The Recovery from the Great Recession

Did the FOMC Learn the Right Lessons?

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Abstract

In August 2020, monetary policymakers articulated a new framework for conducting monetary policy. That framework reflected the conclusion, drawn from the recovery from the Great Recession, that monetary policy had erred in pursuing preemptive increases in the funds rate. Starting in December 2015, the Federal Open Market Committee (FOMC) had raised the funds rate off the zero lower bound and the inflation rate continued to run below the 2 percent target. Going forward, the FOMC will forgo preemptive increases to ensure an overshoot of its inflation target until the FOMC achieves the goal of "maximum employment."

What should policymakers have learned from the Great Recession recovery? It was a period of considerable nominal and real stability. In part, that stability was an artifact of an initial moderately contractionary monetary policy that limited the strength of the recovery. But that price stability provided the foundation for the significant decline in the unemployment rate during the recovery.

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The Recovery from the Great Recession: Did the FOMC Learn the Right Lessons?

Robert L. Hetzel

Using the experience of the recovery from the Great Recession, the Federal Open Market Committee (FOMC) revised its policy framework. Federal Reserve Chair Jerome Powell (2020) summarized the conclusions drawn from the assessment of that experience in the policy of flexible-average-inflation targeting (FAIT). A striking characteristic of the recovery period was a funds rate at the zero lower bound (ZLB) for seven years with inflation running mainly below the FOMC's 2 percent inflation target. Moreover, a steady decline in the unemployment rate failed to raise inflation to the 2 percent target.

The FOMC drew two conclusions. First, at the ZLB, there is a danger that the public's expectation of inflation will become unanchored to the downside. Second, the level of unemployment consistent with the mandate of maximum employment could only be achieved through the experiment of running down the unemployment rate through an expansionary monetary policy—that is, by running the economy hot. The emergence of inflation persistently in excess of the 2 percent inflation target would reveal this mandate-consistent level of unemployment. These two features of FAIT are complementary in that the inflation overshoot signaling achievement of maximum employment would prevent an undesirable reduction in the inflationary expectations of the public through a period of above-target inflation that compensates for the prior period of below-target inflation.

An implication of FAIT is the undesirability of preemptive increases in the funds rate intended to prevent the emergence of inflation. Such preemptive increases had been a hallmark of the Paul Volcker–Alan Greenspan era and had guided the policy of returning to price stability.

A motivation for the revised policy was the belief that the preemptive increases in the funds rate that started with an increase in December 2015 and then resumed in December 2016 limited desirable job creation. The narrative here provides an alternative version of what policymakers should have learned from the recovery from the Great Recession.

The first characteristic of the recovery to note is that it was a period of considerable nominal and real stability.[1] In part, that stability was an artifact of an initial moderately contractionary monetary policy that limited a vigorous economic rebound. However, the preemptive increases in the funds rate that were intended to prevent an overshoot of inflation from the 2 percent target contributed to the stability exhibited in the recovery. It was desirable to maintain a noninflationary recovery. Price stability provided the foundation for the significant decline in the unemployment rate during the recovery. Moreover, during the recovery, a funds rate at the ZLB did not undermine the efficacy of monetary policy. Inflationary expectations never became unanchored. They remained anchored at the level of near price stability produced by earlier monetary policy aimed at restoring price stability.

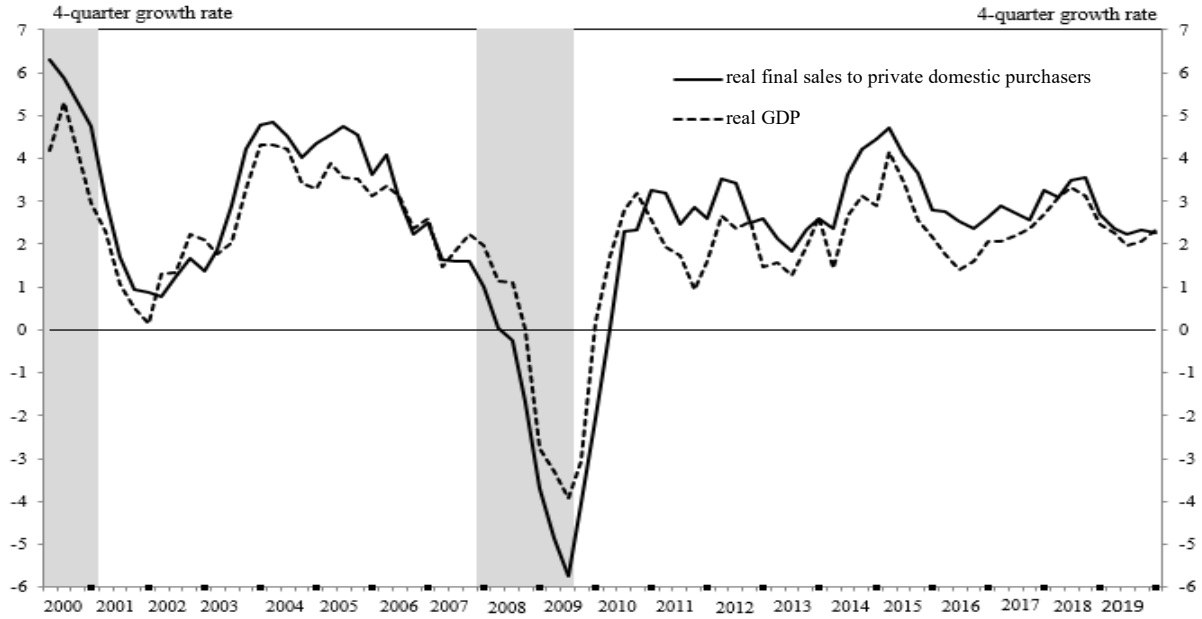
When a V-shaped recovery failed to emerge, a commonly expressed fear was that with the funds rate pressed against the ZLB, the FOMC was "out of ammunition." That is, at the ZLB, the FOMC could not pursue an expansionary monetary policy to offset contractionary "headwinds" impeding a strong recovery. In fact, the FOMC's "unconventional" monetary policies of forward guidance and quantitative easing (QE) maintained the efficacy of monetary policy even at the ZLB. There is no need to raise inflation and thereby raise nominal interest rates to avoid running into the ZLB.

[1] For a review of the FOMC's post-pandemic monetary policy, see Hetzel (2020a, 2020b, 2020c, and 2021).

A low real rate of interest misled policymakers to believe policy was accommodative

Monetary policy was contractionary in the Great Recession (Hetzel 2012, chap. 12). That contention is supported by the decline in both real output and inflation in the recession (figures 1 and 2). In Q2 2009, real GDP growth (four-quarter percentage change) declined to −3.2 percent, while in Q4 2009 core personal consumer expenditures (PCE) inflation (four-quarter percentage change) fell to 0.95 percent (four-quarter percentage change).

Figure 1. Growth Rates of Real GDP and Real Final Sales to Private Domestic Purchasers



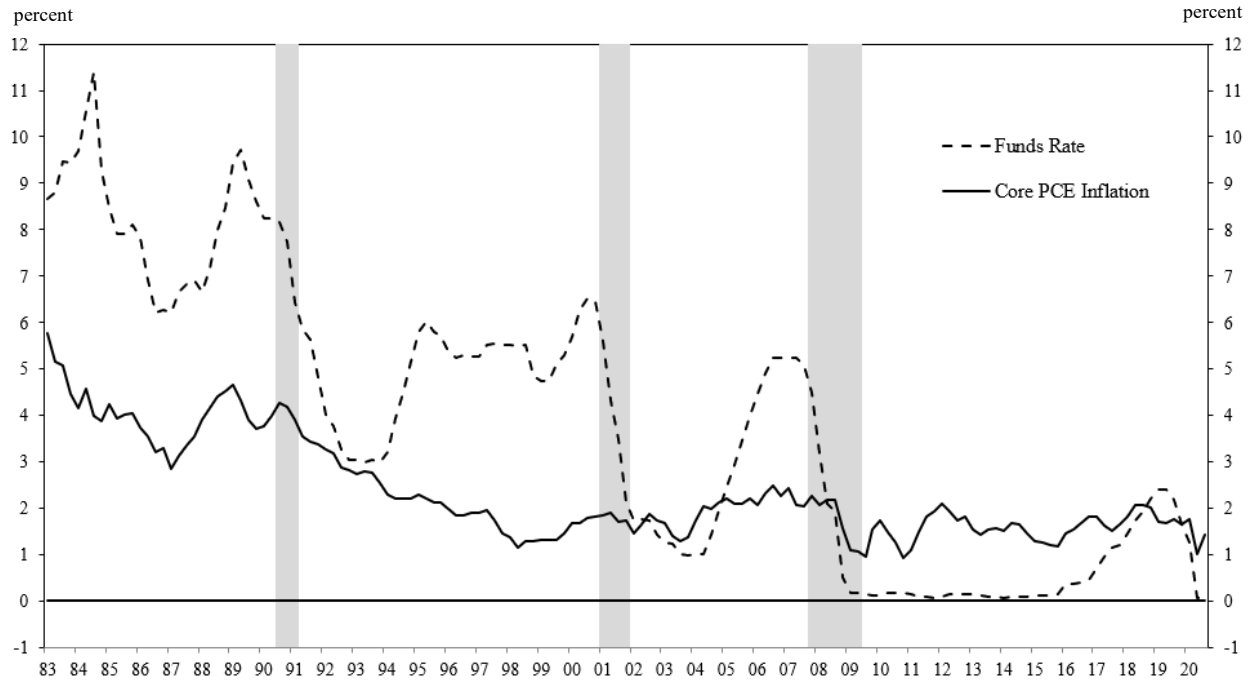
Note: Quarterly observations of four-quarter percentage changes. Heavy tick marks indicate the fourth quarter.
Source: St. Louis FRED.

Figure 2. Headline and Core PCE Inflation, 1994–2019

Note: Quarterly observations of four-quarter percentage changes in the headline and core personal consumption expenditures (PCE) deflator. Shaded areas indicate National Bureau of Economic Research recessions.
Source: St. Louis FRED.

Figure 3, which shows the funds rate and inflation, can help explain why policymakers thought of policy as accommodative. The realized real funds rate is the difference between the funds rate and contemporaneous inflation. In Q2 2008 the funds rate, whose target the FOMC had lowered to 2 percent at its April 30, 2008, meeting, basically equaled inflation. With a real interest rate at zero, FOMC participants divided into two groups, neither of which considered monetary policy to be contractionary. All shared the belief that high headline inflation risked exacerbating inflationary expectations. (Figure 2 shows how the worldwide commodity price shock raised headline inflation to 4 percent, a level not seen since 1991.) The hawks believed that monetary policy was expansionary and would raise inflation. The doves believed that an increase in risk premiums on risky borrowing offset the expansionary effect of a low funds rate (Hetzel 2012, 217). The June 2008 FOMC minutes recorded the following:

Figure 3. Funds Rate and Core PCE Inflation, 1983–2020



Note: Quarterly observations of four-quarter percentage changes in the core personal consumption expenditures (PCE) deflator. Shaded areas indicate National Bureau of Economic Research recessions.
Source: St. Louis FRED.

> Recent increases in energy and some other commodity prices would boost inflation sharply in coming months. . . . [P]articipants had become more concerned about upside risks to the inflation outlook—including the possibility that persistent advances in energy and food prices could spur increases in long-run inflation expectations. . . . Participants agreed that the possibilities of greater pass through of cost increases into prices, higher long-run inflation expectations feeding into labor costs and other prices, and further increases in energy prices all posed upside risks to inflation that had intensified since the time of the April FOMC meeting.
>
> Some participants noted that certain measures of the real federal funds rate, especially those using actual or forecasted headline inflation, were now negative, and very low by historical standards. In the view of these participants, the current stance of monetary policy was providing considerable support to aggregate demand and, if the negative real federal funds rate was maintained, it could well lead to higher trend inflation. . . . [O]ther participants observed that the high level of risk spreads and the restricted availability of credit suggested that overall financial conditions were not especially accommodative; indeed, borrowing costs for many households and businesses were higher than they had been last summer. . . . With increased upside risks to inflation and inflation expectations, members believed that the next change in the stance of policy could well be an increase in the funds rate. (Board of Governors 2008, 6–7)

In fall 2008, FOMC Chairman Ben Bernanke would find consensus by lowering the funds rate only reluctantly given the shared concern for inflation and given the hawkish faction. After the Lehman bankruptcy in September, the emphasis was on programs to channel credit to ensure the "availability of credit." Given the decline in inflation that began in fall 2008 and the worsening of the recession, despite the decline in the funds rate, the FOMC had to play catch-up with a decline in the natural rate of interest. A key point is that in 2008 no FOMC participant considered that monetary policy could be contractionary with a zero real interest rate. As shown in figure 3, however, from December 2008 through 2016 the realized real interest rate averaged around −2 percent. Although the FOMC judged monetary policy to be "accommodative," the duration of such a negative rate without inflation could only have occurred from a decline in the natural rate of interest.

Nothing in the historical experience prepared policymakers for a sharp, sudden decline in the natural rate of interest to a negative value. In the 1970s, the realized real rate of interest was often negative, and after the fact policymakers realized that monetary policy was inflationary. Starting with the Volcker disinflation and before the Great Recession, the realized real rate of interest was consistently, significantly positive. The exception occurred in the years 2003 and 2004. However, that period was considered to be one in which a low funds rate had encouraged excessive risk taking and a housing bubble. It seemed obvious that a negative realized real interest rate was expansionary. That belief carried over into the recovery and allowed policymakers to believe that a moderately contractionary monetary policy was stimulative.

Monetary policy was initially moderately contractionary in the recovery

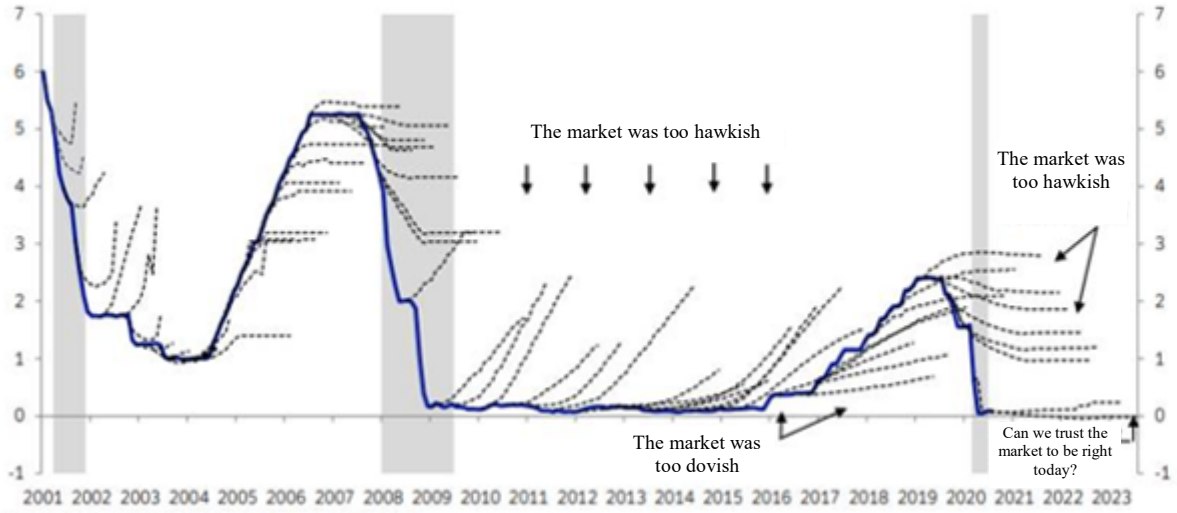
The contention that monetary policy was moderately contractionary early in the recovery is supported by the failure of output to rebound in a V-shaped recovery as had always occurred in

the past, when a vigorous recovery followed a sharp decline in output. After an initial rebound, over the interval Q1 2010 through Q1 2014, real GDP growth (four-quarter percentage changes) averaged only 2 percent, well below the nearly 5 percent in the prior recovery for the years 2003 through 2005. A tepid recovery combined with a reduction in inflation. For Q3 2008 through Q3 2017, core PCE inflation (four-quarter percentage changes) averaged 1.5 percent. Over the preceding period, Q2 2004 through Q3 2008, the corresponding number was 2.2 percent. The most straightforward explanation of the tepid recovery with a decline in inflation is a moderately contractionary monetary policy.

The initial failure of the FOMC to realize that the natural rate of interest had fallen to historic lows appears in the Summary of Economic Projections (SEP). The median value of the longer-run funds rate contained in the SEP, a proxy for the natural rate, was 4.3 percent at the January 2012 FOMC meeting and still at a relatively high 3.8 percent for the March 2014 meeting. Similarly, the forecasts of FOMC participants for real GDP growth started relatively high in line with a normalization of the funds rate requiring a significant increase. In January 2010, FOMC participants' "central tendency" (the midpoint of the "central tendency range") for growth in real GDP was 4 percent for both 2011 and 2012. The actual growth rates (averages of quarterly annualized rates of growth) for these years came in significantly lower at 1.6 percent for 2011 and 1.5 percent for 2012.

As shown in figure 4 (from Sløk 2020), in the early years of the recovery until December 2016, markets also consistently forecasted an imminent rise in the funds rate. That misforecast in turn derived from the past observation that the recoveries from sharp recessions had all been vigorous, that is, V-shaped. The resulting upward tilt to the yield curve acted to make monetary policy more restrictive.

Figure 4. Fed Funds Rate: Actual and Forecasted from Fed Funds Futures Market

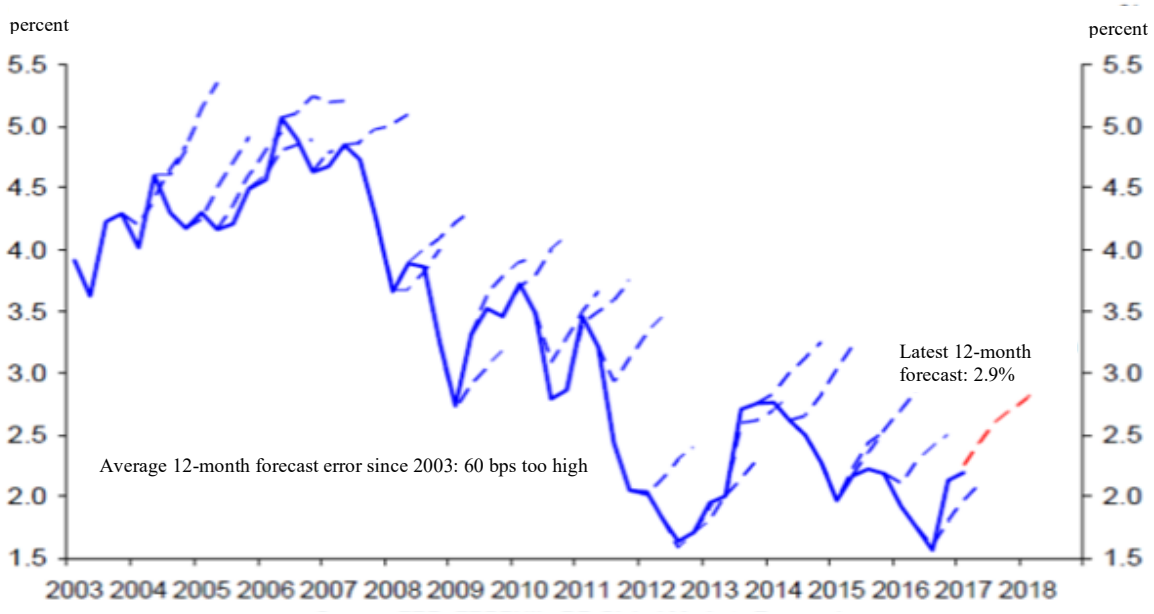


Source: Sløk 2020.

Figure 5 (from Sløk 2017a) shows that this ex post upward bias in forecasts of the funds rate carried over to the forecasts by market professionals of bond rates. FOMC participants learned only slowly that the natural rate of interest had fallen. The resulting upward sloping term structure of interest rates initially made policy moderately contractionary. Consequently, the economic recovery was relatively slow and prolonged.

One piece of evidence for the lack of a stimulative monetary policy was the lack of vigorous growth in M2. Initially, as cash investors fled nonbank financial intermediaries in favor of the too-big-to-fail banks, M2 growth surged. However, from June 2009 to July 2010, annualized monthly growth rates for M2 averaged only 1.9 percent. From August 2010 to January 2020, the number was 6.4 percent. The decline in market rates of interest, the desire among households and corporations for liquidity, and the ongoing secular decline in M2 velocity should have resulted in vigorous M2 growth in the year after the recession trough of June 2009.

Figure 5. Actual 10-Year Rate and Forecasts for the 10-Year Rate, from the Fed's Quarterly Survey of Professional Forecasters



Note: bps = basis points.
Source: Sløk 2017a.

Because the FOMC never considered that monetary policy might be restrictive, it attributed the absence of a V-shaped recovery and the extended period required for the unemployment rate to decline to a potpourri of "headwinds." Yellen (2015, 13) stated the belief that "headwinds" kept the normal funds rate unusually low:

> This expectation [of rate increases] is consistent with an implicit assessment that the neutral nominal federal funds rate . . . is currently low by historical standards and is likely to rise only gradually over time. The marked decline in the neutral federal funds rate [r*] after the crisis may be partially attributable to a range of persistent headwinds . . . [including] tighter underwriting standards and limited access to credit for some borrowers, deleveraging by many households to reduce debt burdens, contractionary fiscal policy at all levels of government, weak growth abroad coupled with a significant appreciation of the dollar, slower productivity and labor force growth, and elevated uncertainty about the economic outlook. As the restraint from these headwinds further abates, I anticipate that the neutral federal funds rate will gradually move higher.

Although the economy recovered after the cycle trough in June 2009, a V-shaped recovery did not occur. In June 2013, four years after the cyclical trough, the unemployment rate was 7.5 percent. One reason for the restrained recovery was another inflation shock, which the FOMC did not accommodate with expansionary monetary policy. Headline PCE inflation (four-quarter) rose sharply in two peaks (figure 2). It first went from −1 percent in Q3 2009 to 2.3 percent in Q1 2010. It then declined to 1.2 percent in Q4 2010 before rising to 3 percent in Q3 2011. Economic stimulus measures in China produced strong Chinese growth, which raised world commodity prices. The resulting high headline inflation in the United States passed into core inflation.[2] Plausibly, the post–Great Recession inflation shock was one factor in limiting the recovery in real personal consumption expenditures after summer 2011 (figure 6). The 2015 surge then reflects catch-up.

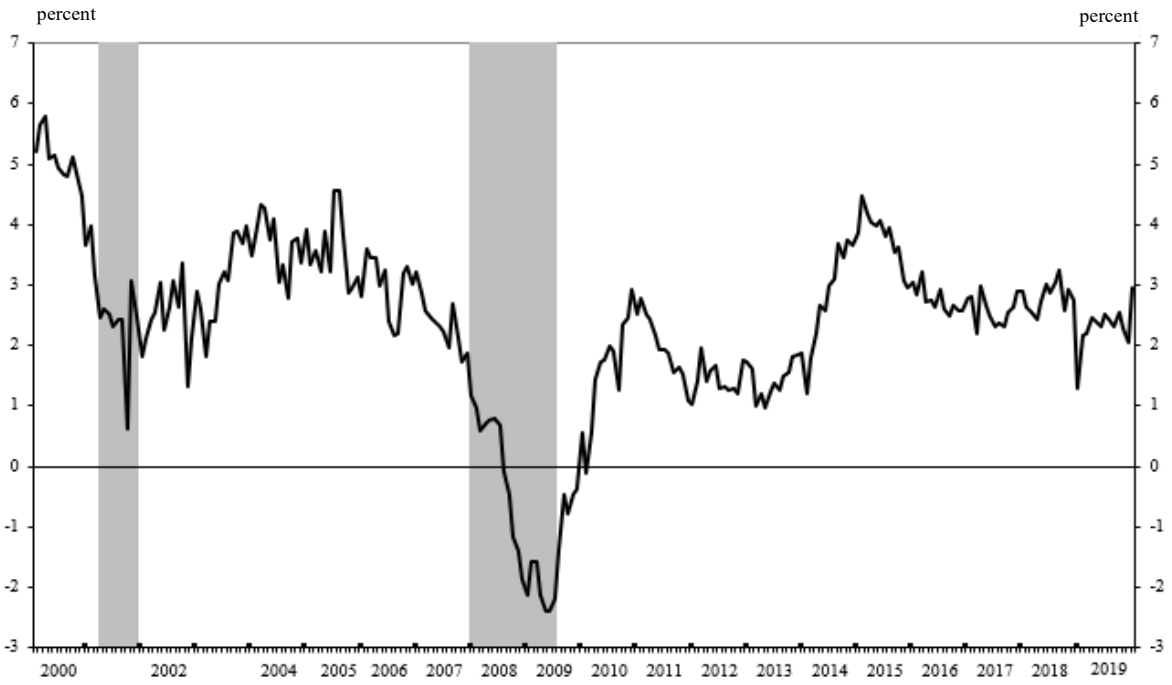
A slow start to the recovery and preemptive increases in the funds rate

Starting in December 2008 with the statement language "Weak economic conditions are likely to warrant exceptionally low levels of the federal funds rate for an extended period," the FOMC experimented with forward guidance. Initially, this communication focused on guiding the market's forecast of the liftoff date for the funds rate from the ZLB. The market's expectation of the number of months to liftoff influenced the 10-year bond rate until August 2013 (figure 7). Postponing the expectation of liftoff was the equivalent of reducing the funds rate. Starting in

[2] The annual growth rate of real GDP in China rose from 7.6 percent in 2008 to 13.0 percent in 2010. Yearly M2 growth for China, which had averaged 16.6 percent for the years 2004 through 2008, rose to 26.5 percent and 20.6 percent, respectively, in 2009 and 2010. Annual changes in the world price of commodities averaged 19.6 percent for the years 2003 through 2008, fell to −28.4 percent in 2009, and then rose back to 25 percent in 2010 and 2011. The world commodity inflation rate then subsided to −10.6 over the years 2012 through 2016. The figures are from St. Louis FRED: (a) 2010 (University of Groningen and University of California, Davis, real GDP at constant prices for China; (b) International Monetary Fund (IMF), M2 for China; (c) IMF Global Price Index of All Commodities.

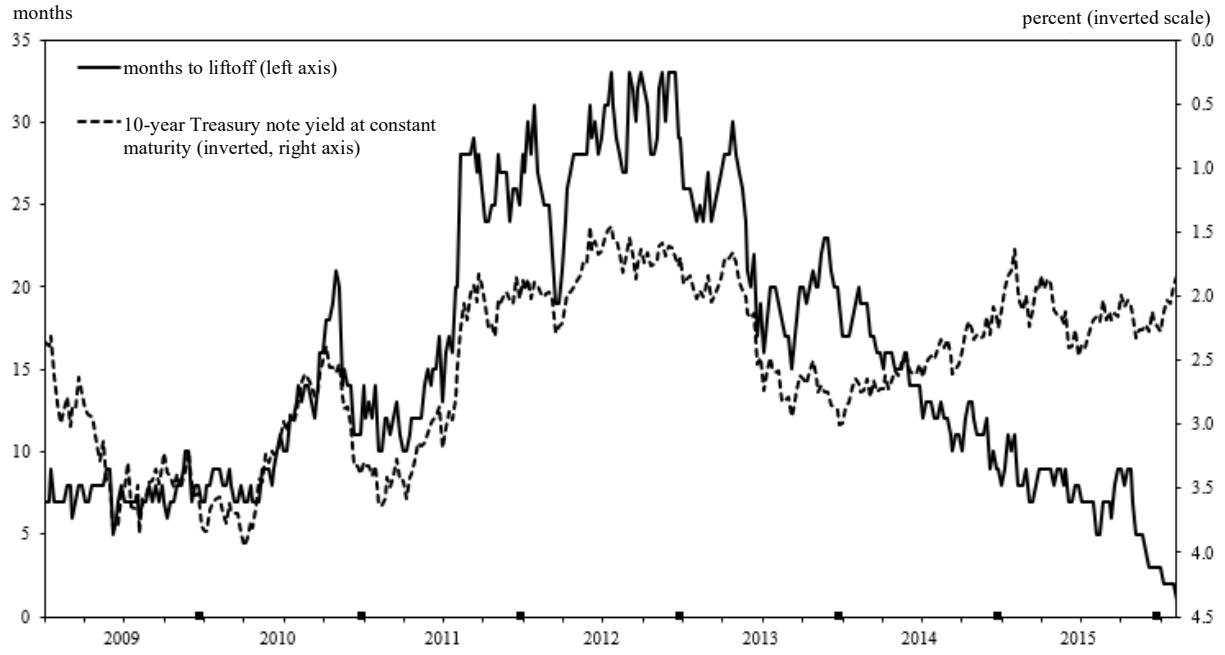
August 2013, however, the number of months to liftoff declined while the 10-year Treasury yield (plotted on an inverted scale) also declined. As shown in figure 2, both core and headline PCE inflation declined after this date. Plausibly, without a concern for a revival of inflation, the approach of liftoff did not cause markets to raise their expectation of the required level of long-term interest rates. A Deutsche Bank newsletter (Sløk 2015) wrote, "The present narrative in markets that 'long rates in the US will stay low, even when the Fed hikes rates' is normally based on the view that the US is experiencing secular stagnation and the terminal fed funds rate is low."

Figure 6. Growth of Real Personal Consumption Expenditures



Note: Twelve-month percentage changes in real personal consumption expenditures (PCE). Shaded areas indicate National Bureau of Economic Research recessions. Heavy tick marks indicate December.
Source: St. Louis FRED.

Figure 7. Number of Months until Expected Fed Tightening vs. 10-Year Treasury Note Yield



Note: Thanks to Torsten Sløk of Deutsche Bank Securities for providing this idea. Months until liftoff refers to the number of months at or below 38 basis points on federal funds futures contracts. Heavy tick marks indicate the end of fourth quarter.
Source: Fed Fund Futures via Bloomberg and 10-Year Treasury Yield via Haver Analytics.

At the August 2011 meeting, the FOMC adopted date-based forward guidance with the statement that economic conditions were "likely to warrant exceptionally low levels for the federal funds rate at least through mid-2013." At the November 2011 FOMC meeting, Charles Evans, president of the Chicago Fed, revived an idea advanced earlier by then Fed Governor Janet Yellen for outcome-based forward guidance using as a threshold the unemployment rate. At the December 2012 FOMC meeting, the FOMC adopted such forward guidance with the statement language as follows:

> [T]he Committee decided to keep the target range for the federal funds rate at 0 to 1/4 percent and currently anticipates that this exceptionally low range for the federal funds rate will be appropriate at least as long as the unemployment rate remains above 6-1/2 percent, inflation between one and two years ahead is projected to be no more than half

> a percentage point above the Committee's 2 percent longer-run goal, and longer-term inflation expectations continue to be well anchored.

In January 2012, the FOMC decided on an explicit inflation target of 2 percent. In the first three months of 2012, 12-month core PCE inflation reached 2.1 percent, probably because an inflation shock passed through into core prices. The 2 percent target then seemed to ratify the status quo. However, the strength in inflation was transitory.

As described by Jeffrey Lacker (2019), former president of the Richmond Fed, inflation hawks on the FOMC felt uncomfortable with the FOMC's efforts at stimulus in the form of QE and forward guidance without an explicit inflation target. After the initiation of QE2 in November 2010, inflation hawk Charles Plosser, president of the Philadelphia Fed, with Chairman Bernanke's blessing, had negotiated a draft of what became the document "Statement on Longer-Run Goals and Monetary Policy Strategy" released in January 2012. Lacker (2019, 10) wrote, "Adopting an inflation objective seemed to be a prerequisite to formulating forward guidance in terms of an unemployment threshold without confusing the public" [later adopted at the December 2012 FOMC meeting].

In 2014, the funds rate path projected by the FOMC in the SEP and in public statements of FOMC Chair Yellen rose, but funds rate futures failed to follow. Part of the political economy of monetary policy is to communicate the need to raise the funds rate solely in terms of the need to restrain inflation rather than in terms of the need to slow economic growth and employment. However, markets did not believe that inflation was a problem. As evidenced by the behavior of the 10-year yield on Treasury securities and the increase in global debt with negative interest rates starting in 2015 and especially in 2016, deflation scares replaced the earlier inflation scares. Sløk (2014) summarized: "She [Yellen] is basically saying the following: 'I know that when capacity utilization is at 2005–2006 levels, ISM [index] is around 60, the unemployment rate

close to NAIRU [nonaccelerating inflation rate of unemployment], [growth in] nonfarm payrolls is above 300k and GDP is around 4 percent then I feel very confident that it won't be long before we see a move up in inflation.' To this the markets say: 'Ok, but we have not seen inflation for the past six years, and you have been too optimistic for the past six years, so why should inflation be a problem in 2015?'"

Starting in 2014, it became clear that the economy was growing above potential, which argued for a normalization of the funds rate by moving it up from the ZLB. The numbers were strong. From March 2014 through December 2018, growth in payroll employment averaged 210,000 a month, twice the sustainable rate, and the unemployment rate continued to decline. Hatzius (2017) wrote: "Measures [of unemployment] such as U3, U6, job openings, quits, reported skill shortages, and household job market perceptions all send a similar message—the labor market is about as tight as in the full-employment years 2006 and 1989. . . . All this suggests that further labor market tightening is likely to result in a significant overshoot of full employment." Real median household income increased, rising 18.5 percent from 2014 through 2019. An optimistic outlook for the future increases the natural rate of interest and requires a positive real rate of interest. At the same time, markets forecast a minimal rise in the funds rate, and the 10-year Treasury constant maturity yield declined from 3.0 percent on January 3, 2014, to 1.4 percent on July 11, 2016. (It then rose and reached a peak of 3.2 percent on November 9, 2018.)

The *Financial Times* (Harding 2014) reported the following in an interview with St. Louis Fed President James Bullard:

> The median forecast on the FOMC expects an interest rate of 1 per cent to 1.25 per cent by the end of 2015, and Mr. Bullard said he was "worried" to see markets expecting a slower path for rate rises. "I do think that's a mistake on the part of the market," he said. "I think the committee means what it says. To have markets trading more dovishly than

> what the committee is intending I think suggests there will be a day of reckoning at some point in the future—either for us or for them."

Yellen's roots were Keynesian. She naturally used the framework outlined by Modigliani and Papademos (1976), in which changes in inflation depend on the difference between the unemployment rate and a benchmark for full employment known as the nonaccelerating inflation rate of unemployment (NAIRU). With the NAIRU taken as the median value of FOMC participants' SEP projections for the longer-run unemployment rate, as of the December 2015 FOMC meeting, the Fed's proxy for the NAIRU was 4.9 percent. At that time, the unemployment rate was 5.0 percent. At the December FOMC meeting, the FOMC raised the funds rate off the ZLB.

Even given her Keynesian roots, Yellen had absorbed the lessons of the Great Inflation incorporated by Volcker and Greenspan in their policy of preemptive increases in the funds rate to forestall a rise in inflation (Hetzel 2008). Yellen (2017, 16) said the following:

> [W]e should also be wary of moving too gradually. Job gains continue to run well ahead of the longer-run pace we estimate would be sufficient, on average, to provide jobs for new entrants to the labor force. Thus, without further modest increases in the federal funds rate over time, there is a risk that the labor market could eventually become overheated, potentially creating an inflationary problem down the road that might be difficult to overcome without triggering a recession. Persistently easy monetary policy might also eventually lead to increased leverage and other developments, with adverse implications for financial stability. For these reasons, and given that monetary policy affects economic activity and inflation with a substantial lag, it would be imprudent to keep monetary policy on hold until inflation is back to 2 percent.

Yellen (in Condon and Smialek 2017) summarized, "[I]f the economy ends up over heating and inflation threatens to rise well above our target, we don't want to be in a position where we have to raise rates rapidly, which could conceivably cause another recession. So we want to be ahead of the curve and not behind it."

Yellen was replaying the earlier policy of the 1990s when the Greenspan FOMC raised the funds rate preemptively. The unemployment rate fell from 7.8 percent in June 1992 to

3.8 percent in April 2000 while inflation changed only minimally. Inflation, measured by the core PCE, went from 2.2 percent in Q2 1992 to 1.3 percent in Q2 2000. Measured by the headline PCE deflator, it remained unchanged over this period at 1.8 percent. Greenspan, however, did not give up on a policy of preemption. Without evidence of inflation, the FOMC raised the funds rate target from 3 percent at its December 1993 meeting to 6 percent at its February 1995 meeting (figure 3). Again, without evidence of inflation, the FOMC raised the funds rate at its June 1999 FOMC meeting (Hetzel 2008, chaps. 15 and 17).

Greenspan was not running the economy "hot" to lower the unemployment rate to a minimal level indicated by an increase in inflation. Along with his predecessor Volcker, he had renounced any attempt to balance off inflation and unemployment on the basis of a Phillips curve. To recreate the stable nominal anchor lost in the stop-go era, Greenspan had to let the price system work to determine real variables such as unemployment (Hetzel 2008, chap. 21).

Secular stagnation, fear of global recession, and central banks out of ammunition

Starting in fall 2015, concern grew in financial markets that an adverse shock to the world economy, perhaps from a recession in China or from a geopolitical crisis, would push the world back into recession. The fear was that monetary policy lacked the capacity to respond. Central banks had to rely on unconventional and untested policies such as quantitative easing and negative interest rates. Low interest rates created the fear that central banks would lack the ability to stimulate aggregate demand in the event of a recession.

Larry Summers argued that the US economy had entered what Alvin Hansen in the late 1930s called secular stagnation. The norm would be low real growth, low inflation, and near zero rates of interest. This view rationalized the observation that across countries, real GDP growth was anemic, inflation was below central bank targets, and yet interest rates were low or even negative. Central

banks were supposedly "out of ammunition."[3] A common theme was that expansionary monetary policy works through weakening the foreign exchange value of the currency. However, that channel is a zero-sum game for countries collectively. The *Financial Times* (2016, 1) reported the following:

> The yen touched new highs yesterday, defying Tokyo's effort to weaken the Japanese currency in the latest sign policymakers in leading economies are running out of tools to kick-start growth and battle the threat of deflation. . . . Like the [Bank of Japan] BoJ, the European Central Bank [ECB] has intervened in capital markets at unprecedented levels to little effect on the EU's common currency or inflation. . . . Aggressive monetary policies in general, and negative interest rates in particular, have long been seen as a means to depreciate currencies and raise inflation. . . . But despite the aggressive BoJ and ECB moves, global inflation remains lackluster.

With a surprise devaluation of the renminbi (yuan) in August 2015, financial markets became preoccupied with the state of the Chinese economy. China's foreign exchange reserves reached a peak in 2014 at $4 trillion and then ran steadily down to just over $3 trillion in 2016 (Hooper et al. 2017). In September 2015, Citibank (Spence 2015) warned, "A 'hard landing' for the Chinese economy will likely lead the world into a recession in the next year. . . . They [Citi's economists] anticipate the global economy to slide into recessionary territory during the next year, and remain there for most of 2017." Markets feared that a recession in China with low real growth in the world economy could push the world back into recession. (A China shock could come from maintaining an overvalued yuan or from the collapse of its housing market.) The

[3] In five major countries, central banks instituted a negative rate policy in which commercial banks pay to maintain their reserves at the central bank. In the Eurozone, year-over-year growth in real GDP through Q4 2015 was 1.6 percent, barely enough to lower an unemployment rate of 10.3 percent in early 2016. The Eurozone year-over-year growth in the consumer price index (CPI) through March 2016 was −0.1 percent. The corresponding year-over-year figures for the other countries with negative policy rates were Japan (0.7 percent GDP growth through Q4 2015 and 0.3 percent CPI inflation through February 2016); Denmark (0.5 percent GDP growth through Q4 2015 and 0 percent CPI inflation through March 2016); and Switzerland (0.4 percent GDP growth through Q4 2015 and 0.9 percent CPI inflation through March 2016). (Sweden is an outlier. Despite strong real GDP growth for 2015, near 4 percent, and inflation near 1 percent, the Riksbank implemented negative interest rates to prevent an appreciation of the krona.)

concern for China recognized its importance to the world economy. Deutsche Bank estimated that in 2016, of the estimated growth in world real GDP of 3.2 percent, China would contribute 1 percentage point and the United States 0.6 percentage points (Sløk 2016).

In January 2016, RBS (the Royal Bank of Scotland) issued the following warning: "RBS has advised clients to brace for a 'cataclysmic year' and a global deflationary crisis, warning that major stock markets could fall by a fifth and oil may plummet to $16 a barrel. The bank's credit team said markets are flashing stress alerts akin to the turbulent months before the Lehman crisis. 'Sell everything except high quality bonds. This is about return of capital, not return on capital. In a crowded hall, exit doors are small,' it said in a client note" (Evans-Pritchard 2016). The price of oil measured the state of the world economy. Its price went from $102 a barrel in August 2014 (averaging $110 over the years 2011 to August 2014) to $31 in January 2016 (global price of Brent crude from St. Louis FRED).

With the Great Recession, markets associated recession with deflation. Investors bought insurance with nominally denominated Treasuries, which do well in recessions. Bond trading at negative interest rates first appeared in nontrivial amounts in 2015. Over 2016, worldwide, the percentage of bonds trading at negative interest rates went from less than 5 percent to about 28 percent (Sløk 2019a). For most of the recovery, world financial markets were in a "risk-off" or wealth-preservation mood. Low and negative bond rates reflected fear of adverse tail risk.

In 2018 and 2019, market fears concentrated on a trade war. Starting in 2018 with tariffs on solar panels and washing machines, the United States began imposing tariffs on numerous countries. Countries retaliated with their own tariffs. Eisenbeis (2020) wrote, "The scope and scale of the tariffs have been large, with a total of over 20,000 products (12,043 imports and

8,073 exports) amounting to over $400 million in goods being impacted." Donnan and Leonard (2019) wrote the following:

> [W]hat began as method [the calibrated imposition of tariffs on Chinese exports] looks more and more like madness. A tit-for-tat tariff war has ensnared more than 70% of bilateral trade in goods and raised the specter of a decoupling of two economies that once seemed destined to become progressively more intertwined. . . . That tariff round [additional tariffs threatened for December 15, 2019] could jeopardize America's record-long expansion.

In the recovery, the general spirit of market commentary was fear of a self-reinforcing negative feedback loop between pessimism and recession. The International Monetary Fund (2016, Executive Summary, ix) captured the prevailing mood about the fragility of the world economy: "In such circumstances [a recurrence of market turmoil], rising risk premiums may tighten financial conditions further, creating a pernicious feedback loop of fragile confidence, weaker growth, lower inflation, and rising debt burdens. Disruptions to global asset markets could increase the risks of tipping into a more serious and prolonged slowdown marked by financial and economic stagnation."

Chairman Bernanke expressed these views in his explanation of the cause of the Great Recession (Hetzel 2020a, sect. 5). Numerous external shocks threatened confidence in the recovery from the Great Recession. They included the Euro crisis in 2011 and 2012, the Brexit vote in June 2016, the devaluation of the renminbi by China in August 2015, and the trade war in 2018 and 2019. However, if the economy was inherently unstable because of the Keynesian animal spirits of financial markets, such shocks should have set off recessions. The lesson is that the price system is resilient to shocks in the presence of stabilizing (the absence of contractionary) monetary policy.

Quantitative Easing

The great benefit of the Greenspan FOMC in finally achieving credibility for price stability was the elimination of market fears that aggressive reductions in the funds rate would revive inflation. As long as the funds rate was well above the ZLB, the FOMC could then make clear that it would pursue funds rate reductions in the event of weakness in the economy until the economy recovered. However, with the funds rate at the ZLB in the recovery from the Great Recession, the FOMC turned to QE not only as a tool for creating monetary stimulus but also as a way of conveying to markets the "whatever it takes" message that despite the constraint imposed by the ZLB, monetary policy would ensure a recovery. The challenge was to convey the message to markets that a more pessimistic reading of the economy and a consequent lengthening of the estimated liftoff date of the funds rate from the ZLB was embedded in a policy of "whatever it takes" to maintain the recovery. The FOMC had to avoid a message of pessimism that would dampen economic activity.[4] The appendix summarizes the FOMC's QE programs in which it bought long-term securities (see Chen 2015; Engen, Laubach, and Reifschneider 2015; and Rosengren 2019, fig. 4.1).

Numerous papers evaluate the announcement effects of QE—for example, Gagnon et al. (2011) and Vissing-Jorgensen and Krishnamurthy (2011). They found significant announcement effects on long-term interest rates. Others, like Thornton (2017) have pointed out that the reduction in long-term rates was short-lived (figure 8). However, if QE is stimulative, one would expect that it would strengthen the economy and, in the process, raise long-term rates. The assumption here is that QE works through a portfolio balance effect in which replacing illiquid

[4] Swanson (2017) found that both forward guidance and QE raised stock prices. That is, markets did not interpret them as information that the economy was worse than had been expected.

assets like mortgage-backed securities (MBS) with a liquid bank deposit causes investors to rebalance their portfolios by purchasing illiquid assets like stocks, houses, consumer durables, and so on. The effects then would be hard to disentangle from other forces.

The argument for the efficacy of QE is indirect. Assume that the natural rate of interest was extremely low and negative at least through 2015, as suggested by figure 3. As noted, there were significant, negative shocks in the recovery period. Other things equal, they likely would have required a significantly negative real interest rate. Because the Fed was unwilling to consider a negative funds rate, something had to substitute for a reduction in the real rate of interest. The stability exhibited in the post–Great Recession period despite the constraint imposed by the ZLB then likely derives significantly from the Fed's three QE programs.

The fact that at first the FOMC used forward guidance and QE only tentatively is consistent with the claim that initially in the recovery monetary policy was moderately contractionary. The open market purchases announced November 25, 2008, and expanded March 18, 2009, only replaced the reserves supplied by the Fed's various liquidity facilities. That is, the size of the Fed's asset portfolio did not expand after November 25, 2008, but expanded only with the commencement of QE2 announced November 3, 2010.[5] As Williams (2013) noted, "from 2009 to mid-2011, expectations from financial markets showed the federal funds rate lifting off from zero within just a few quarters." However, not until August 2011 did the FOMC use forward guidance "[t]o push back against these excessively tight policy expectations" (Williams 2013). It did so with the August 2011 statement containing the language that economic conditions were "likely to

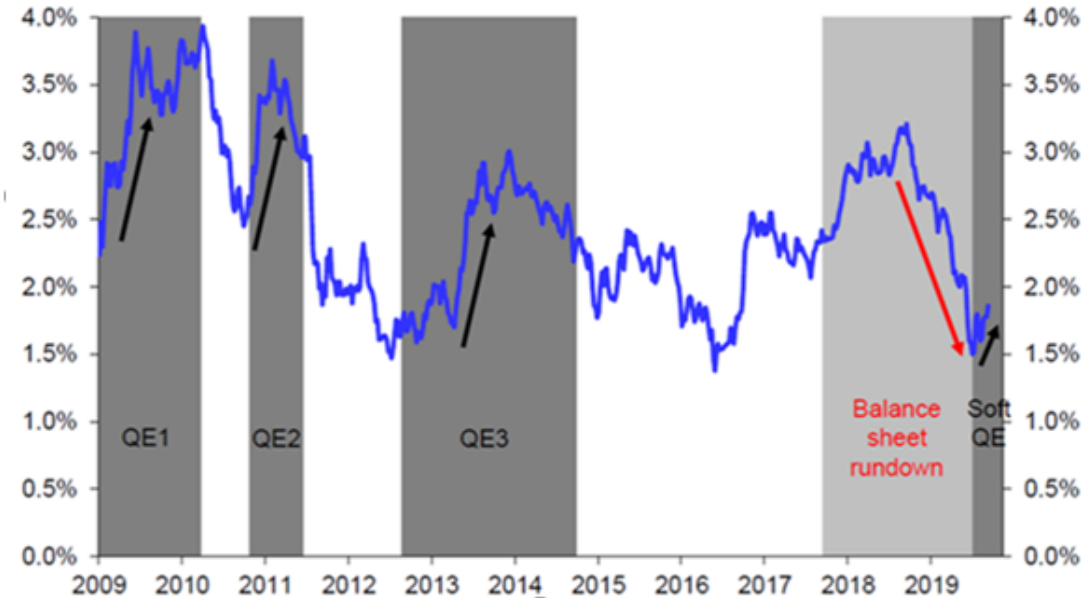
[5] On November 26, 2008, the reserve bank credit in the Fed's portfolio was $2.1 trillion and securities held outright was just less than 0.5 trillion. On November 3, 2010, reserve bank credit was only slightly larger at $2.3 trillion and securities held outright were about $2 trillion. The increase in securities only replaced the bank reserves that had been supplied by the FOMC's credit programs.

warrant exceptionally low levels for the federal funds rate at least through mid-2013." (See Hetzel 2019.)

The fact that initially the FOMC did not "push back against these excessively tight policy expectations" means that the FOMC, like the markets, expected a strong V-shaped recovery. Forward guidance conveying the FOMC's consensus forecast is an important determinant of market expectations. Note the sharp rise in the 10-year Treasury yield in May 2013 associated with the "taper tantrum" (figure 8). Comments by Chairman Bernanke that the FOMC would begin reducing the size of its QE purchases caused the markets to advance the timing of the expected liftoff date of the funds rate from the ZLB. The rise in the 10-year Treasury yield demonstrates the importance of this kind of forward guidance.

The stability of the post–Great Recession period despite the ZLB suggests that QE compensated for the FOMC's inability to implement a negative funds rate. The work of Wu and Xia (2016) shows that the largest magnitude negative shadow rate of −3 percent occurred in 2014. The total announced QE purchases came to about $4 trillion (see appendix), which in the event amounted to $3.35 trillion since January 2008 (Sløk 2017b). They apparently sufficed to offset the FOMC's inability to lower the funds rate to −3 percent. Deutsche Bank (Luzzetti, Ryan, and Weidner 2020, 4) summarized, "One well-known estimate of the shadow fed funds rate—the Wu-Xia shadow rate—indicates that during the period of the Fed's unconventional tools, a roughly $3.5tn expansion of the Fed's balance sheet post the global financial crisis coincided with a shadow fed funds rate trough of −3%." Kim, Laubach, and Wei (2020) found "that absent the LSAP3 [large-scale asset purchase] program implemented between late 2012 and 2014, CPI inflation would have been about 1 percentage point lower, while the unemployment rate would have been about 4 percentage points higher, by the end of 2015."

Figure 8. Ten-Year Treasury Yield and QE Periods



Source: Sløk (2019b).
Note: QE is a signaling tool: Fed buying Treasuries lifted long-term interest rates, and Fed selling Treasuries pushed long-term interest rates down. Ten-year treasury note yield at constant maturity.

A criticism of QE is that with low long-term interest rates, it has a limited impact. Hetzel (2020a) argues, however, that QE undertaken in sufficient magnitude will still exercise a stimulative portfolio balance effect. Hudepohl, van Lamoen, and de Vette (2019) found a positive effect on stock prices in the Euro area from QE after controlling for macroeconomic fundamentals. For the period from October 9, 2019, to December 25, 2019, when the Fed engaged in open market purchases in response to a spike in repurchase agreement (RP) rates, Sløk (2019c) found "a 1% increase in the Fed balance sheet has been associated with a 0.9% increase in the S&P500."

What accounts for the near price stability in the recovery from the Great Recession?

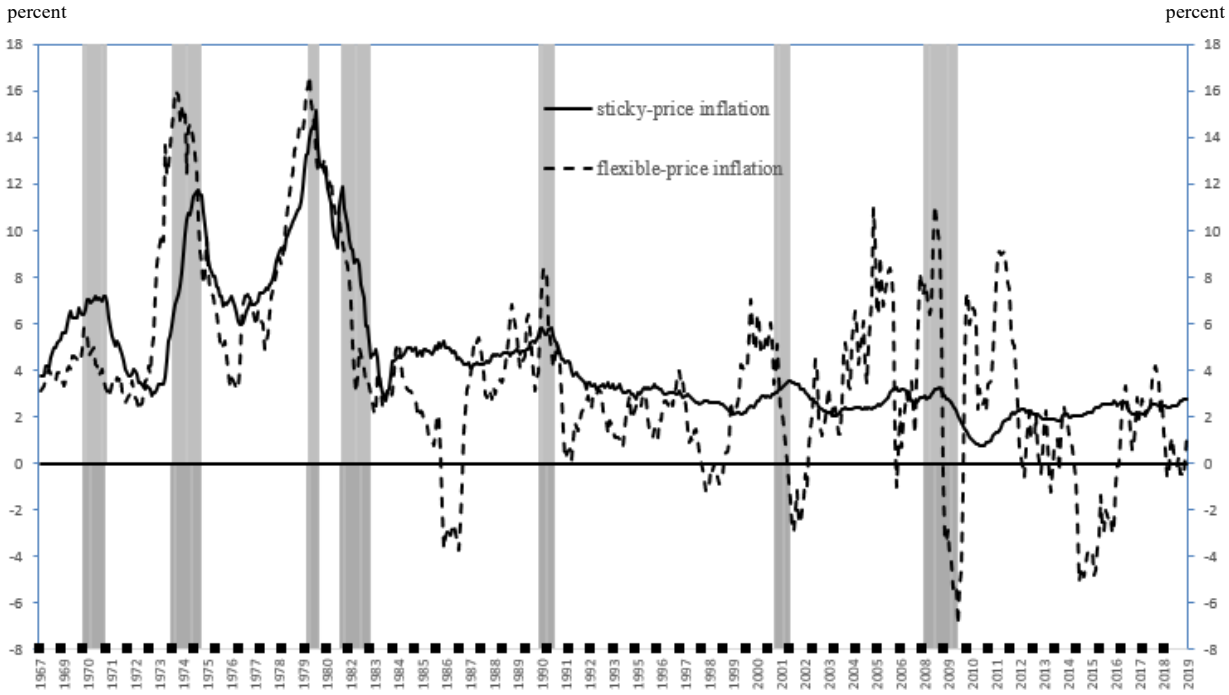
In his August 2020 speech, Chair Powell (2020) expressed concern that without the makeup of inflation shortfalls provided for in FAIT, the public's expectations of inflation would become

unanchored to the downside. Despite the duration of the funds rate at the ZLB, there is no evidence in the recovery from the Great Recession of such a disanchoring. That fact appears in the stability of actual inflation in the "sticky-price" sector, in which firms set prices for multiple periods on the basis of their expectation of inflation. The public's expectation of near price stability reflected the longer-run effort of the FOMC to restore the price stability lost in the Great Inflation.[6] Although the FOMC adopted a 2 percent inflation target in January 2012, monetary policy continued to be consistent with a somewhat lower rate of inflation—that is, with near price stability of about 1.5 percent.

Headline inflation is a combination of inflation in the sticky-price sector and in the flexible-price sector (Aoki 2001; Mankiw and Reis 2003). The Atlanta Fed constructs a proxy for these inflation series using the frequency of price changes of the individual components (figure 9). Figure 10 offers an alternative measure assuming that prices in the services sector are changed less frequently than those in the goods sector. As shown in figure 9, starting with the Volcker disinflation and lasting through the Asia crisis at the end of the 1990s, apart from the period after the Louvre Accord in February 1987, monetary policy lowered sticky-price inflation (Hetzel 2008). Inflation in the sticky-price sector declined after the Great Recession. Going into the recession, from Q1 2007 through Q3 2008, PCE services inflation averaged 3.2 percent. In the subsequent period, Q4 2008 through Q4 2019, it declined to 2.1 percent (figure 10).

[6] Measurement of price stability must take account of upward bias in the price indices due to inadequate controls for quality changes in goods and services. The Boskin Commission (1996) estimated the bias at 1.1 percent.

Figure 9. Sticky-Price and Flexible-Price CPI Inflation

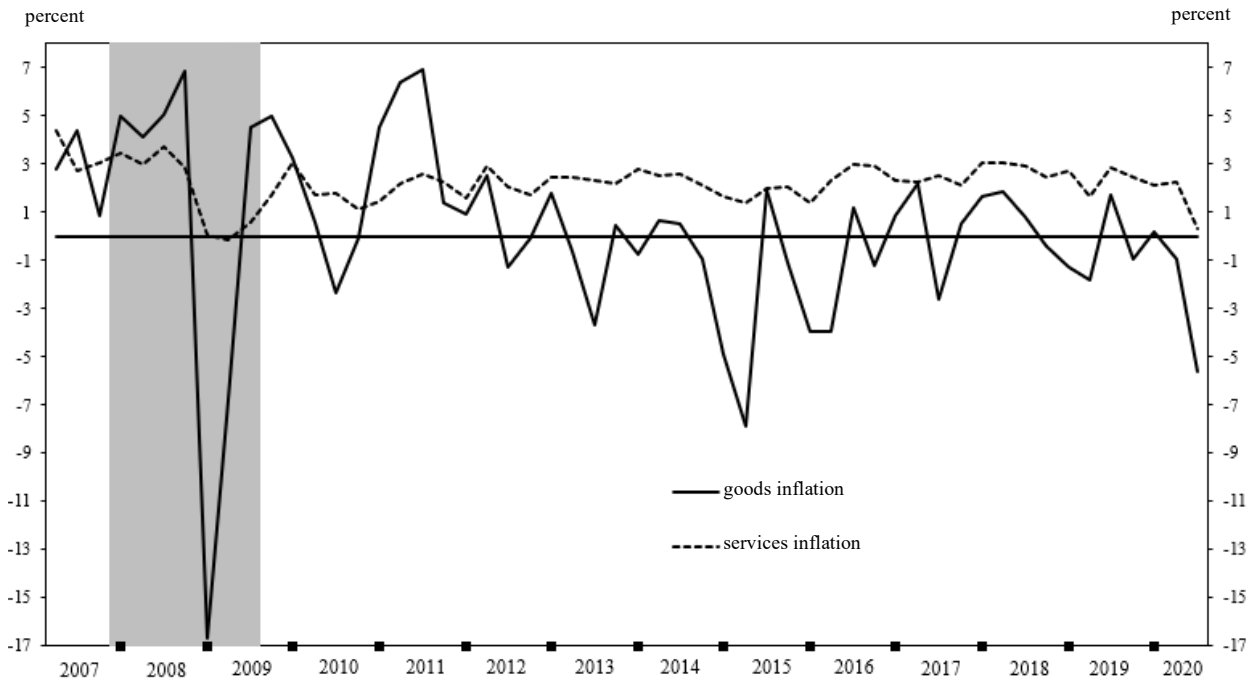


Note: Observations are 12-month percentage changes in sticky-price and flexible-price inflation. Heavy tick marks indicate December. CPI = consumer price index.
Source: Federal Reserve Bank of Atlanta. For construction of the series, see Bryan and Meyer (2010).

Until January 2012 and adoption of an explicit inflation target, the FOMC's implicit inflation objective was somewhat less than 2 percent. The near price stability that prevailed in the recovery period then should not be disconcerting. Shapiro and Wilson (2019a) wrote the following:

> In this *Economic Letter*, we summarize FOMC meeting deliberations leading up to the 2012 explicit target announcement, as examined in our recent study, Shapiro and Wilson (2019[b]). In numerous instances during deliberations, FOMC participants made explicit statements regarding their preferred inflation target. For example, in the March 21, 2007, meeting, then-President of the San Francisco Fed Janet Yellen stated, "I remain comfortable with the goal that I enunciated some time ago—a long-run inflation objective of 1½% for the core PCE inflation rate." Searching over the entire archive of publicly available historical transcripts of FOMC meetings, we track the explicit statements made by participants about their preferred inflation target…. The analysis shows that participants generally expressed a preference for an inflation target around 1½% from 2000 to at least 2007.

Figure 10. PCE Goods and Services Inflation



Note: Quarterly observations of percentage changes in the goods and services personal consumption expenditure (PCE) implicit price deflator. Shaded areas indicate National Bureau of Economic Research recessions. Heavy tick marks indicate fourth quarter.
Source: St. Louis FRED.

San Francisco Fed President Janet Yellen (2005) wrote, "I would characterize a long-run inflation objective centered on 1.5% for core PCE inflation as a 'modal' [FOMC] view." From Q1 2000 through Q1 2004, core PCE inflation (four-quarter averages) averaged 1.7 percent. In a discussion of a deflation trap, Chairman Bernanke (2008, 153) said, "[T]he best two ways to avoid it are, first, as President Lacker suggested, reaffirm our commitment to price stability defined as 1½ to 2 percent." (The second was to move aggressively if deflation threatened.) In discussing inflation targeting, Bernanke pointed out that the long-run projections for inflation contained in the FOMC's SEP made quarterly by FOMC participants substituted for an explicit inflation target. Bernanke (2015, 174) wrote, "The first set of projections under the new system

[at the October 2007 meeting] would show most FOMC members forecasting inflation in three years (in 2010) to be between 1.6 percent and 1.9 percent."

Following the recovery from the 2001 recession, flexible-price inflation significantly exceeded sticky-price inflation. Similarly, headline PCE inflation generally exceeded core PCE inflation. The integration of the BRICs (Brazil, Russia, India, and China) into the world economy raised flexible-price inflation by increasing the demand for commodities. From Q2 2004 through Q3 2008, core PCE inflation rose to 2.2 percent while headline PCE inflation rose to 2.8 percent (figure 2). By concentrating on headline inflation, central banks through restrictive monetary policy lowered core inflation (Hetzel 2012). Trend inflation in the sticky-price sector fell from around 3 percent going into the 2008 recession to around 2 percent afterward (figure 9).

In updating the statistical decomposition of inflation into a time-varying trend and into transitory changes in Stock and Watson (2007), Cecchetti et al. (2017) found that the trend for core PCE inflation declined after the Great Recession to about 1.5 percent. A weak world economy starting in 2012 kept inflation in the flexible-price sector low through weak commodity prices, especially oil. The combination of stable but low inflation in the sticky-price sector and low inflation and even deflation in the flexible-price sector generally kept headline inflation below 2 percent. The disinflation of the Great Recession firmly embedded the public's expectation of near price stability.

The recovery from the Great Recession provides no support for the fear that this expectation of near price stability could become unanchored to the downside. Measures of expected inflation declined slightly as evidence accumulated that historically low interest rates did not produce inflation. In the University of Michigan Surveys of Consumers, the median expected price change for the next 12 months averaged 3.2 percent for the period January 2012 to

December 2014. It then declined to 2.6 percent over the interval January 2015 to February 2020 (2.7 percent for the period March 2020 to October 2020). The five-year, five-year forward expectation of inflation calculated from 10-year and 5-year nominal and Treasury inflation-protected securities (TIPS) averaged 2.6 percent over the period November 2009 through September 2014. It then declined to 2.0 percent over the period October 2014 to February 2020.[7]

Concluding comment

In August 2020 in a speech at the Jackson Hole Conference, Chair Powell used a revision of the FOMC's "Statement on Longer-Run Goals and Monetary Policy Strategy" to announce a new strategy for monetary policy. According to Powell, the FOMC can run an expansionary monetary policy to achieve an unemployment rate low enough to achieve socially desirable goals. The reason is that the world has changed so that even with low levels of unemployment, inflation does not emerge. (The Phillips curve is flat down to historically low levels of unemployment.) To discover this minimal level of unemployment, monetary policy should be expansionary until inflation rises persistently above the FOMC's 2 percent inflation target. The new policy required rejection of the Volcker-Greenspan FOMCs' policy of preemption—that is, raising the funds rate during economic recoveries to forestall the emergence of inflation.

Much of the inspiration for this changed policy rests on the quiescence of inflation in the prior period of economic recovery. Inflationary expectations remained centered near price stability. For the period from December 2008 through December 2016, the funds rate remained

[7] Data are from St. Louis FRED. From August 2020 through November 2020, the five-year, five-year forward expectation of inflation averaged 1.8 percent. The reason for omitting the observations at the start of the pandemic is that in times of financial stress, TIPS become relatively illiquid so that their yield rises. At the same time, the on-the-run 10-year Treasury yields decline because of the demand for safety and liquidity. It then appears as though expected inflation has declined.

at, and then close to, the ZLB and yet inflation generally remained somewhat less than the FOMC's inflation target of 2 percent. Moreover, the unemployment rate fell from a peak in October 2009 of 10.0 percent to 3.5 percent in February 2020. The narrative here is consistent with a monetary policy either moderately contractionary or neutral in the recovery. Nothing in this experience suggests that the FOMC can run an expansionary monetary policy until the unemployment rate has declined sufficiently to cause a controlled, moderate overshoot of the 2 percent target.

The recovery from the Great Recession was a period of considerable economic stability. The FOMC should ask what it did right, not what it did wrong. Preemption did not prevent a decline in the unemployment rate to a historically low level. Inflationary expectations did not become unanchored to the downside. Nothing in this period or in the more distant past demonstrates that the FOMC can successfully exercise the kind of control over the economy required to pursue an expansionary monetary policy to lower the unemployment rate to a minimal level, as indicated by an overshoot of the FOMC's 2 percent inflation target, and do it without destabilizing prices and the economy.

The change in monetary policy that occurred after February 2020 is a rare example of a clear monetary experiment. Its intellectual roots go back to the Keynesian policies of the 1970s. Whatever the outcome, monetary economists and policymakers will need to learn from it.

Appendix: The FOMC's QE programs

QE1: The Fed announced QE1 on November 25, 2008. It targeted total purchases of up to $100 billion in agency debt and $500 billion in agency MBS. On March 18, 2009, it increased substantially the size of the program. The Fed committed to buying an additional $100 billion in agency debt and $750 billion in agency MBS through December 2009, and $300 billion in longer-term Treasury securities through September 2009.[8] From November 2008 through the end of 2009, the Fed purchased $1.75 trillion of securities (10.8 percent of GDP).

QE2: On November 3, 2010, the Fed announced the purchase of $600 billion of long-term Treasuries terminating December 31, 2012 (3.9 percent of GDP).

MEP (maturity extension program): The Fed exchanged $667 billion of short-term Treasuries for long-term Treasuries with no change in the size of its balance sheet (4.1 percent of GDP). The FOMC announced the program in September 2011 and continued it through the end of 2012.

QE3: From September 2012 to October 2014, the Fed purchased about $1.6 trillion of assets consisting of approximately equal amounts of agency MBS and long-term Treasury securities. On September 13, 2012, the Fed announced monthly purchases of $40 billion of MBS and $85 billion of long-term Treasuries in aggregate through year-end as part of the Monetary Extension Program (twist). In December 2012, it continued the monthly purchases of $40 billion per month for agency MBS plus $45 billion per month for Treasuries. QE3 purchases amounted to 9.3 percent of GDP.

[8] The heavy preponderance of purchases of MBS as opposed to Treasury securities reflected the belief that the problem was not contractionary monetary policy but rather a failure of financial intermediation centered on the housing market. QE1 still caused many in financial markets to worry about "runaway inflation" (Torres and Boesler 2016). Purchasing Treasury securities was presumed inflationary because it financed the government's deficit.

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