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**WHAT THE FED NEEDS TO DO
TO CONTROL INFLATION AND
STABILIZE THE ECONOMY**

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Abstract

At least until recently, the consensus has been that central banks are responsible for inflation. However, there has been much less consensus on how central banks control inflation. Is the Federal Reserve (Fed) an inflation creator or an inflation fighter—that is, is inflation a monetary or a nonmonetary phenomenon? To revive the pertinent monetarist-Keynesian debate, it is necessary to re-exposit the quantity theory with its monetary view of inflation. The quantity theory posits a well-defined demand for liquidity in the public’s asset portfolio. However, empirical measures of money, such as M1 and M2, no longer satisfactorily capture that liquidity. To give empirical content to the quantity theory, one must understand what monetary policy procedures provide for the control of that liquidity in the absence of direct targets for money or bank reserves. Given that the Fed uses the funds rate as its instrument to provide price stability, those procedures must discipline the demand for money to be consistent with price stability. To discipline that demand, the Fed must follow a rule that shapes inflationary expectations. The question then becomes “What rule?” This paper provides a quantity-theoretic framework using the New Keynesian model of Marvin Goodfriend and Robert King’s “The New Neoclassical Synthesis,” given content with the first-difference Taylor rules expounded by Athanasios Orphanides. An application demonstrates the contractionary monetary policy of the Great Recession.

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Policymakers and most economists no longer talk about money and the control of money creation as the prerequisite for achieving price stability. Because money does not help to forecast the near-term behavior of the economy, policymakers ignore it. Economists use models without money, so they assume that money is no longer relevant. One consequence of the disappearance of money from the current debate is that policymakers and economists no longer read the vast literature on monetary experiences. What the profession should have learned from the debates under the rubric of rules versus discretion and monetarism versus Keynesianism has largely been lost.

Milton Friedman organized his monetarism around the predictive power of “money” given empirical content through the monetary aggregate M2. However, the empirical definitions of money (M1 and M2) no longer adequately measure the liquidity of the public’s asset portfolio. For this reason, the distinction is made here between “money (measured)” or “money (M1 and M2)” and “money (liquidity).” The former two are the empirical counterpart as traditionally constructed of the latter concept, which is the ideal theoretical counterpart to the liquidity (moneyness) in the public’s asset portfolio. Given that the predictive power of the empirical definitions of money (measured) became significantly less—starting in the early 1980s for M1 and in the early 1990s for M2—what remains of monetarist principles? Is inflation, as Friedman held, always and everywhere a monetary phenomenon? Are monetary disturbances a source of macroeconomic disturbances? How can economists test these hypotheses?

Section 1 highlights the extent to which Friedman expounded monetarist principles in terms of the predictive power of money (measured). It also explains why money (measured) no longer adequately captures the theoretical concept of liquidity. Section 2 explains how the New Keynesian (NK) model of Marvin Goodfriend and Robert King,¹ when combined with the underlying policy (rule) that restored near price stability in the Volcker-Greenspan era, provides

1. Goodfriend and King, “The New Neoclassical Synthesis.”

a quantity-theoretic framework of monetary control. Section 3 illustrates the continued importance of the monetarist concept of the portfolio balance effect when money (liquidity) becomes an independent force through either quantitative easing (QE) or destabilizing monetary policy. It also illustrates the continued importance of the “long-and-variable-lag” critique.

Section 4 illustrates the monetarist case for rules by arguing that stabilizing monetary policy requires a rule—a consistent reaction function for the Federal Open Market Committee (FOMC) to shape the expectations of financial markets. Section 5 reviews NK models with financial frictions. It distinguishes between monetary policy, which explains how the FOMC’s reaction function interacts with the way in which the price system allocates resources intertemporally, and credit policy, which explains how markets allocate resources to particular uses. Financial frictions do not undercut the importance of a rule that allows the price system to work by causing the funds rate to track the natural rate of interest.

Section 6 classifies Taylor rules as either “gap” or “difference” versions and argues that the latter, when combined with the Goodfriend-King model, can explain the Great Moderation that followed the Volcker disinflation. Section 7 excerpts comments from FOMC transcripts expressing dissatisfaction with gap Taylor rules. Section 8 attributes the Great Recession to contractionary monetary policy. Section 9 explains how operating procedures with interest on reserves, which allow for an ample reserves provision that severs the connection between the funds rate target and the quantity of reserves, do not undermine basic monetarist principles requiring monetary control. Section 10 shows how the difference Taylor rule expounded by Athanasios Orphanides² can explain the price stability of the Great Moderation as well as how departures explain the Great Recession and inflation in 2021–2022. Section 11 contends that the FOMC should learn by acknowledging that in the past it has implemented monetary policy using different reaction functions (rules) with stabilizing and destabilizing results for economic stability. Section 12 is a concluding comment.

1. Friedman’s Monetarism and the Lost Predictive Power of Money (Measured)

In “Money and Business Cycles,” Milton Friedman and Anna Schwartz documented the predictive power of money (M2) using the cycle relatives of the National Bureau of Economic Research methodology. In *A Monetary History*

2. Orphanides, “Enhancing Resilience.”

of the United States, Friedman and Schwartz provided a narrative history that gave substance to money (M2) as a causal force as represented by the equation of exchange: $M = pky$.³ In episodes of macroeconomic instability, they showed that instability in M arose independently of the behavior of nominal expenditure (pky) in both the pre- and post-Federal Reserve (Fed) periods. Empirical work also showed that trend money (M2 and M1 adjusted for the trend in its velocity) growth moved with trend inflation. Empirical estimation of real money (M1 and M2) demand functions showed stability and little interest sensitivity. On the basis of the independence in movements in M2 from nominal income in episodes of macroeconomic instability and also stability in estimated real M2 demand functions, Friedman proposed a rule of steady M2 growth.⁴

In *The Counter-Revolution in Monetary Theory*, Friedman listed “the central propositions of monetarism.” They make evident the extent to which he organized his ideas around the predictive ability of money (M2):

There is a consistent though not a precise relation between the rate of growth of the quantity of money and the rate of growth of nominal income. . . . On the average, a change in the rate of monetary growth produces a change in the rate of growth of nominal income about six to nine months later. . . . The changed rate of growth of nominal income typically shows up first in output and hardly at all in prices. . . . On the average, the effect on prices comes about six to nine months after the effect on income and output, so that the total delay between a change in monetary growth and a change in the rate of inflation averages something like 12–18 months.⁵

The Friedman rule embodied two basic monetarist principles:

1. Monetary policy should make the evolution of the price level predictable, ideally by ensuring price stability. It must do so through procedures that provide for monetary control.
2. Monetary policy should leave the determination of real variables (output and employment) to the unfettered operation of the price system.

3. M is money; p is the price level; k is the fraction of real income that the public wants to hold in the form of money; y is real income.

4. Friedman, *A Program for Monetary Stability*.

5. Friedman, *The Counter-Revolution*, 23–25.

Testing the continued validity of these principles requires a re-exposition of the Friedman exposition to make it relevant to a world in which the empirical definitions of money no longer work well to capture their theoretical counterpart—namely, the liquidity of the public’s asset portfolio.

The cessation of money (M1) to predict nominal expenditure began in the early 1980s, when computers made the electronic transfer of money virtually costless.⁶ The problem is that when market interest rates rise, banks are slow to raise the interest rates they pay on deposits. Funds are then disintermediated out of bank deposits into money market instruments. Depositors take funds used primarily for savings purposes rather than transactions purposes and put them into money market instruments. The liquidity of the public’s overall asset portfolio has not changed, but bank deposits and money (measured) decline. A similar phenomenon occurs when market interest rates fall. As a result, M1 ceased accurately measuring liquidity. In the early 1980s, M1 changed from being procyclical to countercyclical and ceased offering useful information on the stance of monetary policy.

The issue of the validity of the central propositions of monetarism, however, remains. It remains even if the methodology Friedman used for testing them is no longer valid in the post-1980 period. Is inflation a monetary or a non-monetary phenomenon? Specifically, is the public’s demand for liquidity in its asset portfolio a stable, well-defined function? By implementing a credible rule, can the FOMC maintain the expectation of price stability? If so, does the price system work well to stabilize the real economy when FOMC procedures are such that they provide an amount of money (liquidity) consistent with the money (liquidity) the public desires, given the expectation of price stability? Is there a model that can embody those principles?

2. A Dynamic Stochastic General Equilibrium Model That Embodies Monetarist Principles

A starting place for a re-exposition of monetarism is the Goodfriend-King version of the NK model.⁷ The authors explicated their model to explain how the discipline imposed by the Volcker-Greenspan policy of restoring near price stability turned over the determination of real variables (output and employment) to the real business cycle core of the economy. The earlier 1970s policy allowed

6. Empirical work showing the continued relevance of empirical measures of money is in Belongia and Ireland, “A Reconsideration of Money Growth Rules,” and Bordo and Duca, “Money Matters.”

7. Goodfriend and King, “The New Neoclassical Synthesis.”

increases in inflation intended to prevent increases in unemployment in a way given by a presumed structural Phillips curve. A policy of price stability produced the Great Moderation.

Robert Barsky, Alejandro Justiniano, and Leonardo Melosi offer a useful exposition.⁸ The real rate of interest, r_t , is the market rate of interest, i_t , minus expected inflation, $E_t\pi_{t+1}$. The natural rate of interest, r_t^n , equals formula (1).

$$r_t^n = \rho_1 + s^{-1}E_t(\Delta y_{t+1}^n), \quad (1)$$

where y_t^n is the natural rate of output expressed in logarithms; r_t is the subjective rate of time preference, in which $\rho \equiv -\log \beta$ and β is the discount factor; s is the intertemporal elasticity of substitution in consumption; and Δ is the first difference operator. The output gap equals $\tilde{y}_t \equiv y_t - y_t^n$ with y_t equal to (the logarithmic value) of output. Using formula (1) and its counterpart expressed in actual values of the real rate of interest and the output gap (the household Euler equation) and solving forward yields formula (2):

$$\tilde{y}_t = -s \sum_{k=0}^{\infty} E_t(r_{t+k} - r_{t+k}^n). \quad (2)$$

That is, the output gap equals the sum of the contemporaneous and future gaps between the real rate of interest and its natural rate counterpart. Formula (3) expresses the NK Phillips curve:

$$\pi_t = \beta E_t[\pi_{t+1}] + k\tilde{y}_t. \quad (3)$$

Testing the empirical relevance of the Goodfriend-King version of the NK model, as expositied by Barsky, Justiniano, and Melosi,⁹ follows the methodology of Friedman and Schwartz.¹⁰ One first examines the historical record to separate periods distinguished by economic stability or instability, both nominal and real. Friedman and Schwartz explained the difference in terms of the associated monetary stability or instability. They used their historical narrative to explain monetary instability in terms of the behavior of the Fed unrelated to responding to the economy in a stabilizing way. The analogue here is to examine whether changes in the rule followed by the Fed (the consistency in its underlying policy actions) predict movements between instability and stability. If so, is the rule associated with stability conformable to the Goodfriend-King NK model?

The test of the model then is whether periods of economic stability are associated with a rule that gives content to formulas (2) and (3). Formula (2)

8. Barsky et al., “The Natural Rate of Interest.”

9. Barsky et al., “The Natural Rate of Interest.”

10. Friedman and Schwartz, “Money and Business Cycles.”

requires that the rule give free rein to the price system to determine real variables (output and employment) by keeping the real rate of interest both in the present and in the future equal to the natural rate of interest. Turning over the determination of real variables to the unfettered operation of the price system maintains the output gap in formulas (2) and (3) equal to zero. A credible rule maintains the expectation of inflation, the first of the right-hand terms in formula (3), equal to zero (price stability). A zero value of both of the right-hand terms in formula (3) ensures price stability. The question then becomes how to give empirical content to the change in the rule between periods of stability and instability in a way that allows the rule to possess predictive content as to what rule the Fed should implement to stabilize the economy. Are the periods of economic stability associated with a rule that (a) maintains the expectation of price stability and (b) allows the price system to work to stabilize the economy's rate of resource utilization so as to maintain the output gap equal to zero and thus cause real output to grow around potential output?

Since the 1951 Treasury-Fed Accord, FOMC procedures can be broadly characterized by William McChesney Martin's phrase "leaning against the wind" (LAW). The basic characteristic of LAW is measured, persistent increases in the short-term interest rates managed by the Fed to offset unsustainable strength in economic growth (unsustainable increases in the economy's rate of resource utilization) and conversely for unsustainable weakness. Since the 1951 Treasury-Fed Accord, these LAW procedures have assumed one of two variants.¹¹

The variant of LAW that allows the stabilizing properties of the price system to work while maintaining the expectation of price stability is known as LAW with credibility. The associated preemptive increases in the funds rate to prevent the emergence of inflation maintain expected inflation equal to zero. LAW with credibility gives the stabilizing properties of the price system full rein to work. If the economy is growing unsustainably fast, the real rate of interest lies below the natural rate of interest and must rise. In this way, monetary policy allows the price system to work to find the natural rate of interest, which distributes aggregate demand intertemporally so that contemporaneous aggregate demand equals potential output. Saving equals investment. This rule characterized the monetary policy in the Volcker-Greenspan era that restored price stability.

In contrast, LAW with tradeoffs (LAW with cyclical inertia in the funds rate) characterized the earlier Burns-Miller era. With it, and given its priority

11. Hetzel, *The Monetary Policy*; Hetzel, *The Great Recession*; Hetzel, *The Federal Reserve System*.

for achieving low unemployment, the FOMC raised the funds rate strongly only with the emergence of inflation. LAW with tradeoffs interferes with the stabilizing properties of the price system, as evidenced by instability in inflation. Hetzel documents that since the founding of the Fed, recessions are preceded by the combination of weakness in the economy and cyclical inertia in short-term interest rates maintained at a cyclically high level by the Fed out of concern for inflation or at times of weakness in the foreign exchange value of the dollar.¹²

How does the NK model of Goodfriend-King implemented with LAW with credibility provide for monetary control? There is a demand and a supply aspect to the rule that provides for monetary control. They correspond, respectively, to the two essential properties of money (liquidity). First, money (liquidity) is a temporary abode of purchasing power. Second, it is used to effect finality of payment in transactions. With respect to the first property, households and firms hold the paper money or the deposits (bookkeeping entries on the books of banks) used in transactions because they believe that they will have value in future transactions. Expectations are central. With respect to the second property, in an uncertain world, an adequate amount of liquidity must be maintained to make unplanned transactions.

One can translate these demand and supply aspects of monetary control into terms of the control required to maintain price stability. Price stability requires that the three terms in formula (3) equal zero. A credible rule that maintains the expectation of inflation equal to zero keeps the $E_t[\pi_{t+1}]$ term in formula (3) equal to zero. A rule that gives content to formula (2) keeps the output gap \tilde{y}_t in formula (3) equal to zero. With both right-hand terms of formula (3) equal to zero, the left-hand term, current inflation, is zero.

On the money demand side, the rule must discipline money demand to be consistent with price stability. First, given a credible rule, firms in the sticky-price sector, which set prices for multiple periods, do not incorporate an inflation premium when they set prices for multiple periods.¹³ Changes in their dollar prices are confined only to relative price changes with no adjustment for expected inflation. Second, with the output gap equal to zero, output grows at potential. Money (liquidity) demand then grows only with potential output and is consistent with price stability.

On the money supply side, departures from a rule that maintains the output gap equal to zero create either an excess supply of or an excess demand for

12. Hetzel, *The Federal Reserve System*, chap. 3.

13. Aoki, "Optimal Monetary Policy Responses."

bonds. In the first case, to maintain its interest rate target, the FOMC's Open Market Desk must engage in purchases and monetize the excess supply. In the second case, it would need to sell bonds to meet the excess demand for bonds and extinguish money (liquidity). The excesses or deficiencies in money (liquidity) would require changes in prices and would destabilize current inflation, π_t , and keep it from being zero. Without destabilizing changes in money supply, as explained previously, money demand grows in line with the expectation of price stability and potential output. Banks accommodate that amount of money demand by creating deposits and the Open Market Desk creates the associated reserves demand as a consequence of defending its interest rate target.

In the Volcker-Greenspan era, LAW with credibility provided for monetary control and the restoration of price stability. In the Burns-Miller era, LAW with tradeoffs did not. It interfered with the operation of the price system by imparting cyclical inertia to the funds rate and created monetary emissions and absorptions that destabilized the price level. The discretionary conduct of monetary policy required in the attempt to make politically acceptable Phillips curve tradeoffs vitiated a stable nominal anchor, and inflation rose secularly. Note that with the monetary control that ensures price stability, money is not a source of disturbances and need not appear in the Goodfriend-King NK model.

3. Monetarist Insights into Monetary Instability

To understand the consequences of departing from the monetary control provided by LAW with credibility, one must add two basic insights from monetarism: (a) the portfolio balance effect and (b) the critique of an activist monetary policy subsumed under the rubric of "long and variable lags." Friedman characterized the transmission process in terms of a portfolio balance effect:

Suppose the monetary authorities increase the stock of money by open-market purchases. . . . Holders of cash will seek to purchase assets. . . . If the extra demand is initially directed at a particular class of assets, say government securities, or commercial paper, or the like, the result will be to pull the prices of such assets out of line with other assets and thus to widen the area into which the extra cash spills. The increased demand will spread, sooner or later affecting equities, houses, durable producer goods, durable consumer goods, and so on. . . . The key feature of this process is that it tends to raise the prices of sources of both producer and consumer services relative to the prices of the services

themselves. . . . It therefore encourages the production of such sources (this is the stimulus to “investment” conceived broadly as including a much wider range of items than are ordinarily included in that term) and, at the same time, the direct acquisition of services rather than of the source (this is the stimulus to “consumption” relative to “savings”).¹⁴

Friedman’s “long-and-variable-lag” critique of activist aggregate-demand policy applies when FOMC procedures depart from LAW with credibility and disrupt the working of the price system. Friedman assumes that policymakers do not know enough about the structure of the economy to use a simple feedback rule to target the behavior of macroeconomic variables. An activist policy of aggregate-demand management is perversely destabilizing. Friedman illustrated the destabilizing effects, assuming that the Fed controlled money to target the price level. The FOMC’s use of slack in the economy as its intermediate target in an attempt to control movement along a Phillips curve is equally relevant. Friedman wrote:

There is much evidence that monetary changes have their effect only after a considerable lag and over a long period and that the lag is rather variable. . . . Under these circumstances, the price level—or for that matter any other set of economic indicators—could be an effective guide only if it were possible to predict, first, the effects of non-monetary factors on the price level for a considerable period of time in the future, second, the length of time it will take in each particular instance for monetary actions to have their effect, and third, the amount of effect of alternative monetary actions.¹⁵

Quantitative easing works through the portfolio balance effect. It entails open-market purchases that replace relatively illiquid assets such as long-term Treasury securities and mortgage-backed securities (MBS) in the public’s asset portfolio with liquid bank deposits. The price of illiquid assets must rise to reconcile the public to holding a more liquid asset portfolio—that is, the price of assets such as equities, houses, consumer durables, commodities, and so on must rise (Tobin’s Q). The rise in their price relative to the value of their service flow at

14. Friedman, “The Lag in Effect of Monetary Policy,” 255–56.

15. Friedman, *A Program for Monetary Stability*, 87–88.

first initiates an increase in investment. With a negative natural rate of interest, QE works to make the natural rate positive through the portfolio balance effect.

4. Forward-Looking Financial Markets Require a Rule to Shape Expectations

A fundamental monetarist premise is that monetary policy needs to be rule based to shape expectations. The reason is that financial markets are forward looking. Formula (2) captures the forward-looking characteristic of financial markets. Specifically, the transmission of monetary policy works through the way that the consistency of policy (the FOMC's reaction function) shapes how the term structure of interest rates (the yield curve) responds to new information (news) about whether the economy is growing unsustainably fast or slow. To shape this behavior in a way that causes it to stabilize the economy in response to shocks, the FOMC must behave in a way that is predictable by financial markets.

In the Volcker-Greenspan era, monetary policy consisted of rule-like behavior (LAW with credibility) that over time conditioned the yield curve to behave in a stabilizing way. With the establishment of credibility after 1994, in response to new information showing that the economy was growing faster than markets had anticipated, the yield curve rose with all the increase in forward rates being real rather than being due in part to an increase in inflation premiums. Earlier, as a legacy of the 1970s cyclical inertia in the funds rate leading to lagged procyclical increases in inflation, unanticipated strength in the economy led to a rise in the yield curve with forward rates reflecting both an increase in the real forward rate and an increase in inflation premiums. In the Volcker-Greenspan era, preemptive increases in the funds rate to prevent the emergence of inflation replaced the previous cyclical inertia in the funds rate. In doing so, it allowed the price system to work by causing the yield curve to track the natural rate of interest.

The FOMC shapes the behavior of the yield curve through its reaction function (rule), which markets must now infer from observing FOMC behavior over time. Through its own response to incoming information on the economy, the FOMC implicitly communicates its reaction function to the Fed watchers. However, the FOMC does not explicitly communicate its reaction function to the general public. With the forward guidance provided by the FOMC's quarterly Summary of Economic Projections and with speeches by FOMC participants, instead it highlights conjectures about the future path of the funds rate. This forward guidance is not a substitute for communication in terms of the underlying consistency of policy—a reaction function.

Two characteristics of policy and its communication by the FOMC obscure the central role of monetary policy in allowing the price system to stabilize the economy. First, confusion arises because the transmission of monetary policy occurs through FOMC conditioning how the yield curve responds to news about whether growth is or is not at a sustainable pace. To the casual observer, it looks as though the FOMC conducts monetary policy through its influence on financial intermediation. However, when stabilizing, FOMC procedures are tracking the natural rate of interest and allowing the price system to work. With an optimal monetary policy, the FOMC sets the risk-free rate of interest embedded in the yield curve in a way that stabilizes economic activity. Credit markets set interest rates on the basis of the behavior of the risk-free rate. Nothing in such a monetary policy regime requires the FOMC to become involved in the allocation of credit. Financial markets can and should be left alone to allocate credit, set risk premiums, and so on. Second, the language of discretion obscures the reality that for monetary policy to be stabilizing, the FOMC must impose a consistency to policy.

Commentary from the Greenspan era reflects the importance of consistency in FOMC behavior to shape expectations constructively. As a governor in the Greenspan FOMC, Ben Bernanke wrote:

The Fed controls very short-term interest rates quite effectively, but the long-term rates that really matter for the economy depend not on the current short-term rate but on the whole trajectory of future short-term rates expected by market participants. Thus, to affect long-term rates, the FOMC must somehow signal to the financial markets its plans for setting future short-term rates. . . . FOMC talk probably has the greatest influence on expectations of short-term rates a year or so into the future, as beyond that point the FOMC has very little, if any, advantage over market participants in forecasting the economy or even its own policy actions. . . . First, to the extent practical, the FOMC strives to be consistent in how it responds to particular configurations of economic conditions and transparent in explaining the reasons for its response. By building a consistent track record, the FOMC increases its own predictability as well as public confidence in its policies. Second, more generally, comments by FOMC officials about the Committee's general policy framework, including the Committee's economic objectives and members' views about the channels of monetary policy transmission and the structure

of the economy, help the public deduce how policy is likely to respond to future economic circumstances.¹⁶

Michael Woodford expressed the general point:

Because the key decision-makers in an economy are forward-looking, central banks affect the economy as much through their influence on *expectations* as through any direct, mechanical effects of central bank trading in the market for overnight cash. As a consequence, there is good reason for a central bank to commit itself to a systematic approach to policy, that not only provides an explicit framework for decision making within the bank, but that is also used to explain the bank's decisions to the public.

The signals that have been given thus far through the post-meeting [FOMC] statements all attempt to say something about the likely path of the funds rate for the next several months They do not speak of the way in which future policy should be *contingent* on circumstances that are not already evident. If the statements are interpreted as *commitments* to particular non-state-contingent paths for the funds rate, . . . then they are likely to constrain policy in ways that are not fully ideal. For while an optimal policy commitment will generally imply that policy should be *history-dependent*, . . . it will also generally imply the policy should be *state contingent* as well.¹⁷ (italics in original)

5. Financial Frictions in the NK Model and Separating Monetary and Credit Policy

Another fundamental monetarist premise is that the Fed is a creator of money, not a large financial intermediary. As explained in section 2, FOMC procedures must provide for monetary control. With the latter “credit” view, the Fed can regulate the amount of intermediation that takes place through the financial system to adjust savings and investment to maintain aggregate demand equal to potential output. Regulating financial intermediation can entail Fed allocation of credit to sectors presumed underserved by the market. With the Great Recession, the

16. Bernanke, “Implementing Monetary Policy,” 5.

17. Woodford, “Central-Bank Communication,” 401, 436–37.

Fed intervened under the assumption that markets were not allocating sufficient resources to housing. The Fed became part housing government-sponsored enterprise (GSE). In March 2020, the Fed expanded such intervention to a panoply of areas traditionally served by banks.

Woodford stated the traditional view that monetary policy should avoid interfering with financial intermediation:

Not only do expectations about policy matter, but, at least under current conditions, very little *else* matters. Few central banks of major industrial nations still make much use of credit controls or other attempts to directly regulate the flow of funds through financial markets and institutions. Increases in the sophistication of the financial system have made it more difficult for such controls to be effective. And, in any event, the goal of improving the efficiency of the sectoral allocation of resources stressed above hardly would be served by such controls, which (if successful) inevitably create inefficient distortions in the relative cost of funds to different parts of the economy.¹⁸ (italics in original)

Frictions in credit markets can amplify economic disturbances. However, the monetarist position is that the Fed should implement a stable policy that gives free rein to the price system to stabilize the economy. Left alone, credit markets can allocate resources efficiently. Unfortunately, the issue is complicated by the way in which the financial safety net creates moral hazard among financial intermediaries and renders the financial system unstable in response to shocks.

NK models support the monetarist position of the primacy of monetary policy over credit policy. Various NK models incorporate a shock that proxies for stress in financial markets and increased uncertainty about the future (an intertemporal demand shock) and that is amplified by financial frictions. Consider different intertemporal demand shocks. Frank Smets and Rafael Wouters add a shock that creates a wedge between the household's intertemporal rate of substitution in consumption (the Euler equation) and the risk-free real rate of interest.¹⁹ The Board of Governors' estimated dynamic optimization (EDO) model adds a wedge in the budget constraint between the policy rate and the return on bonds held by households.²⁰ In Kosuke Aoki's "Optimal Monetary Policy Responses,"

18. Woodford, "Inflation Targeting," 16.

19. Smets and Wouters, "Shocks and Frictions," eq. 2.

20. Chung et al., "Documentation of the EDO Model," eq. 12.

the shock enters directly into the household's utility function. An intertemporal preference shock that causes households to value future consumption relatively more highly than current consumption lowers the natural rate of interest.²¹ A positive savings shock, at the existing interest rate, causes households to want to transfer additional consumption from the present to the future.

Consider a positive savings shock, which appears as an increased demand for the risk-free asset. The FOMC can neutralize the impact on the economy by lowering its policy rate in line with the natural rate. In doing so, it satisfies the increased demand for the risk-free asset. The real-world counterpart is that with the FOMC's interest rate target, an increased demand by households for insured bank deposits is met by an increased supply. It is plausible that the Lehman Brothers bankruptcy on September 15, 2008, produced a sharp decline in the natural rate of interest. As happened, the FOMC put inertia into a decline in the funds rate relative to the natural rate. Nominal rigidities required that real income decline to offset the incipient increased demand for the risk-free asset.

Lawrence Christiano, Roberto Motto, and Massimo Rostagno allow for financial intermediation with financial frictions. Their model includes savers and investors whose rates of intertemporal substitution differ due to a financial friction.²² An external finance premium that moves negatively with the net worth of firms creates a financial-accelerator mechanism that amplifies the effect of macroeconomic shocks on economic fluctuations. A "credit-risk" shock in the form of a positive exogenous shock to the external finance premium caused by the belief that the productivity of firms has become more dispersed exacerbates default risk and captures the idea of a financial crisis.

As noted, with intertemporal demand shocks, the FOMC can neutralize the impact on the real economy by lowering the funds rate in line with the natural rate of interest. At the same time, adding a financial friction in addition to the sticky-prices friction creates one more objective for the FOMC beyond its inflation and employment objectives at a time of financial disturbances. The central bank then should go beyond tracking the natural rate of interest and adopt a rule that trades off among multiple objectives—price stability, full employment, and elimination of financial frictions.²³ Optimal policy in a financial crisis would require missing the price stability and full employment objectives on the upside, but not on the downside, as occurred in the Great Recession.

21. Aoki, "Optimal Monetary Policy Responses," eq. 1.

22. Christiano et al., "Financial Factors"; Christiano et al., "Risk Shocks."

23. Carlstrom et al., "Optimal Monetary Policy."

The disinflation accompanying the Great Recession came from contractionary monetary policy.²⁴ In terms of the NK model, especially starting in summer 2008, when the economy weakened perceptibly, the FOMC failed to track the decline in the natural rate of interest and to implement a policy to give content to formula (2). Despite the fact that additional frictions beyond sticky prices make tracking the natural rate of interest strictly nonoptimal, the overall conclusion from these models is that such a policy still provides nominal and real stability very close to the optimality of the divine coincidence of the Goodfriend-King model.

Barsky, Justiniano, and Melosi²⁵ explicated the classic version of the NK model. Their formula (2), as displayed in section 2, shows the optimality of interest rate procedures that track the natural rate of interest. Barsky, Justiniano, and Melosi give empirical content to their model by using the model of Smets and Wouters.²⁶ According to this model, the natural rate of interest declined steadily from a cyclical peak of about 4 percent prior to the Great Recession to a low of –6 percent in 2009.²⁷ Barsky, Justiniano, and Melosi noted that the Smets and Wouters model “includes price and wage stickiness, backward-looking components in wage and price setting, habit formation, nonseparable utility in consumption and leisure as well as investment subject to adjustment costs,” along with a “risk shock” that “lowers the required return to saving and reduces consumption.”²⁸

Nevertheless, in a testament to the power of the stabilizing properties of the price system, Barsky, Justiniano, and Melosi found that “even if setting the nominal interest rate to target the natural rate is not guaranteed to achieve full stabilization of inflation and the output gap, according to our model pursuing this policy, had it been feasible, would have considerably diminished the volatility of these variables in the last 25 years—including the Great Recession.”²⁹ The argument here is that such a policy would have been feasible provided that the FOMC had been willing to push the funds rate into negative territory and had engaged in aggressive QE by fall 2008, as explained in section 3.

Vasco Cúrdia reported measures of the natural rate of interest using the model in Cúrdia et al.³⁰ The natural rate of interest began to decline with the

24. Measured by annualized quarterly percentage changes in the core personal consumption expenditures (PCE) deflator, inflation averaged 2.2 percent from 2004/Q1 to 2008/Q3, 1.0 percent from 2008/Q4 to 2010/Q3, and 1.6 percent from 2010/Q4 to 2020/Q1.

25. Barsky et al., “The Natural Rate of Interest.”

26. Smets and Wouters, “Shocks and Frictions.”

27. Barsky et al., “The Natural Rate of Interest,” figure 1.

28. Barsky et al., “The Natural Rate of Interest,” 38, 40.

29. Barsky et al., “The Natural Rate of Interest,” 40.

30. Cúrdia, “Why So Slow?” figure 1; Cúrdia et al., “Has U.S. Monetary Policy Tracked?”

business cycle peak in 2007/Q4 and then dropped sharply, going from 2.5 percent in 2007/Q3 to -2.5 percent in 2008/Q4³¹ (numbers supplied by Cúrdia to the author). It stayed negative in the recovery from the Great Recession, became zero in 2017/Q1, and then rose gradually just as the FOMC began to raise the funds rate in a sustained way from its near-zero value in December 2016.

A variety of dynamic stochastic general equilibrium (DSGE) models reinforces the general conclusion that the slowness of the Fed to track a decline in the natural rate of interest either caused or exacerbated the Great Recession. In a memo written for the FOMC, Chung et al. noted that using the version of the natural rate, r^* , employed in the Board of Governors staff Tealbook, monetary policy was contractionary from fall 2008 well into the recovery: “Board staff estimates of the real interest rate needed to close the output gap over a 12-quarter time frame—the short-run r^* regularly reported in the Tealbook—remained consistently below the actual real federal funds rate from late 2008 through the third quarter of 2013.”³²

The Chung et al. memo is especially useful because it reports a broad similarity of results over different variants of the NK model.³³ Although the introduction of a variety of frictions implies that setting the real rate equal to the natural rate of interest does not yield the divine coincidence result, such a policy “promotes stable inflation and economic activity.”³⁴ All the models agree that the natural rate of interest “plunged to its historical lows during the Great Recession.”³⁵ A policy of tracking the natural rate of interest “does deliver more stable inflation *and* output gaps than the estimated monetary policy rules in most of our models” (italics in original).³⁶ Moreover, this result holds when the models include financial frictions incorporating “an explicit connection between firms’ balance sheets and the spread on external financing that those firms pay.”³⁷ The natural rate of interest “declines abruptly in downturns,”³⁸ a result implicitly critical of FOMC behavior that introduces cyclical inertia into the behavior of the funds rate. Finally, “maintaining the policy rate close to its natural counterpart over time

31. Work by Lawrence Schmidt, aptly titled “Climbing and Falling Off the Ladder,” shows when an economy is going into a recession, the distribution of labor-income idiosyncratic shocks becomes increasingly skewed to the left tail, as proxied for by state unemployment insurance claims. The resulting increase in precautionary savings would lower the natural rate of interest.

32. Chung et al. “Estimates of Short-Run r^* from DSGE Models,” 1.

33. Chung et al. “Estimates of Short-Run r^* from DSGE Models,” 4.

34. Chung et al. “Estimates of Short-Run r^* from DSGE Models,” 1.

35. Chung et al. “Estimates of Short-Run r^* from DSGE Models,” 2.

36. Chung et al. “Estimates of Short-Run r^* from DSGE Models,” 2.

37. Chung et al. “Estimates of Short-Run r^* from DSGE Models,” 3.

38. Chung et al. “Estimates of Short-Run r^* from DSGE Models,” 5.

can deliver desirable outcomes along both dimensions of the dual mandate.”³⁹ In sum, maintaining full employment does not require exploiting Phillips curve tradeoffs—just letting the stabilizing properties of the price system work.

6. Which Taylor Rule Gives the Goodfriend-King Model Predictive Content?

As argued in section 2, in the post-1951 Accord period, monetary policy regimes can be roughly divided into two variants: LAW with tradeoffs (LAW with cyclical inertia in the funds rate) and LAW with credibility (LAW with preemptive increases in the funds rate). LAW with tradeoffs can be associated with gap Taylor rules⁴⁰ and LAW with credibility with the difference Taylor rules of Orphanides⁴¹ and Orphanides and van Norden.⁴² When given substance with LAW with credibility, the Goodfriend-King model can explain the Great Moderation that followed the Volcker disinflation.

Taylor showed that the gap rule shown in formula (4) with g_π and g_x equal to 0.5 predicted the funds rate from 1987 through 1992, a period of contractionary policy.⁴³

$$i_t = 2 + \pi_t + g_\pi(\pi_t - \pi^*) + g_x x_t. \quad (4)$$

The funds rate is i_t . The constant term, 2, is the long-run average of the real rate of interest. The prior four-quarter inflation rate is π_t . The FOMC’s inflation target, π^* , is 2 percent. The output gap, x_t , is the percentage deviation of real GDP from a trend line.

Taylor argued that, over time, monetary policy has improved because the FOMC has responded more vigorously to deviations of inflation from the 2 percent target by increasing the magnitude of the coefficient g_π on the inflation term ($\pi_t - \pi^*$).⁴⁴ However, a rule that allows inflation to emerge is consistent with the activist aggregate-demand policy of the 1970s rather than with the nonactivist policy in the Volcker-Greenspan era with preemptive increases in the funds rate

39. Chung et al. “Estimates of Short-Run r^* from DSGE Models,” 10.

40. Taylor, “Discretion versus Policy”; Taylor, “The Robustness and Efficiency.”

41. Orphanides, “Monetary Policy Rules Based on Real-Time Data”; Orphanides, “Monetary Policy Rules and the Great Inflation”; Orphanides, “The Quest for Prosperity”; Orphanides, “Monetary Policy Evaluation”; Orphanides, “Historical Monetary Policy Analysis”; Orphanides, “Monetary Policy Rules, Macroeconomic Stability”; Orphanides, “Improving Monetary Policy”; Orphanides, “Enhancing Resilience.”

42. Orphanides and van Norden, “The Unreliability of Output-Gap Estimates.”

43. Taylor, “Discretion versus Policy.”

44. Taylor, “The Robustness and Efficiency.”

preventing the emergence of inflation. A gap Taylor rule then fits better in an activist monetary policy regime characterized by balancing off two independent targets, low inflation and low unemployment, in a way constrained by a Phillips curve. The Phillips curve is presumed to offer a menu of choices between inflation and an output gap measured as the difference between an unemployment rate and a nonaccelerating inflation rate of unemployment (NAIRU), which is the value of unemployment assumed consistent with no change in inflation. Monetary policy is expansionary or contractionary depending, respectively, on whether low inflation or low unemployment is of more concern.

In contrast to a gap Taylor rule, a difference Taylor rule takes the form of a change in the funds rate with no constant term. With a credible rule that maintains expected inflation equal to zero, the FOMC can focus on offsetting unsustainable increases or decreases in the economy's rate of resource utilization. By stabilizing the economy's rate of resource utilization, the FOMC causes output to fluctuate around potential. It is not using an output gap as an intermediate target to move the economy along a Phillips curve.

In the Volcker-Greenspan era, the FOMC concentrated on restoring the expectation of price stability, LAW with credibility (LAW with preemptive increases in the funds rate). Bond holders, the so-called bond market vigilantes who had been burned by inflation in the 1970s, raised bond rates at any sign that the FOMC was tolerating sustained strength in the economy (the "inflation scares").⁴⁵ Given its desire to restore a stable nominal anchor in the form of the expectation of price stability, the FOMC raised the funds rate to counteract inflation scares. The resulting discipline on policy foreclosed any attempt to treat the unemployment rate as a separate objective competing with price stability. With the restoration of credibility for price stability with the funds rate increases from February 1994 through February 1995, the Greenspan FOMC began to use signs of overheating in the labor market as the trigger for preemptive increases in the funds rate. The concentration on restoring the expectation of price stability required letting the price system work to find the natural rate of interest. Contrary to the predictions of Keynesians, it did not require periodic spells of high unemployment to stifle presumed cost-push inflation.

In his Humphrey Hawkins testimony to Congress in July 1993, Alan Greenspan stated:

In assessing real rates, the central issue is their relationship to an equilibrium interest rate, specifically, the real rate level that,

45. Goodfriend, "Interest Rate Policy."

if maintained, would keep the economy at its production potential over time. Rates persisting above that level, history tells us, tend to be associated with slack, disinflation, and economic stagnation—below that level with eventual resource bottlenecks and rising inflation, which ultimately engenders economic contraction. Maintaining the real rate around its equilibrium level should have a stabilizing effect on the economy, directing production toward its long-term potential. . . . Inflation is counterproductive in many ways. Of particular importance, increased inflation has been found to be associated with reduced growth of productivity, apparently in part because it confounds relative price movements and obscures price signals.⁴⁶

Although Greenspan was never willing to characterize monetary policy in terms of a rule, his congressional testimony is consistent with a difference Taylor rule. Consider the following testimony from Greenspan, which focuses on stabilizing the economy's rate of resource utilization:

Persistent deviations of actual growth from that of capacity potential will soon send signals that a policy adjustment is needed. . . . Through the four quarters of 1994, for example, real GDP . . . rose 3½ percent. If that were the true rate of increase in the economy's long-run potential, then we would have expected no change in rates of resource utilization. Instead, industrial capacity utilization rose nearly 3 percentage points, and the unemployment rate dropped 1 percentage point. Moreover, we began to see signs of strain on facilities: deliveries of materials slowed appreciably, and factory overtime rose sharply.⁴⁷

Greenspan further testified:

By themselves, surges in economic growth are not necessarily unsustainable provided they do not exceed the sum of the rate of growth in the labor force and productivity for a protracted period. . . . Assessing conditions in the labor market can be very

46. *Semiannual Monetary Policy Report to the Congress: Testimony before the Subcommittee on Economic Growth and Credit Formation of the House Committee on Banking, Finance, and Urban Affairs*, 103rd Cong., 1st sess., July 22, 1993 (testimony of Alan Greenspan), 11–12.

47. *Conduct of Monetary Policy: Hearing before the House Committee on Banking and Financial Services*, 106th Cong., 1st sess. (July 22, 1999) (testimony of Alan Greenspan), 8.

helpful in forming those judgments. Employment growth has exceeded the growth in working-age population this past year by almost 1/2 percentage point. This implies that real gross domestic product is growing faster than its potential. What is important is the information offered by changes in resource utilization for the *difference* between actual and potential growth.⁴⁸ (italics in original)

Greenspan also testified: “We cannot tell . . . what the actual potential [growth rate] is. . . . But it shouldn’t be our concern. Our concern should be the imbalances that emerge.”⁴⁹

Greenspan replied to a question about whether the Fed limited growth in raising interest rates:

Senator, I do understand where you are coming from because I have been in the same place. . . . The question of how fast this economy grows is not something the central bank should be involved in. . . . What we are looking at is basically the indications that demand chronically exceeds supply. . . . The best way to measure that is to look at what is happening to the total number of people who . . . are unemployed. . . . What . . . we are concerned about is not the rate of increase in demand or the rate of increase in supply, but only the difference between the two. . . . In other words, we don’t know whether the potential growth rate is 4, 5, 6, or 8 percent. What we need to focus on . . . is solely the difference between the two.⁵⁰

For a while in the last half of the 1990s, the FOMC experimented with using Taylor as a tentative guide.⁵¹ The FOMC abandoned the attempt when it consistently led to overprediction of inflation as the unemployment rate fell without an increase in inflation. The unemployment rate declined from a cyclical peak of 7.8 percent in June 1992 to a low of 3.9 percent in December 2000. Despite the

48. *Federal Reserve’s Second Monetary Policy Report for 1999: Hearing before the Senate Committee on Banking, Housing, and Urban Affairs*, 106th Cong., 1st sess. (July 28, 1999) (testimony of Alan Greenspan), 10.

49. *Conduct of Monetary Policy: Hearing before the House Committee on Banking and Financial Services*, 106th Cong., 1st sess. (July 22, 1999) (testimony of Alan Greenspan), 19.

50. *Federal Reserve’s First Monetary Policy Report for 2000: Hearing before the Senate Committee on Banking, Housing, and Urban Affairs*, 106th Cong., 2nd sess. (February 23, 2000) (testimony of Alan Greenspan), 14.

51. Taylor, “Discretion versus Policy.”

decline, consumer price index (CPI) inflation remained stable at about 3 percent from October 1991 through February 1997 and then declined to 1.4 percent in September 1998 (year-over-year percentage changes using the monthly CPI). That failure in predicting inflation led to an FOMC discussion of the usefulness of gap Taylor rules.

7. FOMC Criticism of Gap Taylor Rules and an Updated Difference Taylor Rule

As early as the December 1995 FOMC meeting, Greenspan said: “Whenever we miss the inflation forecast, we say the NAIRU fell.”⁵² At the May 1999 FOMC meeting, Governor Edward Gramlich espoused the kind of difference rule championed by Orphanides:

For the last few meetings, I have been trying to determine rules of thumb or guides for how we should be making our decisions. The Taylor Rule, a favorite of many academic economists studying monetary policy, does not work well when it is difficult to define operating targets for inflation or unemployment. As we have discussed often in this room, this difficulty may now be showing up particularly with respect to the unemployment term, given the problems in identifying the NAIRU. One could make a case that the NAIRU is 6, 5, or 4 percent. There are several substitute approaches. . . . Another approach, which I have championed here, is to go to a change rule. Assuming both inflation and unemployment are in their desired band, the Fed would try to lead the growth in aggregate demand to be equal to the long-term growth in aggregate supply. This rate used to be about 2.5 percent per year, but now may be as high as 3.25 percent if one is a productivity optimist. A third approach is Bob Parry’s nominal GDP standard. I haven’t thought about that thoroughly, but I think most of the time that would give the same suggestion as my change approach.⁵³

52. Board of Governors of the Federal Reserve System, “Meeting of the Federal Open Market Committee Meeting, December 19, 1995,” 39 (as cited in Thornton, “Is the Phillips Curve Dead?,” A15).

53. Board of Governors of the Federal Reserve System, “Meeting of the Federal Open Market Committee, May 18, 1999,” 45.

At the subsequent June 1999 meeting of the FOMC, Governor Donald Kohn repeated the arguments that led Orphanides and other staff members to recommend what Orphanides calls the natural growth rule.⁵⁴ Kohn said:

Revisions to the assumed NAIRU and to potential GDP growth have been unusually large in recent years, responding in part to over projections of inflation. This experience suggests that uncertainty about the specifications of the supply side of the economy in the staff forecast and its extension might be quite sizable. The studies you received by Orphanides and by Orphanides, Porter, Reifschneider and Tetlow highlighted the extent to which estimates of potential, and hence the gap between actual and potential output, have been revised over the years. . . . One alternative in response to uncertainty is not giving the level of the gap any weight in your policy reactions and instead paying attention only to the growth rate of nominal GDP relative to a targeted growth rate, which reflects a change in the output gap and inflation. This is a risk-averse strategy. . . . This research suggests that in a situation where the Committee is rather uncertain about the true level of labor resource utilization, it might attach the highest priority to seeking growth in the economy that would maintain the prevailing level of labor utilization unless evidence begins to accumulate that this level of utilization is inappropriate.⁵⁵

Federal Reserve Bank of Richmond president Al Broaddus argued that the gap Taylor rule was deficient because it assumed that the natural rate of interest was a constant. He also made the point that FOMC procedures needed to incorporate preemptive changes in the funds rate. Broaddus said:

I'd like to point out a deficiency in the Taylor rule as I see it; I think it is fundamentally the one identified in the Orphanides paper. And that is that the rule suggests that we only need to move the real funds rate away from a fixed constant, given by the historical average, if in fact an output gap or an inflation gap arises. But as Larry Meyer suggested earlier, even if these gaps were zero, macroeconomic developments can make it necessary

54. Orphanides, "Enhancing Resilience."

55. Board of Governors of the Federal Reserve System, "Meeting of the Federal Open Market Committee, June 29-30, 1999," 69.

for real short rates to move and for us to follow and accommodate those rate changes. An example, . . . is that an increase in trend productivity growth means that real short rates need to rise. Just to repeat, the reason is that households and businesses would want to borrow against their perception of higher future income now in order to increase current consumption and investment before it's actually available. So the rate needs to rise to induce those consumers and businesses to defer that spending until in fact the output is available. The Taylor rule doesn't give any attention to that kind of real business cycle reason for a move in rates. It only allows reaction to inflation gaps and output gaps.

This is really the simple point I want to make—our main policy successes in the 1980s and 1990s have come when we have acted more preemptively. The go/stop cycles that all of us remember in the 1960s and 1970s were, in my view at least, often the result of not reacting aggressively enough to early signs of rising inflation pressures.⁵⁶

8. Contractionary Monetary Policy and the Great Recession

Monetary policy in the Great Recession was contractionary. That failure arose in part from the association of the financial disruption following the Lehman failure on September 15, 2008, with an intensification of the recession. Given its fear that high headline inflation would raise the public's expectation of inflation, the FOMC decided to deal with the recession by adding a tool to its armory. To avoid lowering the funds rate to the zero lower bound (ZLB), the FOMC turned to credit policy. It decided to become a financial intermediary by lending directly to a variety of nonbank institutions and foreign banks all lacking access to the discount window. The FOMC would add a credit channel to policy by allocating credit to the money market funds and foreign banks shunned by private investors as too risky after the apparent retraction of the financial safety net with the Fed's failure to bail out Lehman, a nonbank. The FOMC would prevent a decline in the funds rate by sterilizing the resulting reserves creation through the payment of interest on reserves (IOR).

56. Board of Governors of the Federal Reserve System, "Meeting of the Federal Open Market Committee, June 29–30, 1999," 100.

Bernanke expressed the importance he attached to reinventing the Fed as the financial intermediary of last resort:

Virtually all the markets—particularly credit markets—are not functioning or are in extreme stress. . . . I think we can agree that it [liquidity provision] obviously is not a panacea because, as the Vice Chairman points out, it doesn't address the underlying capital issues. That suggests that the right solutions probably have a significant fiscal element to them.⁵⁷

Only at the December 2008 FOMC meeting would the FOMC turn to an expansionary monetary policy. It would do so by lowering the funds rate to the ZLB. It would also turn to the liquidity provision spurned earlier. Through buying the debt of the housing GSEs, which began in early 2009, the FOMC began what later became known as quantitative easing. Although Bernanke's intent was to stimulate only the housing market, the power of QE combined with the ZLB was the key to pulling the economy out of recession.

Until QE, which began in earnest with the purchase of Treasury securities in addition to MBS at the March 2009 FOMC meeting, the FOMC ignored the power of money creation working through a portfolio balance effect as emphasized in the monetarist tradition. With the focus on credit markets, the FOMC also ignored the Friedman long-and-variable-lags critique⁵⁸ of how directly targeting a macroeconomic variable, in this case inflation, would be destabilizing—that is, it allowed a negative output gap to develop, especially starting in summer 2008, to lower high headline inflation. Although not apparent initially because of reporting lags in the data, the economy of the developed nations went into serious recession in summer 2008. The financial turmoil after the Lehman failure lowered the natural rate of interest. The inertia in lowering the funds rate, which could have been made negative as done by European central banks, turned a serious recession into the Great Recession.

The Great Moderation ended with the Great Recession. Although popularly attributed to a disruption in bank lending produced by the housing bust, contractionary monetary policy offers an explanation in line with earlier recessions. A characteristic of postwar recessions is that, in the prior recovery, the FOMC failed to implement the preemptive increases in the funds rate required to maintain low inflation. When inflation rose, the FOMC initiated sustained

57. Board of Governors of the Federal Reserve System, "Conference Call of the Federal Open Market Committee, October 7, 2008," 12.

58. Friedman, *A Program for Monetary Stability*.

increases in the funds rate until the economy weakened. Despite the weakness in the economy, the FOMC limited reductions in the funds rate out of concern that it would be sending a signal to the financial market that it was resigned to a higher rate of inflation.

The Great Recession diverged from this pattern in two respects.⁵⁹ First, inflation came from an inflation shock powered by an increase in commodity prices caused by the integration of Brazil, Russia, India, and China into the world economy. From \$20 a barrel in January 2002, the price of a barrel of oil (West Texas Intermediate, WTI) rose from \$20 to \$134 in June 2008. Headline personal consumption expenditure (PCE) inflation rose from 0.8 percent in 2002/Q1 to almost 4 percent in 2008/Q3. With some passthrough from headline inflation, core PCE inflation (four quarter percentage changes) rose from 1.3 percent in 2003/Q3 to 2.2 percent over the interval 2006/Q2 to 2008/Q3.

Second, the FOMC initially did lower the funds rate in response to the recession, which began in December 2007. By its April 30, 2008, meeting, the FOMC had lowered the funds rate to 2 percent. After the April meeting, however, the FOMC remained focused on high headline inflation for fear that it would raise the inflationary expectations of the public. The FOMC sent the message to markets that the next change in the funds rate would likely be an increase. The consensus was that the zero realized real funds rate (a 2 percent funds rate and underlying inflation of 2 percent) made monetary policy undesirably stimulative in an environment of high inflation. The minutes released in the intermeeting period after the June 2008 FOMC meeting captured the consensus:

Participants continued to see significant downside risks to growth. At the same time, however, the outlook for inflation had deteriorated. Recent increases in energy and some other commodity prices would boost inflation sharply in coming months. . . . Participants had become more concerned about upside risks to the inflation outlook—including the possibility that persistent advances in energy and food prices could spur increases in long-run inflation expectations. . . . Participants agreed that the possibilities of greater pass through of cost increases into prices, higher long-run inflation expectations feeding into labor costs and other prices, and further increases

59. Hetzel, *The Federal Reserve System*; Sumner, *The Money Illusion*.

in energy prices all posed upside risks to inflation that had intensified since the time of the April FOMC meeting.⁶⁰

Well before the peak in the business cycle in December 2007, the economy had begun to weaken, with real disposable personal income failing to grow after March 2007 until increased temporarily in May 2008 by the Bush tax rebates. Annualized real GDP growth was -1.7 percent in 2008/Q1. It rose to 2.4 percent in 2008/Q2, powered by the one-time spending from the Bush tax rebates and a temporary boost from net imports and inventories. By summer, the economy had returned to recession, with 2008/Q3 growth at -2.1 percent. The average of annualized, monthly real personal consumption expenditures was -5.4 percent for July, August, and September 2008 and, at -5.0 percent, slightly less for the months of October, November, and December 2008. Annualized monthly changes in nonfarm payrolls averaged only 0.5 percent from June 2007 through December 2007. Payroll employment declined by 267,000 and 424,000 in the months of August and September 2008, respectively. (The September numbers were recorded in the survey conducted before the Lehman bankruptcy on September 15.) However, after its April 2008 meeting, the FOMC ceased lowering the funds rate as the economy continued weakening.

For the period from early 2004 through summer 2008, year-over-year percentage changes in the core PCE remained steady within a narrow range of 2 percent to somewhat less than 2.5 percent. As recorded in the minutes of the August 5, 2008, FOMC meeting, “most participants anticipated that core inflation would edge back down during 2009.”⁶¹ Presumably, that would have placed inflation at or below the FOMC’s implicit target. Although underlying inflation remained near target, the negative output gap widened. The August 5, 2008, FOMC minutes noted:

[T]he staff continued to expect that real GDP would rise at less than its potential rate through the first half of next year. . . . [M]embers agreed that labor markets had softened further, that financial markets remained under considerable stress, and that these factors—in conjunction with still-elevated energy prices and the ongoing housing contraction—would likely weigh on economic growth in coming quarters.⁶²

60. Board of Governors of the Federal Reserve System, “Minutes of the Meeting of the Federal Open Market Committee, June 24–June 25, 2008,” 6–8.

61. Board of Governors of the Federal Reserve System, “Minutes of the Meeting of the Federal Open Market Committee, August 5, 2008,” 5.

62. Board of Governors of the Federal Reserve System, “Minutes of the Meeting of the Federal Open Market Committee, August 5, 2008,” 4, 6.

However, the FOMC remained focused on a concern that persistent, high headline inflation would raise the public's expectation of inflation. The August 5, 2008, FOMC minutes noted:

Participants expressed significant concerns about the upside risks to inflation, especially the risk that persistent high headline inflation could result in an unmooring of long-run inflation expectations. . . . Members generally anticipated that the next policy move would likely be a tightening.⁶³

Given its concern about inflation, the FOMC became willing to allow the magnitude of a projected negative output gap to grow to restrain inflation. The unemployment rate, which is a lagging indicator, rose steadily from 4.7 percent in November 2007 to 6.1 percent in August 2008.⁶⁴ Governor Kohn stated, "About the output gap, the incoming information strongly suggests that we are on a trajectory that at least for some time will have the economy growing appreciably below the growth rate of its potential. The most obvious evidence is the persistence of a soft labor market."⁶⁵ On October 6, 2008, the FOMC did lower the funds rate from 2 percent to 1.5 percent. However, Bernanke told the FOMC that the reduction possessed a "tactical" objective. The European Central Bank was having difficulty getting a consensus to lower its policy rate. Having a "coordinated" reduction in interest rates would provide "them an opportunity to get out of the corner into which they are somewhat painted."⁶⁶

Finally, the FOMC lowered the funds rate to the ZLB at the December 2008 meeting. Later, it became clear that the underlying natural rate of interest had become negative, likely exacerbated by a decline in real disposable income from the commodity-price inflation shock and a decline in house prices. Only over time did the FOMC come to understand that removal of a contractionary monetary policy would require not only a funds rate at the ZLB but also forward guidance indicating a prolonged period of the funds rate at the ZLB and QE in the form of purchasing illiquid assets (long-term Treasury securities and MBS). In the recovery from the recession, the Tealbook showed estimates of the real

63. Board of Governors of the Federal Reserve System, "Minutes of the Meeting of the Federal Open Market Committee, August 5, 2008," 6.

64. For the Board staff estimate of the output gap, see Board of Governors of the Federal Reserve System, *Current Economic and Financial Conditions*, I-30.

65. Board of Governors of the Federal Reserve System. "Meeting of the Federal Open Market Committee on August 5, 2008," 76.

66. Board of Governors of the Federal Reserve System, "Conference Call of the Federal Open Market Committee, October 7, 2008, October 7, 2008," 4-15.

rate of interest averaging around –2 percent from 2009 through 2014, well below the zero real rate that the FOMC had assumed to be stimulative in fall 2008.⁶⁷

The Great Recession is also known as the Great Financial Crisis. The failure of Lehman Brothers on September 15, 2008, precipitated turmoil in short-term funding in the money market. Markets had assumed that regulators would never allow a leveraged financial institution to fail (“too indebted to fail”). The bailout of the creditors of Bear Stearns earlier in the year in March reinforced that belief in that it set a precedent for the Fed lending to bail out a nonbank financial institution. The bailout of the depositors of IndyMac in July followed. Shortly before Lehman, the Treasury had just bailed out the debt holders of the GSEs—Fannie Mae and Freddie Mac. Under heavy criticism from Republicans in Congress, Treasury Secretary Henry Paulson was unwilling to bail out additional financial institutions, including Merrill Lynch and Morgan Stanley. Bernanke was unwilling to act alone to bail out Lehman.

When, immediately after the Lehman bankruptcy, the insurance company AIG failed, Bernanke reversed course and bailed AIG out. Consternation prevailed among the cash investors who perceived a retraction of the financial safety net but to an uncertain, new boundary. The willingness to allow Lehman to fail followed by the bailout of AIG suggested that the Fed had abandoned the principle of “too indebted to fail,” but had retained the “too big to fail” principle of the financial safety net basically codified with the 1984 bailout of Continental Bank’s creditors. The result was a flight of cash investors from the prime money market funds and the investment banks in favor of government money market funds and the too-big-to-fail banks such as JPMorgan Chase. Through a variety of special programs, the Fed undid the flight from the institutions shunned by the cash investors because of their highly leveraged funding of illiquid, hard-to-value asset portfolios, especially portfolios composed of mortgages.

Newspaper accounts associated the turmoil in financial markets after the Lehman bankruptcy with recession. That turmoil coincided with news in early October 2008 that the developed world had gone into recession. However, all major central banks had responded to the high headline inflation through contractionary monetary policy, and the economies of those countries had entered into a serious recession in the summer, when financial markets were operating normally.⁶⁸

67. Board of Governors of the Federal Reserve System, “Report to the FOMC,” 81.

68. Hetzel, *The Federal Reserve System*, figure 21.7.

The mistaken belief that monetary policy was expansionary came from observing the near-zero real funds rate, which the FOMC interpreted as expansionary monetary policy. From January 2008 through August 2008, core PCE inflation (compounded annual monthly changes, chain-weighted price index) averaged 1.9 percent. With a 2 percent funds rate, the real funds rate was near zero. Only later did it become clear that the natural rate of interest was negative—an unprecedented occurrence. That fact can be inferred from two observations. First, over the period from January 2009 through December 2016, the real funds rate averaged -1.24 percent.⁶⁹ Over the same interval, inflation (12-month percentage changes in the core PCE, chain-weighted deflator) remained steady at 1.5 percent. If monetary policy had been expansionary because the real funds rate lay below the natural rate of interest, inflation would have risen instead of remaining stable. Second, with the funds rate at the ZLB, economic recovery required both forward guidance and quantitative easing.

What had been a moderate recession turned into a severe recession in summer 2008, when the business inventory/sales ratio shot up and businesses had to work off significant excess inventories.⁷⁰ The economies of the member countries of the Organisation for Economic Co-operation and Development, other than the United States, began sharp downturns in 2008/Q2.⁷¹ Because of the lag in data reporting, that fact was reported only in early October 2008, coincidentally shortly after the Lehman bankruptcy. The disruption in financial markets, however, likely contributed to the recession by making the natural rate of interest even more negative.

In retrospect, the FOMC should have pursued an expansionary monetary policy in fall 2008 through a combination of pushing the funds rate to zero or a negative value, quantitative easing, and committed forward guidance. Only at its December 15, 2008, meeting did the FOMC lower the funds rate to the ZLB. The FOMC should have addressed its concern over the unanchoring of inflationary expectations by announcing an inflation target, something it did not do until January 2012. The emergency lending of the Fed after the Lehman failure provided liquidity but failed to stimulate demand. The reason was that the Fed loans were short term and had to be repaid with interest charged at market rates. It was the QE undertaken starting in early 2009 and augmented in March 2009 with the purchase of Treasury securities that demonstrated the

69. Hetzel, *The Federal Reserve System*, figure 18.5. The series for expected inflation is from Board of Governors staff forecasts of inflation.

70. Hetzel, *The Federal Reserve System*, figure 21.3.

71. Hetzel, *The Federal Reserve System*, figure 21.7.

power of the portfolio balance effect. The economy began a recovery in June 2009. With its credit view, the FOMC ignored the monetarist portfolio balance effect.

On September 9, 2008, just before the Lehman bankruptcy, reserve bank credit amounted to \$888 billion, with \$480 billion in securities held outright. As of November 5, 2008, reserve bank credit had jumped to about \$2 trillion because of the Fed's emergency lending programs with almost no change in securities held outright. As of June 4, 2009, the month the recovery began, with no change in reserve bank credit, securities held outright (mainly Treasuries and MBS) amounted to half the total of reserve bank credit. By January 6, 2010, again with little change in reserve bank credit, securities held outright had basically replaced emergency lending and amounted to almost all reserve bank credit.⁷² Although the credit programs initiated after the Lehman bankruptcy met the demand for liquidity, the loans were made at the market rate of interest. Only with the replacement of the loaned reserves with outright open-market purchases of Treasuries and MBS could the stimulative power of QE take hold and promote economic recovery.

Bernanke drew on his belief that the severity of the Great Depression had derived from restriction of a credit channel.⁷³ As understood by Bernanke and Paulson, the recession originated in an unwillingness of banks to lend because their balance sheets were clogged with dubious subprime mortgages. Paulson wrote:

We all knew that the root cause lay in the housing market collapse that had clogged bank balance sheets with toxic mortgages that made them unwilling to lend. . . . The situation called for fiscal policy. . . . We wanted . . . [banks to] clean up their balance sheets, and break the logjam of credit.⁷⁴

Bernanke resurrected the Fed's views in the Great Depression—namely, open-market purchases would fail to stimulate spending because of the unwillingness of banks to lend. Bernanke wrote:

For reserves-based QE to work, banks would have to lend large amounts of their new reserves to finance profitable projects and new spending. But, in a depressed economy, with the risks of

72. Data from Federal Reserve Statistics, statistical release H.4.1. For a graphical overview, see Hetzel, *The Federal Reserve System*, figure 21.5.

73. Bernanke, "Nonmonetary Effects."

74. Paulson, *On the Brink*, 256–57, 260.

lending high, banks would have little incentive to lend more and would be just as happy leaving their reserves at the Fed. Counting on the expansion of reserves alone to stimulate the economy would be like the proverbial pushing on a string, most of us believed. In short, although securities purchases would increase bank reserves, unless the banks put those reserves to work, that increase by itself would not automatically translate into growth in lending and economic activity.⁷⁵

Again, Bernanke implicitly rejected Friedman's portfolio balance effect. Friedman wrote:

An increased rate of monetary growth . . . raises the amount of cash that people and businesses have relative to other assets. . . . This tends to raise the prices of assets and to reduce interest rates, which encourages spending to produce new assets and also encourages spending on current services rather than on purchasing existing assets.⁷⁶

Although Bernanke initiated QE1, the program purchased GSE securities to buttress investors' confidence in the GSEs. Bernanke wrote:

I hoped that large-scale purchases of GSE securities . . . would backstop investor's demand for mortgages. . . . Now, in addition to serving as a lender of last resort . . . the Fed would act as a *buyer of last resort* for mortgage-backed securities. We were moving well beyond Bagehot's dictum."⁷⁷ (italics in original)

The move by the FOMC away from relying on traditional monetary policy to relying instead on credit policy appeared in the introduction of the payment of IOR, which began on October 10, 2008. With IOR, the Fed could implement its panoply of credit programs without the accompanying reserves creation depressing the funds rate. As long as the FOMC sets IOR in line with market interest rates, banks are willing to hold the additional reserves. More generally, IOR allows the Fed to become more aggressively involved in the allocation of credit because it can expand the size of its portfolio without depressing the funds rate below its targeted value. IOR allows the Fed to expand beyond the traditional role of a central

75. Bernanke, *21st Century Monetary Policy*, 141–42.

76. Friedman, *The Counter-Revolution*, 24–25.

77. Bernanke, *21st Century Monetary Policy*, 136.

bank to acquire the attributes of a government GSE such as Fannie Mae devoted to allocating credit. However, the distraction of credit policy diverted the focus on monetary policy and contributed to a contractionary monetary policy.

Rockoff contrasted the break by Friedman and Schwartz with the earlier view that monetary policy worked through its influence on the size and composition of financial intermediation:

Friedman and Schwartz emphasized a direct channel running from changes in money to changes in national income, while [Wesley Clair] Mitchell emphasized a channel that ran through bank lending and credit markets. . . . The most widely accepted addition to the Friedman and Schwartz interpretation of the Great Depression, the influential work of Bernanke (1983), restores the role of bank lending to the central role in the monetary transmission process.⁷⁸

In response to the Great Recession, FOMC chairman Bernanke profoundly changed the character of the Fed. Since the creation of the modern central bank by William McChesney Martin after the 1951 Treasury–Federal Reserve Accord, the Fed had vigorously resisted any involvement in the allocation of credit—credit policy. Bernanke reinvented the Fed as a combination central bank effecting monetary policy through the Volcker-Greenspan policy of setting the risk-free rate of interest to stabilize the economy’s rate of resource utilization and a financial intermediary influencing the allocation of credit through the composition of the asset side of its balance sheet. With this combination of monetary policy, the FOMC appeared to have two independent tools. In fall 2008, the FOMC could limit reductions in the funds rate in response to high headline inflation while using credit policy to deal with the recession.

In an elaboration of his Nobel lecture, Bernanke defended the Fed’s involvement in credit policy:

Credit markets, including the market for bank loans, are characterized by imperfect and asymmetric information. These informational frictions can interact with other economic forces to produce periods of credit-market stress, in which intermediation is unusually costly and households and businesses have difficulty obtaining credit. A high level of credit-market stress, as in a severe financial crisis, may in turn produce a deep and

78. Rockoff, “On the Origins,” 87.

prolonged recession. I present evidence that financial distress and disrupted credit markets were important sources of the Great Depression of the 1930s and the Great Recession of 2007–2009.

Once the crisis began, however, the fact that the US regulatory system was designed to handle crises in a bank-dominated system, rather than the system as it existed, meant that the crisis-fighting tools of the Federal Reserve and other agencies were mismatched with the most urgent needs. For example, shadow banks' lack of access to the discount window, not a concern in normal times, impeded the Federal Reserve's efforts to stop runs outside the traditional banking sector and to act as lender of last resort for the financial system as a whole.⁷⁹

Strikingly, in his Nobel lecture, Bernanke never mentioned monetary policy as opposed to credit policy. However, monetary policy was contractionary in 2008. The apparent need for credit policy came from failure to understand this fact. Moreover, the disorder in financial markets after the Lehman bankruptcy in September 2008 was a result of the moral hazard created by the regulatory financial safety net. If financial intermediaries were subject to the market discipline imposed on the risk-taking of regular businesses, investment banks such as Lehman would not have had an incentive to play a game of “heads we win, and tails the taxpayer loses.”

9. The Significance of Different Regimes of Reserves Provision

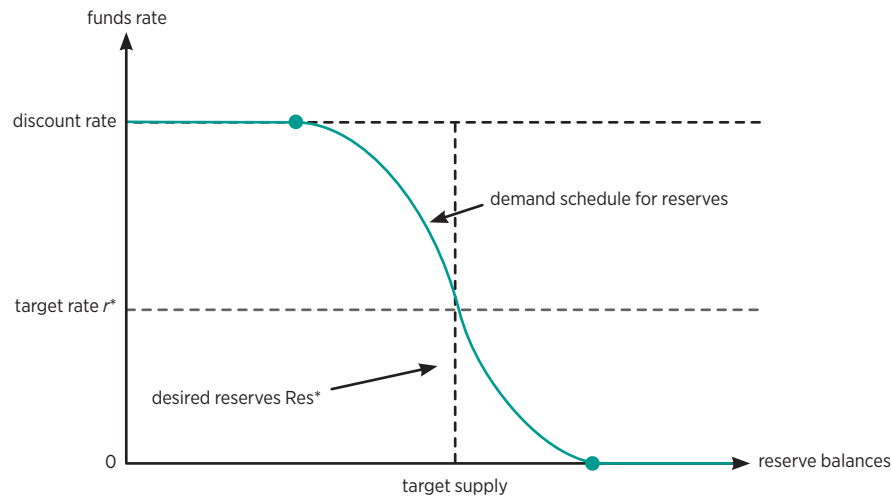
Keeping track of how the FOMC changed its operating procedures is informative about the kind of monetary policy it was following. The major innovation was the introduction of the payment of IOR in October 2008.⁸⁰ Interest on reserves in no way makes monetarist principles less relevant. Figure 1 shows the market for bank reserves in the pre–October 2008 period.⁸¹ The New York Fed's Open Market Trading Desk would supply the amount of reserves that put banks on the part of their downward-sloping reserves-demand schedule that would validate

79. Bernanke, “Nobel Lecture,” abstract, 1156.

80. For a complete history and a negative assessment of how IOR allowed the Fed to expand its balance sheet, see Nelson, “How the Federal Reserve Got So Huge.” See also Mercatus Center, “Bill Nelson on Using the Discount Window.”

81. Keister, Martin, and McAndrews, “Divorcing Money,” 43.

FIGURE 1. Market for reserves without interest on reserves



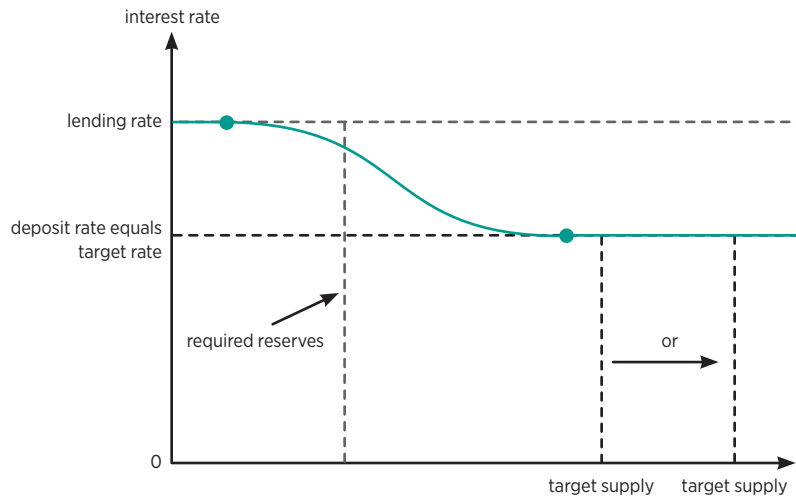
Source: Keister et al., “Divorcing Money from Monetary Policy,” 43.

the FOMC’s funds rate target. Banks would not borrow in the funds market at a rate above the discount rate in the discount window. They would hold excess reserves rather than lend at a negative rate of interest. The discount rate and a zero interest rate set a ceiling and floor on the funds rate.

Figure 2 shows the reserves market after the introduction of IOR in October 2008. Banks will not borrow at rates above the discount rate (“lending rate”). They will not lend at a rate below the IOR rate. Interest on reserves divorces the funds rate from the size of the Fed’s asset portfolio. The New York Desk can engage in open-market purchases to push reserves (“target supply”) beyond the downward-sloping section of banks’ reserves-demand schedule without lowering the funds rate.

The FOMC could have implemented monetary policy by relying exclusively on setting the IOR rate. However, there is a problem of political economy. By law, the Board of Governors, not the FOMC, sets the IOR rate. Maintaining the authority of the FOMC required continuing the practice of setting a funds rate target as the instrument of monetary policy. With the ample supply of reserves provided by the Fed putting banks on the horizontal section of the reserves supply schedule, banks no longer use the funds market. Only the GSEs, which do not have deposits at the Fed, use it. The assumption was that if the funds rate fell

FIGURE 2. Market for reserves with interest on reserves



Source: Keister et al., “Divorcing Money from Monetary Policy,” 45.

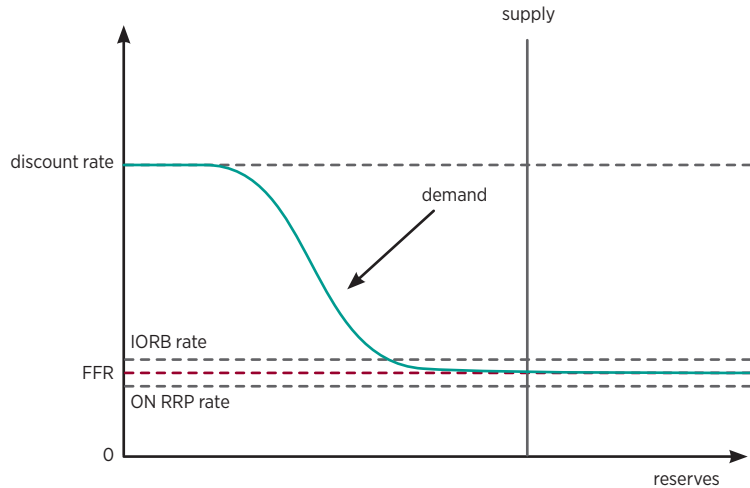
below the IOR rate, banks would borrow funds from the GSEs to hold reserves at the IOR rate, and arbitrage would keep the funds rate at the IOR rate.

With successive QE programs, however, the supply of reserves grew so large that the funds rate fell below the IOR rate. The FOMC then introduced overnight reverse repurchase agreements. Reserves accumulated at the money market mutual funds, which placed them with the New York Desk. The money funds would transfer reserves to the New York Desk in return for a Treasury security, a loan reversed the next day. The result was to absorb reserves and lessen downward pressure on the funds rate. As shown in figure 3, the overnight reverse repurchase (ON RRP) rate puts a floor on the funds rate (FFR), and the IOR (IORB rate) puts a ceiling on the funds rate. Standard terminology is to call the operating procedures in figure 2 a floor system and figure 3 a corridor system. Nelson terms figure 1 a “necessary” reserves system and figures 2 and 3 an “ample” reserves system.⁸²

The FOMC should return to the pre-2008 model of avoiding credit policy. The FOMC should have retained the operating procedures shown in figure 1. By September 2008, it should have pushed the reserves supply schedule (“target

82. Nelson, “How the Federal Reserve Got So Huge.”

FIGURE 3. Market for reserves with interest on reserves and overnight reverse repurchase rate



Source: Ihrig and Wolla, “The Fed’s New Monetary Policy Tools,” 5.
 Note: FFR = floor on the funds rate; IORB = interest on reserves balance; ON RRP = overnight reverse repurchase.

supply”) into the flat section of the reserves balances line—that is, it should have reduced the funds rate to zero and started QE. At the ZLB, monetary policy retains its power to raise the natural rate of interest through a combination of committed forward guidance and QE, ideally supplemented by a negative funds rate.⁸³

10. Making the Implicit Rule Providing for Price Stability Explicit

As elaborated in section 4, a stabilizing monetary policy requires consistency in the way in which the FOMC responds to new information about the economy. That consistency, a reaction function, is a prerequisite for shaping how the yield curve responds to new information about the economy. Since the mid-1990s until the 2020 COVID epidemic, inflation remained largely stable. It follows that over this period, the FOMC in the main followed a rule. The task then is to identify it. The rule is simple and intuitive in that it gives content to procedures that

83. Dominguez and Foschi, “Whatever-It-Takes Policymaking.”

provided for price stability. With a target (implicit or explicit) for inflation of 2 percent (or somewhat less), nominal GDP growth must exceed the growth of potential by 2 percent.

The rule, a difference Taylor rule, causes changes in the funds rate to counteract forecast deviations of nominal GDP growth from forecast potential output growth. Orphanides explained: “In real time, the natural growth rule employs short-term forecasts to check whether nominal income grows in line with the economy’s natural growth rate.”⁸⁴ Orphanides defined the “natural growth rate” as equal to growth in potential output plus 2 percent, the inflation target. The following expounds the rule and then summarizes how the FOMC departed from it in the Great Recession and in 2021–2022.

Orphanides described the rule:

According to this rule, the change of the federal funds rate from the previous quarter can be guided by the difference between the projected growth of nominal income, n , and the natural growth rate, n^* , defined as the sum of the Fed’s inflation goal, π^* , and the growth rate of real potential GDP, g^* . The rule takes the first-difference form:

$$\Delta i = \theta(n - n^*), \quad (1)$$

where Δi is the rule’s prescription for the quarterly change of the funds rate from the previous quarter, and θ is a parameter governing how responsive policy should be to the projected imbalance.

I rely on real-time data and forecasts from the Survey of Professional Forecasters that are published by the Federal Reserve Bank of Philadelphia Specifically, I rely on the median survey responses to construct the forecast of nominal income growth over four quarters ending three quarters ahead. This is the “year-ahead” forecast starting from the quarter before the survey—the most recent quarter for which actual data are available in real time. . . . Since 1992, the survey conducted in the first quarter has also included a question on the 10-year annual-average real GDP growth. I use the median responses from this question as a real-time estimate of potential output growth.

84. Orphanides, “Enhancing Resilience,” 9.

The survey only includes this question in the first quarter, so I retain the same estimates for subsequent quarters until a revised estimate is available in the first quarter of the following year. The quarterly series for the natural growth rate shown in the figure reflects the sum of this series and the Fed's 2% inflation goal.⁸⁵

Orphanides' rule follows logically from the imperative imposed by an FOMC inflation target. However, because of the Friedman long-and-variable-lags phenomenon, the simple fact of an inflation target imposes no discipline on the FOMC's period-by-period policy actions. Orphanides' rule does. The fact that the rule focuses on maintaining stability in inflation gives content to the Goodfriend-King model and its implication that a policy of price stability rather than one of inflation-unemployment tradeoffs is optimal.⁸⁶

Orphanides's figure 6 plots actual changes in the funds rate and changes in the funds rate derived from the natural growth rule.⁸⁷ Figure 6 highlights the contractionary monetary policy, discussed in section 7, in the 2007–2009 Great Recession. Although forecast growth in nominal GDP declined steadily in 2008, the FOMC maintained its funds rate target unchanged from the April 2008 meeting until early October 2008.

Orphanides highlights how the 2021–2022 inflation is associated with the expansionary monetary policy because of the FOMC's departure from the rule. Orphanides's figure 6 clearly shows the surge in forecast nominal GDP growth starting in 2021 with no increase in the funds rate. The brief COVID-19 recession was due to a negative productivity shock accompanied by “the Great Resignation” of individuals withdrawing from the labor force. A reduction in the growth of potential output would have increased the nominal real growth divergence captured by the natural growth rule. The conclusion has to be that expansionary monetary policy caused the underlying rise in inflation of 2021–2022.

The comparison of the QE in the recovery from the Great Recession with the QE that began in March 2020 is instructive. In the earlier episode, through the portfolio balance effect, QE raised the natural rate of interest from a negative

85. Orphanides, “Enhancing Resilience,” 7, 9.

86. Hendrickson does for the earlier period what Orphanides does for the later period. Hendrickson, in the abstract to “An Overhaul of the Federal Reserve Doctrine,” wrote, “The change in monetary policy beginning in 1979 is reflected in the Federal Reserve's response to expectations of nominal income growth rather than realized inflation as previously argued. I provide evidence for this hypothesis by estimating the parameters of a monetary policy rule in which policy adjusts to forecasts of nominal GDP for the pre- and post-Volcker eras.”

87. Orphanides, “Enhancing Resilience,” figure 6.

value to a positive value preceding the sustained increase in the funds rate off the ZLB begun in December 2016. Because policy was allowing the price system to work, there was no reason for QE and the associated expansion of the Fed's balance sheet and bank reserves to produce inflation. The QE that started in March 2020, however, was accompanied by a commitment to maintain the funds rate at the ZLB until inflation rose for some undefined period of time above 2 percent. The monetization of government debt then was comparable in kind but not in quantity to the cause of inflation in countries such as Zimbabwe and Venezuela.

A metaphor can help in understanding the issue of rules versus discretion. The language of discretion suggests that the FOMC is driving a car on a twisting road and having to steer around the occasional roadblock. In the absence of a formula to guide the car, the FOMC driver must go period by period, watching for the unanticipated roadblock. From the rules perspective, steering around a roadblock is an extended process. The steering mechanism relating the steering wheel to the tires depends on an encoded memory of how the driver has responded to past roadblocks. Successfully evading roadblocks requires a movement of the tires that depends on this memory.

Beyond the issue of the nature of a stabilizing monetary policy, the language of discretion creates a problem for the perception of Fed independence in an election year. Derek Tang of LHMeyer wrote: "Between the Republican side warning him [Powell] not to let up too soon and the Democratic side hounding him to 'cut more and sooner' and to raise the inflation goal, the Fed is caught between a rock and a hard place."⁸⁸ If the Fed had in place the Orphanides rule, it could defend its policy in 2024 on the basis of objective criteria. The chair could start with Board staff forecasts and explain how FOMC debate altered those forecasts. Forecasting always involves judgment, but the chair could point to the forecasts of professional forecasters to defend the FOMC's position.

11. Learning and Articulating the Optimal Monetary Policy Regime

Within the basic leaning-against-the-wind procedures developed by William McChesney Martin, two variants have emerged. They are labeled here LAW with tradeoffs (cyclical inertia in the funds rate) and LAW with credibility (preemptive increases in the funds rate). The FOMC needs to engage in a systematic investigation of its past to determine which one of these rules is stabilizing.

88. Tang, "Policy Prism."

The change in culture needed is to admit that learning requires accepting that monetary policy can and has resulted in mistakes. Such an exercise would require the courage to admit that mistakes are not just a feature of a long-gone past.

The place to start is with an evaluation of the change in policy represented by the last two “Statements on Longer-Run Goals and Monetary Policy Strategy.” Starting January 2012, the FOMC issued a document titled “Statement on Longer-Run Goals and Monetary Policy Strategy.”⁸⁹ In August 2020, it revised the document significantly.⁹⁰ The first document reflected the policy views of the Volcker-Greenspan era by distinguishing sharply between inflation and employment. As a nominal variable, the FOMC can set a target for inflation. As a real variable, the FOMC cannot set a target for employment but must respect the real forces that determine it over time. The second document set inflation and employment as separate, competing objectives. On the assumption of a Phillips curve flat at least down to an unemployment rate of 3.5 percent, the pre-pandemic level of unemployment that had coexisted with inflation less than the FOMC’s target of 2 percent, the FOMC adopted an expansionary monetary policy to move the economy leftward along the Phillips curve. A key characteristic of the new policy was abandonment of the former policy of preemptive increases in the funds rate—a signal to financial markets not to raise bond rates as the unemployment rate declined.

In the recovery from the Great Recession, the stability of underlying inflation in the pre-2020 period combined with a steady reduction in the unemployment rate is striking. FOMC Chair Janet Yellen’s rationale for preemptive increases in the funds rate to prevent the emergence of inflation captures the character of policy in the Volcker-Greenspan era (LAW with credibility). Yellen said:

We should also be wary of moving too gradually. Job gains continue to run well ahead of the longer-run pace we estimate would be sufficient, on average, to provide jobs for new entrants to the labor force. Thus, without further modest increases in the federal funds rate over time, there is a risk that the labor market could eventually become overheated, potentially creating an inflationary problem down the road that might be difficult to overcome without triggering a recession. Persistently easy monetary policy might also eventually lead to increased leverage and

89. FOMC, “Statement on Longer-Run Goals,” January 24, 2012.

90. FOMC, “Statement on Longer-Run Goals,” as amended August 27, 2020.

other developments, with adverse implications for financial stability. For these reasons, and given that monetary policy affects economic activity and inflation with a substantial lag, it would be imprudent to keep monetary policy on hold until inflation is back to 2 percent.⁹¹

Yellen summarized, “[I]f the economy ends up overheating and inflation threatens to rise well above our target, we don’t want to be in a position where we have to raise rates rapidly, which could conceivably cause another recession. So we want to be ahead of the curve and not behind it.”⁹²

The 2020 statement rejected preemptive increases in the funds rate before the emergence of inflation, signaling to markets the abandonment of the earlier Volcker-Greenspan policy. Because the 2020 statement is long and convoluted, it is convenient to summarize it through the commentary of Chair Jerome Powell. Powell said:

We need only look to February of last year [2020] to see how beneficial a strong labor market can be. The overall unemployment rate was 3.5 percent, the lowest level in a half-century. The unemployment rate for African Americans had also reached historical lows. . . . These late-breaking improvements in the labor market did not result in unwanted upward pressures on inflation, as might have been expected; in fact, inflation did not even rise to 2 percent on a sustained basis. There was every reason to expect that the labor market could have strengthened even further without causing a worrisome increase in inflation were it not for the onset of the pandemic.⁹³

More succinctly, just before the emergence of inflation, Powell explained:

We have a flat Phillips curve, meaning there’s still a small connection [between slack in the labor market and inflation] but you need a microscope to find it. We’ve also got low persistence of inflation, so that if inflation were to go up for any reason it [inflation] . . . doesn’t stay up. . . . Remember, we’re a long way

91. Yellen, “Inflation, Uncertainty, and Monetary Policy,” 16.

92. Yellen, “Yellen Says Fed’s Focus Has Shifted.”

93. Powell, “Getting Back.”

from maximum employment. There's plenty of slack in the labor market.⁹⁴

The change in monetary policy from the Volcker-Greenspan era to the Powell pandemic monetary policy also incorporated the Bernanke innovation of adding credit policy to traditional monetary policy. As reported in an Board of Governors April 9, 2020, press release, “The Federal Reserve on Thursday took additional actions to provide up to \$2.3 trillion in loans to support the economy. This funding will assist households and employers of all sizes and bolster the ability of state and local governments to deliver critical services during the coronavirus pandemic.”⁹⁵

12. Concluding Comment

Nothing in the historical record contradicts the basic principles of monetarism. First, the price level is a monetary phenomenon whose behavior is determined by the Fed's control of money creation. Second, macroeconomic stability requires that the Fed respect the working of the price system by giving it free rein to determine real variables (output and employment). Without clarification of the monetary policy required to allow a free market system to operate with full employment, political pressures will always exist to interpret the dual mandate in a way that treats “maximum employment” as a separate, competing goal with “stable prices.” If successful, the resulting pressure to abandon price stability and to allow inflation in an attempt to lower unemployment will perversely recreate the 1970s go-stop policy that destabilized both inflation and unemployment. Stability in the monetary institutions of the United States requires adoption of a rule-based monetary policy to ensure price stability.

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