



December 8, 2016

Breaking the Conventional Mold: Monetary Policy Actions since the 2008 Financial Crisis

The Federal Reserve defines monetary policy as “what the Federal Reserve, the nation's central bank, does to influence the amount of money and credit in the U.S. economy. What happens to money and credit affects interest rates (the cost of credit) and the performance of the U.S. economy.”¹ In the 21st century, however, central banks’ actions have reached beyond what are considered conventional tools that affect the amount of money and credit in the economy to less conventional monetary tools such as enabling generous availability of low-cost funding to lenders.

Central bank use of unconventional monetary tools has now become common practice. Tools like financial asset purchases and below-market discount rates were intended to be temporary measures for use in times of economic crisis, then retired when the economy returned to normal. Now, eight years removed from the 2008 financial crisis, the path out of this experiment is not clear. If unconventional tools become more permanent features of monetary policy, their effectiveness must be better understood and measured.

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Section I: Conventional and unconventional monetary policy tools explained

In the wake of the 2008 financial crisis and recession, which lasted from December 2007 to June 2009, central banks around the world believed their usual tools for conducting monetary policy were insufficient. Consequently, unconventional policy tools were introduced. This section describes how the conventional and unconventional tools operate.

Box 1. Monetary Policy Tools

Conventional policy tools:

- Open Market Operations
- Discount Window
- Reserve Requirements

Unconventional policy tools:

- Quantitative easing
- Credit easing
- Interest on reserves
- Negative interest rates

Contrary to popular opinion, central banks, such as the Federal Reserve² (Fed), do not truly control interest rates.³ Influence? Yes. Control? No. A central bank can only control its *monetary base*.⁴ This consists of currency plus private bank reserves. The latter consists of required reserves and excess reserves. *Required reserves* are the fraction of their customers' checking account deposits, which a private bank must, by law, hold as cash within the private bank's vaults or on deposit at the Federal Reserve.⁵ These act as a buffer against unexpected customer withdrawals. *Excess reserves* are funds that private banks deposit with central banks beyond their required reserves, choosing to leave them at a central bank instead of lending them.⁶

The Fed's dual mandate⁷ directs it to maintain maximum employment and price stability (low, stable inflation). To accomplish this balancing act, the Fed adjusts the monetary base by changing the quantity of bank reserves. The Fed uses this control of reserves to influence its policy interest rate, the *federal funds (fed funds) rate*.

Conventional tools: Using the Fed as an example, the following explains how central banks traditionally execute their control over the monetary base, and how this can influence interest rates.

- The Fed's primary conventional policy tool consists of open market operations to expand and contract the monetary base and thus influence interest rates.
 - To expand the monetary base, the Fed creates new reserves ("prints money")⁸ by purchasing Treasury securities (Treasuries) on the open market, thus injecting reserves into the economy. The Treasuries purchased then sit on the Fed's balance sheet as assets. The cash that the Fed adds to the system expands the monetary base by giving private banks new excess reserves that can be lent to their customers. To lend more, private banks must lower interest rates to entice borrowers to use the more widely available credit. More loans allow households and businesses to increase spending, which—all other things being equal—increases economic activity such as investment and employment. As economic activity accelerates from the additional spending, prices and wages rise—commonly known as inflation. Therefore, an increase in the monetary base should lead to more economic activity and eventually to higher inflation.
 - To decrease the monetary base (i.e., reduce bank reserves), the Fed sells Treasuries on the open market, thus leading to a reduction in private bank reserves. The reduction to bank reserves reduces the monetary base and thus constrains private banks' ability to lend. The scarcer credit leads interest rates to rise, which—all other things being equal—slows the growth of spending, economic activity, employment, and eventually inflation.
 - Traditionally, private banks would trade reserves among each other at the fed funds rate. If the Fed determines that this rate starts to rise above its target range, it can buy Treasuries to increase reserves and bring the fed funds rate lower. If the fed funds rate falls too far below the Fed's target, the Fed will sell Treasuries to decrease reserves and increase the fed funds rate toward its target. Thus, the Fed conducts open market operations in order to maintain its fed funds rate target.

- The Fed can also increase the size of the monetary base through its discount window. Discount loans increase the amount of bank reserves, which in turn increases the monetary base. Private banks, unable to get extra reserves from other private banks in the fed funds market, can borrow from the Fed at its discount rate. The Fed can influence the amount of discount loans by changing the discount rate. The discount rate is typically higher than the fed funds rate, making the Fed the lender of last resort when private banks cannot borrow from other private banks within the fed funds target range. In addition, banks prefer to avoid the discount window as there is a stigma attached to using it. If other private banks and investors discover a particular bank has taken a discount loan from the Fed, creditworthiness concerns will plague the bank in question, suggesting it is in danger of failing as it couldn't acquire cheaper private loans. Consequently, a private bank may have even more difficulty raising capital despite the Fed's assistance.
- The Fed can alter the monetary base by changing the required reserve ratio. However, the Fed has not made major changes to this tool since the late 1930s. The Fed's current required reserve ratio is 10 percent.⁹ Therefore, for every \$100 million of checkable deposits, a bank must keep \$10 million as required reserves.

Unconventional tools: As the 2008 financial crisis unfolded, central banks' conventional policy moves pushed target rates to the zero lower bound (ZLB),¹⁰ in which the fed funds target rate falls to zero. Around the world, the central banks managing monetary policy for the EU (the European Central Bank, referenced as "EU" in this paper), the United Kingdom (the Bank of England, referenced as "England" in this paper), and Japan (the Bank of Japan, referenced as "Japan" in this paper) reached their ZLB. Central banks dread ZLB because, it is (and was) generally believed that interest rates could not go below zero. Once at zero, a central bank perceives it is unable to use its conventional tools to further stimulate economic activity. Therefore, central banks introduced a variety of unconventional tools:

- *Interest on reserves (IOR)* allows central banks to pay private banks to hold reserves¹¹ rather than lend them. Central banks pay interest on required reserves and interest on excess reserves. If, for example, the interest on excess reserves rate is 2 percent and the best a private bank can earn from a loan is 1.5 percent interest, the private bank will opt to hold excess reserves instead. This tool gives a central bank greater control over how much the private banks lend. By raising the interest rate paid on excess reserves, a central bank can quickly decrease or slow the pace of lending by increasing the return from holding reserves. Conversely, if it decreases the excess reserve rate, private banks will hold less reserves, thus increasing the pace of lending.¹²
- *Quantitative easing (QE)*¹³ occurs when a central bank purchases private bank-owned assets, such as Treasuries or mortgage-backed securities (MBS) on an unusually large scale to create new reserves for banks to lend. QE is an unusually large-scale expansion of the monetary base deemed necessary if a central bank has reached its ZLB. The Fed's large-scale asset purchases (LSAPs), which it first initiated in November 2008, fall under this category.
- *Credit easing* occurs when a central bank buys particular assets in order to provide liquidity to a specific market segment without changing the size of the monetary base. Historically, central banks bought and sold short-term government bonds. However, central banks now trade other securities, such as long-term government bonds, corporate bonds, or mortgage-backed securities. A central banks' change to the composition of its portfolio (e.g., from short-term to long-term bonds or from Treasuries to MBS) eases credit to a specific market by providing it with additional liquidity.¹⁴ The Fed's maturity extension program and reinvestment policy, better known as "Operation Twist," falls under this category.

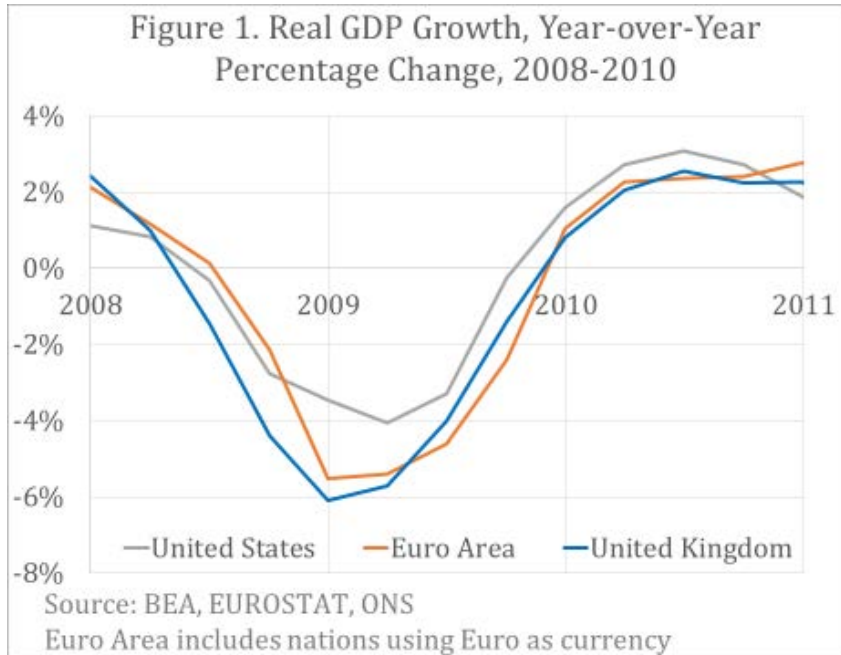
- *Forward guidance*¹⁵ occurs when a central bank announces its intended policy actions to meet *future* monetary base levels. If the Fed commits to maintain a fed funds target rate of 0.25 percent for at least one year, this signals a *future* larger monetary base for at least one year. Another form of forward guidance is when a central bank promises to keep interest rates low until variables such as unemployment, inflation, or both reach a specified threshold. Central banks use forward guidance to give the public an idea about the future course of monetary policy. This greater certainty may incentivize firms and households to borrow and spend more in the present.¹⁶
- *Zero interest rate policy (ZIRP)* and *negative interest rate policy (NIRP)* refer to keeping the policy rate, such as the fed funds rate in the United States, at zero (ZIRP) or at a negative rate (NIRP). Some central banks, such as the EU, Japan, and the Swiss National Bank (SNB), have moved from ZIRP to NIRP in recent years.¹⁷ The objective of this policy is to stimulate household spending and increase investment by making borrowing funds even cheaper. Operationally, if a central bank has a policy of paying interest on excess reserves (IOER), rather than paying private banks to deposit excess reserves, the central bank charges them for holding excess reserves, and this implies a negative rate of interest.^{18, 19}

Having introduced the conventional and unconventional tools of monetary policy, the subsequent sections discuss when and how central banks around the world have applied them, as well as the resulting outcomes.

Section II: Comparative monetary policy – Similarities and differences between the tools used and outcomes experienced by the Federal Reserve, the European Central Bank and the Bank of England

Central banks used the asset purchase tool for the 2008 recession and financial crisis

The end of 2007 through the first half of 2009 were recessionary times for many major countries and the beginning of central banks' unconventional efforts to stabilize their economies. The severe economic disruptions following the 2008 financial crisis motivated the Fed and European central banks to rapidly expand their monetary



policy toolboxes. This section focuses on the actions taken by the Fed,²⁰ England, and the EU. A summary of bank actions from 2008 to 2016 is contained in Table 1 at the end of this section.

Reflecting on lessons learned from years of studying the Great Depression, Federal Reserve Chairman Ben Bernanke pushed for additional Fed powers to become Wall Street's "lender of last resort"²¹ by buying illiquid assets from private institutions and extending \$1.5 trillion for troubled loans.

The Fed implemented the first round of QE shortly after the financial crisis. Its magnitude was unprecedented. Prior to the 2008-09 recession, the Fed held nearly \$900 billion worth of assets on its balance sheet.²² By late November 2008, the Fed bought an

additional \$600 billion in mortgage-backed securities from Fannie Mae and Freddie Mac (the GSEs).²³ By March 2009, it held \$1.75 trillion of mortgage-backed securities, Treasuries, and troubled bank debt acquired in the crisis. It reached \$2.1 trillion in June 2010, doubling in less than two years. By December 2014, Fed long-term holdings would more than double again to \$4.5 trillion²⁴ and have remained near that level since then.

EU and England followed a similar strategy. In 2009, the EU initiated its long-term refinancing operations (LTROs) by purchasing covered (collateral-backed) bonds, with the aim of lowering borrowing costs to stimulate investment spending. Its initial purchases were worth about €60 billion (\$80 billion) in May 2009. Beginning in March 2009, England announced the intent to maintain its purchases to £165 billion (\$233 billion) in government debt by September 2009 and to continue at a slower pace that would reach approximately £175 billion (\$284 billion) in assets by the end of October 2009. In November 2009, England's Monetary Policy Committee voted to increase total asset purchases to £200 billion (\$332 billion).

Despite the end of many countries' recessions around 2009, unconventional monetary policy did not conclude as expected. Instead, central banks launched a second round of experiments. Fed asset purchases, halted in March 2010 as the economy improved, resumed in November 2010²⁵ once the Fed determined that the economy was not growing robustly. By then, central bankers worked in a new paradigm of QE, known as QE2, where theory provided the justification for their next steps, which are described by *The Economist* in a March 2015 synopsis:

To carry out QE central banks create money by buying securities, such as government bonds, from banks, with electronic cash that did not exist before. The new money swells the size of bank reserves in the economy by the quantity of assets purchased—hence "quantitative" easing. Like lowering interest rates, QE is supposed to stimulate the economy by encouraging banks to make more loans. The idea is that banks take the new money and buy assets to replace the ones they have sold to the central bank.

That raises stock prices and lowers interest rates, which in turn boosts investment. Today, interest rates on everything from government bonds to mortgages to corporate debt are probably lower than they would have been without QE. If QE convinces markets that the central bank is serious about fighting deflation or high unemployment, then it can also boost economic activity by raising confidence. Several rounds of QE in America have increased the size of the Federal Reserve's balance sheet—the value of the assets it holds—from less than \$1 trillion in 2007 to more than \$4 trillion now.²⁶

2011: The Fed changed QE from a stabilization tool to a stimulus tool

In November 2010, Fed Chairman Ben Bernanke announced “QE2,” an expansion of the LSAP program. The Fed purchased an additional \$600 billion of longer-term Treasury securities by the end of the second quarter of 2011, at a pace of \$75 billion per month, while maintaining the target range for the fed funds rate at 0 to 0.25 percent.²⁷ Fed asset purchases included MBSs, intended to support the real estate market by keeping rates low and prevent bank insolvency by removing the toxic assets from their balance sheet.

Noting anemic economic growth trends that began in September 2011, the Federal Open Market Committee (FOMC) decided to undertake an additional unconventional policy of credit easing through a maturity extension program (MEP) more commonly known as “Operation Twist,” referring to its intended manipulation of the shape of the Treasury yield curve. The FOMC meeting press release described its intention:

To support a stronger economic recovery and to help ensure that inflation, over time, is at levels consistent with the dual mandate, the Committee decided today to extend the average maturity of its holdings of securities. The Committee intends to purchase, by the end of June 2012, \$400 billion of Treasury securities with remaining maturities of 6 years to 30 years and to sell an equal amount of Treasury securities with remaining maturities of 3 years or less. This program should put downward pressure on longer-term interest rates and help make broader financial conditions more accommodative.²⁸

The Fed would replace short-term Treasury securities it held with longer-term Treasuries. The intended outcome was to decrease long-term interest rates relative to short-term interest rates, lowering rates on auto loans and 30-year mortgages.

After GDP growth slowed, the Fed initiated a third round of quantitative easing (QE3) the following September, announcing plans to purchase \$40 billion per month of mortgage-backed securities. More significantly, the program would continue indefinitely:

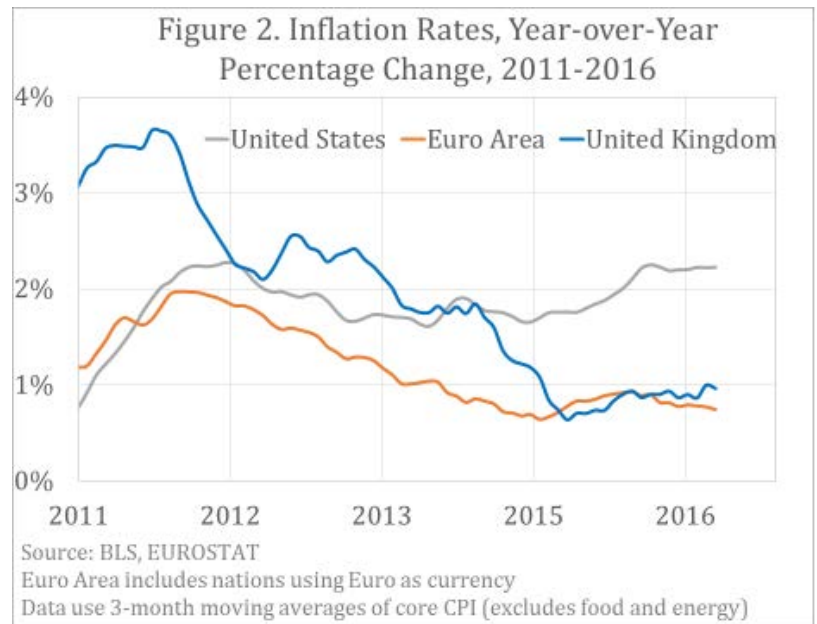
If the outlook for the labor market does not improve substantially, the Committee [FOMC] will continue its purchases of agency mortgage-backed securities, undertake additional asset purchases, and employ its other policy tools as appropriate until such improvement is achieved in a context of price stability.

This open-ended commitment earned QE3 the nickname “QE-Infinity.”²⁹ In December 2012, the Fed increased the amount of open-ended purchases from \$40 billion to \$85 billion per month. This included increased QE, continuation of its credit easing “Operation Twist,” and a forward guidance commitment to hold the fed funds rate near zero at least until mid-2015.

Meanwhile, England leveled asset purchases as the EU downsized

While the Fed aggressively expanded into new QE programs, England and the EU moved slowly—partially in reaction to an inflation bump that followed the first round of QE.

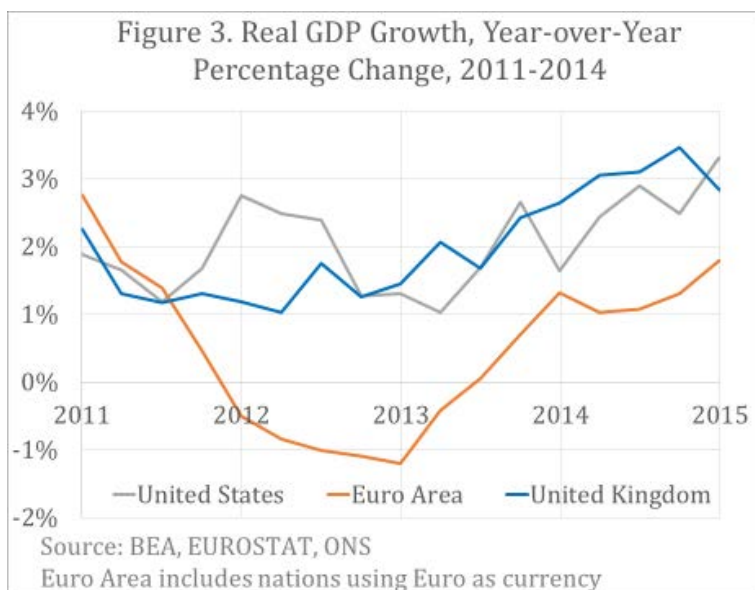
England saw domestic inflation rates heading toward 4 percent in mid-2011, and suspended asset purchases, holding its balance sheet steady.³⁰ As inflation trended downward, it resumed its QE program. In October 2011, February 2012 and July 2012, England announced additional rounds of QE, bringing the total amount to £375 billion (\$585 billion). In response to a July 2012 study³¹ estimating that QE disproportionately benefited wealthy households, England launched a credit easing program, the Funding for Lending Scheme (FLS), in which private banks would swap their loans for some of England's British Treasury bonds for a period of four years.³² The private banks could then use these safe assets as collateral to borrow money more cheaply from capital markets under the condition they lend to households and private non-financial corporations.³³



The EU responded to the inflation threat by pulling back on asset purchases in 2012. The EU also launched a low-interest-to-lenders program in 2012 to encourage new lending.³⁴ In September 2012, the EU attempted more aggressive QE with its controversial Outright Monetary Transactions (OMT) program. It was delayed until 2015 by an unsuccessful court challenge alleging OMT was an unauthorized use of central bank power. It was designed to purchase sovereign debt from EU country members, as long as they agreed to fiscal constraints. OMT has not yet been used, but Greece may provide the first case study.³⁵

2013: GDP trended positive for the U.S. and Europe, so central banks made policy shifts

Positive growth trends in 2013³⁶ prompted Fed moves toward normalization. On June 19, 2013, Chairman Bernanke announced possible tapering of asset purchases contingent on continuing positive economic data. The market responded with a “taper tantrum,”³⁷ marked by falling stock prices and a jump in interest rates. The Fed



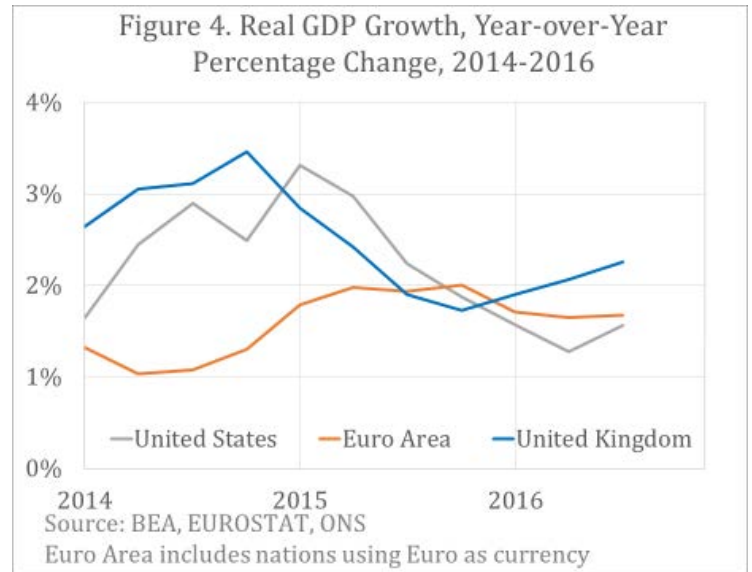
pulled back its interest rate rise talk. It began a practice of providing forward guidance guidelines for future rate increases, removing the risk of a negative market reaction to a sudden, unannounced change in Fed policy.³⁸

The EU and England took notice of investors' “taper tantrum.” England, facing more variable economic data, maintained a “stay the course” attitude, keeping interest rates steady, encouraging lending through FLS, and holding balance sheet asset levels high. The EU also developed “forward guidance” protocols to advise markets of future policy rate changes. After holding steady on asset purchases, it began shedding assets as economic growth picked up in 2013, shrinking its balance sheet by one-third by 2014.³⁹

2014-2015: Divergent QE paths, but the U.S. and European economies converge on weak growth, low inflation

Despite the fact that the Fed, the EU, and England followed distinctly different monetary strategies from 2014 through 2015, their economies ended 2015 with similar GDP growth. In its latest projections, the Fed expects two percent growth in real GDP for 2017 and 2018 and a slight increase in inflation through 2018.⁴⁰ EU-country economic growth continues at anemic levels, but central bank President Draghi asserts that negative interest rates need more time to become effective.⁴¹ The United Kingdom's GDP was projected to grow more than 2 percent⁴² earlier this year, in England's pre-Brexit GDP forecast.

The U.S. unemployment rate fell from 8 percent in 2013 to 5.6 percent in 2014,⁴³ which bolstered market expectations of a Fed increase in the fed funds target rate. Citing substantial recovery in the labor market and stable GDP growth, the Fed announced the first increase in target fed funds rates in December 2015.



While the Fed took the first move to draw back on its use of unconventional monetary policy, the EU took divergent action, introducing a NIRP in June 2014. Slow EU-area economic growth prompted a return of the EU's covered bond purchase plan. On January 22, 2015, central bank President Draghi announced an asset purchase program, buying €60 billion (\$70 billion) of euro-area bonds from central governments, agencies and European institutions every month. Beginning in March 2015, the QE was planned to last until at least September 2016, with minimum total purchases of €1.1 trillion (\$1.2 trillion). In contrast to the activist EU, England provided a case study of a central bank taking actions during a crisis, but then holding steady. Its policy rate remained at 0.5 percent since 2009. England also purchased assets from 2009 until 2012, then held its portfolio at 2012 levels. It aimed to spur the economy through its aforementioned FLS credit easing, which began in 2012.

By 2016, central banks continued along divergent paths, no longer presuming similar results based on past experience. As the Fed discussed possible interest rate increases, the EU moved deeper into negative interest rates. With the implications of the June Brexit vote when British voters chose to leave the European Union, England faces additional economic uncertainty. The mechanics and economic impact of Brexit over the next two years on both the United Kingdom and the Eurozone are yet to be defined and are certainly not understood. As events unfold, England's policy may well depart from its steady and stable stance, and the bank took its first steps toward a more activist stance last August.

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2016: The emerging investment market in central bank policy

Central banks' impact on investment markets has gone far beyond the financial sector influence wielded in 2008. Varied central bank policies created new investor opportunity in stocks as well as bonds.⁴⁴ Negative interest rates elsewhere have proven to be a boon to Treasury securities, as global investors "buy American" in search of yield and safety.⁴⁵ Fed minutes indicate that the U.S. labor market and economy are showing enough positive momentum to support another interest rate increase,⁴⁶ barring an unexpected shift in data. Janet Yellen, the current Fed Chair, has emphasized that adequate forward guidance will precede central bank policy changes to prevent surprising the economy and financial markets.⁴⁷ The Fed continues to watch the struggling European economy as a source of potential risk. Reacting to the June Brexit vote, the International Monetary Fund and Organization for Economic Cooperation and Development have lowered global growth projections for 2016.⁴⁸

Elsewhere in Europe, the EU took its negative interest rates lower in early 2016,⁴⁹ and central bank President Draghi affirmed the program would continue "until we see a continued adjustment in the path of inflation."⁵⁰

At the same time, the EU embraced an expansion of QE initiatives with the purchase of €80 billion (\$86 billion) of assets. In the months since then, EU actions have not changed the direction of the Eurozone economy.

In the UK, the “pro-Brexit” vote⁵¹ in June shifted England’s “stay the course” path, as it took action to bring stability to the British economy. In early August, it introduced a bulked-up corporate bond purchase plan,⁵² committing to buy £10 billion (\$13 billion) over eighteen months while cutting its policy rate to an historic low of 0.25 percent.⁵³ Worries about a drag on GDP growth from Brexit continue, but the early post-Brexit data is mixed.⁵⁴

Until the Fed normalizes its target rate, Chair Yellen has indicated there will be no decrease in the size of the Fed balance sheet. In the post-crisis world, the expanded balance sheets of central banks require higher reserves.⁵⁵ Chair Yellen recently described the interaction between these two unconventional tools: ⁵⁶

Two of the Fed’s most important new tools--our authority to pay interest on excess reserves and our asset purchases--interacted importantly. Without IOER authority, the Federal Reserve would have been reluctant to buy as many assets as it did because of the longer-run implications for controlling the stance of monetary policy.

The path to normalized rates will be gradual. As Chair Yellen told the Joint Economic Committee when she presented the Federal Reserve’s Economic Outlook on November 17, 2016:

Nonetheless, the Committee must remain forward looking in setting monetary policy. Were the FOMC to delay increases in the federal funds rate for too long, it could end up having to tighten policy relatively abruptly to keep the economy from significantly overshooting both of the Committee’s longer-run policy goals. Moreover, holding the federal funds rate at its current level for too long could also encourage excessive risk-taking and ultimately undermine financial stability. The FOMC continues to expect that the evolution of the economy will warrant only gradual increases.⁵⁷

During the hearing, Chair Yellen indicated that rates could rise relatively soon, and FOMC minutes confirm that the economy is showing enough resilience to support another interest rate rise in December 2016.⁵⁸

Table 1. Overview of Fed, EU and England Actions in the Wake of the 2007-2009 Recession
Conventional and Unconventional Central Bank Actions, 2008 to June 2016⁵⁹
(Note: Conventional actions are not bolded; **unconventional actions are in bold**)

Year	Month	Federal Reserve	European Central Bank	Bank of England
2008-09 Summary		Emergency actions, large scale asset purchases	Covered bond purchases (CBP)	Government bond purchases
2008	Mar		6-month LTROs	
	Oct		Repurchase Agreements	
	Nov	Purchase \$100B of GSE Debt and \$500B of MBS		
	From Oct to Dec, central banks took emergency action to lower policy rates			
2009	Jan			Purchase up to £50B in private assets
	Mar	Purchase \$300B in Treasures, add'l \$100B in GSEs, \$750B in MBS		£75B QE program
	May		Purchase €60B CBP, announce 12mo LTROs	Expand QE to £125B
	Aug			Expand QE to £175B
	Nov			Expand QE to £200B

2010-11 Summary		Expand LSAP, keep policy rate low	Continue CBP, keep policy rate low	More bond purchases, keep policy rate low
2010	May		Buy sovereign debt in secondary markets	
	Nov	Buy add'l \$600B in Treasuries		
2011	Sep	Buy add'l \$400B in long-term Treasuries/sell \$400B in ST Treasuries		
	Oct			Expand QE to £275B
	Dec		Announce 36mo LTROs	
2012-13 Summary		Operation Twist; balance sheet maintained	OMT announced, forward guidance; balance sheet shrinks	More bond purchases, but QE policy curtailed due to varying rich/poor impact
2012	Feb			Expand QE to £325B
	Jun	Extend long bond purchases/short bond sales		
	Jul			Expand QE to £375B
	Sep	Purchase additional \$40B in MBS per month		
	Dec	Continue purchase \$45B in LT Treasuries monthly		
2014-15 Summary		Post-Tantrum exit forward guidance; balance sheet maintained	Balance sheet reduction through 2014, then LSAPs build thru 2015	FLS begins; bank balance sheet remains at 2012 asset high
2014	Jun		LTROs to encourage bank lending	
	June		Introduce NIRP (-.1%)	
	Sep		Reduce policy rate to -.2%	
	Oct		Announce 2-yr ABS and CBP purchase program	
2015	Jan		ABS purchases set at €60B monthly	
	Oct		Expand the ABS program	
	Dec	Raise fed funds target rate by 0.25%	Reduce policy rate to -.3%	
2016 summary (thru June)		Guidance to next interest rate rise; balance sheet maintained	Aggressive use of unconventional tools	Stay the course, until the Brexit vote, which raises possibility of a rate cut
2016	Mar		Announce new LTRO program, 4-yr maturities	
	Mar		Reduce policy rate to -.4%	
	Apr		Expand CBP with new standards in place until inflation reaches 2%	

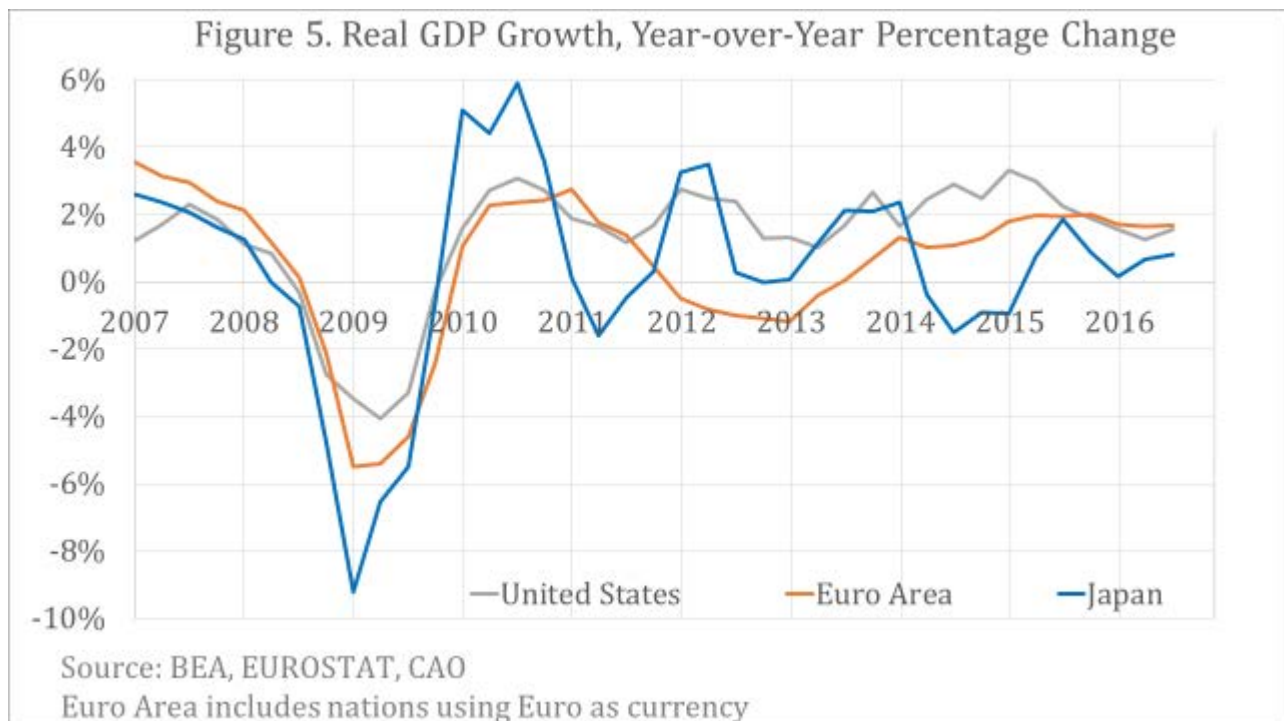
Section III: Japan's role as monetary policy incubator

Following a long stretch of “miracle growth,” the Japanese economy faltered in 1990 after one of the biggest financial bubbles in history abruptly burst. Between the end of 1989 and 1992, the Nikkei stock market index collapsed over 60 percent, and Japan entered its “lost decade” in which its average annual per capita GDP growth rate was a dismal 0.5 percent.⁶⁰ In comparison, the United States averaged 2.6 percent over the same time frame. Adding to Japan's woes, residential real estate prices in six major cities fell by two-thirds from 1991 to 1998.⁶¹ The first episode of QE took place in early 2001,⁶² when Japan attempted to jumpstart its anemic economy. Japan's QE had three objectives: minimize the risk of a liquidity shortage, decrease real interest rates, and stimulate new, long-term investments.⁶³ At first, it appeared that QE worked. However, by 2006 economic growth slowed again, and Japan ended its program that year. The first QE experiment failed.⁶⁴

Following the 2008 financial crisis, Japan's monetary policy strategy tracked other central bank actions. Even though the Japanese economy contracted from the second quarter of 2008 to the first quarter of 2009, it wasn't until October of 2010 that Japan announced a modest round of QE,⁶⁵ in which it would purchase ¥5 trillion (\$61 billion) worth of Japanese government bonds through 2011. Ten months later, this amount doubled. On April 4, 2013, Japan increased its asset purchases over 500 percent. By late 2014, Japan increased its QE program to ¥80 trillion (\$740 billion) per year in response to the country's third recession in four years.⁶⁶

In January 2016, Japan joined EU in implementing a NIRP. Initially, Japan's NIRP announcement led the Yen to fall substantially. Contrary to expectations, the Yen actually strengthened in the following weeks. The policy disrupted money market trading and drove Japanese investor capital abroad in search of positive yields.⁶⁷ In March 2016, central bank Governor Kuroda argued negative rates needed a few more months to show beneficial results.⁶⁸ However, S&P Global has found, “Japan's negative interest rate policies show few signs of boosting the economy.”⁶⁹

Although the Japanese economy has experienced slower and more erratic economic growth than other developed countries since the financial crisis, Japan's actions still merit attention from policymakers. They test the impact of monetary policy on the sluggish Japanese economy, which suffers from the drag of a growing public debt burden of over 200 percent of the country's GDP.⁷⁰



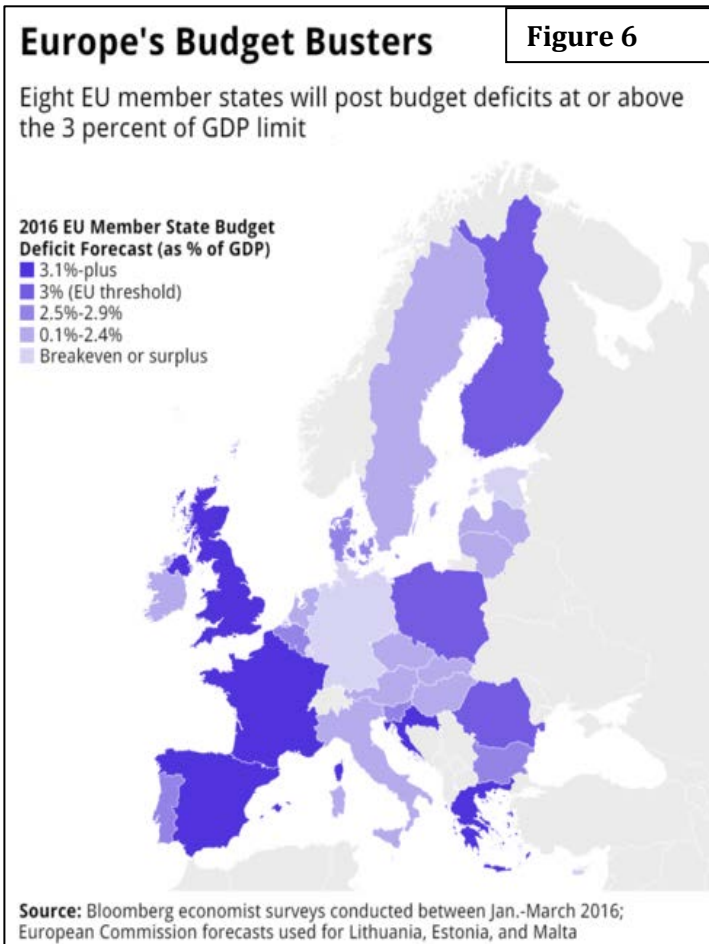
Section IV: After eight years, new questions—and one old, unanswered one

Eight years after the financial crisis, data are emerging to determine the effectiveness of new monetary policy tools. Research indicates that the Fed’s 2013 mortgage purchases dropped long-term interest rates a meager 0.11 percentage points.⁷¹ The budget relief of smaller debt-service payments offered by QE-lowered interest rates has not prevented eight Eurozone countries from producing large budget deficits over 3 percent of GDP (see Figure 6). Additionally, since the 2008 financial crisis, developed economies are growing at materially slower rates:

Table 2. Quarterly Real GDP Growth, Pre-financial Crisis Compared to Recovery

	USA	UK	Eurozone
1 st Qtr. 2000 to 4 th Qtr. 2007	2.7%	3.0%	2.3%
1 st Qtr. 2009 to 4 th Qtr. 2015	1.4%	1.0%	0.1%

Sources: US data from FRED, using chained CPI (2009); UK and Eurozone from OECD



Central bank policy moves cannot change the reality that, absent changes in spending and taxation, lower economic growth produces higher budget deficits. The Fed, the EU and England are currently following three different monetary policy strategies. All three central banks expect positive outcomes. However, the link between different monetary policies and their respective expected results is strained, if not broken. Monetary policy experiments meant to engineer GDP growth – such as NIRP and yield curve “twists” – have not provided reliable “action-result” models. When central bankers pull these policy levers, there is no certainty about their effectiveness or possible “unintended consequences.”

Many central bankers warn that “the full effects of monetary policy are felt only after long lags.”⁷² For example, GDP may be in steady recovery, but the labor market may remain slack, so interest rate “doves”⁷³ argue that rates must be kept low to bolster employment. While central bankers press for more time, others worry about the broader effects of unconventional monetary policy. German regulators call negative rates “a slow poisoning of the pension system,” and France’s largest pension fund faces the risk of implosion if negative rates continue.⁷⁴ Real events

are telling central banks that the time to wait for results is running out.

Shortly before the world’s central bankers met for their annual August symposium in Jackson Hole, Wyoming, the *UK Telegraph* published “*Three Tough Questions*” for them to address:

- 1) Why isn’t QE working the way it was meant to? Does anyone out there still believe central banks can create inflation by printing money?
- 2) Are we destroying the banking system? When rates come down to zero, it is impossible for banks to make money. Can you revive an economy with a broken banking system?
- 3) Isn’t it time for some fresh thinking?⁷⁵

Unconventional tools ushered in an era of monetary policy that more than doubled the amount of assets that central banks hold, exerted a broad influence on global financial markets, and fueled wide uncertainty about how interest rates will move when and if central bank balance sheets eventually shrink. Markets anxiously watch the meetings and minutes of the Fed's FOMC, as its policy statements exert immediate impact on stock and bond prices.⁷⁶

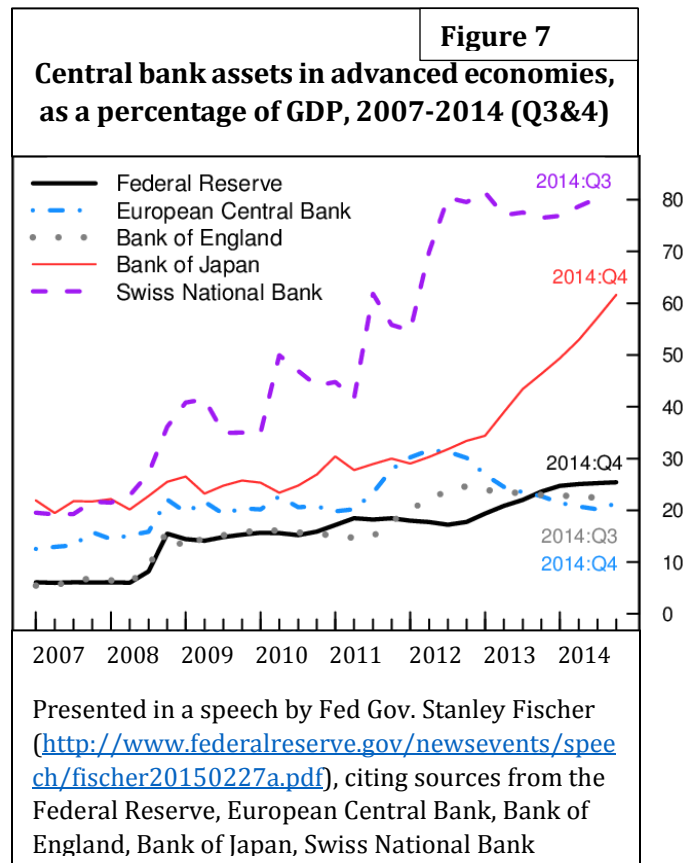
Central bank tools like unconventional LSAPs and unusually low target policy rates were intended as temporary measures for economic crises. Nearly eight years later, the strategy to exit unconventional central bank programs is unclear – and there is little evidence that central bankers plan to put these tools away.

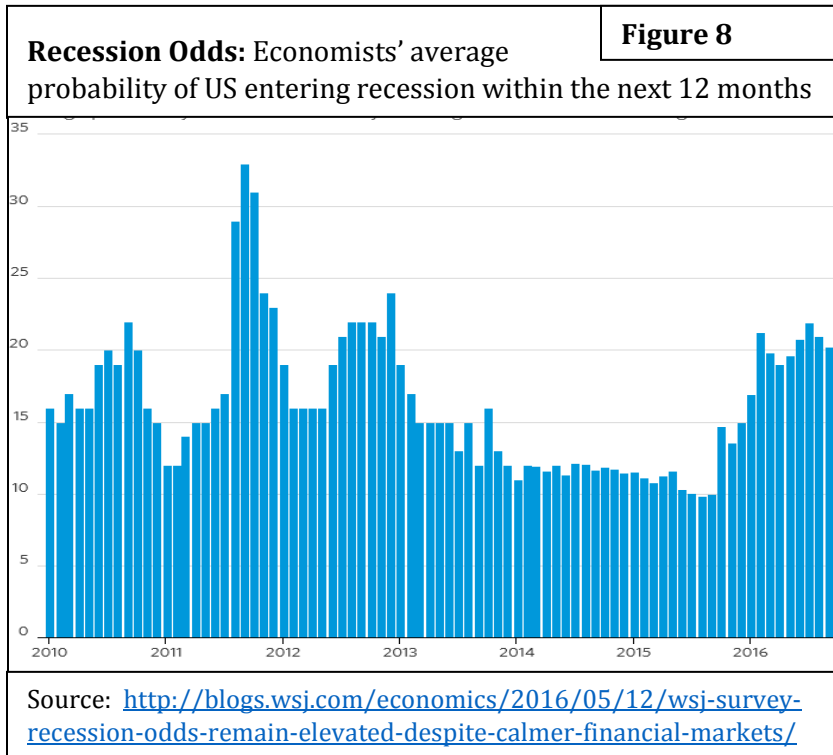
Some distortionary impacts of unconventional monetary policies are already known:

- Borrowers and sophisticated investors benefit at the cost of savers and households on fixed income, fueling income inequality.⁷⁷
- Financial market volatility is intensified by investor speculation on upcoming central bank moves,⁷⁸ along with a shift in investor focus from real investments in the economy at large to narrow monetary policy moves.⁷⁹

As central banks continue down unconventional paths, the risk of unintended consequences grows. The current status of weak global economic growth despite aggressive monetary policy leads to new questions:

- 1) What is the potential for **asset bubbles** to arise because of central banks' low-interest programs, and how might the Fed's asset purchases encourage investors to allocate funds toward assets favored by government policies?⁸⁰
- 2) Do we understand "**financial linkages**"⁸¹ revealed by the financial crisis? How do we measure the effects of new unconventional monetary policy actions on a global economy or market sectors—impacts previously unrecognized or with no historical precedent?
- 3) How do we evaluate policy levers that produce **divergent, and therefore unpredictable, results**?
- 4) Are divergent central bank actions creating a **monetary policy marketplace** in which yield-seeking investors cross borders to buy foreign debt instead of domestic debt?⁸² If so, how does this action feed back into monetary policy?





One final question becomes more pressing as time passes: **If central banks keep rates near zero or take no action to sell assets, what tools might be available to address the next recession?**⁸³ Recent economic growth, even as weak as it is, will likely not continue indefinitely. Chair Yellen has told Congress, “We don’t have a lot of room using our traditional tried and true methods.”⁸⁴ What happens if interest rate “normalization”⁸⁵ has not occurred before the next recession commences? Could artificially low interest rates and large asset portfolios held by central banks become a drag on future central bank actions?

When this uncertainty is coupled with possible bubbles, unrecognized linkages, unpredictable results and cross-border interactions, the imperative to identify and address the distortions caused by

unconventional monetary policy becomes too important to dismiss. The use of “retrospective guidance” detailed in Table 3 below reveals the potential trade-offs of monetary tools based on real-world results.

Table 3. Retrospective Review of the Intent and Impact of Unconventional Monetary Policy Tools

Unconventional tool	What it attempts to cure	What it tends to cause
Emergency and targeted lending	Assures liquidity in a crisis; incentivizes business investment through favorable borrowing rates	Mark-to-market audits might show underwater loan value not reflected in central bank balance sheet
Quantitative Easing (QE), “Operation Twist”	By shifting yield curves, it keeps interest rates low to encourage borrowing, consumption, investing	Addition to low interest rates delays exit; increases bond investment risk, thereby pushing demand for equities
Negative Interest Rate Policy (NIRP)	Negative rates push banks to lend funds and hold less in reserve	Risks future pension cuts; unpredictable financial market impact
Interest on Reserves (IOR)	Central banks use low rates to increase private bank lending	Increases central bank power by setting both policy and reserve rates

Fresh thinking is needed. Unconventional monetary policy tools have unpredictable, varied impacts, including unprecedented central bank intervention through large asset holdings. Their sustained use since 2008 argue for new policy protocols⁸⁶ to offer alternatives and sensitivity analysis of the effectiveness of these new tools. A clear measure of their impacts is needed to prudently craft exit strategies that return markets to normal operations.

Appendix: Currency conversion table

Dollar to Pound Sterling, Euro, Yen – 2008 to 2016

Source: Federal Reserve

<https://www.federalreserve.gov/datadownload/>

Date	Dollar per euro \$/€	Dollar per pound \$/£	Dollar per yen \$/¥
2008-06	1.5562	1.9664	0.009353207
2008-07	1.5759	1.9888	0.009358757
2008-08	1.4955	1.8865	0.009143911
2008-09	1.4342	1.7973	0.009383081
2008-10	1.3266	1.6862	0.010003411
2008-11	1.2744	1.5327	0.010312936
2008-12	1.3511	1.4854	0.010955902
2009-01	1.3244	1.4462	0.011096254
2009-02	1.2797	1.4422	0.010762432
2009-03	1.305	1.417	0.010219202
2009-04	1.3199	1.4712	0.010109179
2009-05	1.3646	1.5418	0.0103472
2009-06	1.4014	1.6369	0.010350413
2009-07	1.4092	1.6378	0.010596925
2009-08	1.4266	1.6532	0.01053773
2009-09	1.4575	1.6323	0.010955926
2009-10	1.4821	1.6212	0.011065974
2009-11	1.4908	1.6599	0.011202298
2009-12	1.4579	1.6226	0.011117176
2010-01	1.4266	1.6158	0.010976816
2010-02	1.368	1.5618	0.011093916
2010-03	1.357	1.5058	0.011023402
2010-04	1.3417	1.5332	0.0107006
2010-05	1.2563	1.4669	0.010872756
2010-06	1.2223	1.4768	0.0110125
2010-07	1.2811	1.5304	0.011428506
2010-08	1.2903	1.5661	0.011713346
2010-09	1.3103	1.5591	0.011854367
2010-10	1.3901	1.5867	0.012235634
2010-11	1.3654	1.5961	0.012118568
2010-12	1.3221	1.5595	0.011999386
2011-01	1.3371	1.5782	0.012102874
2011-02	1.3656	1.6124	0.012115808
2011-03	1.402	1.6159	0.012247847
2011-04	1.446	1.6379	0.01202254
2011-05	1.4335	1.6332	0.01232655
2011-06	1.4403	1.6219	0.012433806

2011-07	1.4275	1.6158	0.012619491
2011-08	1.4333	1.6356	0.012992801
2011-09	1.3747	1.5771	0.013021562
2011-10	1.3732	1.5768	0.013047506
2011-11	1.3558	1.5806	0.012893327
2011-12	1.3155	1.5587	0.012854016
2012-01	1.291	1.5524	0.012993088
2012-02	1.3238	1.5804	0.012743724
2012-03	1.3208	1.5824	0.012126224
2012-04	1.316	1.6	0.012307329
2012-05	1.2806	1.5924	0.01255228
2012-06	1.2541	1.5556	0.012607924
2012-07	1.2278	1.5593	0.012668684
2012-08	1.2406	1.5722	0.01270795
2012-09	1.2885	1.6126	0.012798313
2012-10	1.2974	1.608	0.012656113
2012-11	1.2837	1.5968	0.012341032
2012-12	1.3119	1.6145	0.011934527
2013-01	1.3304	1.5965	0.011228625
2013-02	1.3347	1.5474	0.010752503
2013-03	1.2953	1.508	0.010551862
2013-04	1.3025	1.5311	0.010229321
2013-05	1.2983	1.5297	0.009908976
2013-06	1.3197	1.5493	0.010284363
2013-07	1.3088	1.5179	0.010032837
2013-08	1.3314	1.5505	0.010223663
2013-09	1.3364	1.5885	0.010079629
2013-10	1.3646	1.6098	0.010228086
2013-11	1.3491	1.61	0.009992635
2013-12	1.3708	1.6383	0.009665571
2014-01	1.3618	1.647	0.009637495
2014-02	1.3665	1.6558	0.009791893
2014-03	1.3828	1.6624	0.009771398
2014-04	1.381	1.6748	0.009760078
2014-05	1.3739	1.6842	0.009825712
2014-06	1.3595	1.6908	0.00979788
2014-07	1.3533	1.7066	0.009828976
2014-08	1.3315	1.67	0.009714038
2014-09	1.2889	1.629	0.009308759
2014-10	1.2677	1.6074	0.009256996
2014-11	1.2473	1.5771	0.008598497
2014-12	1.2329	1.5644	0.008380593
2015-01	1.1615	1.5142	0.00845666
2015-02	1.135	1.5329	0.008420344
2015-03	1.0819	1.4958	0.008306027

2015-04	1.0822	1.4968	0.008367536
2015-05	1.1167	1.5456	0.008278283
2015-06	1.1226	1.5576	0.008082859
2015-07	1.0997	1.556	0.008109583
2015-08	1.1136	1.5578	0.00812983
2015-09	1.1229	1.5338	0.008323096
2015-10	1.1228	1.5343	0.008329994
2015-11	1.0727	1.5194	0.008153734
2015-12	1.0889	1.4981	0.008221318
2016-01	1.0855	1.4392	0.008458391
2016-02	1.1092	1.429	0.008724823
2016-03	1.1134	1.4249	0.00885491
2016-04	1.1346	1.4319	0.009128094
2016-05	1.1312	1.4524	0.009187115
2016-06	1.1232	1.4197	0.009492088
2016-07	1.1055	1.3134	0.009597758
2016-08	1.1207	1.3101	0.009877685
2016-09	1.1218	1.314	0.009824698
2016-10	1.1014	1.233	0.009623944
2016-11	1.0827	1.2426	0.009292765

¹ “Monetary Policy Basics,” Federal Reserve Education. <https://www.federalreserveeducation.org/about-the-fed/structure-and-functions/monetary-policy>

²For an overview of the structure and functions of the Federal Reserve see the Congressional Research Service’s “[Structure and Functions of the Federal Reserve System](#)” by Pauline Smale. Smale, Pauline, “Structure and Functions of the Federal Reserve System,” Congressional Research Service, November 10, 2010. <http://fpc.state.gov/documents/organization/151977.pdf>

³ Jeffrey Rogers Hummel. “The Myth of Federal Reserve Control Over Interest Rates,” Library of Economics and Liberty, October 7, 2013, <http://www.econlib.org/library/Columns/y2013/Hummelinterestrates.html>

⁴ For an overview of the monetary base, and excess reserves since the Great Recession refer to the Federal Reserve Bank of San Francisco’s Economic Research division’s “Monetary Policy, Money, and Inflation” by John C. Williams. July 9, 2012. Williams, John C, “Monetary Policy, Money, and Inflation,” Federal Reserve Bank of San Francisco, July 9, 2012. <http://www.frbsf.org/economic-research/publications/economic-letter/2012/july/monetary-policy-money-inflation/>

⁵ “Required reserves must be held in the form of vault cash, and if vault cash is insufficient, also in the form of a deposit maintained with a Federal Reserve Bank.” Stigum, M. and Crescenzi, A. *Stigum’s Money Markets*. McGraw Hill. New York, NY, 2007.

⁶ Normally banks want to avoid holding excess reserves since they do not earn any interest on them.

⁷ “The Federal Reserve’s Dual Mandate.” Federal Reserve Bank of Chicago. November 7th, 2016.

<https://www.chicagofed.org/publications/speeches/our-dual-mandate>

⁸ See the National Center for Policy Analysis’ brief analysis, “How the Fed Creates Money” by Bob McTeer and Pamela Villarreal published February 28th, 2008. McTeer, Bob and Pamela Villarreal, “How the Fed Creates Money,” National Center for Policy Analysis, February 28, 2008. <http://www.ncpa.org/pub/ba611>.

⁹ Please refer to the Federal Reserve Board’s article “Reserve Requirements”. Note that the actual reserve requirements work on a margin. For example, on the first 15.2 million of a bank’s net transactions accounts (roughly checking account deposits less what other banks owe to it) have a 0% reserve requirement. \$15.2 million to 110.2 million of a bank’s net transactions accounts are subject to a 3% reserve requirement. Lastly, net transactions accounts in excess of 110.2 million are subject to a 10% reserve requirement. “Reserve Requirements,” Board of Governors of the Federal Reserve System, October 27, 2016.

<https://www.federalreserve.gov/monetarypolicy/reservereq.htm>

¹⁰ Brian Madigan, Steve Meyer, and Dave Reifschneider “Notes on Issues Related to the Zero Lower Bound on Nominal Interest Rates,” Federal Open Market Committee, Pages 3-4, December 12th, 2008.

https://fraser.stlouisfed.org/scribd/?item_id=23280&filepath=/files/docs/historical/FOMC/meetingdocuments/memos/fomc20081212memocombined.pdf#scribd-open

¹¹ See the Board of Governors of the Federal Reserve System’s “Interest on Required Balances and Excess Balances.” “Interest on Required Balances and Reserves,” Board of Governors of the Federal Reserve System, November 25, 2016.

<https://www.federalreserve.gov/monetarypolicy/reqresbalances.htm>

¹² For additional information on interest on reserves refer to the New York Federal Reserve Bank’s, “FAQs about Interest on Reserves and the Implementation of Monetary Policy.” “FAQs about Interest on Reserves and the Implementation of Monetary Policy,”

Federal Reserve Bank of New York. https://www.newyorkfed.org/markets/ior_faq.htm

¹³ “What is Quantitative Easing?” The Economist, March 9, 2015. <http://www.economist.com/blogs/economist-explains/2015/03/economist-explains-5>

<http://www.economist.com/blogs/economist-explains/2015/03/economist-explains-5>

¹⁴ It is possible to undertake QE and credit easing simultaneously. So long as the Fed is expanding their balance sheet (e.g., adding new reserves and expanding the monetary base), such that the new reserves are being used to purchases specific assets (e.g., commercial paper for nonfinancial corporations).

¹⁵ “What is forward guidance and how is it used in the Federal Reserve’s monetary policy?” Board of Governors of the Federal Reserve System, December 15, 2015. <https://www.federalreserve.gov/faqs/what-is-forward-guidance-how-is-it-used-in-the-federal-reserve-monetary-policy.htm>

¹⁶ Ibid

¹⁷ Jobst, Andreas and Huidan Lin, “Negative Interest Rate Policy (NIRP): Implications for Monetary Transmission and Bank Profitability in the Euro Area,” International Monetary Fund, Page 6, August 2016.

<https://www.imf.org/external/pubs/ft/wp/2016/wp16172.pdf>

¹⁸ Typically, legally required reserves are exempt from NIRP, only reserves held in excess of required reserves are subject to NIRP for the ECB, BOJ, and SNB.

¹⁹ If a bank holds \$10,050 in excess reserves today, and the IOER is negative 1 percent, then at the end of one year, the bank’s reserves will be worth \$9,950.50. In essence, they’re being charged \$99.50 for holding the reserves rather than lending them. If a risk-free government bond with zero coupon payments, payable in 1 year, has a face value of \$10,000, how much is it worth today? If its current market price were \$9,803.92, it has a yield of 2 percent (the interest rate). If its current market price is \$10,000, it has a yield of 0 percent. The question is, how much is a bank willing to pay for the bond today, if it recognizes its \$10,050 of reserves will only be worth, \$9,950.50 one year from now? If the bank pays \$10,050 for it, it ends up with \$10,000 at the end of a year—a

much better improvement over the \$9,950.50 if it holds the funds in reserve. In this case, the bond's yield turns to negative 0.5 percent. Therefore, by charging negative IOR, central banks can bring about negative interest rates.

²⁰ JEC Republican Chart Book, "The Federal Reserve's Extraordinary Monetary Policy", follows the history of Fed QE from 2009 to 2014 "The Federal Reserve's Extraordinary Monetary Policies," Joint Economic Committee, February 2015.

<http://www.jec.senate.gov/public/cache/files/be14f1cd-3003-4df2-91ad-b19736bcd35a/qechartbookfebruary2015.pdf>

²¹ A detailed history of government actions taken in response to the 2008 financial crisis can be found at: Cassidy, John, "Anatomy of a Meltdown," The New Yorker, December 2008. <http://www.newyorker.com/magazine/2008/12/01/anatomy-of-a-meltdown>

²² "All Federal reserve Banks: Total Assets," Federal Reserve Bank of St. Louis, <https://fred.stlouisfed.org/series/WALCL>

²³ "Press Release," Board of Governors of the Federal Reserve System, November 25, 2008.

<https://www.federalreserve.gov/newsevents/press/monetary/20081125b.htm>

²⁴ "All Federal Reserve Banks: Total Assets," St. Louis Fed

²⁵ Ricketts, Lowell and Christopher Waller, "The Rise and Eventual Fall in the Fed's Balance Sheet," Federal Reserve Bank of St. Louis, January 2014. <https://www.stlouisfed.org/publications/regional-economist/january-2014/the-rise-and-eventual-fall-in-the-feds-balance-sheet>

²⁶ "What is Quantitative Easing," The Economist

²⁷ "Press Release," Board of Governors of the Federal Reserve System, November 3, 2010.

<http://www.federalreserve.gov/newsevents/press/monetary/20101103a.htm>. The Fed justified its policy change as stimulus to boost slow employment trends and sluggish economic growth.

²⁸ "Press Release," Board of Governors of the Federal Reserve System, September 21, 2011.

<https://www.federalreserve.gov/newsevents/press/monetary/20110921a.htm>

²⁹ "Press Release," Board of Governors of the Federal Reserve System, September 13, 2012.

<http://www.federalreserve.gov/newsevents/press/monetary/20120913a.htm>

³⁰ Joyce, Mike, "The Bank of England's unconventional monetary policies: why, what and how," European Central Bank, June 18, 2013.

http://www.ecb.europa.eu/events/pdf/conferences/130607/PanelDiscussion_joyce.pdf?9b7c697afa3b9dce804543b2b4538d5b

³¹ "The Distributional Effects of Asset Purchases," Bank of England, July 12, 2012.

<http://www.bankofengland.co.uk/publications/Documents/news/2012/nr073.pdf>

³² "Funding for Lending: How does it work?" BBC, May 29, 2014. <http://www.bbc.com/news/business-18460302>.

³³ Churm, Rohan and Amar Radia. "The Funding for Lending Scheme." Bank of England, 2012.

<http://www.bankofengland.co.uk/publications/Documents/quarterlybulletin/qb120401.pdf>

³⁴ Traynor, Ian, "ECB to launch second wave of euro 'quantitative easy'," The Guardian, February 28, 2012.

<https://www.theguardian.com/business/2012/feb/28/european-central-bank-euro-eurozone>

³⁵ The case was decided in June 2016 ("Top German court clears ECB's OMT bond buying scheme," Reuters, June 21, 2016.

<http://www.reuters.com/article/ecb-policy-germany-court-idUSF9N18B019>); previous speculation that OMT would be used by Greece ("ECB's OMT programme to remain out of action despite Greek worries," Reuters, June 29, 2015.

<http://www.reuters.com/article/eurozone-greece-omt-idUSL5N0ZF2GL20150629>) has not been fulfilled, as of yet. (A.P. NOTE: No way for me to check Financial Times links; I don't have access.)

³⁶ "QE, finitely," The Economist, December 19, 2013. <http://www.economist.com/node/21592107/>

³⁷ Derby, Michael, "Last Year's Taper Tantrum May Have Been Taste of the Future, Paper Says," Wall Street Journal, February 28, 2014. <http://blogs.wsj.com/economics/2014/02/28/last-years-taper-tantrum-may-have-been-taste-of-the-future-paper-says/>

³⁸ This *Economist* article ("Controlling interest," The Economist, September 19, 2013. <http://www.economist.com/node/21586527/>) provides a concise summary of unconventional monetary policy as of mid-2013. It includes "forward guidance" as an unconventional tool, describing it as "an attempt to boost the economy by signaling central banks' future policies more clearly."

³⁹ Yardeni, Edward and Mali Quintana, "Global Economic Briefing: Central Bank Balance Sheets," Yardeni Research, Inc., November 25, 2016. <http://www.yardeni.com/pub/peacockfedecbassets.pdf>

⁴⁰ "Economic projections of Federal Reserve Board members and Federal Reserve Bank presidents under their individual assessments of projected appropriate monetary policy, September 2016," Federal Reserve, September 2016, <https://www.federalreserve.gov/monetarypolicy/files/fomcproitabl20160921.pdf>.

⁴¹ "Eurozone inflation and growth to pick up say Draghi," BBC News, June 2, 2016. <http://www.bbc.com/news/business-36432827>

⁴² "Inflation Report," Bank of England, February 2016.

<http://www.bankofengland.co.uk/publications/Documents/inflationreport/2016/feb.pdf>;

see also Domit, Silvia, et al, "Do inflation expectations currently pose a risk to inflation?" Bank of England, Q2 2015.

<http://www.bankofengland.co.uk/publications/Documents/quarterlybulletin/2015/q205.pdf>.

⁴³ "Unemployment Rate," Bureau of Labor Statistics, November 28, 2016. <http://data.bls.gov/timeseries/LNS14000000>

⁴⁴ Koesterich, Russ, "Investing Opportunities and Central Banks Diverge," BlackRock Blog, November 23, 2015.

<https://www.blackrockblog.com/2015/11/23/investing-opportunities-as-banks-diverge/>

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- ⁴⁵ Zeng, Min and Ben Eisen, "Investors' Flight from Negative Rates Flattens Yield Curve," Wall Street Journal, May 17, 2016. <http://www.wsj.com/articles/flood-of-foreign-cash-flattens-yield-curve-1463512016>
- ⁴⁶ "Federal Reserve Press Release," Federal Open Market Committee, September 21, 2016. <https://www.federalreserve.gov/monetarypolicy/files/monetary20160921a1.pdf>
- ⁴⁷ Yellen, Janet, "Speech at 'Monetary Policy Implementation and Transmission in the Post-Crisis Period' Research Conference," Board of Governors of the Federal Reserve System, November 12, 2015. <http://www.federalreserve.gov/newsevents/speech/yellen20160329a.htm>; Chair Yellen concludes her remarks with this comment: "I continue to strongly believe that monetary policy is most effective when the FOMC is forthcoming in addressing economic and financial developments such as those I have discussed in these remarks, and when we speak clearly about how such developments may affect the outlook and the expected path of policy."
- ⁴⁸ "IMF Cuts Global Growth Forecasts on Brexit, Warns of Risks to Outlook," IMF News, International Monetary Fund, July 19, 2016. <https://www.imf.org/en/News/Articles/2016/07/18/18/11/NA07192016-IMF-Cuts-Global-Growth-Forecasts-on-Brexit-Warns-of-Risks-to-Outlook>
- ⁴⁹ Michaels, Raymond, "The Effect of Negative Interest Rates on European Banking," International Banker, July 7, 2016. <http://internationalbanker.com/banking/effect-negative-interest-rates-european-banking/>
- ⁵⁰ "ECB unveils massive QE boost for Eurozone," BBC News, January 22, 2015. <http://www.bbc.com/news/business-30933515>
- ⁵¹ Tharoor, Ishaan, "The chaos of post-Brexit politics in Britain, explained," Wall Street Journal, July 1, 2016. <https://www.washingtonpost.com/news/worldviews/wp/2016/07/01/britains-political-chaos-makes-brexit-all-the-more-confusing/>
- ⁵² Goldfarb, Sam and Christopher Whittall, "New Tool for Central Banks: Buying Corporate Bonds," Wall Street Journal, August 4, 2016. <http://www.wsj.com/articles/new-tool-for-central-banks-buying-corporate-bonds-14703502761473707785>
- ⁵³ Bray, Chad, "Bank of England Cuts Interest Rate to Historic Low, Citing Economic Pressures," New York Times, August 4, 2016. http://www.nytimes.com/2016/08/05/business/dealbook/bank-of-england-interest-rates-brexit.html?_r=0
- ⁵⁴ Moore, James, "How Brexit has already changed Britain two months after the EU referendum," UK Independent, August 23, 2016. <http://www.independent.co.uk/news/business/comment/brexit-britain-what-s-happened-so-far-and-what-to-expect-if-article-50-is-triggered-a7205071.html>
- ⁵⁵ Bernanke, Ben, "The Fed's interest payments to banks," Brookings Institution, February 16, 2016. <https://www.brookings.edu/blog/ben-bernanke/2016/02/16/the-feds-interest-payments-to-banks/>
- ⁵⁶ Yellen, Janet, "Speech at 'Designing Resilient Monetary Policy Frameworks for the Future,'" Federal Reserve Bank of Kansas, August 26, 2016. <http://www.federalreserve.gov/newsevents/speech/yellen20160826a.htm>
- ⁵⁷ Yellen, Janet, "Testimony before the Joint Economic Committee at *The Economic Outlook*," Joint Economic Committee, November 17, 2016. <https://www.federalreserve.gov/newsevents/testimony/yellen20161117a.htm>
- ⁵⁸ Torry, Harriet, "Economic Resilience Bolsters Prospects for December Rate Rise," Wall Street Journal, November 23, 2016. <http://www.wsj.com/articles/split-fed-in-november-signaled-rate-increase-could-come-in-december-1479927708>
- ⁵⁹ Fawley, Brett and Christopher Neely, "Four Stories of Quantitative Easing," Federal Reserve Bank of St. Louis Review, January/February 2013. <https://research.stlouisfed.org/publications/review/13/01/Fawley.pdf>;
See also: "ECB launches targeted LTRO, intensifies preparation for ABS buy," Reuters, June 5, 2014. <http://www.reuters.com/article/us-ecb-tiltro-idUSKBN0EG1TX20140605>;
See also: "ECB Announces operational details of asset-backed securities and covered bond purchase programmes," European Central Bank, October 2, 2014. https://www.ecb.europa.eu/press/pr/date/2014/html/pr141002_1.en.html;
See also: "Eurosystem adjusts purchase process in ABS programme," European Central Bank, September 23, 2015. <https://www.ecb.europa.eu/press/pr/date/2015/html/pr150923.en.html>;
See also: "ECB announces expanded asset purchase programme," European Central Bank, January 22, 2015. https://www.ecb.europa.eu/press/pr/date/2015/html/pr150122_1.en.html;
See also: "Monetary Policy Decisions," European Central Bank, March 10, 2016. <https://www.ecb.europa.eu/press/pr/date/2016/html/pr160310.en.html>;
See also: "Monetary Policy Decisions," European Central Bank, June 5, 2014. <https://www.ecb.europa.eu/press/pr/date/2014/html/pr140605.en.html>;
See also: "Monetary Policy Decisions," European Central Bank, September 4, 2014. <https://www.ecb.europa.eu/press/pr/date/2014/html/pr140904.en.html>;
See also: "Press Release," Board of Governors of the Federal Reserve System, December 16, 2015. <https://www.federalreserve.gov/newsevents/press/monetary/20151216a.htm>
- ⁶⁰ Hayashi, Fumio and Edward Prescott, "The 1990s in Japan: A Lost Decade*," University of Tokyo and University of Minnesota, <https://www.minneapolisfed.org/research/wp/wp607.pdf>
- ⁶¹ "Wooden Frame House Market Value Index," Japan Real Estate Institute, <http://www.reinet.or.jp/en/>

⁶² Andolfatto, David and Li Li, “Quantitative Easing in Japan: Past and Present,” Federal Reserve Bank of St. Louis Economic Research, January 10, 2014. <https://research.stlouisfed.org/publications/economic-synopses/2014/01/10/quantitative-easing-in-japan-past-and-present/>

⁶³ “New Procedures for Money Market Operations and Monetary Easing,” Bank of Japan, March 19, 2001. https://www.boj.or.jp/en/announcements/release_2001/k010319a.htm/

⁶⁴ Hayashi, Yuka, “Japan’s Tale of Caution on Fed Monetary Policy,” Wall Street Journal, November 22, 2010. <http://www.wsj.com/articles/SB10001424052748704444304575628403102379326>

⁶⁵ “Factbox: BOJ unveils asset purchase program,” Reuters, October 28, 2010. <http://www.reuters.com/article/us-japan-economy-boj-idUSTRE69R17R20101028#zb626jU8J8Gx7ff.97>

⁶⁶ See also: “Statements on Monetary Policy,” Bank of Japan. https://www.boj.or.jp/en/mopo/mpmdeci/state_2014/index.htm/

⁶⁷ Warnock, Eleanor and Mayumi Negishi, “Japan’s Negative-Rate Experiment is Floundering,” Wall Street Journal, April 14, 2016. <http://www.wsj.com/articles/japans-negative-rate-experiment-is-floundering-1460644639>

⁶⁸ Rowley, Anthony, “Negative rates are working, Kuroda insists – full benefits ‘in a few months’,” Global Capital, May 3, 2016. <http://www.globalcapital.com/article/yvxyjqc08v9z/negative-rates-are-working-kuroda-insists-full-benefits-in-a-few-months>

⁶⁹ “Negative Interest Rates,” S&P Global, Page 19, August 17, 2016. https://media.spglobal.com/documents/SPGlobal_Negative_Interest_Rates_August_2016.pdf

⁷⁰ “Japan – Central government debt, total (% of GDP),” The World Bank, <http://data.worldbank.org/indicator/GC.DOD.TOTL.GD.ZS?locations=JP>

⁷¹ Hancock, Diana and Wayne Passmore, “How the Federal Reserve’s Large-Scale Asset Purchases (LSAPs) Influence Mortgage-Back Securities (MBS) Yields and U.S. Mortgage Rates,” Federal Reserve Board Divisions of Research and Statistics and Monetary Affairs, Page 20, December 2012. <https://www.federalreserve.gov/pubs/feds/2014/201412/201412pap.pdf>

⁷² Yellen, Janet, “Normalizing Monetary Policy: Prospects and Perspectives,” Speech at “The New Normal Monetary Policy” at the Federal Reserve Bank of San Francisco, March 27, 2015. <http://www.federalreserve.gov/newsevents/speech/yellen20150327a.htm>

See also: “Fed’s Janet Yellen: Taylor Rule and Fed Funds Rate,” Bloomberg, June 21, 2016.

<http://www.bloomberg.com/news/videos/2016-06-21/fed-s-janet-yellen-taylor-rule-and-fed-funds-rate>

⁷³ Condon, Christopher, and Jeanna Smialek, “This is the Fed’s Hawk-to-Dove Scorecard,” Bloomberg Markets, December 18, 2015. <http://www.bloomberg.com/news/articles/2015-12-18/fed-birdcage-new-voters-new-grades-for-fomc-in-2016>

⁷⁴ Fixen, Rachel, “Pensions in Germany: The joys of negative rates,” Investment and Pensions in Europe, April 2016.

<https://www.ipe.com/pensions/pensions-in-germany/pensions-in-germany-the-joys-of-negative-rates/10012506.fullarticle>

⁷⁵ Lynn, Matthew, “Jackson Hole: the three tough questions central banks must ask themselves,” The Telegraph, August 25, 2016.

<http://www.telegraph.co.uk/business/2016/08/22/jackson-hole-the-three-tough-questions-central-banks-must-ask-th/>

⁷⁶ See also: “Open Market Operations,” Board of Governors of the Federal Reserve System, December 16, 2015.

<https://www.federalreserve.gov/monetarypolicy/openmarket.htm>

⁷⁷ Da Costa, Pedro Nicolaci, “Stiglitz: Fed’s Zero-Rate Policy Boosts Inequality,” Wall Street Journal, June 4, 2015.

<http://blogs.wsj.com/economics/2015/06/04/the-feds-zero-rate-policy-boosts-inequality-nobel-economist-joseph-stiglitz-says/>

⁷⁸ Wu, Tao, “Unconventional Monetary Policy and Long-Term Interest Rates,” International Monetary Fund, September 2014.

<https://www.imf.org/external/pubs/ft/wp/2014/wp14189.pdf>;

⁷⁹ “Current high levels of financial repression create significant costs and lower long-term investors’ ability to channel fund into the real economy, a new Swiss Re study shows,” March 26, 2015, Swiss Re.

http://www.swissre.com/media/news_releases/nr_20150326_financial_repression.html

⁸⁰ Tracy, Ryan, “Fed Policy Makers Raise Concerns About Their Policy Tools,” Wall Street Journal, May 18, 2016.

<http://www.wsj.com/articles/fed-policy-makers-raise-concerns-about-their-policy-tools-1463608165>

See also: Sharma, Ruchir, “The Federal Reserve Asset Bubble Machine,” Wall Street Journal, May 11,

2015. <http://www.wsj.com/articles/the-federal-reserve-asset-bubble-machine-1431386994>

⁸¹ In opening remarks at a November 2015 Fed research symposium (Yellen, Janet, “Speech at ‘Monetary Policy Implementation and Transmission in the Post-Crisis Period,’” Board of Governors of the Reserve Reserve System, November 12, 2015.

<http://www.federalreserve.gov/newsevents/speech/yellen20151112a.htm>), Chair Yellen called on policymakers “to be mindful of new channels for monetary policy transmission that may have emerged from the intricate economic and financial linkages in our global economy that were revealed by the crisis.”

⁸² In a 2012 speech (Caruana, Jaime, “Why central bank balance sheets matter,” Bank for International Settlements, December 2011.

<http://www.bis.org/publ/bppdf/bispap66b.pdf>), the General Manager of the Bank for International Settlements identified risks related to large central bank balance sheets: Inflation; Financial stability; Financial market distortions; and Sovereign debt management conflicts. He outlined this hypothetical distortion resulting from investors expecting central bank intervention: “When financial markets are subject to elevated uncertainty, central bank actions (actual and expected) on asset markets can play a disproportionate role in influencing financial market outcomes. And this could create a potent cross-border feedback loop: large-

scale asset purchases in the West depress the domestic yield curve, which tends to widen the interest rate gap with emerging Asia; the threat of capital flows encourages more foreign reserve accumulation in emerging Asia and easy monetary policy; and this puts additional downward pressure on US treasury yields as the demand in Asia for US treasury securities rises. Anticipating such a dynamic, investors can become overly sensitive to expected central bank policies.”

⁸³ In the April 2016 minutes (“Minutes of the Federal Open Market Committee,” Federal Open Market Committee, April 26-27, 2016. <https://www.federalreserve.gov/monetarypolicy/fomcminutes20160427.htm>) Fed staff and FOMC participants noted the paucity of available “macroprudential tools” to effectively address financial instability.

⁸⁴ Gillespie, Patrick, “Janet Yellen: Fed low on options to handle another recession,” CNN Money, June 21, 2016. <http://money.cnn.com/2016/06/21/news/economy/janet-yellen-fed-congress-tools/>

⁸⁵ The St. Louis Federal Reserve Bank recently emphasized the need for normal: “How is the Normalization of Monetary Policy Going to Work?” Federal Reserve Bank of St. Louis, August 3, 2015. <https://www.stlouisfed.org/on-the-economy/2015/august/fomc-monetary-policy-normalization>.

⁸⁶ A “rules-based” protocol suggested in Sumner, Scott, “Nudging the Fed Towards a Rules-Based Policy Regime,” Mercatus Center at George Mason University, March 2016. <http://mercatus.org/publication/nudging-fed-toward-rules-based-policy-regime> is one example of new approaches.