

# How do the Federal Reserve's new tools really work?

By Ramin Toloui

## KEY TAKEAWAYS

- In response to the 2008 crisis, the Fed introduced unconventional policies to stimulate the economy.
- Those policies reshaped how investors expected the Fed to respond to future inflation and GDP growth.
- Such shifts in market beliefs were associated with larger and more persistent changes in Treasury yields, corporate borrowing costs, and equities than found in previous studies.
- While potent, monetary tools need fiscal support to achieve economic goals, especially when long-term interest rates are low.

For the Federal Reserve — the nation's central bank responsible for maintaining the stability of the economy — the global financial crisis of 2008 represented an emergency of the highest order. The United States experienced the largest plunge in economic output in decades. More than 8.7 million jobs disappeared, millions lost their homes, and the financial system appeared on the brink of collapse.

Determined to avoid another Great Depression, the Fed introduced a series of unconventional policies to combat the crisis. The policies included large-scale, outright purchases of longer-term U.S. Treasury and mortgage-backed securities that collectively became known as “quantitative easing” (QE).

The objective of QE was to generate more far-reaching reductions in the cost of borrowing for consumers and businesses than the traditional monetary policy of lowering short-term interest rates. Successive waves of QE were implemented between 2008 and 2014.

Did QE work? More than 10 years after the crisis, economists continue to debate this question as well as the mechanisms by which unconventional policies affected financial markets and the broader economy. Ben Bernanke — who led the Fed through the crisis — recently lauded the new tools in a major address at the American Economic Association (Bernanke 2020), while skeptics like former Treasury Secretary Lawrence Summers have questioned their effectiveness.

The stakes are not merely academic: With policy rates close to zero around the world, it is likely that central banks will again turn to asset purchases as a way to combat a future economic slowdown. Coronavirus fears and recent volatility in financial markets have brought renewed attention to the efficacy of central bank policies.

My research, outlined in this policy brief, concludes that the effect of unconventional policies on financial markets was larger and more pervasive than previously identified (Toloui 2019). My analysis finds evidence that the policies fundamentally reshaped investor expectations about how the Fed would react to future economic data. These shifts in market expectations were in turn associated with large and persistent changes in U.S. Treasury yields, corporate borrowing costs, and equity valuations that provided support to the economy.

While monetary tools were powerful, the post-crisis period also shows that fiscal policy should be used to provide more aggressive and sustained support for economic recovery. This is especially true in the current environment where long-term interest rates are already extremely low, giving less room for even unconventional monetary policies to operate.

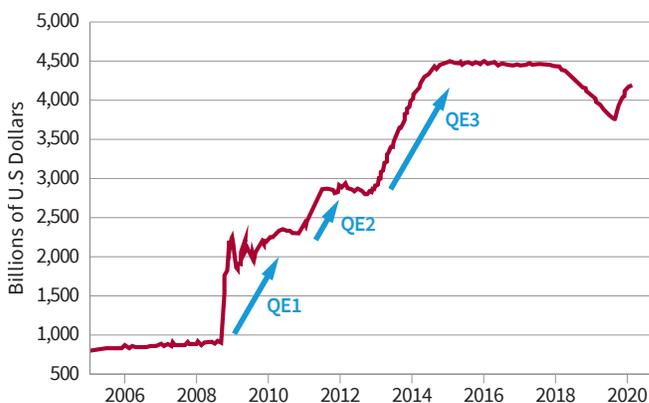
### What is quantitative easing?

With the interest rate near zero by the end of 2008, Fed policymakers feared the central bank's standard tool of lowering short-term rates to encourage borrowing and spending would not be enough to pull the economy out of the spiraling crisis. More needed to be done to halt the economic slide and support a fragile recovery.

In response, the Fed executed three rounds of large-scale purchases of longer-term U.S. Treasury and mortgage-backed securities between 2008 and 2014. These three waves — which became known as QE1, QE2, and QE3 — pushed up the Fed's asset holdings from around \$900 billion to approximately \$4.5 trillion (Figure 1), injecting massive amounts of cash into the financial system in the process. The Fed also shifted the composition of some of its holdings by selling shorter-term Treasury securities and buying longer-term Treasury securities in a program known as Operation Twist.

At the same time, the Federal Reserve also took unprecedented steps to communicate the path that Fed policymakers expected interest rates to take in the

Figure 1. Assets of the Federal Reserve



Source: Federal Reserve

future. This “forward guidance” was intended to reassure the public and financial markets that monetary stimulus would stay in place as long as needed.

The prevailing theory behind QE was that the Fed's large-scale purchases would drive up the prices of the securities it was buying, specifically long-term Treasury and mortgage-backed bonds. Because bond prices move in the opposite direction of bond yields, Fed policies would thereby push down key longer-term yields in the financial system on which many other lending rates are based.

In addition, some economists argued, the large injection of cash in the financial system produced by the Fed purchases would percolate into other assets like corporate bonds and other instruments, making it easier for companies and households to borrow money more cheaply. This effect was known as the “portfolio rebalancing” channel of quantitative easing.

The bulk of economic research has indeed found that quantitative easing does appear to have reduced long-term bond yields. A review of such studies found that the Fed's asset purchases reduced the 10-year Treasury yield by an average of roughly 1 percentage point (Borio and Zabai 2016). Most of this effect was attributed to the first round of quantitative easing (QE1), while many researchers found a diminished effectiveness for later rounds (QE2 and QE3).

## What will the Fed do next? That's the trillion-dollar question!

My research suggests that this conventional wisdom substantially *underestimates* the effect of quantitative easing and other Fed policy innovations. To see how, we need to examine the role that these policies played in changing investor expectations about future monetary policy.

The job of the Federal Reserve is to stabilize the path of unemployment and inflation. When the economy sags (high unemployment, falling inflation), the Fed cuts interest rates to encourage households and business to spend more and thereby get people back to work. When the economy heats up (low unemployment, rising inflation), the Fed's job is to tighten monetary conditions to prevent inflation from getting out of control. The Fed's role in this regard has been alternatively described as "leaning against the wind" or "taking the punchbowl away just as the party is getting going."

Economists encode these principles in a quantitative formula called the Taylor Rule. Originally proposed by Stanford economist and SIEPR Senior Fellow John Taylor, the rule calibrates how a central bank changes interest rates in response to two factors: the inflation rate, and how far the economy is from its full-employment potential.

The specific numbers in the Taylor Rule reflect just how aggressively the central bank sets interest rates in response to different combinations of inflation and economic growth. Depending on the specific values of those parameters, a central bank might be categorized as more "dovish" (reacting less forcefully to inflation, thus willing to accept higher inflation in return for faster growth) or more "hawkish" (more aggressive in confronting inflation even if it means slower growth).

Economists have long used the Taylor Rule to characterize how central banks behave as well as prescribe how they should behave. Until now, however, economists have never before used the Taylor Rule to measure something equally consequential: How do markets believe central banks will behave in the future?

How people perceive the Fed's orientation can have profound effects on economic behavior. For example, if people believe that the central bank will do "whatever it takes" to jump-start economic growth, businesses and consumers may become more willing to invest and spend, thereby increasing the chances of economic recovery.

Beliefs about what the Federal Reserve will do in the future also have far-reaching consequences for decisions made in financial markets. If investors believe that the Fed will pursue a more dovish policy — one that keeps interest rates low even if inflation accelerates — that is likely to make riskier assets that benefit from faster economic growth more attractive. And when investors are more willing to buy corporate bonds, for example, that makes it easier for companies to borrow money and fund physical investments that boost economic activity.

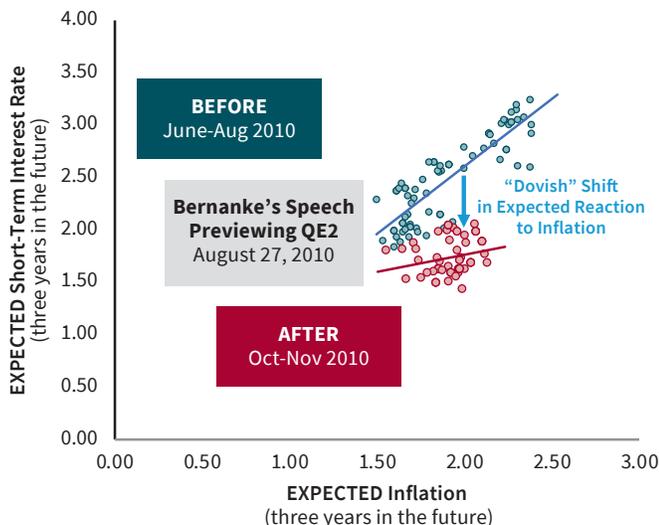
## Money talks: How quantitative easing reshaped market expectations

By combining the Taylor Rule framework with financial market data reflecting investor expectations, we can distill a rigorous measure of what the market implicitly believes the "future policy reaction function" of the Federal Reserve will be.

Figure 2 shows an example from 2010. The dots map out the relationship that the market expected between future inflation (on the horizontal axis) and future short-term interest rates (on the vertical axis) for a series of days during the summer (blue dots) and autumn (red dots) of 2010.

Each group of dots exhibits a distinctive pattern: Lower inflation corresponds to lower interest rates, exactly as predicted by the Taylor Rule.

But notice the apparent break between each group of points. The red points seem to have suddenly shifted lower than the blue points. For instance, where the market had previously expected 2 percent future inflation to correspond to a 2.5 percent short-term interest rate, by the autumn the market expected that

**Figure 2.** Impact of QE2 Preview on the Expected Policy Reaction Function

Source: Bloomberg

same 2 percent future inflation to correspond to a short-term interest rate closer to 1.75 percent.

The market seems to have shifted its expectation of future Fed behavior to be more dovish — with a lower interest rate for any given rate of inflation.

This is no accident. At the end of August 2010, Bernanke gave a prominent speech as the Fed’s chair indicating that the central bank was prepared to undertake a second round of asset purchases that would become QE2. Although this speech did not make any new commitments about the Fed’s interest rate policy, it coincided with a distinctive shift in market expectations about how the Fed would conduct its monetary policy in the future.

It turns out that this pattern occurred systematically as the Fed announced and withdrew its unconventional policies between 2010 and 2018. Policy announcements indicating new asset purchases were accompanied by dovish shifts in the market’s expectation of the future Fed policy reaction function. In contrast, announcements indicating that those policies would be withdrawn were associated with hawkish shifts in market expectations for the reaction function.

## Quantifying the impact of unconventional policies

The impact of Fed unconventional policy announcements on expectations for monetary policy is illustrated in Figure 3. It shows the cumulative shifts in the market-expected Taylor Rule, calculated using financial data on expected future interest rates, future expected inflation, and measures of corporate credit risk that are correlated with the economy’s expected distance from full-employment potential. Specialized statistical techniques (Bai and Perron 2003) used to identify the timing of “structural breaks” in the Taylor Rule parameters find the dates of those shifts regularly occurred in proximity to changes in Fed unconventional policy.

The analysis estimates the combined impact of QE2, forward guidance, Operation Twist, and QE3 induced investors to expect short-term rates that were up to 2.25 percentage points lower than what they previously thought would prevail at identical levels of inflation and economic growth.

But that is not where the impact of unconventional policies ended. Changed expectations of the Fed’s future policy reaction function in turn imply that these later rounds of unconventional policies pushed down yields on 10-year Treasury bonds by as much as 1.5 percentage points, substantially more than previous studies have found.

The data also suggest that as investors came to believe that the Fed would keep its foot on the accelerator and not slow down as the economy gained momentum, they became more willing to buy risky assets. Half of the 10 largest quarterly stock market rallies and sell-offs between 2010 and 2018 began within a week of a Fed statement indicating that the central bank would either pursue or cut back unconventional policies. The same is true for rallies and sell-offs of corporate bonds. In fact, three of the five largest sell-offs in corporate bonds between 2010 and 2018 started within one week of the ends of QE1, QE2, and QE3.

### Lessons for the future: Potent tools, but fiscal firepower needed

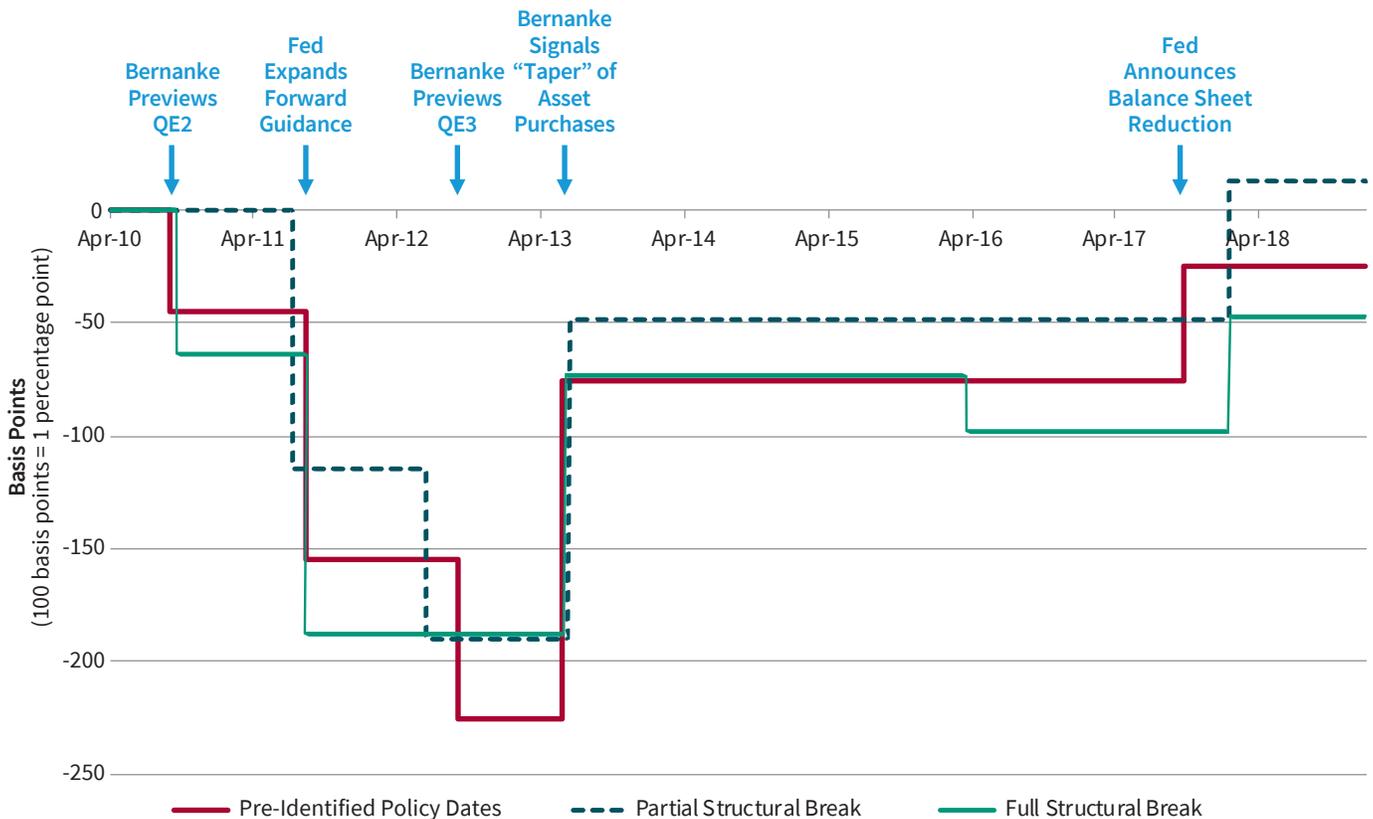
This analysis finds that the Fed’s unconventional policies — including asset purchases and forward guidance — are potent tools for emergency economic management. The experience of the Federal Reserve since the financial crisis suggests that asset purchases played a powerful role in reshaping market expectations of the central bank’s future policy reaction function, which in turn exhibited pervasive effects on financial conditions that supported economic activity.

But it would be wrong to conclude that central banks can — or should — assume all responsibility for supporting the economy when weakness materializes. This is particularly true now. Long-term interest rates

are already extremely low (with 10-year Treasury yields below 1 percent in early March 2020 versus more than 3.5 percent in March 2010), giving less room for even unconventional monetary policies to operate.

Indeed, my research finds that another key lesson from the post-crisis period is that fiscal policy must play a more sustained role in supporting economic recovery. One reason the Fed was so active between 2010 and 2014 was that support from fiscal stimulus was being *withdrawn* during this period, even though the recovery remained fragile. Rather than work at cross-purposes, all policy tools should work together so that less of the burden falls on exceptional monetary policies — a lesson worth bearing in mind as policymakers prepare to navigate future economic challenges.

**Figure 3.** Estimated Shifts in Market-Expected Future Fed Reaction Function



Source: Toloui (2019). Graph shows three specifications used in the estimates.

## References

- Bai, Jushan, and Pierre Perron (2003). "Computation and Analysis of Multiple Structural Change Models." *Journal of Applied Econometrics*, 18(1), 1-22.
- Bernanke, Ben (2020). "The New Tools of Monetary Policy." American Economic Association Presidential Address, January 4.
- Borio, Claudio, and Anna Zabai (2016). "Unconventional Monetary Policies: A Re-Appraisal." Bank for International Settlements Working Paper No. 570, July.
- Toloui, Ramin (2019). "How Did Quantitative Easing Really Work? A New Methodology for Measuring the Fed's Impact on Financial Markets." Stanford Institute for Economic Policy Research Working Paper No. 19-032, November.



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