

Conventional Monetary Policy¹

We now examine the Federal Reserve's response to the economic downturn. I divide monetary policy into two types. These notes deal with conventional monetary policy which I define to include changes to the Federal Funds Rate target and efforts to affect expectations of future short term interest rates. Non-conventional monetary policy includes less common measures such as quantitative easing and TARP. This definition is somewhat arbitrary, but I find it convenient.

Some background

The Federal Open Market Committee meets and selects a target for the Federal Funds Rate, a rate at which banks lend to each other overnight through the Fed. Recall that banks must hold at least 10% (the precise level depends on the size of the bank) of their deposits as reserves. If one bank is short of reserves, it may borrow from another bank that has a surplus. The Effective Federal Funds rate is an average of all such interest rates. The Fed cannot decree the Federal Funds Rate. It can only choose a target which then differs from the effective rate by some amount.

Historically, the Fed has tried to hit its target through open market operations conducted by the Trading Desk at the New York Fed. This has not been the case since about 2008. Instead, the primary tool by which the Fed affects interest rates are reverse-repo loans. Here, The Fed takes out overnight loans from member banks. As an essentially risk free lender, lenders will never choose to make a loan at a lower rate than offered by the Fed. The interest rate on reverse-repo loans thus acts as a floor on other overnight rates. This has been sufficient for the FOMC to manage The Fed Funds rate since 2008. Other tools may be needed in the future.

Suppose that the Fed is able to effectively lower the Federal Funds Rate. Arbitrage (the ability to borrow at one rate and lend at another for a profit) suggests that other short term rates will fall as well. Part of the decrease in short term interest rates may be passed on to longer term interest rates. If prices are sticky, then real interest rates may also be affected.

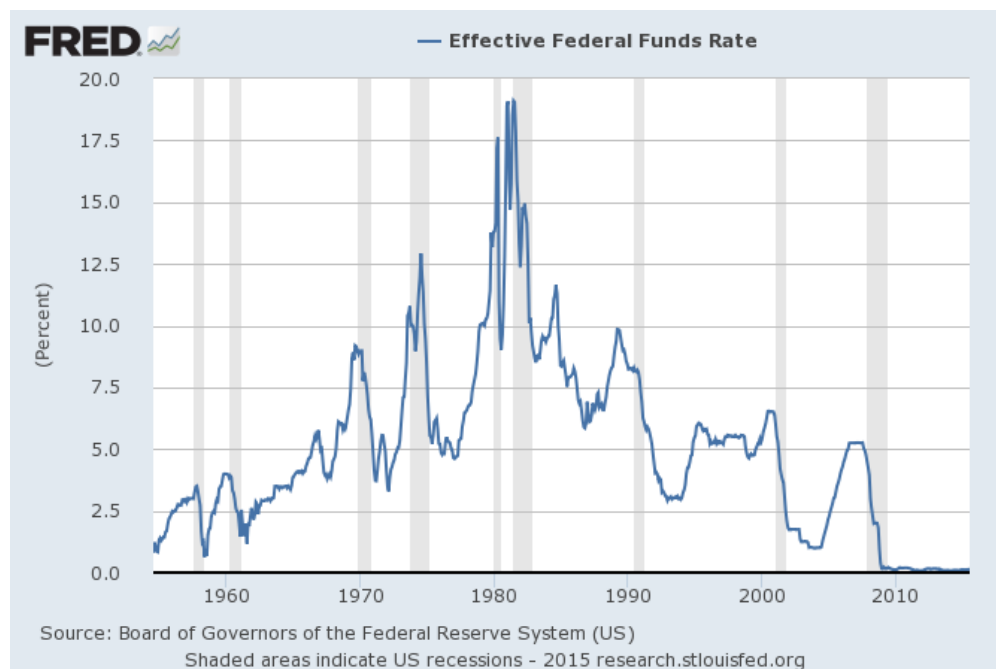
¹These are undergraduate lecture notes. They do not represent academic work. Expect typos, sloppy formatting, and occasional (possibly stupefying) errors.

Lowering interest rates has two major channels by which output is increased and unemployment reduced:

1. The Interest Rate Channel. Recall that interest rates equal the opportunity cost of financing investment. More investment increases output. Also, as real interest rates fall, households have less incentive to save and consumption increases.

2. The Credit Channel. Lower interest rates increase prices and output. All three of these results also cause a relaxation of credit constraints which amplifies and propagates the effects on P and Y .

The following, now familiar, graph shows the Federal Funds Rate since 1990.



FOMC Policy

In September 2007, the Federal Funds Rate target stood at 5.25%. First in response to the subprime mortgage crisis, and then in response to the financial panic, the FOMC instituted a series of rate decreases beginning on September 18, 2007. The tenth and final rate decrease occurred

on December 16, 2008 when the FOMC lowered its target to its current level of 0-0.25%. At this point, the FOMC had exhausted its preferred weapon for stimulating the economy.

Another short term interest rate that the Fed employs is the discount rate, the rate at which the Fed loans reserves to banks. The FOMC also lowered this interest rate to very low levels.

The following paper conducts a useful exercise which allows us to quantify the liquidity trap, as well as shed further light on whether the Fed contributed to the housing bubble in the first place:

Rudebusch, Glenn. 2009. "The Fed's Monetary Policy Response to the Current Crisis." *Federal Reserve Bank of San Francisco Economic Letter*, 2009-17.

The author estimates the Fed's normal policy by regressing the federal funds rate (actual, not target) on inflation and the unemployment gap, which equals unemployment less the CBO's estimate of the natural rate:

$$FFR_t = 2.07\% + 1.28\pi_t - 1.95UEGAP_t + \mu_t \quad (1)$$

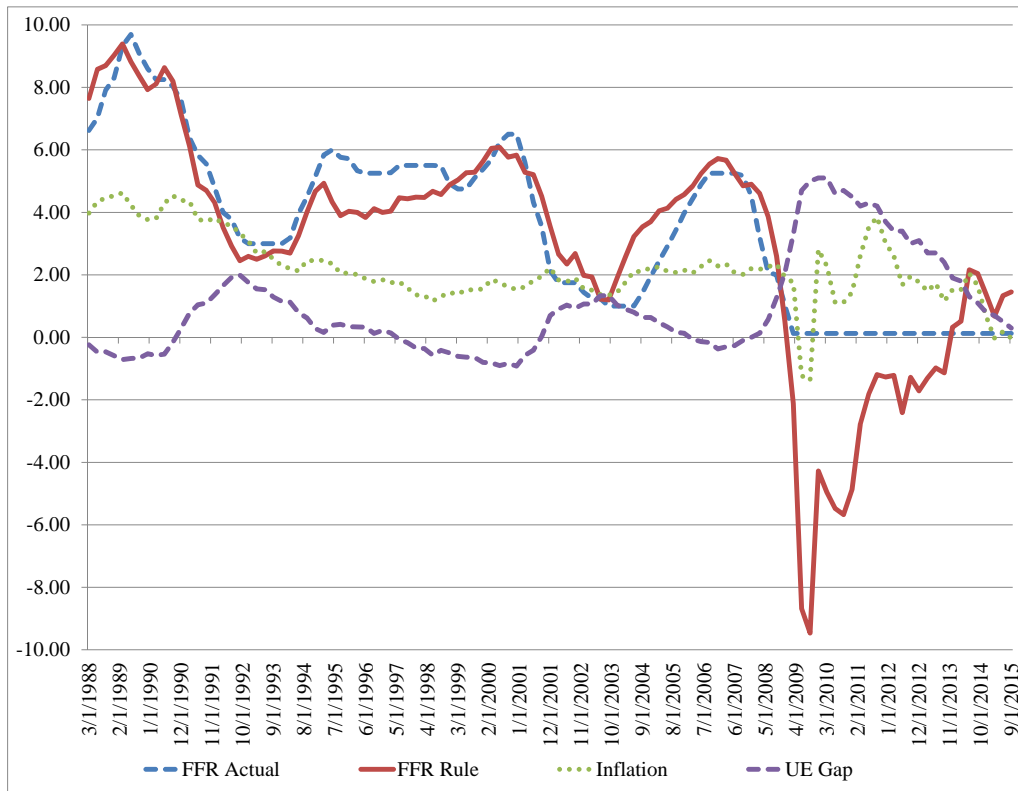
Rudebusch then examines how the Fed deviated from this normal rule. I extended the results from his paper using newer data. The following graph includes the Federal Funds rate vs. the rate implied by (1).

There are some notable deviations from the rule:

1. Between 2004 and 2006, interest rates were from 1-2% lower than the rate implied by the rule. This does not prove that rates were "too low for too long." But it does suggest that Fed policy was at least more expansionary than it would have been in the past for given values of inflation and unemployment.

2. By early 2009, the Fed had reached the zero lower bound on interest rates. It was thus no longer possible to closely follow (1). Were there no longer bound, the Fed would have liked to lower interest rates to about -9.5% during the worst of the recession.

Figure 1: Actual Federal Funds Rate vs. Rule



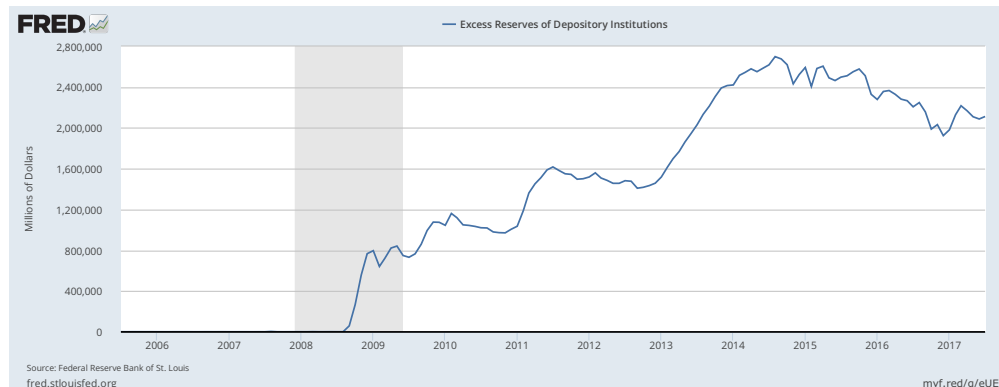
3. By late 2013, the rule suggested that the Fed raise interest rates above near zero. By September 2015, the rule suggested a 1.46% target.

4. By 2015, the FOMC would argue that this rule is no longer a good description of how it should conduct monetary policy. The neutral rate is the level of the Fed Funds Rate consistent with full employment and 2% inflation. In (1), this is 4.63%. The FOMC believes that this rate has declined significantly since the Great Recession, mostly due to weak productivity growth expectations resulting from an aging workforce. As of October 2017, The Fed estimates the neutral rate is about 2.0% (suggesting that the constant from (1) should decline by about 2.6%) with it expected to rise to 2.8% longer-term. This is also why the Fed would argue that it was right not to raise

interest rates in 2013, despite what this rule says.

Risks of Inflation

Commercial banks are currently holding over \$2 trillion in (largely excess) reserves. Recall from ECO 103 that this behavior reduces the effectiveness of the money creation process and thus the money multiplier. During the downturn, velocity has also decreased.



The Fed's large purchases of assets have dramatically increased the monetary base (currency plus electronic reserves). Recall, however, that the money supply, not the monetary base, affects inflation. The following table illustrates how these variables have changed since prior to the recession.

Since March 2008, the Fed has more than quadrupled the monetary base. This has not, however, resulted in significant inflation. Using the equation of exchange: $PY \equiv MV$, we see several reasons. First, because banks are holding excess reserves, the money multiplier has declined, it now is less than one (this is possible because electronic reserves are part of the monetary base but not the money supply). The increase in the money supply, though significant, is far less than the increase in the monetary base. Second, during the economic downturn, velocity has declined. Finally, slower growth has itself put downward pressure on prices.

An interesting exercise is to consider what would have happened had the Fed kept the monetary base at its March 2008 level while velocity and the money multiplier fell to their October 2012

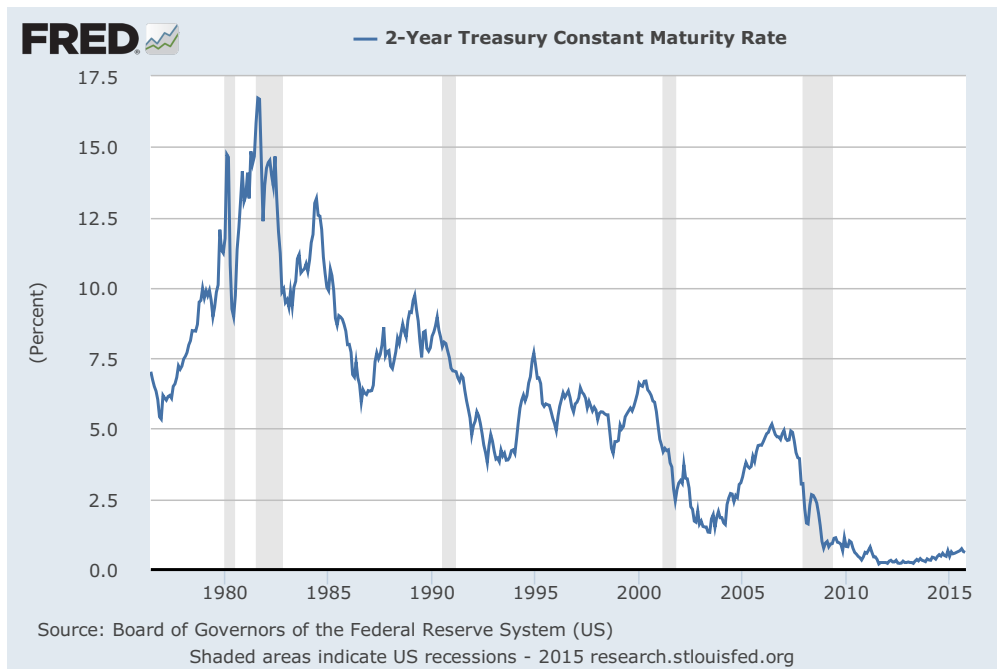
Table 1: Monetary Base and Money Supply

	March 2008	February 2011	August 2013	October 2017
Monetary Base	860.6	2275.1	3393.8	3910.0
M1	1388.3	1852.7	2572.2	3539.1
M2	7749.0	8882.9	10784.0	13,609.0
V (M1)	10.3	7.9	6.6	5.3
V (M2)	1.871	1.693	1.575	1.427
Money Multiplier (M1)	1.628	0.8881	0.758	0.905

levels. Obviously this is overly simplistic, the latter two variables are endogenous and would not have fallen by these amounts had the Fed not increased the monetary base. But the exercise is still instructive. Using M1, MV would then have fallen by about 70%. This would require that the price level and output collectively fall by the same amount. Again, this is not intended to be taken literally. But it is clear that the Fed risked serious deflation if it did not expand the monetary base.

Managing Expectations and Forward Guidance

The Federal Funds Rate is a short term, overnight, interest rate. Most major economic decisions, however, are based on longer term rates. It has been suggested that two year interest rates are the best measure of monetary policy. The following figure shows the yield for 2 year Treasury Bonds:



There are two ways that the Fed can affect this interest rate. First, it can buy longer term assets, an action that is left for the next set of notes. Second, it can influence this rate by affecting expectations of future short term rates. Suppose for example, that I wish to save for two years. I can either buy a two year bond, or I can continuously buy overnight debt. Setting the expected returns equal yields:

$$i_{2yr,t} = E_t \left[\prod_{i=0}^{2yr} i_{1day,t+i} \right] \quad (2)$$

Because longer term interest rates are the product of expected future short term rates, changing markets' expectations of the latter will affect the former. The Fed may do this through the statements issued by the FOMC, or Fed officials can hint at future policy in interviews, in testimony before Congress, etc. Consider two examples of this policy.

1. When the FOMC target to near zero in early 2009, it expected this policy to remain in effect for an extended period of time. It did not, however, effectively communicate its intention. Financial markets seem to have expected rates to increase within a fairly short period of time. As a result, 2 year interest rates did not approach zero. Because the stimulus (ARRA) was being enacted

at the same time, the Fed may have reduced the effectiveness of fiscal stimulus by allowing some crowding out to have occurred.

2. The FOMC is quite aware of #1. In its September 13, 2012 statement, it was usually explicit about future policy:

To support continued progress toward maximum employment and price stability, the Committee expects that a highly accommodative stance of monetary policy will remain appropriate for a considerable time after the economic recovery strengthens. In particular, the Committee also decided today to keep the target range for the federal funds rate at 0 to 1/4 percent and currently anticipates that exceptionally low levels for the federal funds rate are likely to be warranted at least through mid-2015.

This type of statement has come to be known as “forward guidance.” Faced with the inability of further lower short term interest rates, the Fed seeks to influence longer term rates by being more explicit about the future path of policy.

In December 2012, the Fed again used forward guidance. The FOMC stated:

In particular, the Committee decided to keep the target range for the federal funds rate at 0 to 1/4 percent and currently anticipates that this exceptionally low range for the federal funds rate will be appropriate at least as long as the unemployment rate remains above 6-1/2 percent, inflation between one and two years ahead is projected to be no more than a half percentage point above the Committee's 2 percent longer-run goal, and longer-term inflation expectations continue to be well anchored.

Forward guidance has had the desired short term effect, longer term interest rates have dropped as hoped for. It does, however, come with some costs. First, the policy possibly ties the Fed's hands going forward. Second, it is easy for these types of statements to be misinterpreted as a signal that

the Fed is worried about the state of the economy. The Fed itself is skeptical, however, of this latter concern. It does not believe that its forecasts are much better than others that are available.

Lift Off

The Fed finally raised interest rates in December 2015 to a range between 0.25% and 0.50%. As of October 2017, this range is 1-1.25% and the expectation is that the Fed will continue to raise rates over the next few years, with the main issues being how fast it will do so and when it will stop. Among the motivations for higher rates are:

1. The U-3 unemployment rate is close to its natural rate (estimated to be around 4-6% and 4.7%). Other measures, such as labor force participation, however, have exhibited a much more tepid recovery. Most popular macroeconomic models predict that with a credible Central Bank and a strong labor market, inflation should converge to target fairly quickly.

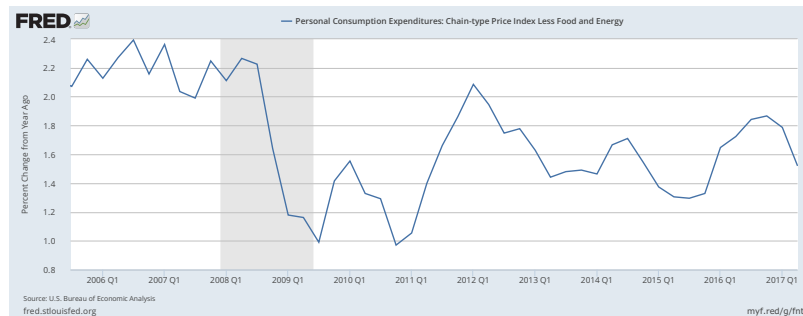


2. Financial markets and the overall macroeconomy have taken recent rate hikes in stride. Some Fed officials, including outgoing Vice-Chairman Stanley Fischer have also suggested that low rates may incentivize agents to take on inefficiently high levels of risk.

3. Estimated policy rules, like the one from (1) (even adjusting the constant downwards), suggest more rate hikes.

As of October 2017, there is still considerable uncertainty over whether the Fed will raise rates again in 2017. The arguments against doing so start with the lack of inflation.

1. Core-PCE inflation, the Fed’s preferred measure, has rarely hit 2% since the Great Recession and as of October 2017 is just 1.3%. Some FOMC members want to wait for harder evidence of inflation returning to target. The Fed’s inflation forecasts have been consistently wrong (by predicting too much inflation) for several years and most private forecasters project less inflation than the Fed.



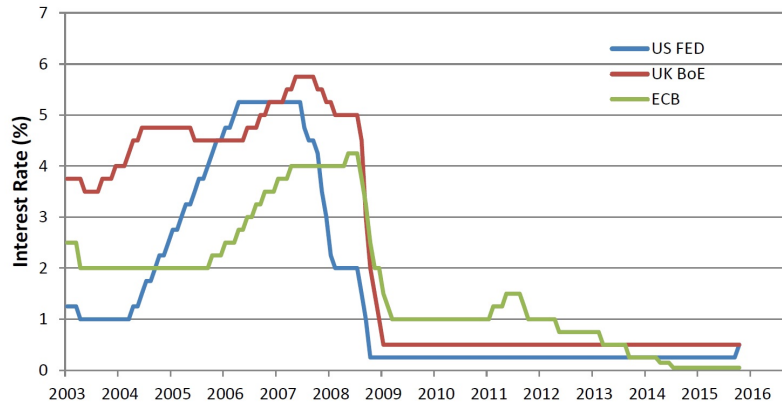
2. As of October 2017, two successful leading economic indicators, the housing market (recall Leamer) and the yield curve have been raising yellow flags. Perhaps the Fed should wait to see if these variables improve.

3. Fiscal and monetary policies are related. Currently, the U.S. national debt is 77% of GDP. Debt service (the interest paid on this debt) , however, is just 1.4%, a low figure. Interest rate normalization will cause this figure to rise, contributing to troublesome long-run fiscal projections.

In addition to choosing its Federal Funds rate target, the Fed must also decide what to do with its \$4.5 trillion dollar balance sheet. The Fed has just begun (as of October 2017) to reduce its balance sheet by allowing up to \$4 billion of mortgage backed securities and \$6 billion of long-term Treasuries to mature (without being repurchased) per month. It will increase these amounts by an additional \$4 billion and \$6 trillion per quarter until they hit \$20 billion and \$30 billion.

Finally, we consider two other Central Banks, the Bank of England and the European Central Bank. Their story is similar, if somewhat less aggressive, to that of the Fed. They also responded to the Great Recession by lowering rates.² Both responded less aggressively than the Fed, however.

²Source: www.assetview.co.uk



Where Will Normalization End?

It isn't obvious how high rate's will go. The FOMC's September 2.8% projections are centered at 2.8%. Ultimately, the neutral rate (like a steady state) is the sum of the Fed's 2% inflation target and the natural real interest rate. There is evidence that the latter has fallen dramatically in recent years.³

The latest estimate is that the natural rate of interest is negative. This is mostly due to expected low productivity growth due to 1) an aging and less productive workforce, 2) lower labor force participation (related to #1), and 3) a relatively low impact of technology on productivity. If we take this estimate seriously, it suggests that the neutral rate is just 1.8%. Low inflation may also justify rates even lower, explaining Janet Yellen's recent comments that not many more rate hikes may be needed. The Fed's 2.8% long-run Fed Funds rate forecast is based on their expectation that the natural rate of interest will rise somewhat and that inflation will return to target. Note that there is considerable uncertainty on both of these points indicating that there is also considerable uncertainty over where normalization will end.

³Results made available by authors of: Laubach, T. and J. Williams. 2015. "Measuring the Natural Rate of Interest Redux." Hutchins Center on Monetary and Fiscal Policy Working Papers #15.

Figure 2: Natural Real Interest Rate

