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*“Unwinding Quantitative Easing: How the Fed Should Promote Stable Prices,
Economic Growth and Job Creation”*

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The Federal Reserve did an admirable job navigating through the financial crisis that began in 2007, the resulting Great Recession, and the subsequent economic recovery. Without the Fed's aggressive actions, the financial system would have collapsed and the economy would have suffered a depression.

The Federal Reserve took a range of extraordinary steps to quell the financial panic. It established new credit facilities to provide liquidity to financial institutions and markets. To stabilize the banking system, the Fed required the nation's largest bank holding companies to conduct stress tests and raise enough capital to withstand the worst credit losses on record.

The Fed aggressively lowered interest rates, adopting a zero interest-rate policy by the end of 2008. To bring down long-term interest rates, it has engaged in massive bond-buying, aka quantitative easing. The QE program began in 2009; by the time it ends, likely later this year, it will have added nearly \$3 trillion in Treasury bonds and Fannie Mae and Freddie Mac mortgage-backed securities to the Fed's balance sheet.

QE has drawbacks, but on net it has supported a weak economy. The increase in the Fed's balance sheet has reduced 10-year Treasury yields by an estimated 85 basis points and lifted stock prices more than 10%. This in turn has lifted real GDP by 1.2 percentage points, supporting 1.35 million additional jobs and lowering the unemployment rate by approximately 0.7 percentage point.

As the recovery has gained traction and unemployment has declined, the Fed has begun to taper its bond-buying program. The Fed has the tools and the resolve necessary to ensure its exit will not undermine the recovery, but shrinking its balance sheet and raising rates will be a slow and difficult process.

Key to the successful normalization of monetary policy is the Fed's use of forward guidance—signaling to financial markets, businesses and households the central bank's intentions regarding monetary policy—to manage the increase in long-term interest rates consistent with improvements in the job market. The Fed has moved away from explicit unemployment-rate thresholds for future rate increases to qualitative guidance regarding the criteria for those rate increases. The Fed will almost surely have to adjust its forward guidance to gracefully manage future increases in long-term interest rates.

Getting this right will not be easy, and an unwanted increase in interest rates is the most serious threat to the recovery. The economy's long-term potential would be impaired if long-term unemployment remains high, wasting much valuable human capital. Nonetheless, the chances are good that policymakers will get this reasonably right and the economy will continue to improve, completing a long and painful trip back from the financial crisis and Great Recession.

Policy in the panic

The Federal Reserve's unprecedented policy response to the crisis that began in 2007 was vital to forestall a collapse of the financial system and a much more severe economic downturn. Most notable were new credit facilities, stress-testing for financial institutions, zero short-term interest rates, and quantitative easing.

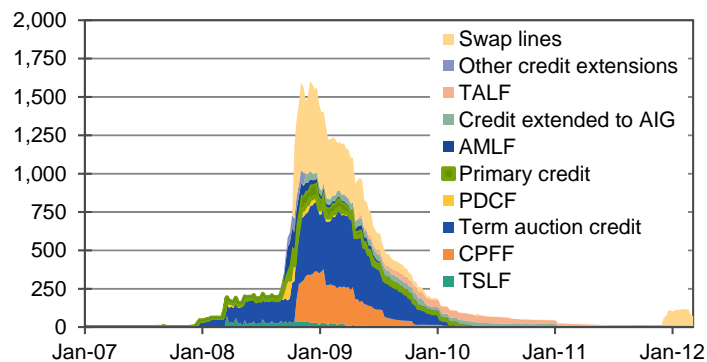
Credit facilities

The Fed introduced a series of new credit facilities beginning early in the financial crisis. Within a few months, the Term Auction Facility, the Term Securities Loan Facility, the Term Asset-Backed Securities Loan Facility, the Commercial Paper Funding Facility, the Money Market Investor Funding Facility, and currency swap lines had been set up.

During the height of the crisis in late 2008, these facilities provided close to \$1.5 trillion in liquidity to the financial system (see Chart 1). Without them, vital parts of the financial system could easily have shut down. Particularly threatened was the important commercial paper market, a key source of short-term funds for nonfinancial corporations. Losing the ability to issue commercial paper would have impaired many firms' operations, with a devastating impact on the economy.

Chart 1: Aggressive Fed Action During the Crisis

Federal Reserve's short-term lending operations, \$ bil



Sources: Federal Reserve, Moody's Analytics

The credit facilities were artfully designed to grow more costly to financial institutions as credit markets healed and private sources of liquidity became available. Consequently, the facilities wound down as the crisis abated, and had all but faded away by the end of 2011.

Stress-testing

Also instrumental in stemming the financial crisis were bank stress tests, introduced in the U.S. in early 2009. The banking system was then near collapse, and while the government had managed to keep some institutions alive, no one knew what it would take to restore them to health.

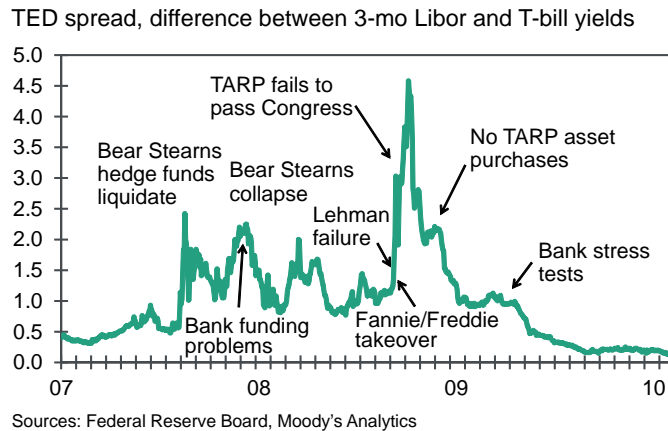
The U.S. Treasury and Federal Reserve designed the stress tests to find out. Banks were asked to assess what could happen to their mortgages, credit cards and other loans if the economy were to fall into a 1930s-style depression, and to raise the capital necessary to withstand the losses that would result from such a scenario.

Banks objected to the exercise. The stress tests were complicated, and the thought of going cap in hand to investors for more capital was uncomfortable. Worse, if banks could not raise the necessary capital from private sources, they would have to accept it on punitive terms from the government.

But regulators overruled the banks, wisely as it turned out. The stress tests worked. The banks were recapitalized, and markets as well as the bankers themselves were reassured that the system was sound. A few months after the U.S. financial system had been near collapse, it was up and running again. The TED spread, a good measure of

banks' fear about lending to each other, quickly returned to its precrisis level (see Chart 2). The banks knew that if their counterparties went through the stress tests as they had, they were on very solid financial ground.

Chart 2: Policymakers Stabilize Banking System



Stress-testing has since become a standard part of global financial regulation. Former Fed Chairman Ben Bernanke often points to stress-testing when asked what he likes most in financial regulatory reform.¹ European authorities are conducting extensive stress tests this year, and the International Monetary Fund advocates their adoption by all its member countries. The largest financial institutions in the world test every year. They no longer complain, viewing the exercise as critical for robust risk and capital management.

Stress-testing has helped put the global financial system on a stronger foundation, but it has also given central banks an immensely powerful tool. More than ever, central bankers can now determine the flow of credit to the economy and where that credit goes. The potential for unintended consequences is significant.

Overly stringent stress tests could force the banks to hold too much capital and to restrict credit, stunting economic growth and hampering the global recovery. Even in better times, central banks will need to be aware of how excessively rigorous stress-testing can affect the economy. It is comforting to think that if such tests had been the norm a decade ago, they might have helped central banks curb the runaway mortgage lending that inflated the housing bubble. But what if the tests had also discouraged banks from backing worthwhile innovations, such as clean power and information technology, which have raised living standards?

Stress-testing could stifle financial innovation. By definition, new financial products have no track record; thus the historical data needed for rigorous analysis are lacking. Central banks will likely be harder on new products that cannot be assessed quantitatively.

There is also the risk that stress-testing could evolve into financial protectionism. Most major banks maintain global operations, and the stress tests rightly consider global economic conditions. But if regulators grow concerned that banks are lending too much overseas, they could construct test scenarios in which the global economy is hit by a severe downturn. Banks would be forced to hold more capital against overseas loans, prompting them to cut back on foreign activities.

Like any tests, these also encourage test-takers to focus simply on passing. This means banks' models and risk-management methods will look increasingly the same, and lending practices will grow increasingly uniform. If passing the stress tests means favoring some types of loans over others, banks could herd in that direction, threatening financial stability.

Banks may take less risk because of the stress tests, but those risks may simply move to other, less visible, parts of the financial system where there are no stress tests and central banks have less influence. The failure of institutions in this so-called shadow banking system could ultimately threaten the economy.

Central bankers must be sensitive to the added clout they wield through the stress tests. They must be more transparent about the tests' methodology, the results, and how they will ensure that tests are in the public interest. In the U.S., the Financial Stability Oversight Council—a consortium of regulators established under the Dodd-Frank Act to identify systemic threats to the financial system—should evaluate the stress tests.

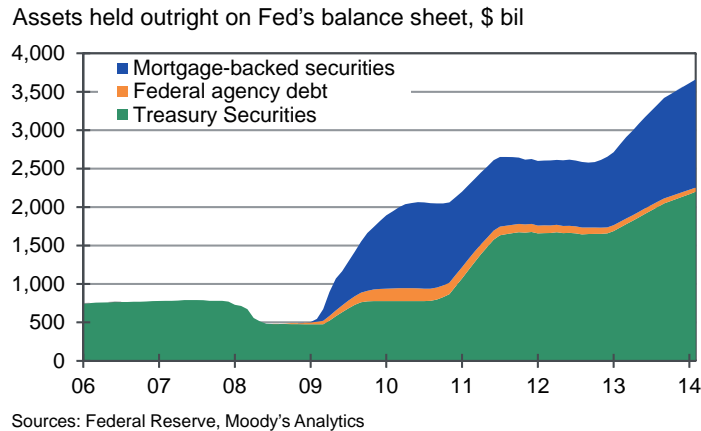
Legislators must also increase their oversight of the Fed, probing not only interest-rate policy and balance-sheet size, but also the stress tests' mechanics. Lawmakers should be asking, why are banks being asked to stress to one economic scenario and not another? Why is the recession in a given scenario not more severe, or less? And should the test be harder on one type of lending than another? Legislators have a responsibility to regulate the regulators.

Bank stress tests helped save the global economy from depression, and remain critical to a well-functioning financial system. Prudent oversight will ensure that they continue to play a positive role.

ZIRP and QE

Further mitigating the severity of the financial crisis and its economic fallout was the Fed's aggressive lowering of interest rates. The Fed cut short-term rates effectively to zero by early 2009, and then worked to reduce long-term interest rates further by expanding its balance sheet through massive bond purchases (see Chart 3).

Chart 3: Fed's Balance Sheet Balloons With QE



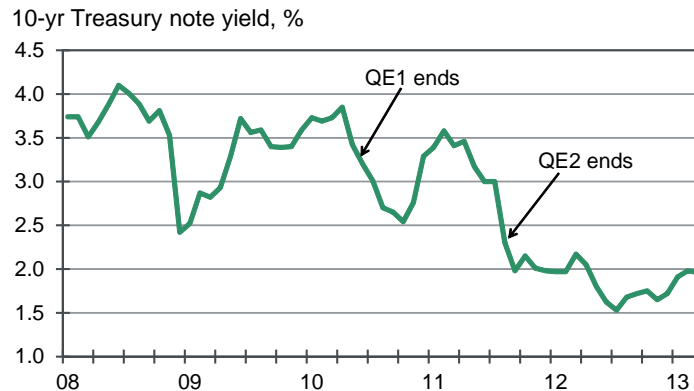
The Fed's bond-buying or quantitative easing program has been controversial, but its fundamental mechanics are no different than those of traditional monetary policy. As when the Fed lowers its benchmark short-term rate target, QE simply increases reserves in the banking system. The difference is simply scale, as QE has resulted in a significant surfeit of bank reserves.

There is a reasonable debate over how QE lowers long-term interest rates. The "stock view" holds that different financial assets are not perfect substitutes. As such, changes in the net supply of an asset affect its yield and those of similar assets.ⁱⁱ As the Fed purchases assets, the pool of those assets shrinks, reducing the risk premium required to hold the remainder. Some investors are displaced and invest in other financial assets.ⁱⁱⁱ The stock view holds that bond investors price in QE programs when they are announced, and that when bond-buying ends there will be little immediate impact on interest rates.

The "flow view" holds that future Fed purchases, not the amount of an asset that the Fed has already bought, affect the price of the assets the Fed is purchasing. The flow view implies that long-term rates will increase when bond-buying concludes. Bond investors will not step up at current interest rates and purchase tens of billions of dollars in monthly Treasury and MBS issuance when the Fed stops buying.

There is substantial empirical evidence to support the stock view. Interest rates did not increase significantly when the Fed ended its first or second rounds of QE (see Chart 4).^{iv} Moreover, if it is obvious that rates will spike once the Fed ends QE, why are investors not selling U.S. debt now in anticipation? Even if one does not believe markets are efficient, and that investors price in the effects of Fed purchases when they are announced, one would have to believe that obvious gains or losses will be anticipated.

Chart 4: Stock, Not Flow, Counts in Long-Term Rates



Sources: Federal Reserve, Moody's Analytics

Insurance companies, pension funds, the Social Security Trust Fund, and sovereign wealth funds will remain big buyers of U.S. government debt given their covenants and business models. And investors who are not buying U.S. debt at current interest rates will not have an effect on interest rates when QE3 ends since they have already been priced out of the U.S. government debt market.

In the current macroeconomic environment, the logical implication of the stock view is that Treasury yields will increase only to the extent that the Fed's portfolio of Treasuries shrinks. The end of QE will certainly put upward pressure on long-term interest rates, but the stock view implies that by gradually shrinking its portfolio of bonds, the Fed can gracefully manage the increase in long-term rates.

Quantifying the Fed's role

To quantify the economic impact of the Fed's actions during the financial crisis, the Moody's Analytics model of the U.S. economy was simulated under a baseline scenario that includes all the policies actually pursued (financial and fiscal), and a counterfactual scenario that excludes the policies implemented by the Fed.^v The difference between these scenarios provides an estimate of the impact of the steps taken by the Fed during the crisis.^{vi}

In the scenario that assumes the Fed did not respond, the Great Recession would have gone on for another year; instead of an 18-month downturn lasting through mid-2009, it would have extended into summer 2010. By 2011, real GDP would have been almost \$800 billion, or 6%, lower without the Fed's actions, and the unemployment rate almost 3 percentage points higher. By the second quarter of 2011—when the economic impacts are their largest—the Fed's financial-rescue policies are credited with saving almost 5 million jobs.

Evaluating QE

Of all of the Fed's policy actions since the financial crisis, QE is the most controversial. This is with good reason, as QE has both positive and negative economic consequences. On net, QE has provided a meaningful boost to the economy and jobs, but that net benefit has diminished with each successive round.

The economic benefit of QE is straightforward. By reducing long-term interest rates, QE lifts stock prices and house values and thus household wealth, reduces borrowing costs for households and businesses, and makes it easier for debtors to deleverage.^{vii}

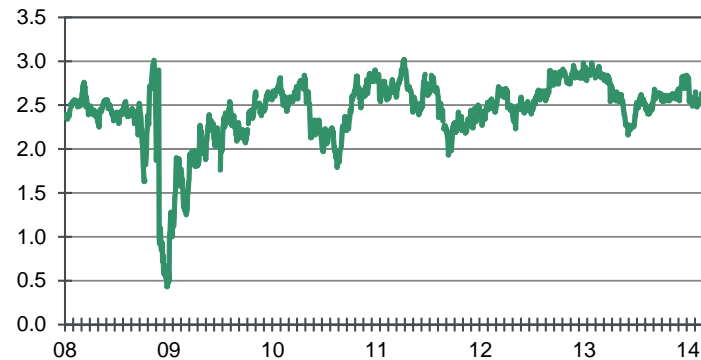
These benefits have diminished with each new round of QE. The first round of QE was launched when the downturn was at its sharpest; each subsequent round occurred with the economy in successively better shape. The impact of the first round of QE was amplified by signaling how aggressive the Fed would be in responding to the crisis. Investor, business and consumer confidence were fragile, and the Fed's decision to launch QE stabilized sentiment. The first round of QE also provided liquidity to the financial system, a benefit that became less important as financial markets settled.

Many potential costs of QE have also been identified. Most notable include: (1) dislodging long-term inflation expectations; (2) disrupting financial markets; (3) creating financial imbalances and asset bubbles; (4) pressuring emerging economies with large current account deficits; (5) financial repression; and (6) capital losses on the Fed's Treasury and MBS holdings.

Fears that QE could dislodge long-term inflation expectations have not been realized, at least to date. Survey- and market-based measures of long-term inflation expectations have been well-behaved. The five-year forward, five-year breakeven consumer price inflation rate has remained remarkably stable near 2.5% (see Chart 5). This is consistent with the Fed's inflation target.^{viii}

Chart 5: Inflation Expectations Still Well-Anchored

Inflation expectations, 5-yr, 5-yr forward



Sources: Bloomberg, Moody's Analytics

QE could also potentially impair the functioning of financial markets. As the Fed increases its bond purchases, it could inhibit liquidity in the Treasury and MBS markets. There is some evidence of this occurring in Japan, as the Bank of Japan is purchasing roughly three-quarters of net government issuance, and Japanese government debt yields have become more volatile while trading volumes have fallen markedly. However, despite the recent decline in MBS issuance given weaker mortgage origination volumes, there is scant evidence of this occurring in the U.S. bond market.

Financial imbalances or even asset bubbles could form as a result of QE. This could happen if QE causes excessive risk-taking as investors search for higher returns. This is a consequential risk, but to date there is no evidence that bubbles are forming in asset markets. QE has helped push stock prices to record highs, but price-to-earnings ratios—among the best gauges of equity valuation—are still near their long-run averages. Corporate earnings have never been higher and profit margins never wider, as American companies have significantly reduced their cost structures. Credit spreads in the bond market have also narrowed, but they are also within historical norms. Leverage is also a telltale sign of a bubble, and leverage is currently low and stable.

The low level of interest rates has reduced income for households with most of their savings in cash-like instruments. Most of these households have other asset holdings, such as stocks, bonds and homes, and thus have on net benefited financially from QE. However, some older savers are not invested in these other assets and are appropriately reluctant to trade cash-like investments for riskier assets. While this is clearly a downside to QE, this group is small.

Emerging economies with large current account deficits have also been buffeted by QE, most notably Brazil, India, Indonesia, Turkey and South Africa. When the Fed was ramping up QE and global interest rates were falling, global investors seeking higher returns invested heavily in these countries, driving up their currency exchange values and asset prices. Now that the Fed is tapering QE, these same economies have seen their currencies fall and interest rates rise as their central banks defend their exchange rates and battle inflation. Growth in these economies has slowed sharply as a result. This is certainly a negative side effect of QE that should matter to the Fed, as emerging markets are key to global and thus U.S. growth. Still, the Fed must ultimately focus first on what is best for the U.S. economy.

There is also some concern that QE poses a risk to the Fed's balance sheet. Rising interest rates could lead the Fed to suffer an operating loss if it sells assets before they mature. But the Fed has made it clear that it intends to allow the securities on its balance sheet to go to maturity. Even if the Fed decided to sell assets at a loss, the biggest hazard would be to its own credibility. While the Fed is not required to have positive remittances to the Treasury, not doing so could bring political repercussions.

Quantifying QE's impact

An event study was conducted to quantify the economic impact of QE. The dates when there was a Fed announcement on QE are identified, and the impact on interest rates, stock, and the value of the U.S. dollar during a one-day observance window is recorded.^{ix} To determine the impact on the economy, the direct interest rate, stock market, and U.S. dollar effects of QE from the event study were used to shock the Moody's Analytics macroeconomic model.

The event study makes the assumption that the selected event set captures all instances in which Fed communications affected QE expectations, and that no other events affected expectations. Financial markets are also assumed to be efficient so that the effect of QE announcements occurs not when the actual bond purchases take place, but instead when the announcement changes market participants' expectations.

The first step in conducting an event study is to identify all instances in which the Fed provided new information about its QE programs. There have been four noteworthy programs: QE1, QE2, Operation Twist and QE3 (see Table 1). After the events have been selected, it is important to define the adjustment interval in which market participants "price in" the announcement or adjust asset prices based on new information—in this case information released by the Fed. Some event studies use intraday prices to determine response windows, but given the novelty of QE, market participants may respond more

slowly to QE announcements than to conventional monetary policy.^x As such, this study considered a one-day response window: the change in the asset price from the last value prior to a QE announcement and the last closing value on the day of the announcement was recorded. The one-day response window used in the study is assumed to be wide enough to capture the financial market effects of the announcements, but not so wide that it also captures the impact of information unrelated to QE.

Table 1: Chronology of Federal Reserve Large-Scale Asset Purchase Announcements

Event	Date	Related LSAP Program	Action
Fed press release	11/25/2008	QE1	Federal Reserve announces \$100 bil in agency debt purchases and \$500 bil in agency MBS purchases
Chairman speech	12/1/2008	QE1	Chairman Ben Bernanke suggests the Fed could expand its initial LSAP program by buying Treasuries
FOMC statement	12/16/2008	QE1	FOMC announces it is considering purchasing Treasuries
FOMC statement	1/28/2009	QE1	FOMC moves closer to Treasury purchases
FOMC statement	3/18/2009	QE1	FOMC expands its initial LSAP program by announcing purchases of up to \$300 bil in longer-term Treasuries, \$200 bil in agency debt and \$1.25 tril in agency MBS
FOMC statement	8/12/2009	QE1	FOMC drops language qualifying the maximum amount of Treasury purchases
FOMC statement	9/23/2009	QE1	FOMC drops language qualifying the maximum amount of agency MBS purchases
FOMC statement	11/4/2009	QE1	FOMC announces it would purchase around \$175 bil in agency debt
FOMC statement	8/10/2010	QE1	FOMC announces reinvestment of agency debt and agency MBS principal payments
Chairman speech	8/27/2010	QE2	Bernanke lays the groundwork for QE2
FOMC statement	9/21/2010	QE2	FOMC explicitly acknowledges that it is considering QE2
FOMC statement	11/3/2010	QE2	FOMC announces additional purchases of \$600 bil in longer-term Treasuries and reaffirms principal reinvestment
Chairman speech	8/26/2011	Operation Twist	Bernanke foreshadows Operation Twist
FOMC statement	9/21/2011	Operation Twist	FOMC announces \$400 bil in purchases of 6- to 30-yr Treasuries, offset with equal sales of Treasuries with maturities of 3 yrs or less
FOMC statement	6/20/2012	Operation Twist	FOMC announces it will extend Operation Twist through the end of 2012
FOMC statement	9/23/2012	QE3	FOMC announces it will purchase \$40 bil in agency MBS and \$45 bil in longer-term Treasuries per month indefinitely
FOMC statement	12/12/2012	QE3	FOMC announces it will replace Operation Twist with outright Treasury purchases of equal amount

Source: Moody's Analytics

According to the event study, the yield on the 10-year Treasury note is 85 basis points lower than it otherwise would be if the Fed had not conducted any large-scale asset purchases. The 30-year fixed wholesale mortgage rate is 45 basis points lower, and the

yield on three-year agency debt obligations is 100 basis points lower (see Table 2).^{xi} Stock prices, as measured by the S&P 500 index, rose more than 10%, and the broad trade-weighted value of the U.S. dollar declined by about the same amount. These estimates are probably conservative, as bond and stock investors anticipated QE2 and QE3 long before the Fed announced the programs. This cannot be picked up by the event study.^{xii}

Event	Date	2-yr UST Bps	10-yr UST Bps	30-yr WMR* Bps	30-yr agency MBS Bps	3-yr agency debt Bps	10-yr swap Bps	Baa index Bps	S&P 500 %	Value of the \$ %
Fed press release	11/25/2008	-2	-21	7	-44	-24	-29	-9	0.66	-1.25
FOMC statement	12/16/2008	-8	-25	-8	-29	-18	-32	-15	5.14	-1.93
FOMC statement	1/28/2009	10	14	-11	7	5	14	14	3.36	0.28
FOMC statement	3/18/2009	-22	-48	1	-15	-33	-38	-23	2.09	-2.68
FOMC statement	8/12/2009	-2	5	-5	3	-2	-99	10	1.15	-0.49
FOMC statement	9/23/2009	1	-2	-2	-1	-5	-5	-2	-1.01	-0.09
FOMC statement	11/4/2009	-1	5	4	0	4	5	9	0.10	-0.98
FOMC statement	8/10/2010	-1	-7	-1	-2	-3	-6	3	-0.60	0.11
Chairman speech	8/27/2010	3	16	-4	12	9	17	17	1.66	-0.01
FOMC statement	9/21/2010	-4	-13	-8	-10	-8	-12	-8	-0.26	-1.11
FOMC statement	11/3/2010	-1	-2	-9	-2	-1	-2	12	0.37	-0.31
Chairman speech	8/26/2011	-2	-4	-6	-3	-6	-6	-4	1.51	-0.63
FOMC statement	9/21/2011	3	-8	-1	-24	8	-7	-16	-2.94	0.40
FOMC statement	6/20/2012	2	4	2	7	2	3	-2	-0.17	0.25
FOMC statement	9/23/2012	0	-4	-5	-3	0	-4	-7	-0.22	0.24
FOMC statement	12/12/2012	0	5	1	3	0	4	5	0.04	-0.30
Cumulative effect:		-24	-85	-45	-101	-72	-197	-16	10.9	-8.5

*30-day commitment rate for 30-yr fixed mortgage; represents the wholesale mortgage rate
Sources: Bloomberg, Moody's Analytics

The event study also supports the view that QE works through the portfolio balance effect. Swap rates and corporate bond yields declined even though the Fed did not directly purchase these assets. Similarly stock prices rose and the value of the dollar declined.

In order to measure how QE affected the economy, the Moody's Analytics macroeconomic model was simulated incorporating the direct changes in interest rates and stock prices derived from the event study. Based on this simulation, as of the fourth quarter of 2013, QE increased real GDP by 1.2%, lifted employment by 1.35 million jobs, and reduced the unemployment rate by 0.7 percentage point.

Graceful exit

Whether the Fed's aggressive policy actions since the financial crisis will ultimately be deemed a success depends on whether the Fed is able to normalize monetary policy without hurting the recovery. Normalization entails ending QE and raising short-term interest rates from zero to around 4%, the consensus of the Fed on where short-term rates should settle in the long run. This requires that policymakers manage short- and long-term rates higher consistent with an improving job market and inflation near the Fed's 2% target. While there will surely be fluctuations in interest rates over the next several years, and some moves could be harrowing, policymakers have the necessary tools, creativity, and resolve to engineer a reasonably graceful exit from QE and ZIRP.

Since the financial crisis, monetary authorities have developed a number of mechanisms for managing short-term interest rates when the banking system is awash in excess reserves, as it is today. This includes the ability to pay interest on excess reserves, term deposits, and fixed-rate reverse repurchase operations.

The fixed-rate reverse repo program appears especially effective in setting a floor under short-term rates. The Fed has been working with primary dealers and money market funds to ensure the program is effective. While there may be some changes to the program, including increasing the counterparties such as the Federal Home Loan Banks and adding to the universe of eligible collateral, it appears to be operating well.

The rate on reverse repos is likely to become the key benchmark short-term rate, with the federal funds rate and interest on excess reserves eventually harmonized to it. The repo market is especially important to the financial system. Repos allow investors to finance long positions by selling securities with an agreement to repurchase them at a later date at a specified price. This allows the efficient transformation of collateral between investors, and is thus essential to creating liquidity in financial markets.

Forward guidance

The Fed's principal mechanism for managing long-term interest rates is forward guidance—communicating to bond investors its intentions regarding quantitative easing and the size of its balance sheet and the path of short-term interest rates. Policymakers have honed their use of forward guidance, at times using calendar-based guidance and at others employing performance-based guidance.

At the mid-March meeting of the Federal Open Market Committee, policymakers dropped explicit unemployment-rate thresholds for ending QE and raising short-term rates in favor of qualitative guidance. That is, stating that the Fed's ZIRP will remain in place for a "considerable time after the asset purchase program ends," depending on "measures of labor market conditions, indicators of inflation pressures and inflation expectations, and readings on financial developments."^{xiii}

If growth accelerates this spring as expected, the current qualitative forward guidance may not be sufficient to keep long-term interest rates where policymakers want them. Bond investors will begin to pull forward expectations of the Fed's first rate hike. This will be an important test, much like the jump in long-term rates last summer when discussion of QE tapering first began. Policymakers succeeded in reining in long-term rates last fall, and they will likely need to be as creative and resolute this spring. While it will be tricky to successfully calibrate a communication strategy, odds are good they will succeed.

Fallout from higher rates

Rising interest rate cycles have been hard on the economy in times past, and there surely will be another adjustment this time. However, there are good reasons to think the adjustment will be manageable.

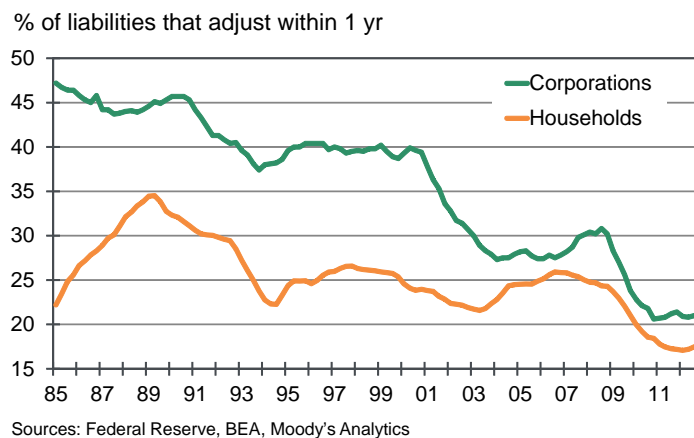
Arguably the biggest adjustment is already taking place in the mortgage market. Mortgage refinancing activity was going strong earlier in the year when fixed mortgage rates were hovering around 3.5%. With the average coupon on outstanding mortgages close to 5%, refinancing was robust. Refinancing by underwater homeowners was also being accelerated by a popular federal government program. However, with mortgage rates now at 4.5%, refinancing has tailed off, and if rates move much above 5%, activity will come to a standstill.

The rise in rates will dampen the housing recovery, at least temporarily. Potential first-time homebuyers are especially sensitive to any increase in rates given tight lending conditions. The average credit score for new purchase loan originations is close to 750, compared with closer to 700 prior to the recession. For context, the average credit score among all consumers with scores is about 700.

Higher rates may also have crimped the stock market rally. Stock prices have risen sharply, so it would not take much to jar them. The easy money in the stock market has probably been made, at least until the rising interest rate cycle is over.

Cushioning the fallout from rising rates on the economy is the diligence of households, businesses and government to lock in historically low rates. Households have worked especially hard at this, replacing adjustable-rate with fixed-rate mortgages. They have also paid down or defaulted on other higher cost variable-rate credit card and home equity loans. Only about 15% of household liabilities have interest rates that adjust within one year of a change in market rates. This compares with a peak of 35% in the late 1980s (see Chart 6).

Chart 6: Businesses, Households Lock In Low Rates



Bigger businesses have also diligently worked to raise as much cash as possible at favorable interest rates. Corporate bond issuance has surged over the past several years. Companies with the best financials are borrowing at rates close to that of the Treasury, while even companies with riskier financials have been able to borrow at record low rates. Interest coverage ratios for nonfinancial corporations—the share of cash going to debt service—are about as low as they have ever been.

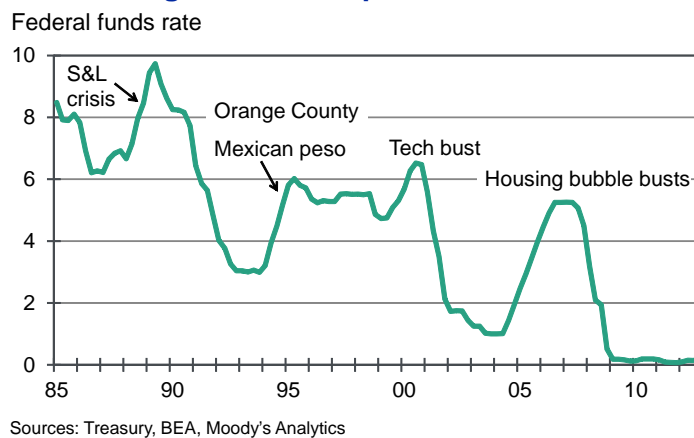
Even the federal government is scrambling to lock in low long-term interest rates. The average maturity of outstanding Treasury debt is well over five years and rising. Assuming that rates normalize over the next several years as expected, the government's interest expense as a share of GDP will remain within historical averages and not threaten the government's fiscal situation.

The nation's banking system is also well-prepared for the coming increase in interest rates. The Fed's Comprehensive Capital Analysis and Review stress-testing process has as one of its scenarios rapidly rising inflation and interest rates. The hypothetical rise in rates is so large and so fast that it is hard to imagine happening in reality, but this is the scenario the biggest banks are raising capital and liquidity to withstand. With regulators

and bankers on high alert for a spike in rates, odds are low that such a scenario, if it were to come to pass, would do the kind of damage it has in past rate cycles.

This is not to say there will not be a significant misstep somewhere in the financial system as rates rise. Regardless of how well the Fed telegraphs rate increases, it would not be surprising if an unregulated financial institution were to be caught making a wrong-way bet. Similar missteps occur in all rising interest rate cycles (see Chart 7). However, with such a well-capitalized and liquid banking system, it is less likely such a financial event would become a serious macroeconomic problem this time.

Chart 7: Higher Rates Expose Excesses



Exceptionally favorable credit conditions also put the banking system in good stead as rates rise. Underwriting has been especially tight since the recession and, along with better household and business balance sheets means that banks will not see the credit problems suffered in earlier periods of rising rates. Delinquencies on commercial and industrial loans, credit cards, and auto loans have never been as low. Even first mortgage loan quality is fast improving, with exceptionally low and falling 30- and 60-day delinquency rates. It would take much higher rates and a much weaker economy to significantly undo this.

Banks will also benefit from a wider yield curve. Both short-term and long-term rates will rise, but bond investors will push up long-term rates well before the Fed increases short-term rates. The recent increase in long-term rates demonstrates this. While the Fed must manage long-term rates so they do not get too far ahead of short-term rates, the yield curve will widen through early 2015, fattening banks' net-interest margins, something bankers have been anticipating for some time.

Higher rates and borrowing costs pose a challenge for loan growth, however. If higher rates are driven by better economic growth and lower unemployment as anticipated, loan growth should hold up. Moreover, bankers will likely respond by easing their underwriting standards, as they should, given good credit conditions. Besides, greater credit availability will be necessary to fuel the stronger economy.

The nation's economic prospects are improving. While the recovery has faltered several times before, the economy is now in a much better place. The last serious threat to this optimism is the coming rise in interest rates. The Federal Reserve should be able to manage this, and if it succeeds as anticipated, the economy will soon be growing at full stride.

ⁱ See the speech “Stress Testing Banks, What Have We Learned,” Bernanke, April 8, 2013. Speech at Atlanta Federal Reserve Financial Markets Conference.

<http://www.federalreserve.gov/newsevents/speech/bernanke20130408a.htm>

ⁱⁱ Bernanke, Ben. 2010. Speech at Jackson Hole, Wyoming.

<http://www.federalreserve.gov/newsevents/speech/bernanke20100827a.htm>

ⁱⁱⁱ This is the “portfolio balance” effect. Tobin, James. 1958. “Liquidity Preference as Behavior Towards Risk.” *Review of Economic Studies* 25: 124-31.

^{iv} Many prominent commentators predicted such a spike in interest rates and were ultimately disproved.

<http://blogs.wsj.com/marketbeat/2010/10/27/pimcos-bill-gross-qe2-is-a-ponzi-scheme>

^v This analysis is based on “How the Great Recession Was Brought to an End,” Alan Blinder and Mark Zandi, July 2010. Moody’s Analytics and Princeton University white paper.

<https://www.economy.com/mark-zandi/>

^{vi} Estimating the economic impact of the Fed’s policies is not an accounting exercise, but an econometric one. It is not feasible to identify and count each job created or saved by these policies. Rather, outcomes for employment and other activity must be estimated using a statistical representation of the economy based on historical relationships, such as the Moody’s Analytics model. This model is regularly used for forecasting, scenario analysis, and quantifying the impacts of a wide range of policies on the economy. The Congressional Budget Office and the Obama administration have derived their impact estimates for policies such as the fiscal stimulus using a similar approach. The modeling techniques for simulating the fiscal policies were straightforward, and have been used by countless modelers over the years. While the scale of the fiscal stimulus was massive, most of the instruments themselves (tax cuts, spending) were conventional, so not much innovation was required on our part. But modeling the vast array of financial policies, most of which were unprecedented and unconventional, required some creativity, and forced some major simplifying assumptions. The basic approach was to treat the financial policies as ways to reduce *credit spreads*, particularly the three credit spreads that play key roles in the Moody’s Analytics model: the TED spread, the spread between fixed mortgage rates and 10-year Treasury bonds, and the below-investment grade bond yield spread over Treasury bonds. Each of these spreads rose alarmingly during the crisis, but came down quickly once the financial medicine was applied. The key question was how much of the decline in credit spreads to attribute to the policies.

^{vii} The Fed also earns more interest income on its larger bond holdings, which is remitted to the Treasury and goes to reducing the federal government’s budget deficit.

^{viii} The Fed’s inflation target is 2% for core PCE inflation, which is roughly equivalent to 2.5% core CPI inflation given differences in the way the two measures are constructed.

^{ix} Bernanke, Ben, Vincent Reinhart, and Brian Sack. 2004. “Monetary Policy Alternatives at the Zero Bound: An Empirical Assessment.” *Brookings Papers on Economic Activity* 2004-2: 1-100.

^x Gagnon, Joseph, Matthew Raskin, Julie Remache, and Brian Sack. 2010. “Large-Scale Asset Purchases by the Federal Reserve: Did They Work?” *Federal Reserve Bank of New York Staff Reports* 2004: 17-18.

^{xi} The three-year Fannie Mae-issued on-the-run debt obligation was used as a proxy for agency debt since the Federal Reserve concentrated its agency debt purchases on notes maturing within two and five years.

^{xii} Moreover, with some of the events included in the event study, the Fed provided non-QE information that could have affected financial asset prices.

^{xiii} This is from the FOMC’s March 19, 2014 statement

<http://www.federalreserve.gov/newsevents/press/monetary/20140319a.htm>