of financial turmoil than during calm periods.

### ***1.C. The Federal Reserve Balance Sheet Needs to Be Larger in 2022 than in 2008***

Another important finding from research is that the minimum level of reserve balances needed to ensure a smooth functioning of the interbank

**Figure 2.** Google Bond Yield Spread and CDS

Source: Haddad, Moreira, and Muir (2021); adapted with permission from Oxford University Press and the Society for Financial Studies.

Note: Vertical dashed line indicates Federal Reserve corporate bond purchase program, announced March 23, 2020.

market is in excess of \$1.5 trillion, and considerably larger than the pre-crisis reserve balance of around \$60 billion. This is the finding of Copeland, Duffie, and Yang (2021), who examine the repo market dislocation in September 2019, concluding that the level of reserves at the time of \$1.4 trillion was too small given the regulatory and economic regime after the 2008 crisis. Afonso and others (2022), as well as Lopez-Salido and Vissing-Jorgensen (2022), estimate the banking sector's reserve demand function over the 2010s. Afonso and others (2022) show that reserve demand flattens at quantities of reserves of around 13 percent of bank assets, or in excess of \$2 trillion currently. Lopez-Salido and Vissing-Jorgensen (2022) predict that reserve demand flattens at quantities around \$3.5 trillion. While these numbers differ across research papers, they all indicate a substantially higher minimum reserve balance, running into the trillions of dollars, and hence a larger Fed balance sheet than the pre-2008 balance sheet, when reserves were on the order of tens of billions of dollars.

## II. Lessons for Policy

Conceptually, there are two different types of QE the Fed has pursued. It has done crisis QE to alleviate systemic risk in an illiquidity episode, such as the COVID-19 corporate bond actions, and easing QE to reduce long-term rates, as the Fed did with its MBS purchases in 2010 to 2013 and again in 2020 to 2022. The research indicates that these two types of QE work differently—that the impacts of crisis QE are much larger than easing QE (point 2 above) and that easing QE has its largest impact on the asset market targeted (point 1 above).

The two types of QE suggest that the Fed should have two different rules governing QE/QT, but in practice, the Fed has followed a single rule. As I argue next, this has led to policy errors. Of most significance to the current 2022 tightening cycle, the Fed may have needlessly contributed to a housing market bubble that will now need to be popped.

### II.A. Channel Fallacy

During the COVID-19 illiquidity period of March and April 2020 and during the recovery from the COVID-19 recession, the Fed purchased MBS. As noted in points (1) and (2) above, these purchases have their largest impacts during an illiquidity period and in the asset market targeted. That is, QE works through a narrow channel. The narrow effects meant that the MBS purchases (crisis QE) in the spring of 2020 were beneficial given the systemic liquidity stresses in the fixed-income market (Chen and others 2021). However, the Fed continued the MBS purchase program well after the period of liquidity stress ended, through 2020, and only ceased purchases and reinvestments in September 2022. This is a policy error that stems from not recognizing that MBS purchases work through a narrow channel and not the broad channel of conventional policy.

The MBS purchases outside an illiquidity episode are easing QE. These purchases brought down mortgage rates and had beneficial impacts in the recovery from the 2008 financial crisis because housing and mortgages were central to macro dynamics during that recovery. In 2021 and 2022, the MBS purchases to reduce mortgage rates can only be rationalized if the support to the housing market would have had beneficial spillovers to the rest of the economy. But there has been no evidence for that. Instead, the Fed's purchases may have needlessly contributed to a housing market bubble. As policy has shifted to a tightening mode, this housing boom now looms as a risk to financial stability.

### *II.B. The Ratchet Problem*

The Fed's policy rule governing QE/QT is best described by what I call a "tying together" rule. The Fed expands the balance sheet in crisis states. But then it ties balance reductions to changes in the stance of conventional policy. In the Fed's 2014 statement on policy normalization, it outlined a plan to gradually raise its target range for the federal funds rate to more normal levels and gradually reduce the Fed's securities holdings to normal levels.<sup>1</sup> While these plans have been updated several times since 2014, the underlying approach to tie together balance sheet policy during QT with policy rate increases has remained.

Let us next consider what a QE/QT policy rule would look like in light of the research I have reviewed. If we index financial stress by  $x$ , then, the Fed should expand the balance sheet in states worse than  $x$  and shrink the balance sheet in states better than  $x$ . Here,  $x$  is determined by the cost of balance sheet size and the macro benefit of policy. Point (3) above—that the economy requires much higher reserve balances than was the case before the global financial crisis of 2008—is relevant to the cost of balance sheet size and the determination of  $x$ . Moreover, in states better than  $x$ , the Fed should shift from crisis QE to a smaller balance sheet size governed by the benefit of easing QE. The balance sheet should be smaller because the benefit of QE is smaller in normal states compared to crisis states.

In contrast to this policy rule, the Fed's tying-together policy has led it to delay balance reduction. The Fed has created a balance sheet ratchet, which the banking sector then adapts to, making it costlier to subsequently reduce the balance sheet, as argued by Acharya and Rajan (2022).

### *II.C. Communication*

The tying-together rule also creates communications challenges for the Fed. A QT which is about a winding down of crisis QE and a QT which is about a winding down of easing QE send very different signals to economic agents. Suppose that investors see a QT which the Fed intends as the end of crisis QE but which investors misinterpret to be the end of easing QE. In this case, investors will then expect that the QT will be followed by increases in the policy rate, and this expectation will lead to an unintended

1. Board of Governors of the Federal Reserve System, "Policy Normalization," <https://www.federalreserve.gov/monetarypolicy/policy-normalization-discussions-communications-history.htm>.

tightening of monetary conditions for conventional reasons. If, on the other hand, the Fed was able to communicate its intent clearly, then this effect would not arise, and indeed agents may see the end of crisis QE as good news regarding the health of the financial system.

The best example of this communication breakdown is the taper tantrum of 2013. In Krishnamurthy and Vissing-Jorgensen (2013), a paper prepared for the Jackson Hole Symposium, we argued that the taper tantrum occurred because the Fed communicated that it would undertake QT, which then led the market to conclude that the Fed would also raise the policy rate. In short, the market anticipated that if QE was no longer required, then the zero lower bound would no longer be a constraint on policy.

### **III. Conclusion**

Research over the last decade has shed considerable light on the ways in which QE works. I have outlined how this research can inform the rules governing QE/QT. While more research is needed on the workings of QE, there is already enough evidence in the research to indicate the manner in which the Fed could update its policy normalization principles and plans. Not doing so will likely lead to more errors of the kind that I have described.

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