



Working Paper Series

This paper can be downloaded without charge
from: <http://www.richmondfed.org/publications/>



Richmond • Baltimore • Charlotte

The Evolution of U. S. Monetary Policy

Robert L. Hetzel

Senior Economist
Federal Reserve Bank of Richmond
Research Department
P. O. Box 27622
Richmond VA 23261

804-697-8213
robert.hetzel@rich.frb.org

December 5, 2017
Working Paper No. 18-01

Abstract: Since the establishment of the Federal Reserve System in 1913, policymakers have always pursued the goal of economic stability. At the same time, their understanding of the world and of the role of monetary policy has changed dramatically. This evolution of views provides a laboratory for understanding what kinds of monetary policy stabilize the economy and what kinds destabilize it.

JEL: E52 and E58

Paper prepared for *Handbook of the History of Money and Currency*, eds, Stefano Battilossi, Youssef Cassis, and Kazuhiko Yago, Springer Publishing.

The author is senior economist and research advisor at the Federal Reserve Bank of Richmond. Stefano Battilossi provided helpful comments. The views in this paper are the author's not the Federal Reserve Bank of Richmond's or the Federal Reserve System's.

Since the creation of the Federal Reserve System, the goal of policymakers has been economic stability. Policymakers' strategies for achieving that goal have evolved with their understanding of how the world works. An overview of that understanding and of its consequences for monetary policy provides an approximation to a laboratory for understanding what constitutes a stabilizing monetary policy. As an institution, when has the Fed been a major contributor to economic stability and when has it been a major source of instability?

This laboratory provides guidance in the construction of a model that allows for identification of the forces that drive prices and the business cycle. A model allows one to go beyond the correlations of monetary and macroeconomic variables in order to assign causation. It explains how "exogenous" forces, that is, forces emanating from outside the working of the price system, move markets away from stable outcomes. The historical overview here suggests that monetary policymakers still have not settled on a model and a rule for policy that satisfactorily distills the lessons from historical experience. Much work remains in order to achieve consensus on the design of a rule that will make monetary policy into a consistently stabilizing influence.

Section 1 poses the questions, "What is a central bank and how does the systematic behavior of a central bank create the monetary regime?" Section 2 summarizes the pre-World War II monetary regime, while sections 3 summarizes the era of stop-go monetary policy. Section 4 reviews the post-disinflation Volcker-Greenspan era and the intellectual sea change that it entailed. Section 5 reviews the monetary regime created during the Volcker-Greenspan tenures as FOMC chairmen. Section 6 reviews monetary policy during the Great Recession. (The narrative summarizes Hetzel (2008 and 2012). Section 7 examines the reasons why the Fed regularly missed its inflation target on the downside after the Great Recession. Section 8 offers concluding comments.

1. Defining the monetary regime

What makes central banks unique is their control over money creation. The operating procedures of central banks entail the manipulation of bank reserves in order to set a targeted interest rate on those reserves—the federal funds rate. Bank reserves are the instrument for achieving finality of payment. The FOMC can manipulate their supply in order to achieve its interest rate target because reserves possess a well-defined demand. Bank demand for reserves varies with the quantity of the instruments that serve as media of exchange (money), for example, demand deposits.

Starting October 8, 2008, the Fed began paying interest on reserves (IOR). Prior to that date, the New York Desk achieved the FOMC's funds rate target by reducing reserves (selling securities) when the funds rate fell below target and conversely by increasing reserves (buying securities) when the funds rate rose above target. With IOR, the Desk must supply the minimum amount of reserves consistent with the funds rate target. It then effectively sterilizes any additional reserves provided by open-market operations as banks voluntarily hold them to receive the interest paid by the Fed.

The nature of the monetary regime depends upon the procedures the central bank employs to discipline money creation through its control over bank reserves creation. In a monetary regime of fiat money, the value in exchange of a paper dollar far exceeds its resource cost of production. In order to limit the quantity of money and give it a well-defined value in exchange for goods (a well-defined price level), the central bank must provide a nominal anchor. Markets cannot perform that function. The nature of the monetary regime then emerges from the interaction of that nominal anchor and the extent to which the central bank either allows the price system to operate to determine

the values of real variables or impinges upon its operation in an attempt to trade off between inflation and real variables like unemployment.

In the quantity-theory tradition descended from Irving Fisher and Milton Friedman, a credible rule allows the Fed to separate the determination of the price level from the determination of relative prices and real quantities like output and unemployment. Under the assumption that markets are competitive and that they work well in a regime of nominal (price level) expectational stability, it is optimal for the central bank to follow a rule that turns over to the price system the operation of the real economy—a nonactivist monetary regime. The alternative tradition, which descended from John Maynard Keynes, contends that the exercise of monopoly power in markets forces trade-offs on the central bank. The central bank can mitigate extreme fluctuations in inflation through depressing output and conversely it can mitigate extreme declines in output through increasing inflation—an activist monetary regime. These trade-offs, which are known under the rubric of Phillips curve trade-offs, require the Fed to intervene in the operation of price system.

Given the existence of recessions and inflation variability, the underlying question is whether the economy is inherently stable but subject to periodic episodes of instability arising from mismanagement of the monetary regime by the central bank. Alternatively, is it inherently subject to periodic episodes of instability? In the former, quantity-theory view of the world, periodically the central bank interferes with the operation of the price system and as a consequence creates destabilizing emissions and absorptions of money that cause the price level to evolve in an unpredictable fashion. In the latter, Keynesian view of world, markets are periodically prone to “herd” behavior that overwhelms the stabilizing properties of the price system. Such behavior could take the form of an inflationary investment boom or of a speculative excess that creates ultimately unsustainable imbalances, the collapse of which entails deflation and recession. Both of these two kinds of destabilizing forces, monetary mismanagement and private excess, can produce economic instability. However, the former are preventable through adoption of an optimal monetary rule while the latter are subject only to mitigation by the central bank through exploiting a Phillips curve.

Sections 3 and 4 summarize the evolution of the monetary regime since the early days of the Fed. In assessing the evolution of the monetary regime, the key benchmark will be the attitude of the Fed toward inflation. Does the Fed accept responsibility for inflation and, as an essential prerequisite for its control, the control of inflationary expectations? Because monetary policymakers operate in financial markets, they have always understood the critical role of expectations. But, the question remains, expectations of what?

2. Pre-World War II monetary policy

The conception of a central bank responsible for macroeconomic stabilization is a post-World War II phenomenon. Before modern macroeconomics, there was no understanding of the behavior of the economy determined by the operation of the price system with the real (inflation-adjusted) interest rate the key intertemporal price of resources. With no understanding of the price system, there could be no understanding that the price system worked well in the sense of establishing well-defined values of real variables that equilibrate markets, in particular, a “natural” rate of interest. Before the war, there was then no conception of monetary policy understood as the mutual interaction between the setting of a policy instrument (the interest rate on bank reserves or the funds rate) and the behavior of the economy. As a result, there could be sense that this mutual interaction was a procedure for letting the price system work by causing the real interest rate to track the natural rate of interest.

Before the founding of the Fed, the United States was on the gold standard. After the end of the Second Bank of the United States in 1836, the United States had no central bank, and the gold standard operated automatically. The Bank of England, the central bank for the world on the gold standard, operated with a set of rules that required no understanding of the price system. Nothing prepared the early Fed for the responsibilities of the monetary regime that Congress created in 1912 (Hetzel 2017).

After the creation of the Fed, the United States retained convertibility of gold and Federal Reserve notes. However, the Fed did not follow the rules of the international gold standard for setting its discount rate. In order to understand the consequences of that departure from gold standard rules, it is useful to survey the operation of the gold standard. The classical gold standard provided a “nominal anchor” in that it imparted a well-defined value to the price level. Given the gold content of a dollar, the real (commodity) value of gold determined the price level. Given the coexistence of paper money (banknotes and Greenbacks) and gold dollars, convertibility meant that each had to possess the same purchasing power. Under the gold standard, if the value of gold in exchange for commodities increased, the value in exchange of a paper dollar also had to increase. That increase required a decline in the price level (deflation).

For the countries belonging to the international gold standard that prevailed prior to World War I, the real value of gold set a world price level. At the same time, given the respective gold content of those countries’ currencies, the resulting fixed parities in their currencies (exchange rates) could not adjust in order to equilibrate their balance of payments. As a result, the price levels of countries relative to each other had to adjust. For example, if a country had a good harvest at the time of a worldwide poor harvest, its exports of agricultural commodities would cause a balance of payments surplus, gold inflows, and an increase in its price level relative to the world price level. Its terms of trade would increase.

Although the classical gold standard provided a nominal anchor, the nominal anchor was not stable because the real value of gold fluctuated with the demand for gold such as occurred with the move to the international gold standard at the end of the nineteenth century and with the supply of gold such as occurred with gold discoveries in Australia and California. Quantity theorists like Irving Fisher wanted to change the nature of the monetary regime by making stability in an index number of prices (the dollar price of a basket of commodities) the nominal anchor. However, that departure from monetary orthodoxy for a regime of “managed money” was considered heretical by the established financial and political order. In fact, as explained below, with no understanding of what it was doing, the early Fed created the very regime that the established order considered heretical—a regime in which a central bank controlled fiat money creation.

The reform movement that led to the creation of the Fed centered not on a desire to replace the gold standard but rather on the desire to eliminate the financial panics that disrupted trade. The movement combined two traditions: real bills and American populism (Hetzel 2014). Both traditions assumed that the concentration of reserves in New York led to the speculative extension of credit and asset bubbles, the collapse of which produced recession and deflation. The motivating principle behind the federal organization of the Fed then was to eliminate the concentration (pyramiding) of reserves in the large New York banks by dispersing them among independent depositories of member banks’ reserves.

Congress passed legislation creating the Federal Reserve in December 1912. America's populist tradition meant that creation of a central bank was unacceptable (Lowenstein 2015). As of 1912, the past experience with central banks in the United States was with the First and Second Banks of the United States and the contemporaneous experience was especially with the Bank of England. These central banks had enforced the gold standard. The Bank of England imposed a common interest rate in the money markets based on how gold flows, internal and external, disturbed the adequacy of its gold reserve (Hetzel forthcoming a). That kind of control over the banking system from a central location like New York was not acceptable politically.

Applied to an individual bank, the real bills doctrine was a principle intended to assure that a bank could always meet deposit withdrawals because its assets were liquid. Holding liquid assets meant holding the self-liquidating debt that arose in the process of producing goods and bringing them to market (real bills, or in English parlance, bills of exchange). The founders of the Fed used this logic to understand bank panics in an American context. That is, they intended to design a system in which bank lending would vary with the demand for short-term productive uses of credit and would eschew long-term capital projects that were inherently speculative. In the National Banking Era, which preceded the Fed, banks that issued banknotes had to collateralize them with U. S. Treasury bonds. However, the limited supply of those bonds made banknote circulation "inelastic." The presumption was that the speculative excess that preceded financial panics arose because this inelastic supply created an excess of credit during periods of recession and that excess then produced subsequent booms based on speculative excess (Hetzel 2014).

Applied to the design of the Fed, when combined with American populism, the logic of real bills led to the creation of regional Reserve Banks that would supply Federal Reserve credit (the deposits that the commercial banks held with it) only through the discount window and only by accepting real bills. In that way, the Reserve Banks would proportion the extension of credit to the legitimate needs of commerce. Discount window administration based on real bills principles would create an "elastic" supply of credit and currency in response to "legitimate" demands for credit and supposedly eliminate the excesses that periodically spilled over into the New York financial markets. With no excess reserves and credit to spill over into speculative excess, there would be no more of the financial panics whose collapse led to recession and deflation (Hetzel 2014).

In the spirit of real bills, the intended role of the Fed was to limit the total credit created by banks to the amount required for productive uses. Its role was to control the amount and nature of financial intermediation. The antithesis of this view was purposeful money creation, which forced money and credit on markets regardless of any productive outlet. These views made it impossible for early policymakers to understand the nature of the monetary standard that they had created.

Equally inimical to such understanding were misperceptions of the nature of the gold standard. As implemented by the Bank of England, the gold standard provided for a nominal anchor and a value of the real interest rate set in the international gold market. It did so by moving its discount rate in a way that maintained over time a steady reserve ratio (the ratio of gold to its liabilities in banknotes). As explained above, the price level varied in a way that kept the real value of the paper pound equal to its gold counterpart in coinage. Although the United States maintained convertibility of the paper dollar into gold, it abandoned these rules of the international gold standard.

Convertibility of the dollar into gold created the misleading presumption that the United States was on the "gold standard." However, the United States was not on the classical international

gold standard but rather was pegging the price of gold through a commodity-price stabilization scheme of buying and selling gold at a fixed price. The behavior of the quantity of money was not linked to the behavior of bank reserves through gold flows produced by the international balance of payments. The price level was not then inversely related to the commodity value of gold. Despite gold convertibility, the early Fed operated a regime of fiat money creation. There was never any understanding by early Fed policymakers that the monetary standard they operated determined the behavior of the price level.

By law, the regional Reserve Banks did have to maintain gold reserves against their note issue. However, because of the large influx of gold into the United States from the start of World War I through the early 1920s, this gold-cover requirement was never binding. Contrary to the principles of the international gold standard, the Reserve Banks did not lower their discount rates when their holdings of gold exceeded the required gold cover. Even though the regional Fed Banks did not operate according to the principles of the international gold standard, on three occasions when the gold cover requirement threatened to bite due to gold outflows they raised their discount rates. They did so in late 1919 when gold flowed back to Europe, in fall 1931 when Britain went off the gold standard, and in winter 1933 when newly elected President Roosevelt failed to commit to maintenance of the gold standard. On those three occasions, gold outflows caused the Fed to engineer a severe monetary contraction.

In reality, the actual monetary regime was a fiat money regime. In contemporaneous terms, it was a regime of “managed money.” However, the idea of such a regime was anathema to policymakers. They understood such a regime as one in which the Fed would force Federal Reserve credit onto markets rather than proportioning it in response to the legitimate demands for credit. It was a subversion of real bills principles. There was a quantity-theory tradition, which related money creation to the price level. However, in the eyes of policymakers, because of its association with “managed money,” the theory represented what real bills principles were intended to eliminate.

The historical associations of paper money creation were uniformly negative. They included the French experience with the assignats prior to Napoleon, greenbacks in the Civil War, and, closer to contemporaneous events, the post-World War I hyperinflations in Germany, Austria, and Hungary. Also, the orthodoxy of the gold standard crowded out the quantity theory. There was no perceived need to understand the operation of a monetary standard in which the central bank controlled the price level through its control over money creation. There was then no need for the analytical distinction between the price level and relative prices and the responsibility of the central bank to control an index number measuring the price level (Hetzl 2017).

In order to understand early monetary policy, it is essential to distinguish between “money policy” as understood by early policymakers and “monetary policy” as understood conceptually today with the benefit of decades of subsequent theorizing. Consider first “monetary policy” in its modern sense. The distinguishing characteristic of a central bank is its control over money creation. There is a market for bank reserves, which the Fed creates through a bookkeeping operation and which serve as the media for effecting finality of payment. Bank reserves support a larger superstructure of means of payment (the quantity of money), employed by the public. Through its control over the quantity of bank reserves, the Fed controls the interest on those reserves, the funds rate. The funds rate and, more significantly, the way that markets forecast its future path based on the Fed’s reaction function (response to incoming “news” on the economy) shapes the behavior of the term structure of interest rates in credit (money) markets. The Fed exercises that control through its

role as money creator not through the role of a financial intermediary supplying funds obtained from the public, which is saving through the banking system.

Figure 1 summarizes the market for reserves that evolved in the 1920s. The reserves-demand schedule, R_d , is vertical because banks can only adjust required reserves on deposits over time by adjusting loans and investments. The reserves-supply schedule possesses two segments. The vertical segment measures the amount of nonborrowed reserves, NBR_0 . The factors beyond the Fed's control that moved the nonborrowed reserves of banks were gold flows, currency in circulation, and Treasury deposits with the Fed. The Fed could manipulate nonborrowed reserves through open market purchases. Because the Fed set total nonborrowed reserves below reserves demand, collectively banks had to borrow from their Reserve Bank. The interest rate on reserves, IR_0 , was then determined as the sum of the discount rate, DR_0 , plus a nonpecuniary cost that varied positively with the amount of funds obtained from the discount window. Continuous borrowing was considered a sign of lending based not on real bills principles of self-liquidating loans but rather for speculative purposes. The Reserve Banks limited that borrowing through subjecting banks to stringent supervisory oversight if member banks borrowed continuously. Figure 2 shows how the commercial paper rate stayed above the New York Fed discount rate.

In World War I, the Fed kept the discount rate below the rate paid on Treasury securities so that banks would have an incentive to borrow from the window in order to buy the government debt issued to finance the war. Despite the resulting money creation, given its real bills' views, the Fed interpreted the inflation that followed the war as due to speculation that pushed up commodity prices. In response, it raised the discount rate in late 1919 and again in January 1920 until it reached a high of 7 percent. The country entered a sharp recession in January 1920 but then recovered sharply starting in July 1921. The recovery started even with a discount rate still relatively high, close to 6 percent. Postwar reconstruction in Europe doubtlessly created strong credit demands and high market interest rates.

The Fed felt vindicated in its real bills views in that a strong recovery followed the recession. Just as had apparently occurred in prior episodes during the gold standard, following the collapse of the presumed speculative excess accompanied by a period of liquidation of speculative credit extension and the unsustainable level of economic activity that it supported, the economy entered the decade of the 1920s with sustained growth and only two minor recessions. However, the Fed was lucky the first time around. It would be unlucky in the Great Depression. In the 1920-1921 recession, because the international gold standard had not yet been reconstructed and foreign currencies floated against the dollar, contractionary monetary policy in the United States did not propagate to the rest of the world. In the Great Depression, with the reconstructed gold standard, it did propagate (Hetzel 2002a).

Prior to creation of the Fed, the operation of the price system determined market interest rates. However, with the creation of the Fed, in reality the United States had a central bank, which controlled short-term market interest rates. With no understanding of the consequences of its actions, and even with presumed "low" rates of interest as the Depression persisted, the Fed kept market interest rates above the level required for economic stability, the "natural" rate of interest. As a result, the Fed created an unprecedented spiral of monetary contraction, deflation, expected deflation, a rise in the real rate of interest, and economic contraction (Friedman and Schwartz 1963). Nothing in the Fed's real bills framework prepared policymakers for an understanding of the monetary regime of fiat money in which they were operating.

The Great Depression started with the extremely contractionary monetary policy initiated by the Fed in 1928 intended to deflate the boom in equity prices on the New York Stock Exchange, widely considered “a financial debauch.” (Insightful narratives of the Great Depression can be found in Chandler 1971, Friedman and Schwartz 1963, Meltzer 2003, Wheelock 1991, and Wicker 1996.) As described above, the Fed had adopted procedures in which it set the marginal cost of funds to banks through the cost of borrowing from the discount window. That cost depended upon the discount rate and a nonpecuniary cost of using the discount window for banks that stayed in the window for any extended period. Starting in 1928, the Fed engaged in open market sales that reduced banks nonborrowed reserves and thus forced them into the discount window. In Figure 1, the R_s schedule shifted leftward. The banks had to borrow extensively. Given the stricture that banks should never be in the window except for short periods, the stringent supervision associated with that borrowing at the window raised the cost of funds. Individually, banks attempted to get out of the window by restricting lending. Collectively, the banking system had to contract and money growth dropped to negative levels (Figure 3).

At the same time, in the real bills environment of the time, the universally accepted view was that the recession that began in August 1929 had originated in a circumvention of real bills principles. The presumption was that a combination of gold inflows and easy money produced by the Fed in 1927 when it lowered the discount rate as a way of aiding Britain in its return to the gold standard had forced credit onto markets in excess of the legitimate needs of business. Forced credit creation had created a speculative bubble supporting an unsustainable level of economic activity. When, inevitably, the bubble burst, a period of liquidation of credit and business had to occur before the economy could grow again on a more solid basis. That perception hobbled monetary policy. Expansionary monetary policy in the modern sense of aggressively buying government securities, forcing down interest rates, and creating money would, it was believed, have recreated the old boom-bust credit cycle that had led to the Depression.

Monetary policy was contractionary in the Depression because the Fed kept the marginal cost of reserves to banks above the natural rate of interest. As shown in Figure 2, especially at the regional Reserve Banks other than New York, the discount rate, which set a lower bound on the cost of reserves, was maintained at levels well above zero. As the expectation of deflation grew, the real rate of interest rose to levels that were high for any phase of the business cycle. At the time, policymakers understood nothing of this analysis. The regional Reserve Banks considered themselves as depositories of funds whose use allowed them to influence the cost and availability of credit. The prevailing view was that a historically low level of the discount rate meant that the cost of credit was not an impediment to economic recovery. Although the Reserve Banks could increase the supply of credit through open market purchases, they were hesitant to do so. Real bills principles held that funds “forced” into credit markets would be used for speculation not productive purposes.

After 1930, the failure became obvious of the real bills’ prediction that the economy would recover after the liquidation of speculative excesses. Because of their quotation in the memoirs of President Hoover (1953, 30), Secretary Mellon’s expression of this “liquidationist” view has become famous:

Mr. Mellon had only one formula: “Liquidate labor, liquidate stocks, liquidate the farmers, liquidate real estate.” He insisted that, when the people get an inflation brainstorm, the only way to get it out of their blood is to let it collapse. He held that even a panic was not altogether a bad thing. He said: “It will purge the rottenness out of the system. High costs of living and high living will come down. People will work harder, live a more moral life.”

Mellon's views represented economic orthodoxy.

In 1931, policymakers replaced real bills conceptions with actions appropriate for a financial panic as had occurred in the late nineteenth century international gold standard. In response to an internal drain of currency out of banks into the hands of the public that began in late spring 1931 and in response to an external drain of gold that began after Britain abandoned the gold standard in September 1931, the Reserve Banks raised their discount rates. By 1931, however, without the nominal anchor provided by a gold standard, deflation exacerbated expected deflation, thereby raising real interest rates, and sending the economy downward into a deflationary spiral. At the same time, policymakers interpreted their actions as successful because they had restored confidence in the continued convertibility of the dollar into gold. That interpretation of their actions in 1931 as successful reflected the way in which policymakers filled the void created by the failure of real bills views to assure sustainable growth. They viewed the business cycle as reflecting an internally-driven alternation in the psychology of businessmen between optimism and pessimism.

In February 1932, the New York Fed, which was the de facto leader of the Reserve Banks, persuaded the Reserve Banks to undertake open market purchases. The issue then became whether to push to the point at which the resulting reserves creation would allow banks to repay their discount window borrowing and create excess reserves. As shown in Figure 1, the result would have been to replace the existing system of controlling the cost of funds to banks as the sum of the discount rate and a surcharge positively related to discount window borrowing. Many of the regional Reserve Bank governors objected. By forcing banks into the window, the existing procedures offered the Reserve Banks the ability to control the allocation of lending to "legitimate" uses through the "administrative guidance" exercised over banks in the window. Moving from the world of real bills to one that looked like managed money was too great a leap.

In mid-1932, the commercial paper rate dropped below the discount rate (Figure 2). At this point, because of open market purchases, the New York banks were out of the discount window and had accumulated sufficient excess reserves to be freed from having to fear reserves outflows that would push them back into the window. The resulting decline in money market rates spurred a brief revival in money growth and in economic activity. However, the New York Fed lost the consensus among the Reserve Bank governors it demanded in order to replace the existing real bills procedures with procedures that would allow unlimited reserves creation at a low or zero interest rate.

The New York Fed then backed down from its advocacy of open-ended purchases of Government securities and reserves creation. Again, there was simply nothing in the intellectual and political environment of the time that could have pushed Fed policymakers into renouncing the lifetime they had spent understanding the role of the Federal Reserve as controlling financial intermediation on real bills principles. As they understood it, the alternative was to join forces with the populists who wanted to push the United States into a regime of fiat money creation with the social anarchy that entailed. Fed open market purchases ended in August 1932. In the last half of that year, gold inflows replaced open market purchases as a source of reserves creation. However, starting in February 1933, bank panics resumed and banks again became subject to an internal (currency) and external (gold) drain of reserves. Statewide bank holidays only spread the panic. Upon entering office in early March 1933, President Roosevelt declared a national bank holiday. It came with an implicit guarantee that reopened banks would be supported by the Fed and it restored calm.

Economic recovery only became possible with the advent of the Roosevelt administration and the transfer of control over monetary policy from the Fed to the Treasury that occurred in March 1933. By 1933, the public had come to associate the convertibility of the dollar into gold with deflation and deflation with recession. After March 1933, the Roosevelt administration's embargo on the export of gold and its unwillingness to revive the international gold standard produced a dramatic change in expectations from deflation to inflation. With the accompanying reduction in the real interest rate, the economy revived strongly in summer 1933 (Eggertsson 2008; Hetzel 2012; Sumner 2015).

In 1933, the Roosevelt administration based monetary policy on varying the dollar price of gold with the intention of reviving the price of agricultural exports. In January 1934, it again pegged the price of gold but at a depreciated value of \$35 per ounce, up from \$20.67 per ounce. Combined with political instability in Europe, gold flowed into the United States. Subject to Treasury control, the Fed kept constant its portfolio of government securities. Unable to sell securities and robbed of its control over market interest rates with banks out of the discount window, the Fed monetized the gold inflows. With the recovery in money growth, the economy recovered (Figure 3).

With no understanding that monetary policy had been contractionary and had then turned expansionary, the Fed made no connection between the economic recovery and the change in procedures for controlling the access of banks to reserves. On the contrary, it watched with concern as banks accumulated excess reserves. From a real bills perspective, the concern was that excess reserves would again allow banks to expand credit beyond the legitimate needs of business. In summer 1936, the Fed convinced the Roosevelt administration to allow it to increase required reserves in order to immobilize bank use of the reserves. In that way, as business continued to recover, banks would again have to borrow from the Fed. With a revival of its old operating procedures, the Reserve Banks could resume their job of allocating credit to legitimate, productive uses. Banks, however, had desired those excess reserves as a safeguard against a revival of bank runs. After a succession of increases in required reserves that started in August 1936 along with the end of the monetization of gold inflows, money growth ceased and the economy again entered into recession (Figure 3).

3. Post-World War II monetary policy and stop-go

After 1937 and its ill-fated attempt to again take control of monetary policy, the Fed once more lost control to the Treasury. With the advent of the entry of the United States into World War II, the Fed pegged interest rates on Treasury securities. It pegged the interest rate of three-month bills at 3/8 percent. That is, the Fed monetized all the government securities sold by the Treasury in excess of what the market demanded at the pegged rates. After the war, the Truman administration continued to dictate monetary policy, and the peg continued. When the peg did end, the Fed would have to reinvent monetary policy after almost two decades of having lost control to the Treasury and with real bills views intellectually bankrupt. Since 1933, bank credit had expanded based initially on gold inflows and, with the start of the war, with purchases of government securities. Policymakers looking through the lens of real bills would have expected a vast expansion of unsustainable economic activity built on the fragile scaffolding of an artificial expansion in credit. There should have been a huge depression after the war.

The problem after the war, however, was inflation not deflation and depression. Inflation soared with the end of price controls. In wartime, with the vast expansion of military expenditures, the problem was how to limit total aggregate demand to the physical capacity of the economy to

produce goods and services. With the change in focus on aggregate demand rather than on speculative excess as reflected in asset prices, the role of monetary policy changed to one of limiting the overall expansion of bank reserves and bank credit rather than prevention of a misallocation of credit to speculative uses.

The Korean War became the watershed event that led to the creation of the modern central bank. The entry of the Chinese into the war when their armies crossed the Yalu River in November 1950 created the widespread expectation of a World War III. That fear and the associated anticipation of the reimposition of price controls caused commodity-price inflation to soar. Given its rate peg, the FOMC watched painfully as it created reserves that fed the inflation. Clearly, the Fed rather than speculators was the problem. The Fed, not the marketplace subject to real bills restrictions, had to control reserve creation. The Fed forced the issue in early 1951 when it refused to support the price of long-term Treasury bonds. Given the unpopularity of President Truman with Congress, Congress refused to support the administration. The result was the Treasury-Fed Accord of March 1951. When the new appointee as chair of the Board of Governors and the FOMC, William McChesney Martin, set his own course independent of the Treasury, the Fed regained its independence (Hetzel 2001a and 2001b).

The back-to-back occurrence of the Great Depression with its sustained high unemployment and World War II with its sustained low unemployment changed the intellectual and political environment by placing responsibility for economic stability on the federal government. *The Employment Act of 1946* assigned to government the responsibility “to promote maximum employment, production, and purchasing power.” Later, the *Full Employment and Balanced Growth Act of 1978* explicitly assigned responsibility to the Fed “to promote effectively the goals of maximum employment, stable prices, and moderate long-term interest rates.”

The world did everything wrong in the first half of the century but did most things right in the second half. In addition to the creation of a modern central bank rather than a central bank based on real bills principles, the post-World War II monetary regime did not attempt to recreate a gold standard that forced deflation on its adherents. Instead, preparatory to making the Bretton Woods system operational, European countries devalued their currencies relative to the dollar and thus avoided deflation (Hetzel 2002b).

The Keynesian orthodoxy that developed after the war focused on deficit spending as the instrument for controlling aggregate demand and ignored monetary policy. As seen from the Fed, however, in a reversal of real bills, the problem was to control the growth in bank credit by making it available in recession and by limiting it in booms. Moreover, the Martin Fed concentrated on price stability as its measure of the appropriateness of aggregate demand.

Two conceptual developments laid the groundwork for a modern central bank. First, the Fed developed a national market for reserves in New York. The instrument of monetary policy became the interest rate set by the FOMC on those reserves. With the Fed’s wartime and postwar peg of the interest rate on short-term government securities, the country did have a national market for bank reserves. Banks could buy and sell Treasury bills among themselves in order to adjust their reserves positions. Under the general goal of developing a Treasury market with “depth, breadth, and resilience,” the Fed strengthened the position of government securities dealers. The Fed developed the incipient procedures of the 1920s and 1930s summarized in Figure 1 by routinely offsetting factors that drained and supplied reserves in order to stabilize interest rates in the money market (Roosa 1956; Madden 1959, p. 86).

The second conceptual development entailed behaving predictably. That is, monetary policy could be characterized as a reaction function summarizing how the Fed responded to incoming news about the economy. Martin implemented the “bills only” policy under which the Fed only bought and sold Treasury bills, that is, short-term securities. With such a policy, the term structure of interest rates (the entire yield curve) would move in a way that stabilized economic activity only if the FOMC set short-term interest rates in a predictable way in response to incoming information on the economy.

Martin termed Fed policy “lean against the wind,” in which the FOMC moved short-term interest rates in a way designed to counter sustained weakness or strength in the economy. (Until the end of 1970, the FOMC looked at a complex of financial measures not just the funds rate to measure ease or tightness in the money market.) In response to the onset of the 1953 recession, the Martin FOMC began to lower market rates. What Hetzel (2008) termed lean against the wind with credibility took shape after inflation began to rise in mid-1956 and then persisted into the 1958 recession. Martin concluded that the Fed had to begin raising rates at the onset of economic recovery to stay on top of inflationary psychology. This policy foreshadowed the Volcker-Greenspan policy of placing nominal expectational stability at the center of monetary policy (Bremner 2004; Hetzel 2008).

Credibility meant that Martin accepted responsibility for inflationary expectations. Martin looked to the bond markets for evidence of inflationary psychology not to stock or commodity markets as had been the prewar case with real bills. He wanted to prevent the introduction of inflation premia in bond rates evidenced by sharp jumps in bond rates. That is, the Fed took control of responsibility for inflationary expectations. In this way, these procedures disciplined lean-against-the-wind changes in interest rates to cumulate to whatever degree necessary to maintain price stability. The FOMC moved toward a rule that created a stable nominal anchor based on the expectation of stable inflation.

Martin (U.S. Cong. 2/6/59, 462 and 467) testified to Congress:

About this time [summer 1959] inflationary expectations began to spread. The abrupt upward shift of interest levels in central money markets ... reflected investor demand for an interest premium to cover the risk of a depreciating purchasing power of invested funds.... The experience in the government bond market ... is a vivid example of the influence of inflationary expectations in financial markets. To the extent that such attitudes come to be reflected in decisions on wages, prices, consumption, and investment, they help to bring about their own realization.

In the late ‘50s and early ‘60s the United States suffered back-to-back recessions with cyclical peaks in August 1957 and in April 1960. Contractionary monetary policy evidenced by cyclically low money growth preceded each. The first episode of contractionary policy arose in response to the inflation that emerged starting in 1956. The second arose in response to gold outflows. After the end of World War II, the Bretton Woods system of pegged exchange rates gradually became operational as countries eliminated controls on capital flows. By 1959, the dollar had become overvalued and the United States ran a current account deficit. Both the Eisenhower Treasury and the Martin FOMC interpreted the gold outflows as a loss of confidence in the dollar. As a consequence of these two recessions, the country entered the 1960s with the expectation of price stability thoroughly embedded in the national psyche.

John Kennedy was elected president in 1960 on a platform of getting the country moving again. Under the leadership of Robert Heller, the Council of Economic Advisers (CEA) persuaded Kennedy to sign on to a national goal of 4 percent unemployment. However, in the context of the Cuban missile crisis, Kennedy held it in abeyance out of fear of a dollar crisis. The Martin FOMC and the conservative Douglas Dillon Treasury overrode the Heller CEA. After the Kennedy assassination in fall 1963, in the Johnson administration, however, Martin found himself isolated. In a stressed fiscal environment of guns and butter due to the Vietnam War and Great Society programs, the political system demanded that the economy grow flat out. In an environment of urban riots, it demanded a low unemployment rate, with 4 percent only a provisional target on the way to something lower. Keynesian aggregate demand management promised to deliver all this. All that was required of monetary policy was not to raise interest rates and nullify the expansionary effects of the Kennedy tax cut passed in spring 1964.

Under pressure from Congress and the administration, the FOMC had held off on raising the funds rate after passage of the Kennedy tax cut. To have raised rates would have “thwarted the will” of the political system to stimulate the economy and to lower the unemployment rate. As the unemployment rate fell steadily from 5 percent in early 1965 to 4 percent at the end of 1965, it became evident that the economy was growing at an unsustainable pace. Starting in late 1965, inflation began to rise. In a warning shot to the administration, the Board of Governors ratified an increase in the discount rate in 1965. Belatedly, in summer 1966, the FOMC began to tighten significantly. Then, in spring 1967, when the economy started to weaken, the Fed reversed course and lowered the funds rate despite the rise in inflation from 1 percent to 3 percent. It did so in return for a promise from Treasury Secretary Henry Fowler that, if the Fed would hold off on rate increases, the Johnson administration would submit legislation to Congress for a tax hike.

The Keynesian CEA believed that it was possible to lower the growth of aggregate demand and thus control inflation through restrictive fiscal policy rather than through restrictive monetary policy (the so-called optimal instrument policy). Doing so, it was believed, would avoid the “high” interest rates required by restrictive monetary policy and which hurt housing. Martin bet that if he could not control the fires of inflation with higher interest rates, he would turn down the fire by limiting credit creation. When the tax hike failed to materialize, the FOMC again began to raise the funds rate. However, when a tax surcharge finally materialized in June 1968 after a run on gold that threatened the Bretton Woods system, the Board of Governors approved a reduction in the discount rate.

Despite continued high rates of money growth, Keynesian economists, including the staff of the Board of Governors, forecast a recession. Instead, the economy continued to grow strongly and the unemployment rate fell to 3.4 percent in fall 1968. While interest rates treaded water, inflation rose and reached 6 percent in 1969. The stimulative effects of rapid money growth trumped the contractionary effect of the tax surcharge. Martin realized his mistake and implemented a highly restrictive monetary policy in 1969. Despite growing recession, he held off on any reduction in rates until inflationary expectations would subside. However, his term as FOMC chairman ran out in January 1970, and he left the Fed before he could return the country to price stability.

As a result of this experience, the Keynesian consensus in favor of deficit spending as the tool of aggregate-demand management broke down. Given the evidence that expansionary monetary policy had trumped contractionary fiscal policy, the Keynesian consensus shifted opportunistically to monetary policy as the preferred tool of aggregate-demand management. Although the consensus

went from viewing monetary policy as impotent to being potent, it did so with the assumption that inflation was a nonmonetary phenomenon. That is, inflation had its origins in phenomena unrelated to monetary policy.

Martin's successor, Arthur Burns, who became FOMC chairman in February 1970, was not a Keynesian but he shared the view that inflation was a nonmonetary phenomenon. Burns epitomized the "measurement without theory" tradition of the National Bureau of Economic Research (NBER). He understood monetary policy through the eyes of the businessman, whose psychology, he believed, drove the business cycle. Burns also believed that the country needed him to reconcile the low unemployment required for social stability with the low inflation required for business confidence and investment. For Burns, inflationary expectations were crucial. However, they were the expectations of the businessman and the businessman was concerned about wage inflation. Burns believed that the country could lower inflation and stimulate economic activity by assuaging these expectations through use of incomes policies and evidence of fiscal discipline in the form of a government budget surplus. In practice, Burns traded monetary policy for influence over incomes and fiscal policy. The exception was during the Gerald Ford administration, which, at the urging of CEA Chairman Alan Greenspan, rejected incomes policies (Hetzl 1998).

Burns believed that union power as well as a permissive welfare state had imparted an inherent inflationary bias to the economy. He also believed that the high unemployment rates required to suppress these cost-push pressures would be politically unacceptable. Because of these beliefs and his intellectual stature, Burns became the foremost proponent and intellectual champion of "incomes policies," which entail government intervention in the price setting of private firms. In order to limit the need for an increase in unemployment in order to restrain inflation, policymakers had to analyze the cause of inflation as cost-push or aggregate-demand (demand-pull). They then needed to tailor the remedy to the specific cause of inflation. Cost-push inflation needed intervention in the particular markets that created it. In a Faustian bargain with President Richard Nixon in August 1971 Burns accepted expansionary monetary policy in return for wage and price controls.

In the 1970s, the general belief that 4 percent unemployment represented full employment, when combined with an unemployment rate averaging 6 percent, created the impression that inflation had to be of the cost-push variety. The assumption that powerful monopolies (corporations and labor unions) powered inflation meant that a high rate of unemployment would be required in order to restrain it. In the jargon of the times, the "sacrifice ratio" was high. Incomes policies were the key to relaxing this trade-off. Paul Samuelson, who was the dean of Keynesian economists, expressed these general beliefs view when he opposed lowering inflation through restrictive monetary policy. Samuelson (1979 [1986], 972) argued:

Today's inflation is chronic. Its roots are deep in the very nature of the welfare state. [Establishment of price stability through monetary policy would require] abolishing the humane society [and would] reimpose inequality and suffering not tolerated under democracy. A fascist political state would be required to impose such a regime and preserve it. Short of a military junta that imprisons trade union activists and terrorizes intellectuals, this solution to inflation is unrealistic—and, to most of us, undesirable.

The prevalent belief in the power of cost-push inflation led to the period-by-period discretionary setting of monetary policy in the 1970s. Although the Fed never spoke in terms of trade-offs, Phillips curve trade-offs between inflation and unemployment and the presumption that lowering inflation required large increases in unemployment (a high sacrifice ratio) were at the center

of monetary policy. As Burns (1979) argued in his monograph, *The Anguish of Central Banking*, on an ongoing basis, the Fed had to make a judgment about the extent to which to restrain inflation based on a judgmental decision about much unemployment was politically acceptable.

G. William Miller, who succeeded Burns and was FOMC chairman from March 1978 to August 1979, by liberal temperament was unprepared to raise interest rates dramatically to deal with inflation for fear of recession. However, in spring 1979, a rise in inflation exacerbated expected inflation and lowered real interest rates. Monetary policy became expansionary in an environment of already high inflation. It was in that fraught environment that Paul Volcker succeeded Miller in August 1979.

4. The Great Moderation

In the 1960s while at the Treasury, Paul Volcker had been the mandarin of the Bretton Woods system. He believed that a stable dollar was a bulwark of the free world against communism. For Volcker, a strong dollar was a moral imperative and a patriotic duty. As a product of the open-market desk of the New York Fed, he understood the crucial role of expectations. In the political environment of 1979 with a president, Jimmy Carter, widely seen as weak, Volcker also understood that the Fed was the only alternative for confronting inflation and inflationary expectations.

As recounted above, at key periods when the character of the monetary regime has been in play, the regime that emerged came out of the way in which the intellectual and political environment of the time influenced the interpretation of economic instability. With the failure of the recession that started in August 1929 to end after a year or so with a strong recovery, monetary policymakers entered into a state of paralysis. Under the assumption that the economic collapse had originated in the collapse of economic activity artificially inflated by credit forced on the banking system, policymakers found it impossible to adopt modern policies of money and credit expansion. Had not those very policies created the speculative bubble whose collapse led to the Depression?

When this real bills view of the world disappeared in the changed environment following World War II and the Korean War, the economics profession turned to Keynesian ideas. With real bills, there was no conception of the operation of the price system. As economists, Keynesians thought in terms of the operation of the price system but interpreted the prolonged, high unemployment of the Depression as a failure of the price system to provide for full employment. At the same time, Keynesianism sounded a clarion call to the economic profession with its rejection of the real bills belief that recessions represented the inevitable and required adjustment to imbalances created during periods of prior speculative excess.

American economists especially wanted to give content to Keynes' agenda expounded in *The General Theory*. John Maynard Keynes wanted to explain why the market economy failed to assure full employment and how deficit spending could provide the required lack of aggregate demand. Keynes' followers, who by numbers constituted basically all economists in academia until the late 1970s, wanted to fulfill Keynes' agenda through the development of models that would make the predictions required in order to use fiscal policy as an instrument of aggregate demand management.

In the Keynesian model as developed in its IS-LM formulation, equilibration of the economy to shocks to confidence occurred through quantity adjustments, that is, through output, not prices. The working assumption drawn from descriptive observation in the Great Depression was that the replacement of competitive markets with monopolies in the form of large corporations, labor unions,

and cartels limited the ability of markets to establish market-clearing prices. The replacement of competitive markets with monopolies rendered a free-market economy unstable and riddled it with nominal rigidities. On the one hand, those nominal rigidities meant that aggregate output was subject to the vagaries of an unstable private aggregate demand. On the other hand, they meant that an activist policy based on deficit spending could counter instability in private aggregate demand.

The issue in the 1960s had been how much aggregate-demand inflation would emerge from an activist policy of maintaining full employment, universally taken to be at most 4 percent. Economists sought the answer in empirical estimates of a Phillips curve (the Samuelson-Solow Phillips curve) that offered a long-run inflation-unemployment trade-off. When the combination of 6 percent inflation and 6 percent unemployment emerged in 1970, the profession as well as Fed policymakers concluded that inflation could not be aggregate-demand inflation but instead had to be cost-push inflation. Cost-push wage and price pressures had pushed up the Phillips curve so that inflation accompanied full employment. Motivated by the political expediency of Richard Nixon, the country turned to wage and price controls in August 1971 to deal with inflation.

In the 1960s and 1970s, the intellectual consensus in favor of Keynesian ideas interacted with a political environment that demanded “low” unemployment as a salve for rendering tolerable social divisions. However, by the end of the 1970s, the combination of high inflation and high unemployment, termed stagflation, created a receptivity to new ideas. The Nixon wage and price controls and the Carter attempts at incomes policies had failed to restrain inflation.

In the 1960s and 1970s, a few economists, led mainly by Milton Friedman at the University of Chicago but also including economists at the St. Louis Fed like Homer Jones and Leonall Anderson as well as Karl Brunner and Allan Meltzer, mounted a monetarist attack on Keynesianism. Until the end of the 1970s, in the mind of the public, there was no association of inflation with monetary policy. Monetarists challenged the dominant view of inflation as a nonmonetary phenomenon by attributing it to high money growth. Friedman also challenged the Keynesian view by arguing that there was no long-term trade-off between inflation and unemployment. The Fed should return the country to price stability and allow the price system to determine the unemployment rate.

In the 1970s, a group of economists developed the logic of monetarist ideas in a school of thought known as rational expectations. They included Robert Lucas at the University of Chicago and Tom Sargent at the University of Minnesota. Keynesians assumed that inflation, whether cost-push or aggregate-demand, propagated through a wage-price spiral that imparted to it a built-in inertia. Rational-expectations proponents challenged that view. In doing so, they took aim at popular estimates of the sacrifice ratio, which purported to provide the man-years of unemployment required in order to lower inflation. Proponents of rational expectations argued that a credible monetary policy would attenuate the high unemployment assumed to be required in order to lower inflation (Humphrey 1986).

The rational expectations argument was that markets work because they use information efficiently. If the central bank provides a stable nominal anchor in terms of the domestic price level, firms will set prices in a way that separates the determination of relative prices from the price level. They will coordinate their adjustment of dollar prices on the inflation target of the central bank and then set the relative price of their product at the market-clearing value. Robert Lucas and Tom Sargent espoused the rational-expectations view that the Fed could make the setting of individual dollar prices consistent with price stability through the way in which a credible rule would create an

environment of nominal expectational stability (Nelson 1977). However, the massive Keynesian consensus, which still held at the end of the 1970s, considered the monetarist/rational-expectations views as totally irrelevant to the “real world” in which unions and corporations exercised significant market power. Stated alternatively, the assumption that inflationary expectations tethered to the exercise of market power could instead be tethered to a monetary rule appeared flatly contradicted by observable reality.

This intellectual challenge to Keynesianism interacted with Volcker’s experiment in the monetary control of inflation to create a new monetary regime. The earlier 1970s experiment in monetary policy was based on the premise that monetary policy could control unemployment at an acceptable cost in terms of inflation guided by estimated Phillips curve trade-offs, especially when aided by incomes policies. Conversely, a policy of price stability, it was assumed, would come at a high cost in terms of unemployment given the way in which cost-push pressures powered inflation. Just as Arthur Burns and his successor G. William Miller delivered the Keynesian experiment in aggregate-demand management, Volcker delivered the monetarist/rational-expectations experiment of basing monetary policy on the creation of a stable nominal anchor.

In the 1950s, Volcker had worked at the Open Market Desk of the New York Fed. The exposure to money markets inculcated the importance of expectations. At the same time, until the collapse of the Bretton Woods system in 1973, New York Fed economists as epitomized by Charlie Coombs, head of the foreign exchange desk, viewed market speculation as destabilizing. Speculators attacked the exchange rates set by Bretton Woods and had to be fought.

By the time Volcker had moved from president of the New York Fed to FOMC chairman in August 1979, he understood that expectations were indeed destabilizing. However, by the end of the 1970s, they were destabilizing because financial markets had come to expect that in recession an expansionary monetary policy would raise inflation. That expectation pushed up bond rates in recession and limited the downward adjustment of inflationary expectations. Countercyclical monetary policy based on Phillips-curve trade-offs had become destabilizing.

Volcker knew that reducing double-digit inflation would require a recession. In the past, the economy had suffered through recessions undertaken in order to lower inflation. The character of monetary policy changed because of Volcker’s concern that inflationary expectations should remain subdued during the economic recovery that would follow a disinflationary recession. That is, in order to restore a stable nominal anchor, the Fed not only had to convince markets that it would restore low inflation, but also that trend inflation would remain stable rather than increase over the business cycle. In accepting Fed responsibility for inflationary expectations and for making them invariant to the cyclical fluctuations of the business cycle, Volcker had to reject the Keynesian consensus that favored aggregate-demand management.

Volcker’s acceptance of responsibility for inflationary expectations also rendered irrelevant the endless discussions about the causes of inflation as cost-push or demand-pull and about tailoring the remedy accordingly. Whatever the cause of those inflationary expectations, the Fed had to get them under control or they would pass into negotiated wage settlements and lock in high inflation. At the beginning, Volcker turned to money targets in order to establish credibility. The commitment to maintain low money growth seemed to provide that credibility.

However, with the *Monetary Control Act of 1980*, money demand became procyclical. The act reduced the cost of transferring funds between money market instruments used as savings

vehicles and bank deposits used for transactions. Given that banks change the rates they pay on their deposits sluggishly as money market rates of interest change, money growth would decline in booms when market rates rose relative to bank deposit rates, and conversely. Money growth would then send misleading signals for the desirable behavior of interest rates. As a result, a low, stable target for money growth would not offer a useful guide to monetary policy.

Proponents of monetarism and rational expectations wanted to restore the stability of the nominal anchor lost in the prior stop-go era of monetary policy. Monetarists had advocated either steady money growth or multiyear targets for money. However, after fall 1983, it became evident that the FOMC could not adopt a reserve-aggregate or monetary target. Instead, policy focused on behaving in a consistent way in order to shape the inflationary expectations of financial markets.

The Volcker-Greenspan era became “lean-against-the-wind with credibility” (Hetzel 2008). The Fed followed its long-standing lean-against-the-wind procedures but implemented them in a way disciplined by the bond-market vigilantes, who associated the former policy of aggregate-demand management with inflation that rose across the business cycle. That is, during the economic recovery from the 1982-1983 recession, the FOMC augmented the regular progression of funds rate increases with additional increases when bond rates jumped. The FOMC interpreted these jumps in bond rates as “inflation scares” that challenged its credibility to maintain low, stable inflation (Goodfriend 1993).

One can date the start of the Volcker monetary regime to the May 1983 inflation scare. By raising the funds rate with the unemployment rate at 11 percent and with sharply falling inflation, it began the work of creating a new nominal anchor in the form of a widespread expectation of low, stable trend inflation. The bond market vigilantes forced the FOMC to raise the funds rate early during the cyclical recovery. The disappearance of the cyclical inertia that had characterized funds rate movements in the stop-go period required an end to the exploitation of Phillips curves inherent in the policy of aggregate-demand management. Inflation targeting emerged in the sense that the Fed committed to making expected trend inflation invariant to shocks whether inflation shocks or recession shocks.

The United States moved to a new monetary standard in which the nominal anchor was a rule that stabilized the expectation of the future price level. In doing so, policy had to avoid the attempts to exploit the inflation-unemployment trade-offs that had defined the preceding stop-go monetary policy. The juxtaposition of the Volcker-Greenspan standard with the prior standard in which the Fed had allowed high and rising inflation in an attempt to maintain “low” unemployment could not have been more dramatic. The stop-go monetary policy of the 1970s reflected the Keynesian view of untethered inflationary expectations arising out of a self-reinforcing cycle of market power exercised by large corporations and labor unions. The policy of restoring nominal expectational stability arose out of a belief that inflationary expectations would conform to rule-like monetary policy.

At the time, no one knew whether the Volcker experiment would succeed. There was a foreboding that, if the experiment did not succeed, the United States would live with inflation accompanied by on and off price controls and that a free market economy would survive only in a wounded form. No one knew whether Congress and President Ronald Reagan would support Fed independence through disinflation and recession. And, no one knew with any certainty whether disinflation would be followed by sustained low and stable inflation. The Keynesian consensus held that maintaining low, stable inflation would require periodic bouts of politically unacceptable and

socially undesirable high unemployment in order to contain cost-push inflation. That fear failed to materialize.

In the event, the change in the monetary regime replaced the Great Inflation with the Great Moderation. Friedman had offered an explanation for the inverse correlations between inflation and unemployment summarized in the Phillips curve that predicted the disappearance of those correlations in response to sustained inflation. The stagflation of the United States in the 1970s supported that prediction. In reference to the breakdown of this version of the Phillips curve, popularized by Samuelson and Solow (1960 [1966]), Lucas and Sargent (1978 [1981], 303) talked about “econometric failure on a grand scale.” Similarly, the correlations disappeared with sustained low inflation.

LAW with credibility also shaped the broad contours of the Greenspan tenure as chairman. Like Volcker, Greenspan believed in the fundamental responsibility of monetary policy to shape inflationary expectations. Coming out of the 1990 recession, he lowered the funds rate only cautiously because the inflation premia built into bond rates were inconsistent with his goal of returning to price stability. The strong funds rate increases in 1994 were his decisive response to an inflation scare. The FOMC raised the funds rate from 3 percent going into the February 1994 meeting to 6 percent at the February 1995 meeting. Credibility allowed Greenspan to depart from these procedures at the time of the 1997-1998 Asia crisis, but, in the context of his entire tenure, the departure was brief.

Although money targets would not be a purposeful instrument for achieving control of prices, money would remain central to the power of central banks as the “stick in the closet.” The ability to move nominal money relative to real money demand by moving the real rate of interest relative to the natural rate of interest endows central banks with their ability to enforce a market expectation of inflation consistent with its inflation target. That inflation target then coordinates the nominal price setting of firms that set prices for multiple periods. Moreover, for price stability, nominal money creation must follow the evolution of real-money demand. For that to happen, the central bank must avoid the consequences of price fixing by following a rule that causes the real interest rate to track the natural interest rate, that is, the interest rate that would prevail in a world of completely competitive markets. Otherwise, one is back in the world of Milton Friedman (1960) in which erratic changes in money force changes in prices while “long and variable lags” destabilize expenditure.

The juxtaposition of sustained high unemployment in the Depression with low unemployment in World War II created the impetus for the Keynesian Revolution with its focus on using deficit spending as the tool of aggregate-demand management. The juxtaposition of stagflation in the 1970s with disinflation and moderate unemployment in the Volcker-Greenspan era created the a new professional consensus that economic instability in the past was due to “poor play” by the Fed rather than “poor hand” due to external shocks in the terminology of Francois Velde (2004). Of course, there are “poor hand” interpretations of history also. Blinder (1982), for example, sided with Arthur Burns (1979) in attributing the instability of the 1970s to large supply shocks. Nevertheless, the new professional consensus provided the impetus for the “New Keynesian” models with their focus on the compatibility of price stability and full employment.

In its spare formulation, the New Keynesian (NK) model consists of three sectors of the economy (Woodford 2003). One sector describes how households borrow and lend in order to distribute their consumption evenly over time. In a world in which households are optimistic about their future income prospects, they desire to smooth consumption by bringing it into the present

through borrowing. Because of the inability to move production from the future to the present, the real interest rate needs to be relatively high enough in order to counter the desire to borrow and instead to provide an incentive to lend.

The other sector describes how firms price their products. Firms in the “sticky-price sector” can only set their dollar prices periodically. As a consequence, they must set them based on forecasts of both their marginal costs and inflation. The fact that many prices are preset in this way allows the central bank to influence aggregate real demand through its influence on aggregate nominal demand. At the same time, as pointed out by Marvin Goodfriend and Bob King (1997), through following a policy of price stability, the central bank can neutralize this price-stickiness friction. By rendering inoperative that friction, a policy of price stability allows the price system to work to maintain output at its potential (natural) level.

The implication of a policy concentrated on price stability is that the central bank allows the price system to determine real variables like the unemployment rate. Applied to the monetary policy of the Volcker-Greenspan era, the policy of restoring nominal expectational stability, which is the real-world analogue of price stability, prevented the FOMC from attempting to exploit Phillips curve trade-offs. As a consequence, it had to follow a rule for setting the funds rate in a way that tracked the natural rate of interest determined in the competitive core of the economy. In doing so, it allowed the price system free rein to determine real variables.

In an attempt to revive the Keynesian spirit of the 1970s, Blanchard and Gali (2007) pointed out that in a world in which powerful monopolies generate cost-push inflation (represented in the NK model by the addition of markup shocks—shocks to price over marginal cost) the central bank can reduce output variability by increasing inflation variability. In this Phillips curve world, price stability does not guarantee a zero output gap (full employment). In the terminology of Blanchard and Gali, the “divine coincidence” property of the NK model highlighted by Goodfriend and King no longer holds. However, cost-push inflation has failed to materialize. Central banks have been more concerned about low inflation than high inflation.

As a condition for price stability, the central bank must cause nominal money to grow in line with real money demand. As detailed above, the New Keynesian model provides a framework for understanding how the central bank provides for this monetary control. The central bank must follow a rule that provides for a stable nominal anchor in the form of nominal expectational stability (the expectation of price stability). It must also implement a rule that causes the real interest rate to track the natural rate of interest. Real output follows potential output. As a consequence of its interest rate target, nominal money then grows in line with the real money demand consistent with potential output and random variation in real money demand.

The following section translates this discipline on money creation in terms of the Fed’s procedures developed during the Volcker-Greenspan era. The monetary regime created by the Volcker and Greenspan FOMCs led to a long period of economic stability. What was the baseline monetary policy in this period?

5. What monetary regime did Volcker and Greenspan create?

The FOMC sets a target for the funds rate, which is an overnight interest rate paid on bank reserves. An overnight rate, however, is meaningless. What is relevant for economic activity is the entire term structure of interest rates—the yield curve. The primary determinant of the shape of the

yield curve is the geometric average of the forward (one-period) rates expected by market participants in the future. (The actual yield curve includes term premia that compensate investors for holding a long-term security as opposed to a succession of one-period securities.) It follows that monetary policy consists of how the FOMC communicates to markets its strategy (reaction function) for responding to incoming “news” about the economy, where “news” is new information. In order for monetary policy to be stabilizing, that strategy must cause the yield curve to respond in a stabilizing way to incoming news.

Consider, for example, news that the economy is growing faster than previously anticipated. A stable nominal anchor requires that the yield curve rise with the entire rise occurring in real forward rates and none in inflation term premia. Just as the nominal anchor in the gold standard was the expectation that the central bank would maintain convertibility in the future, the nominal anchor is now the expectation that the Fed will maintain price stability in the future. For that reason, the FOMC continually watches all available measures of expected inflation, for example, the breakevens on TIPS (the difference for a given maturity between the yield on a nominal Treasury security and Treasury securities adjusted for inflation. The difference must compensate holders of nominal securities for inflation.)

The FOMC does not articulate an explicit strategy (a rule) to markets but instead communicates in terms of a forecast of the evolution of the economy in a way that promises both price stability and full employment. Underlying the forecast of the economy is a forecast of the path of the funds rate assumed to be consistent with these objectives. In response to news, the FOMC changes the assumed path of the funds rate but the objectives (price stability and full employment) do not change.

FOMC communication takes several forms. The first two paragraphs of the statement issued following an FOMC meeting contain, respectively, an assessment of the change in the behavior of the economy since the last FOMC meeting and a forecast of its near-term behavior. The Summary of Economic Projections (SEP) included four times a year contains forecasts for the individual FOMC participants of output, unemployment, and inflation as well as a funds rate forecast contained in the so-called “dot plot.” Although the SEP does not directly reveal what markets care about, namely, the FOMC consensus, market participants look at median values for such a consensus. The FOMC chair’s press conferences, congressional testimony, and speeches also offer information.

There is a two-way dialogue between the FOMC and the financial markets. The yield curve comprises the geometric average of the market’s expectation of future forward rates. As time passes and forward rates become today’s spot rate, the FOMC’s funds rate target dominates. Markets then have to respect the funds rate path the FOMC believes appropriate. At the same time, the yield curve comprises a collective forecast of the evolution of the economy made by participants in financial markets. The FOMC has to be concerned if the market’s forecast of the future funds rate implicit in the yield curve differs from its own. Perhaps the market sees incipient strength or weakness that the FOMC is missing.

Because the FOMC does not articulate an explicit strategy, it does not explain how it deals with the fact that there are two targets—inflation and unemployment. Markets learn the strategy through consistency over time in FOMC behavior and from sources such as speeches by the FOMC chair. As noted above, possible strategies fall into two broad categories—nonactivist and activist. Consider first the nonactivist strategy under the assumption that the FOMC has achieved credibility for price stability.

In the period after the 1951 Treasury-Fed Accord, the FOMC developed procedures termed “lean-against-the-wind” by its chairman William McChesney Martin. In the event of unsustainable strength in the economy (sustained increases in the rate of resource utilization or equivalently sustained declines in the unemployment rate), the FOMC raised the funds rate above its prevailing value in a measured way. Credibility required that financial markets make forecasts of the future path of the funds rate based on the assumption that the FOMC would raise the funds rate to whatever extent required in order to maintain price stability.

The situation is complicated when the economy is recovering from recession and the economy is necessarily growing at a rate in excess of potential. The FOMC has to continually assess whether the yield curve possesses a sufficiently steep upward slope so that output will follow a glide path back to and then along the path of potential output. With an activist policy, in contrast, the FOMC limits increases in the funds rate until it starts to observe inflation. If inflation continues at an unacceptably high level, the FOMC raises the funds rate persistently until the economy weakens and in time inflation weakens.

There are then basically two variations in the post-Accord monetary regime. In the nonactivist regime in which the FOMC eschews inflation/output trade-offs, the FOMC provides a stable nominal anchor and then follows a rule that allows market forces (the price system) to determine the real interest rate and by extension real variables like the unemployment rate. In the activist regime, the FOMC attempts inflation/output trade-offs. Those Phillips-curve trade-offs at least in principle allow it to mitigate fluctuations in output by offsetting fluctuations in inflation and conversely. After the disinflation of the early 1980s, the Volcker-Greenspan era was nonactivist.

6. The Great Recession

The real challenge to the Volcker-Greenspan nonactivist policy and its interpretation by Goodfriend/King (1997) in terms of the NK model has come with the Great Recession. It created the widespread perception that the recession arose from a disruption to financial intermediation. Critics of the Fed then argued that “inflation targeting” contributed to the Great Recession through precluding concern for financial stability (Curdia and Woodford 2009). Such explanations often assumed that the low interest rates in the early 2000s initiated a boom-bust cycle in housing whose fallout led to the Great Recession (Taylor 2009).

The intellectual tenor of the times became reminiscent of real bills. In a real bills world, market power appears in the form of the herd behavior of investors. That is, market psychology fluctuates between intervals of excessive euphoria and excessive pessimism. In the periods of optimism about the future, households and firms assume an excessive level of debt. Inevitably, a correction occurs as a consequence of the need to purge these excesses and to eliminate “imbalances.” A period of painful deleveraging and recession ensues. According to this view, the prevention of speculative excess (maintenance of financial stability) should be an additional objective of the central bank beyond output and inflation stability.

In any single recession, many factors are at play. In the Great Recession, the financial disruption that followed the bankruptcy filing of Lehman Brothers on September 15, 2008, undoubtedly exacerbated the decline in economic activity. The failure of Lehman shook the belief of cash investors (holders of short-term, liquid debt like repurchase agreements, RPs) that regulators would never allow the failure of a major financial enterprise. Cash investors ceased buying the short-

term debt (RPs and commercial paper) of financial institutions holding significant amounts of illiquid assets like mortgage-backed securities (MBS) and placed their funds in the too-big-to-fail banks like J. P. Morgan Chase.

At the same time, in the Great Recession, deflation combined with the decline in economic activity (Figure 4). In no model can that combination be consistent with an optimal monetary policy. Similarly, the persistent decline in inflation after 2008 must reflect contractionary monetary policy. The severity of the Great Recession is consistent with a monetary policy that kept real interest rates above their natural level. Two major shocks made households pessimistic about the future and would have required a sharp decline in the real interest rate in order to sustain their consumption.

First, in mid-2007, house prices stopped rising and started falling. Second, an enormous commodity-price inflation shock that lasted from mid-2004 until mid-2008 lowered household real disposable income. The price of a barrel of oil (WTI) went from \$34 in early 2004 to \$134 in June 2008. As shown in Figure 4, in July 2008, 12-month personal consumption expenditures (PCE) inflation reached 4.2 percent and core PCE inflation reached 2.3 percent. Although the FOMC did not set an explicit inflation target until January 2012, implicitly it was aiming for 2 percent inflation. The inflation overshoot created pressure on the FOMC to impart downward inertia to declines in the funds rate relative to declines in the natural rate of interest.

One feature of the NK model is particularly relevant for the Great Recession. The counterpart to firms in the sticky-price sector that are constrained to change prices only infrequently is firms in the flexible-price sector. The latter firms operate in auction markets in which prices are determined continuously. In order to allow the price system to determine relative prices, the central bank should target inflation in the sticky-price sector and allow inflation originating in the flexible-price sector to pass through to headline inflation (Aoki 2001). In terms of Figure 4, assuming an implicit inflation target of 2 percent, in 2008 the FOMC should have been concerned with the slight overshoot of 2.3 percent in core inflation not the 4.2 percent overshoot in headline inflation. However, the Fed was concerned that high headline inflation would push inflationary expectations above its implicit inflation target (Bernanke 2008; Hetzel 2012).

Prior to the cyclical peak in December 2007, the FOMC followed its standard procedures. In cyclical recoveries, it raises the funds rate in steps until the economy weakens. The FOMC raised the funds rate from the 1 percent prevailing at its June 2003 meeting to 5.25 percent at its September 2007 meeting. As the economy began to weaken, the FOMC began to lower the funds rate. The economy deteriorated steadily after the cycle peak in December 2007 and entered into a serious recession in late summer. Annualized monthly changes in nonfarm payrolls grew weakly from June 2007 through December 2007 at .5 percent. They basically stopped growing in January 2008 and then deteriorated steadily. By September 2008, the decline was -3.9 percent. (The September survey date was prior to the Lehman bankruptcy.) The economy declined despite a massive boost to disposable income from the Bush tax cut. Tax rebates produced a jump in real disposable personal income of \$562.1 billion in May 2008.

At the same time, the inflation shock intensified headline inflation. Although the FOMC lowered the funds rate from 2.25 to 2 percent at its April 2008 meeting, it conveyed the message in its post-meeting statement that declines would cease and that the next move was likely upward. As a consequence, the yield curve rose. In retrospect, the natural interest rate continued to fall. At its December 2008 meeting, the FOMC lowered the funds rate to near zero, where it remained until December 2015. With PCE inflation averaging just below 2 percent over the 5 year period 2009Q2

through 2014Q2, after the fact, it became evident that the economy required a short-term real interest rate of about -2 percent. Although the 2 percent funds rate target set at the April 2008 meeting produced a real interest rate near zero using core measures of inflation, it was still too high given the magnitude of the housing and inflation shocks hitting the economy—the shock to wealth from the decline in housing prices and the shock to real disposable income from the inflation shock.

In this respect, the Great Recession evolved similarly to other recessions. Figure 5 shows a measure of the output gap and PCE inflation. A pattern common across recessions is that prior to cycle peaks the economy begins to weaken. That is, the output gap begins to decline. However, going into recession, inflation is at a cyclical high—a level unacceptable to the FOMC. Figure 6 provides a rough measure of the real rate of interest as the difference between the funds rate and inflation. As shown in Figure 6, the FOMC puts downward inertia into reductions in the funds rate as the economy weakens and the real rate of interest remains at cyclical highs (Hetzel 2012, Figures 8.4 and 8.5).

This pattern is consistent with contractionary monetary policy at least exacerbating recessions through inertia in the funds rate relative to reductions in the natural rate of interest. The resulting behavior of inflation and the unemployment rate is captured in empirical Phillips curves. In the jargon of economics, however, the resulting Phillips curves are not “structural,” that is, invariant to the behavior of monetary policy. The Fed itself creates the correlations between inflation and unemployment. Phillips curves are then not reliable guides to the formulation of monetary policy.

In fall 2008, it became obvious that the economy of the developed world was in a serious recession. When Lehman Brothers declared bankruptcy on September 15, 2008, cash investors stopped funding the investment banks that held large amounts of subprime mortgages. The Fed responded with programs that made it into a conduit for the financial intermediation not undertaken by the market. That is, the Fed undid the flight of cash investors from the institutions with illiquid, hard to value asset portfolios. The Fed’s term auction facility (TAF), for example, purchased commercial paper. Also, the Fed engaged in swap arrangements with foreign central banks and especially the ECB in order that they could lend dollars to their banks to replace the dollar funding that had dried up (Hetzel 2008, Chs. 13 and 14). These were credit interventions.

At its December 2008 meeting, the FOMC lowered the funds rate to near zero (a range from 0 to ¼ percent), the zero lower bound. Earlier, in October 2008, it had begun to pay interest on the excess reserves of banks (IOER). In that way, the FOMC could create reserves in a way that allowed it to set a funds rate target independently. Starting in fall 2008 and extending until 2014, it engaged in three series of sustained open market purchases of mortgage-backed securities (MBS) and Treasury securities (the LSAPs or large scale asset purchase programs). The former had aspects of credit-market intervention while both create bank reserves. The Fed’s asset portfolio went from about \$900 billion to \$4.5 trillion, or from 6 percent of nominal GDP to 23 percent (Hetzel 2008, Chs. 13 and 14; Potter 2017).

In terms of monetary policy, when the FOMC could no longer lower the funds rate, it communicated to financial markets its intention to extend the period of a zero funds rate. It used this forward guidance to bend down the yield curve. The difficult part was to avoid communicating to financial markets pessimism about the economy that could exacerbate fears of deflation, raise the real interest rate, and create a downward spiral in the economy. The LSAP program was important in that it communicated a “whatever it takes” policy to markets. That is, the FOMC communicated to markets that it would sustain an aggressively expansionary policy through maintaining the funds rate

at zero for however long was needed in order to assure economic recovery. The FOMC was more aggressive than the ECB and the ECB suffered through back-to-back recessions (Hetzel forthcoming b).

7. Why was raising inflation so hard after the Great Recession?

As of fall 2017, the primary issue confronting the Fed was how to eliminate a persistent shortfall in inflation from its 2 percent target. Since January 2012 when the Fed established an inflation target, it routinely missed the target on the downside. Over the longer period from August 2008 through June 2017, headline PCE inflation averaged 1.2 percent while core PCE inflation averaged 1.5 percent. The persistent shortfall in inflation from target raised the question, “How do central banks control inflation?”

One often hears the rhetorical question, “Given that the Fed controls money creation, why can’t it control inflation?” However, with an interest rate target, nominal money creation follows real money demand. Assuming that the Fed is not going to change the monetary standard to one of direct fiat money creation (helicopter money), what does the NK model say about the control of inflation? As noted, the model distinguishes between inflation in the sticky-price sector and in the flexible-price sector.

Figure 7 shows the Atlanta Fed measure of sticky-price and flexible-price CPI inflation (see Bryan and Meyer 2010). In periods in which inflationary expectations are reasonably well anchored, there is considerable stability of sticky-price inflation relative to flexible-price inflation. As a result, there is a significant amount of noise in headline inflation coming from the flexible-price sector. Also, with the exception of the period following the 2001 recession, from 1999 through 2011, flexible-price inflation significantly exceeded sticky-price inflation. Similarly, over this period, as shown in Figure 4, headline inflation generally exceeded core inflation. The reason is the demand placed upon natural resources by the integration of the BRICS (Brazil, Russia, India, China, and South Africa) into the world economy. Because central banks followed policies intended to restrain headline inflation, monetary policy lowered core inflation.

Moreover, as shown in Figures 4 and 7, with an interruption in the last years of the 1980s, in the two decades preceding 1999, the Volcker and Greenspan FOMCs steadily reduced underlying inflation. As noted above, the Fed gained credibility in bond markets for near price stability after raising rates sharply starting in February 1994. Finally, sticky-price inflation declined about a percentage point between the immediate pre- and post-Great Recession periods. In updating the statistical decomposition of inflation into a time-varying trend and transitory changes in Stock and Watson (2007), Cecchetti et al (2017) found that trend inflation for core PCE inflation declined after the Great Recession to about 1 ½ percent. A weak world economy since 2012 has kept inflation in the flexible-price sector low through weak commodity prices, especially oil. This combination of stable but low inflation in the sticky-price sector and low inflation and even deflation in the flexible-price sector has kept headline inflation below 2 percent.

Figure 8 shows PCE inflation in the services and goods sectors. It offers similar insights under the assumption that services inflation is more representative of sticky-price markets and goods inflation is more representative of flexible-price markets. The figure shows the decline in services inflation that occurred after mid-2008 and the high degree of volatility in goods inflation relative to services inflation. Also, the terms of trade move secularly in favor of services. Hopefully, that

relationship will remain constant. If it varies, achievement of the FOMC's inflation target will be rendered difficult by the need to alter expectations of firms in the sticky-price sector.

The Fed has achieved price stability in the sense defined by Alan Greenspan. When asked by then Gov. Yellen to define price stability, FOMC chairman Greenspan replied that it "is that state in which expected changes in the general price level do not effectively alter...decisions" (Board of Governors *Transcripts* July 2, 1996, 50). Earlier, Greenspan had endorsed this expectational definition of price stability during the hearings in 1989 on Rep. Neal's (D. NC) resolution (H.J. Res. 409) requiring the Fed to achieve zero inflation within 5 years of the resolution's enactment. Greenspan supported the resolution conditional on the language that "inflation be deemed to be eliminated when the expected rate of change of prices ceases to be a factor in individual and business decision making" (citations from Hetzel 2008, 197).

In the current context of fall 2017, it follows that raising inflation requires making firms again take into account inflation in setting prices. However, as shown in Figure 4, only once following mid-2008 has the FOMC achieved 2 percent core PCE inflation. In the first three months of 2012, 12-month core PCE inflation reached 2.1 percent, perhaps because a second inflation shock passed through into core prices. How can the Fed change the inflationary expectations on which firms in the sticky-price sector coordinate? Repetition in speeches of the 2 percent inflation goal sounds like cheap talk. It will probably take an extended period of inflation in the flexible price sector from an economy run "hot" to have that effect. What are the dangers of such a strategy?

In a similar earlier debate in 1997, Joseph Stiglitz, chairman of the CEA, answered that the dangers were manageable. The quandary was that the unemployment rate had fallen below its presumed NAIRU (non-accelerating inflation rate of unemployment) value of 6 percent and was continuing to decline. At the same time, inflation was falling not rising (1997 U.S. *Economic Report of the President*, 48). According to Stiglitz, the Fed could discover the NAIRU by allowing the unemployment rate to decline until inflation rose. In the event of an overshoot of inflation, the cost of lowering inflation would be manageable. The CEA report contained a graph of the Phillips curve (Chart 2-2). As noted in the heading, the Phillips curve implied a "sacrifice ratio" for the control of inflation. Namely, an excess of the unemployment rate over the NAIRU of one percentage point lowers inflation in the subsequent year by .6 percentage points. In the event of an overshoot, a moderate but sustained unemployment rate in excess of its NAIRU value would restore inflation to its desired target.

The 1998 CEA *Report* (1998 U.S. *Economic Report of the President*, 60) stated, "The unemployment rate is a useful predictor of future inflation in that it can directly indicate the potential for rising inflationary pressure on the cost side, as excess demand in the labor market tends to raise nominal wages and thus nominal labor costs." The *Report* made reference to Chart 2-3. It showed the unemployment rate falling below the contemporaneously assumed NAIRU value of 6 percent in 1994Q3 with wage growth starting an upward ascent four quarters later in 1995Q4. However, as shown in Figure 1, headline PCE inflation did not begin to rise until September 1998, with core PCE inflation beginning to rise only in May 1999. That is, if the NAIRU really was 6 percent, the lag between pushing the unemployment rate below NAIRU and the increase in core PCE inflation was almost five years. Figure 5 shows the output gap turning positive in 1997Q1 and inflation starting to rise in 1999Q2—a lag of just more than two years.

In the late 1990s, the FOMC followed the Stiglitz advice to allow the unemployment rate to decline although motivated by a desire not to allow the dollar to appreciate during the emerging-

market crisis in 1997, 1998, and early 1999. The FOMC did not raise the funds rate until June 1999 when the available May unemployment rate was 4.2 percent (Hetzel 2008, Ch. 17). The unemployment rate fell to 3.8 percent in April 2000. A recession did follow with a cyclical peak in March 2001. That fact suggests that while there may be an upside to allowing a positive output gap to emerge in order to raise inflation there is a downside to eliminating it. Stated alternatively, a lowering of the unemployment rate below its natural value requires subsequently raising the unemployment rate by slowing the growth of the economy below potential.

Milton Friedman criticized this sort of aggregate-demand management, which at its heart entails making Phillips-curve trade-offs. He argued that because of the lags in implementing such policies they result in destabilizing go-stop monetary policy (Friedman 1960, 86-87). Friedman (1968 [1969], 109) wrote:

The reason for the propensity to overreact seems clear: the failure of monetary authorities to allow for the delay between their actions and the subsequent effects on the economy. They tend to determine their actions by today's conditions—but their actions will affect the economy only six or nine months later. Hence they feel impelled to step on the brake, or the accelerator, as the case may be, too hard.

Figure 9 plots the unemployment rate along with the Congressional Budget Office (CBO) estimate of the natural rate of unemployment. The black squares demarcate increases in the unemployment rate that cumulated to 40 basis points or more and that did *not* immediately precede a business cycle peak or follow a business cycle trough. What is striking is the paucity of episodes of such increases in the unemployment rate, that is, increases not associated with recession.

The four squares shown in Figure 9 may indicate incipient recessions forestalled by other events. The November 1951 increase demarcated the date when the Korean War intensified due to the entry of the Chinese crossing the Yalu River. It set off fears of World War III with the return of price controls and created an intense demand for any goods that could be stockpiled. The August 1952 increase occurred during the Korean War. The February 1963 increase marked a stalling of the economy. That stalling convinced President Kennedy and his advisors of the need to ask for a tax cut. January 1967 does not meet the criterion for a nontrivial increase in the unemployment rate although the downward movement in the unemployment rate stalled. However, in summer 1966, the Fed tightened in order to snuff out a rise in inflation. When President Johnson agreed to a tax hike, the Martin FOMC backed off tightening. The July 1976 increase remains a puzzle. In that summer the economy seemed to stall but then picked up again in the fall.

Figure 9 is just a graph, but at a minimum a nontrivial increase in the unemployment rate is a leading indicator of recession. Furthermore, if monetary policy operated through Phillips curve trade-offs of balancing off inflation and unemployment, especially in an environment in which cost-push inflation was regularly pushing up inflation, one would expect routine moderate increases in the unemployment rate. The CBO estimate of the natural rate of unemployment shown in Figure 9 is perhaps little more than a trend line. Nevertheless, there is a pattern. Declines in the unemployment rate below the natural-rate line require subsequent reversals. Those reversals are associated with recessions.

8. What is the monetary regime?

Since Henry Thornton (1802), central banks have been identified with the institution that determines how a country controls money creation. At present, with more than a century of experience with the Federal Reserve System, one can make some general statements about how the Fed controls money creation and about the nature of the monetary regime.

The monetary regime emerges out of the mutual interaction between the systematic behavior of the Fed and the behavior of the economy. Because the Fed operates with an interest-rate target, it controls money indirectly. Endowing money with a stable, well-defined value requires that the Fed create a stable nominal anchor in the form of an expectation of price stability. In order to do so, it must behave in a predictable way, that is, follow a rule.

However, there remains significant disagreement over the nature of the rule and how the rule interacts with the economy in order to define the monetary regime. Does a monetary policy that is stabilizing provide for a stable nominal anchor (nominal expectational stability) and then allow the price system an unfettered ability to determine real variables like the unemployment rate? Alternatively, does a monetary policy that provides for economic stability require trade-offs in such a way that the Fed can mitigate extreme movements in output through offsetting movements in inflation and conversely? Moreover, since the Great Recession, there are many who believe that the Fed should trade off against its output and inflation objectives in order to achieve an additional financial stability objective.

The lack of consensus about how the monetary regime has evolved and what kind of rule will best provide for economic stability leaves the monetary regime fragile. Potentially, the nature of the monetary regime could vary based on changes in the views of newly appointed policymakers. It is then extremely important that there remain an active dialogue between central bankers and economists centered on learning from historical experience.

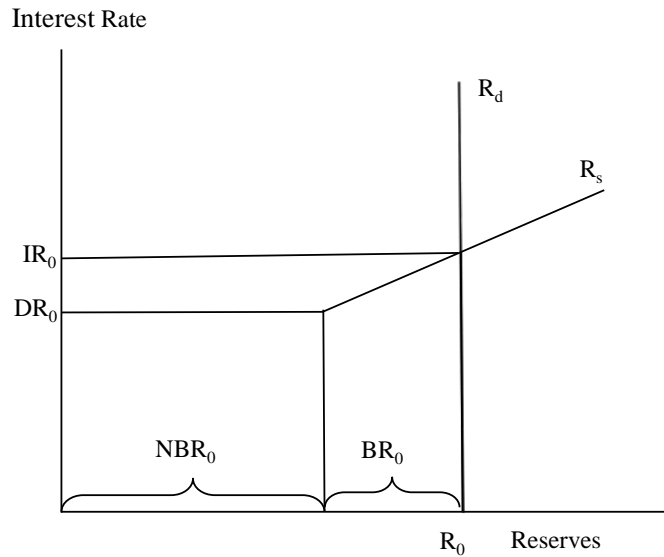
References

- Aoki, Kosuke. "Optimal Monetary Policy Responses to Relative-Price Changes." *Journal of Monetary Economics* 48 (2001), 55-80.
- Bernanke, Ben S. "Remarks on the Economic Outlook." Federal Reserve Board. International Monetary Conference, Barcelona, Spain, June 3, 2008.
- Blanchard, Olivier and Jordi Gali. "Real Wage Rigidities and the New Keynesian Model." *Journal of Money, Credit, and Banking* 39 (February 2007), 35-65.
- Blinder, Alan S. "The Anatomy of Double-Digit Inflation in the 1970s." in Robert E. Hall, ed. *Inflation: Causes and Effects*. Chicago: The University Of Chicago Press, 1982, pp. 261-82.
- Board of Governors of the Federal Reserve System. *Minutes of the Federal Open Market Committee*.
- Bremner, Robert P. *Chairman of the Fed: William McChesney Martin, Jr. and the Creation of the American Financial System*. New Haven, CT.: Yale University Press, 2004.
- Bryan, Michael F. and Brent Meyer. "Are Some Prices in the CPI More Forward Looking than others? We Think So." Federal Reserve Bank of Cleveland *Economic Commentary* 2010-2 (May 19, 2010).
- Burns, Arthur F. *The Anguish of Central Banking*. Belgrade, Yugoslavia, Per Jacobsson Foundation, 1979.
- Chandler, Lester V. *American Monetary Policy 1928-1941*. New York: Harper & Row. 1971.
- Cecchetti, Stephen G., Michael E. Feroli, Peter Hooper, Anil K. Kashyap, and Kermit L. Schoenholtz. *Deflating Inflation Expectations: The Implications of Inflation's Simple Dynamics*, report prepared for the 2017 U.S. Monetary Policy Forum, sponsored by the Initiative on Global Markets at the University of Chicago's Booth School of Business, held in New York, N.Y., on March 3, 2017.
- Curdia, Vasco and Michael Woodford. "Credit Spreads and Monetary Policy." NBER Working Paper 15289, August 2009.
- Eggertsson, Gauti B. "Great Expectations and the End of the Depression." *American Economic Review* 98 (September 2008), 1476-1516.
- Friedman, Milton. "The Role of Monetary Policy" (1968) in Milton Friedman, ed., *The Optimum Quantity of Money and Other Essays*. Chicago: Aldine Publishing Company, 1969.
- Goodfriend, Marvin. "Interest Rate Policy and the Inflation Scare Problem." Federal Reserve Bank of Richmond *Economic Quarterly* 79 (Winter 1993), 1-24.
- Goodfriend, Marvin and Robert G. King. "The New Neoclassical Synthesis." NBER *Macroeconomics Annual*, eds. Ben S. Bernanke and Julio Rotemberg, 1997.
- Harrison, George Leslie. Harrison Papers. Minutes for Meeting of the New York Board of Directors and for the Executive Committee of the New York Board of Directors, Columbia University Rare Book and Manuscript Library.
- Hetzel, Robert L. "Arthur Burns and Inflation." Federal Reserve Bank of Richmond *Economic Quarterly* 84 (Winter 1998), 21-44.
- _____. "German Monetary History in the First Half of the Twentieth Century." Federal Reserve Bank of Richmond *Economic Quarterly* 88 (Winter 2002a), 1-35.

- _____. “German Monetary History in the Second Half of the Twentieth Century: From the Deutsche Mark to the Euro.” Federal Reserve Bank of Richmond *Economic Quarterly* 88 (Spring 2002b), 29-64.
- _____. *The Monetary Policy of the Federal Reserve: A History*. Cambridge: Cambridge University Press, 2008.
- _____. *The Great Recession: Market Failure or Policy Failure?* Cambridge: Cambridge University Press, 2012.
- _____. “The Real Bills Views of the Founders of the Fed.” Federal Reserve Bank of Richmond *Economic Quarterly* 100 (Second Quarter 2014), 159-181.
- _____. “A Proposal to Clarify the Objectives and Strategy of Monetary Policy.” Paper prepared for “Monetary Rules for a Post-Crisis World,” Mercatus-CMFA Academic Conference, September 7, 2016, *Journal of Macroeconomics*, December 2017.
- _____. “The Rise and Fall of the Quantity Theory in Nineteenth Century Britain or Why the Early Federal Reserve System Did Not Understand Its Responsibility to Control the Price Level?” Federal Reserve Bank of Richmond *Economic Quarterly*, forthcoming a.
- _____. “What Caused the Great Recession in the Eurozone?” ed. George Kaufman. *Innovative Federal Reserve Policies during the Great Financial Crises*. World Scientific—Now Publishers Series in Business, forthcoming b.
- Hetzl, Robert L. and Ralph F. Leach. “The Treasury-Fed Accord: A New Narrative Account.” Federal Reserve Bank of Richmond *Economic Quarterly* 87 (Winter 2001a), 33-55.
- _____. “After the Accord: Reminiscences on the Birth of the Modern Fed.” Federal Reserve Bank of Richmond *Economic Quarterly* 87 (Winter 2001b), 57-64.
- Hoover, Herbert. *The Memoirs of Herbert Hoover: The Great Depression 1929-1941*. New York: The Macmillan Company, 1952.
- Humphrey, Thomas M. “From Trade-offs to Policy Ineffectiveness: A History of the Phillips Curve.” Federal Reserve Bank of Richmond, October 1986.
- Lowenstein, Roger. *America’s Bank: The Epic Struggle to Create the Federal Reserve*. New York: Penguin Press, 2015.
- Lucas, Robert E., Jr. and Thomas J. Sargent. (1978) “After Keynesian Macroeconomics.” in Robert E. Lucas, Jr., and Thomas J. Sargent, eds., *Rational Expectations and Econometric Practice*, vol 1. Minneapolis: The University of Minnesota Press, 1981, 295-319.
- Meltzer, Allan H. *A History of the Federal Reserve*, vol. 1, 1913-1951. Chicago: University of Chicago Press, 2003.
- Madden, Carl H. “The Money Side of the ‘Street.’ ” Federal Reserve Bank of New York, 1959.
- Nelson, Clarence W. “Rational Expectations—Fresh Ideas that Challenge Some Established Views of Policy Making.” Federal Reserve Bank of Minneapolis *Annual Report*, 1977.
- Potter, Simon. “Implementing Monetary Policy with the Balance Sheet.” Keynote Remarks for ECB Workshop: Money Markets, Monetary Policy Implementation, and Central Bank Balance Sheets, Frankfurt am Mein, Germany, November 6, 2017.
- Roosa, Robert V. *Federal Reserve Operations in the Money and Government Securities Markets*. Federal Reserve Bank of New York, July 1956.

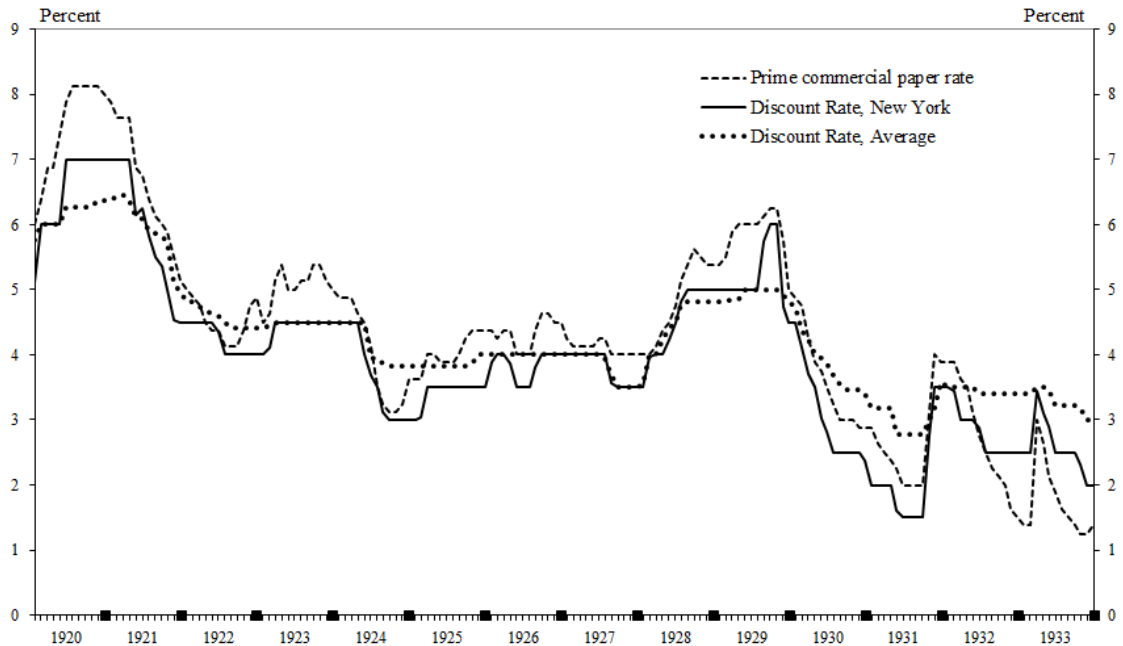
- Samuelson, Paul A. "Living with Stagflation" (1979) in Kate Crowley, ed., *The Collected Scientific Papers of Paul A. Samuelson*. vol. 5, no. 379, 1986, 972.
- Samuelson, Paul and Robert Solow. "Analytical Aspects of Anti-Inflation Policy (1960)," in Joseph Stiglitz, ed., *The Collected Scientific Papers of Paul A. Samuelson*. vol. 2, no. 102, 1966, 1336-53.
- Stock, James H., and Mark W. Watson. "Why Has U.S. Inflation Become Harder to Forecast?" *Journal of Money, Credit and Banking*, vol. 39 (February 2007), 3-33.
- Sumner, Scott. *The Midas Paradox*. Oakland, CA: Independent Institute, 2015.
- Taylor, John B. *Getting Off Track: How Government Actions and Interventions Caused, Prolonged, and Worsened the Financial Crisis*. Stanford, CA: Hoover Institution Press, 2009.
- Thornton, Henry. *An Enquiry into the Nature and Effects of the Paper Credit of Great Britain (1802) and Two Speeches (1811)*, edited with an Introduction by F. A. v. Hayek. NY: Rinehart and Co., 1939.
- U. S. Congress. Statement of Martin, William McChesney. *January 1959 Economic Report of the President*. Hearings before the Joint Economic Committee, U.S. Cong. 86th Cong. 1st sess., February 6, 1959, 495-535.
- U.S. *Economic Report of the President* transmitted to the Congress annually together with the *Annual Report of the Council of Economic Advisers*. Washington, DC: Government Printing Office, various issues.
- Velde, François. "Poor Hand or Poor Play? The Rise and Fall of Inflation in the U.S." Federal Reserve Bank of Chicago *Economic Perspectives* (Quarter 1, 2004), 34-51.
- Wheelock, David C. *The Strategy and Consistency of Federal Reserve Monetary Policy, 1924-1933*. Cambridge: Cambridge University Press, 1991.
- Wicker, Elmus. *Federal Reserve Monetary Policy, 1917-1933*. New York: Random House, 1966.
- Woodford, Michael. *Interest and Prices: Foundations of a Theory of Monetary Policy*. Princeton, N.J.: Princeton University Press, 2003.

Figure 1
The Market for Bank Reserves



Notes: R is bank reserves. R_d is the reserves demand schedule of the banking system and R_s the reserves supply schedule of the Fed. IR is the interest rate on bank reserves. DR is the discount rate. NBR and BR are nonborrowed and borrowed reserves, respectively. The 0's

Figure 2
Money Market Interest Rates and Regional Fed Bank Discount Rates



Notes: Monthly observations of the prime commercial paper rate, the New York Fed discount rate, and the average of the discount rates set by all other regional Reserve Banks. Heavy tick marks indicate fourth quarter. Source: Board of Governors *Banking and Monetary*

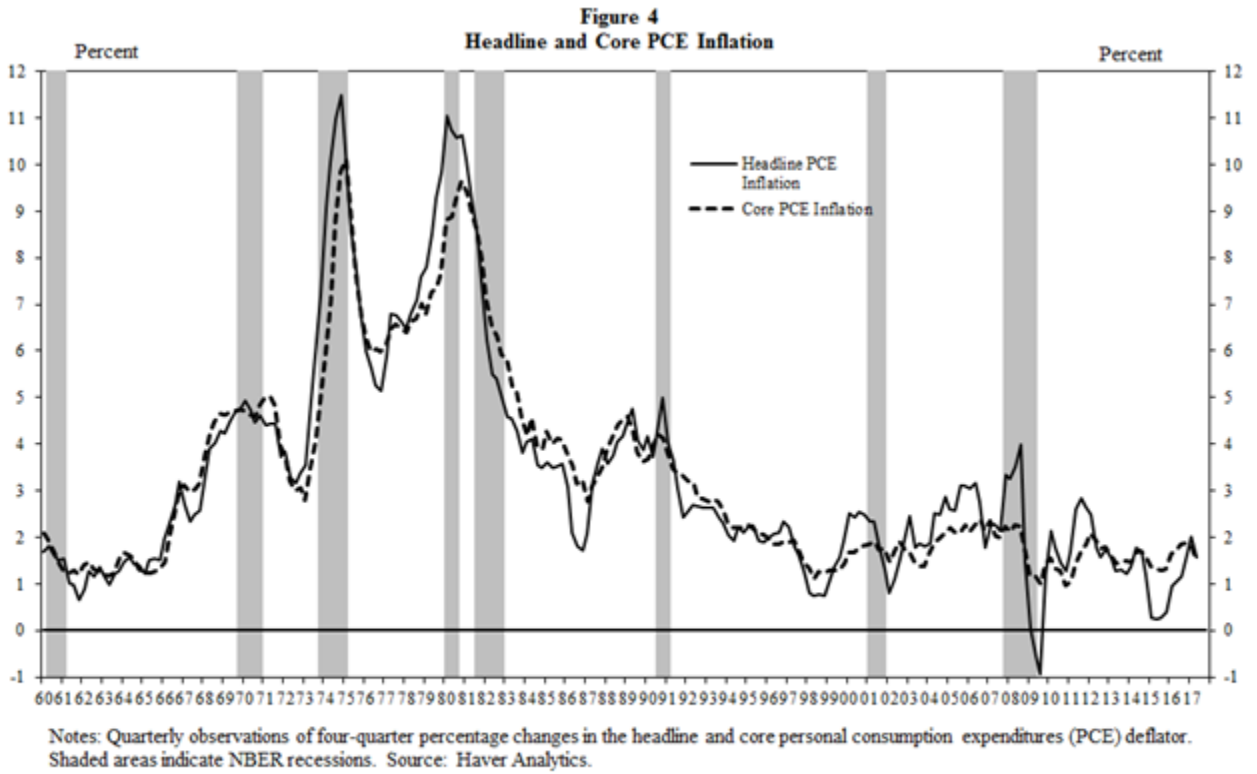
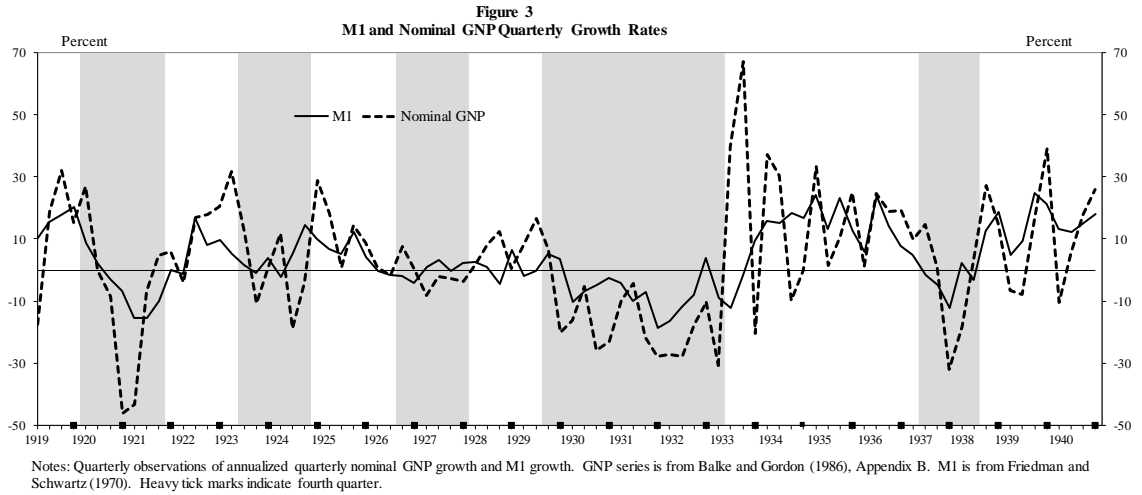
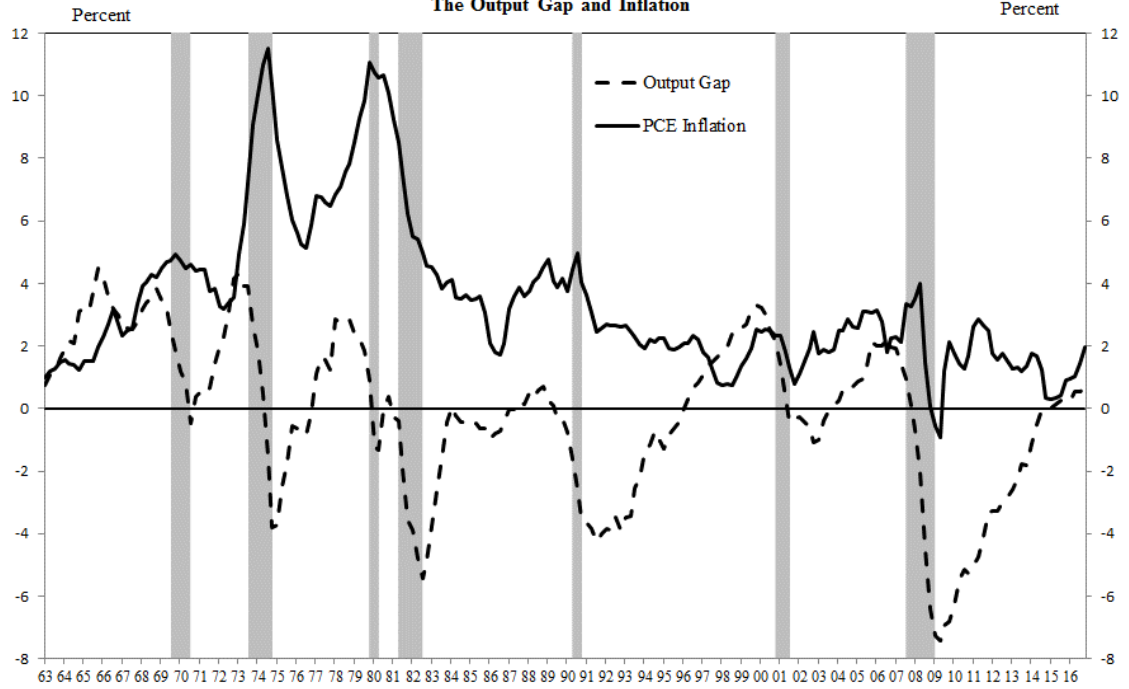
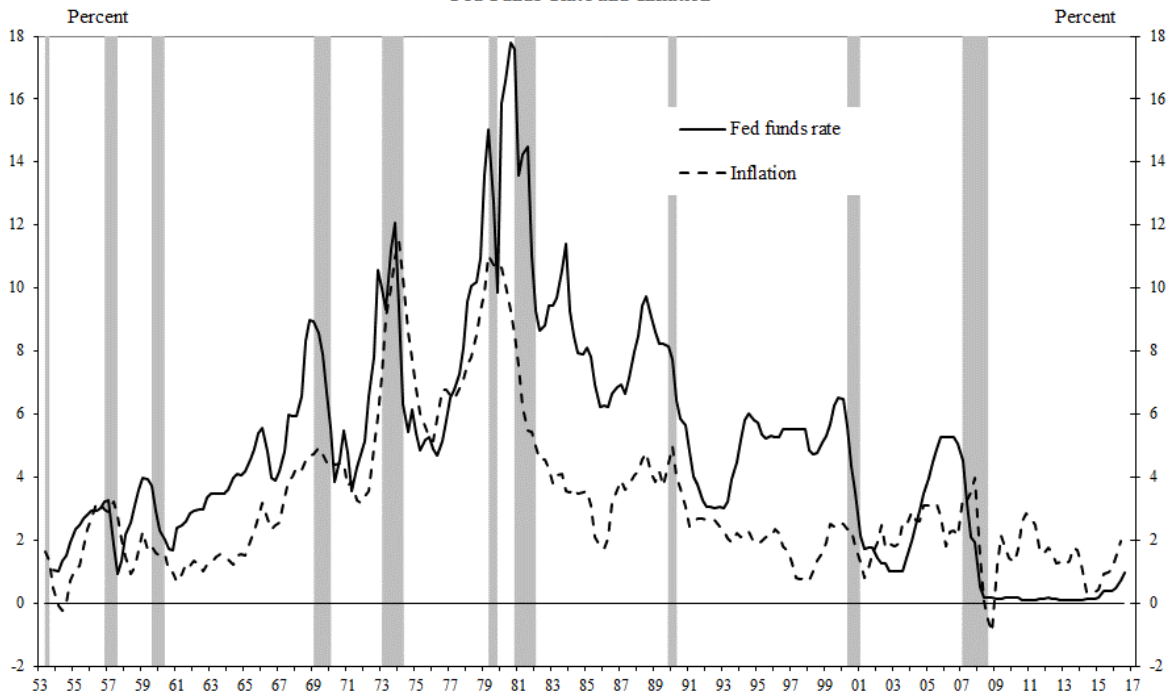


Figure 5
The Output Gap and Inflation



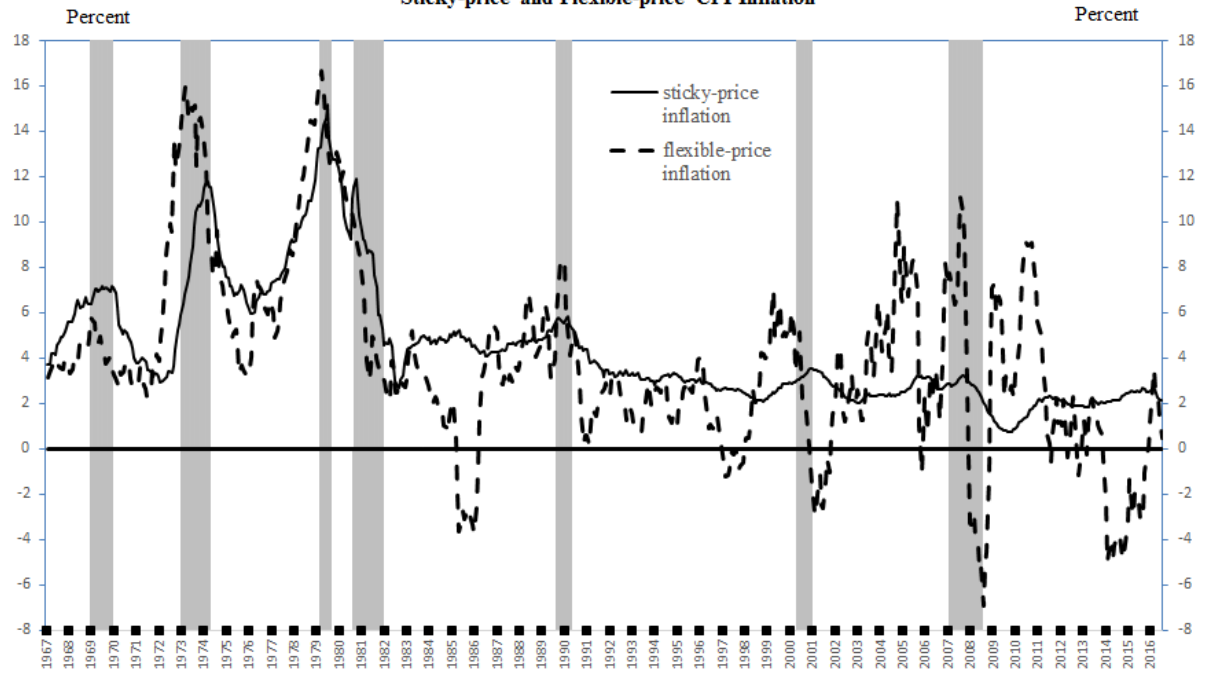
Notes: PCE inflation is 4-quarter percentage changes in the personal consumption expenditures (PCE) deflator. Shaded areas indicate NBER recessions. The output gap is taken from the econometric model FRB/US. See Board of Governors: Economics Research: FRB/US: model: FRB/US model packages: frbus_package. PCE inflation is from Haver Analytics.

Figure 6
Fed Funds Rate and Inflation



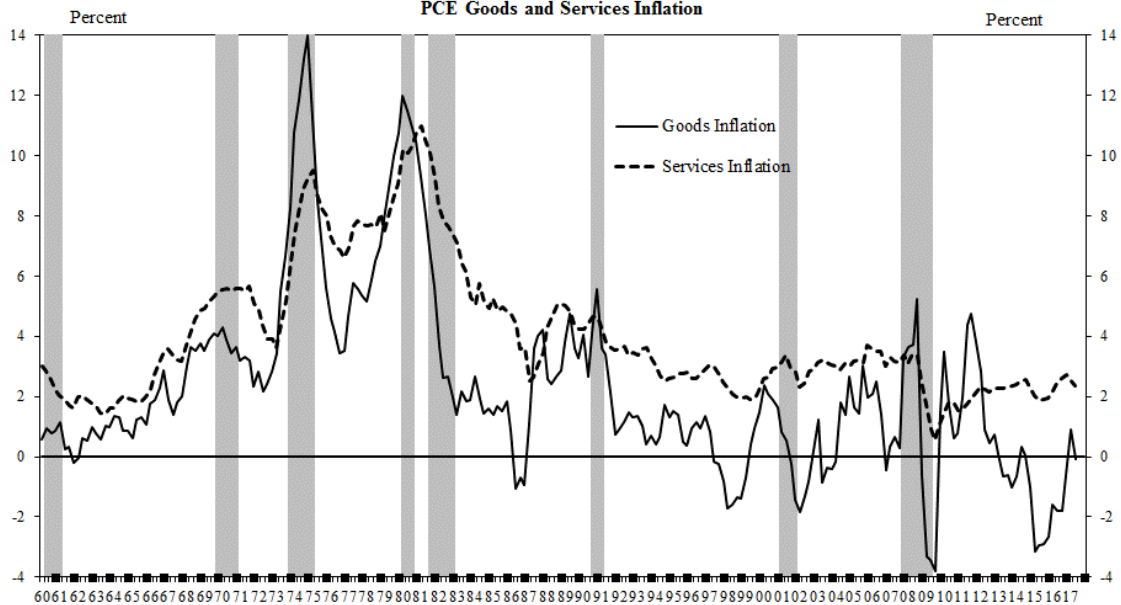
Notes: Quarterly observations of the effective federal funds rate. Inflation is four-quarter percentage changes in the personal consumption expenditures (PCE) deflator. Shaded areas indicate NBER recessions. Data from St. Louis FRED data base.

Figure 7
Sticky-price and Flexible-price CPI Inflation



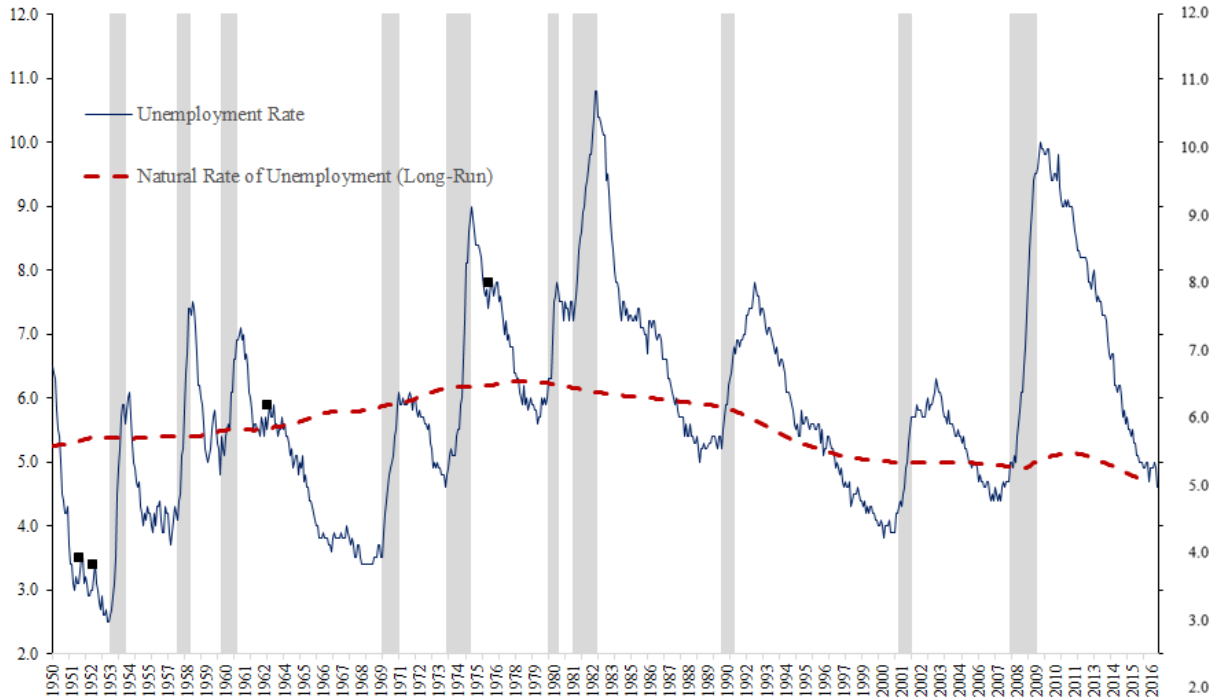
Notes: Observations are 12-month percentage changes in sticky-price and flexible-price inflation. Heavy tick marks indicate December. The years are centered below the January number for that year. For construction of the series, see Bryan and Meyer (2010). Source: Federal Reserve Bank of Atlanta.

Figure 8
PCE Goods and Services Inflation



Notes: Quarterly observations of four-quarter percentage changes in the goods and services personal consumption expenditures (PCE) deflator. Shaded areas indicate NBER recessions. Heavy tick marks indicate the fourth quarter. Source: Haver Analytics.

Figure 9
Unemployment Rate and CBO Natural Rate of Unemployment



Notes: Monthly observations of the unemployment rate. The natural rate of unemployment is from the Congressional Budget Office. The black squares demarcate intervals of increases in the unemployment rate that cumulate to 40 basis points or more and that do not immediately precede a recession peak or follow a recession trough. They fall on the following dates: November 1951, August 1952, February 1963, and July 1976. Source: Haver Analytics.