The Enduring Relevance of Monetarist Principles

Robert L. Hetzel

Federal Reserve Bank of Richmond

Richmond, VA 23261

robert.hetzel@rich.frb.org

May 7, 2015

According to monetarist principles, the monetary arrangements of a country determine the behavior of prices. Moreover, the empirical correlation between nominal and real instability reflects causation going from monetary to real instability. It follows that the central bank should provide for monetary and real stability by following a rule that allows the price system to work. Such a rule should separate the determination of the price level from the determination of relative prices. How relevant have these principles remained over time?

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Miki Doan provided invaluable research assistance. The views expressed here are those of the author not the Federal Reserve Bank of Richmond or the Federal Reserve System.

JEL classification code: E50

*The author is Senior Economist and Research Advisor at the Federal Reserve Bank of Richmond.

Debate in monetary economics concerns the nature of inflation and the efficacy (or inefficacy) of the price system in mitigating cyclical fluctuations. The quantity-theory tradition as given empirical content by Milton Friedman's monetarism takes strong stands on these issues. "Inflation is always and everywhere a monetary phenomenon" (Friedman 1963 [1968]). The price system works well to attenuate cyclical fluctuations as long as the central bank follows a rule that provides for a stable nominal anchor and allows market forces to determine real variables.

Section 1 outlines the monetarist strategy for identification. That is, how can economists identify the forces that drive inflation and the business cycle? Are they real or monetary? Section 2 reviews Friedman's statement of monetarist hypotheses. Section 3 exposits the Aoki (2001) version of the New Keynesian model. As explained in Section 4, the model is general enough to allow both Keynesian and monetarist interpretations. It highlights the issues that economists must resolve in order to reach consensus over the basic issues in monetary economics. For a policy maker committed to transparency, it highlights the choices required in order to clarify his/her understanding of how monetary policy works.

Sections 5 and 6 give the monetarist version of the NK model empirical content. In the past, the movements in money that predicted cyclical peaks and troughs were associated with interest-rate inertia in the funds rate relative to cyclical movements in the economy. Despite the disappearance of monetary aggregates stably related to nominal expenditure, this inertia, which is associated with attempts by the central bank to create an output gap in order to manipulate a Phillips-curve trade-off, continues to predict cyclical fluctuations.

1. Identification of the model of the economy

In the 1970s, Keynesians and monetarists differed over the nature of inflation and the efficacy of the price system in stabilizing economic fluctuations. How can economists identify the correct model? The monetarist methodology for identification begins with narrative histories over long periods of time and across countries. The purpose of the narrative is to identify "robust" correlations. The persistence of such correlations in a variety of historical time periods and across different countries reduces the possibility that they arise from a common third factor. Moreover, because historical narrative provides information that is specific to time and place, it offers clues to the direction of causation behind the correlations. Of course, there is no single narrative. John Kenneth Galbraith (1993) and Hyman Minsky (1986) have written narratives that differ from the monetarist narratives of Friedman and Schwartz (1963), Meltzer (2003, 2009), and Hetzel (2008, 2012).

Friedman (1960, 23) outlined his monetarist methodology:

> This sketch of our monetary experience has concentrated on the major economic fluctuations—those substantial inflations and severe contractions that have from time to time produced widespread distress…. Every such episode has been accompanied by a significant monetary disturbance…. The monetary disturbances have had a largely independent origin in enough cases to establish a strong presumption that they are contributory causes rather than simply incidental effects of the economic fluctuations…. Governmental intervention in monetary matters, far from providing a stable monetary framework for a free market that is its ultimate justification, has proved a potent source of instability.

Given that narrative, the economist makes a choice of model to recommend to the policy maker. The model characterizes the structure of the economy and includes an optimal policy rule. Economists like Alan Blinder (1982), who believes that the poor outcomes of the 1970s originated in powerful inflation shocks rather than in poor policy, argue for a Keynesian model with a policy rule that exploits Phillips curve trade-offs. Economists in the monetarist tradition, who believe that the poor outcomes of the 1970s originated in attempts by the FOMC to exploit Phillips curve trade-offs in order to find an optimal balance between employment and inflation, argue for a monetarist model.

In a world that mimicked controlled experiments, the policy maker would clarify his/her understanding of the world by choosing a model and stating explicitly the policy rule. The identification then would come from the "experiment" in how well policy performs in practice. Unfortunately, policy makers never provide that degree of explicitness. Economists are left with a need to make their best guess of the experiments that policy makers give them and to ask how well they (the economists) do at updating their narratives in a way that preserves the robust character of the highlighted correlations.

Why does the economics profession divide over the nature of the economy—a divide that that continues the Keynesian/Monetarist debate and that appears in disagreement over the desirability of activist and non-activist rules? This division emerges out of the way in which contesting camps impart causal content to the empirical correlations associated with the business cycle.

One persistent correlation is that during periods of cyclical growth households and firms are optimistic about the future and take on debt. With the alternation in the phase of the business cycle from growth to recession, they become pessimistic about the future and attempt to reduce debt. Economists in the Keynesian tradition give this correlation a causal interpretation by attributing the shock that drives cyclical alternations to "animal spirits." Irrational shifts from excessive optimism to excessive pessimism drive cyclical fluctuations. The resulting alternation between speculative excess and collapse overwhelms the stabilizing properties of the price system. On the one hand, the stickiness of nominal (dollar) prices prevents the market clearing required in order to maintain full employment. On the other hand, that stickiness endows the central bank with the ability to engage in countercyclical monetary policy.

Another persistent correlation characteristic of the business cycle is that between nominal (price) and real (output) instability. Economists in the monetarist tradition give this correlation a causal interpretation running from nominal to real instability through attributing nominal instability to monetary instability. A corollary is that given institutional arrangements (a rule) that eliminate monetary instability the price system will work well to mitigate cyclical fluctuations. In contrast to the importance that Keynesians assign to animal spirits, monetarists argue that in the absence of central bank interference with the operation of the price system that forces destabilizing changes in money, households and firms will retain their optimism about the future. In a way made explicit by the permanent income hypothesis of Friedman (1958), the desire of households to smooth their consumption intertemporally will then maintain stability in consumption in the face of adverse aggregate-demand shocks.

2. Milton Friedman's monetarist principles and methodology

The quantity theory gives predictive content to the distinction between nominal and real variables. As developed by Milton Friedman, monetarism was both a set of empirical relationships that gave content to the quantity theory and a methodology for determining the causality embedded

in those empirical relationships. As articulated by Friedman, the way in which the central bank controls money creation determines trend inflation. However, any attempt to go beyond that control in an attempt to control real variables through exploiting the inflation/unemployment trade-offs given by the Phillips curve disrupts the economy. The central bank lacks the detailed knowledge of the structure of the economy required in order to implement such an activist policy. Underlying these hypotheses is the assumption that the price system works well to maintain output at potential in the absence of interference by the central bank in its operation. In this spirit, given the stability and interest insensitivity of real money demand before 1981, the rule advanced by Friedman for steady growth in money would have determined trend inflation (nominal income growth) while allowing the price system to determine real variables. (See Friedman 1960 and 1968 [1969].)

Friedman's critique of activist rules became known as the "long-and-variable-lags" argument. The critique took the form of criticism of a reaction function entailing a direct response by the central bank to misses of a target for inflation (Friedman 1960, 87). An activist policy in the sense of moving the policy instrument in a way designed to eliminate discrepancy between macroeconomic variables and their targeted values would founder on the existence of long, unpredictable lags. As an alternative, Friedman (1960) argued for a policy of steady money growth .

In *A Program for Monetary Stability*, Friedman (1960, 87-8) wrote:

> The Federal Reserve System does not control the price level. It controls the volume of its own earning assets and, at one remove … the stock of money…. If the link between the stock of money and the price level were direct and rigid, or if indirect and variable, fully understood, this would be a distinction without a difference…. But the link is not direct and rigid…. While the stock of money is systematically related to the price level *on the average*, there is much variation in the relation over short periods of time…. [M]onetary changes have their effect only after a considerable lag and over a long period and that lag is rather variable…. Under these circumstances, the price level … 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….

3. A "Big Tent" Exposition of the NK Model

The empirical relationships emphasized by quantity theorists running from Hume (1752 [1955]) to Friedman entailed the "short-run" nonneutrality of money and its "long-run" neutrality. Lucas (1972) first attempted to give this empirical generalization a sound theoretical basis. More recently, the New Keynesian (NK) model makes this attempt while departing from Lucas in leaving open the possibility that the central bank can manipulate a short-run relationship between output and inflation. Despite this ambiguity, the NK model serves to highlight the issues that divide economists.

The NK model exposited below follows Aoki (2001) with the addition of a "cost-push" shock to the Phillips curve as in Clarida, Gali, and Gertler (1999). It has a flexible-price sector and a sticky-price sector. There is a single flexible-price good and a continuum of differentiated goods in the sticky-price sector. Household i maximizes (1).

(1) $E_0 \sum_{t=0}^{\infty} \beta^t [u(B_{i,t} C_t^i) - v(A_{i,t} y_t^i)]$

where u expresses the utility from consumption and v expresses the disutility from the household production of the good y_i^t with β the rate of time preference. The B and A are shocks. C_i^t

aggregates the household's purchases of the flexible-price good and the differentiated goods with the latter aggregated into an index number. The household's optimal consumption (Euler equation) must satisfy (2).

$$(2) \quad \frac{B_t u'(B_t C_t)}{P_t} = \Lambda_t$$

where P_t is the aggregate price level, which in turn is an average of the price level in the flexible-price and sticky-price sectors. Λ_t is the marginal utility of nominal income.

It also follows that

$$(3) \quad \Lambda_t = \beta R_t (E_t \Lambda_{t+1})$$

where R_t is the gross nominal interest rate. The aggregate-demand relationship (4) comes from log-linearizing (2) and (3) around the steady state with price stability. The real rate of interest is $\hat{r}_t \equiv R_t - E_t \hat{\Pi}_{t+1}$. $\hat{\Pi}_{t+1}$ is inflation between periods t and t+1. Aggregate output is $\hat{Y}_t$. (The circumflex indicates the percentage deviation from the steady-state value.)[1] The household's intertemporal elasticity of substitution in consumption is σ.

$$(4) \quad \hat{r}_t = \frac{1}{\sigma}\left(E_t \hat{Y}_{t+1} - \hat{Y}_t \right) + \left(E_t \hat{B}_{t+1} - \hat{B}_t \right)$$

Comparable to (4), there will be a relationship (5) between the natural rate of interest ($\hat{r}^n_t$) and the natural rate of output ($\hat{Y}^n_t$) where these variables are defined as the values that would occur with complete price flexibility.

$$(5) \quad \hat{r}^n_t = \frac{1}{\sigma}\left(E_t \hat{Y}^n_{t+1} - \hat{Y}^n_t \right) + \left(E_t \hat{B}_{t+1} - \hat{B}_t \right)$$

Using these two relationships, as shown in (6), there is a relationship between the real rate of interest and the natural rate of interest. It depends upon the aggregate output gap ($\hat{G}_t$), which is a weighted-average of the output gaps in the sticky-price and flexible-price sectors with the weights coming from the weights in the consumption aggregator of flexible-price and sticky-price goods. $\hat{Y}^n_{S,t}$ and $\hat{Y}^n_{F,t}$ are the natural rates of output in the sticky-price and flexible-price sectors, respectively. γ assigns the relative weights to the sticky-price and flexible-price goods in the consumption aggregator.

$$(6) \quad \hat{r}_t = \hat{r}^n_t + \frac{1}{\sigma}\left(E_t \hat{G}_{t+1} - \hat{G}_t \right)$$

$$(7) \quad \hat{G}_t \equiv \gamma(\hat{Y}_t - \hat{Y}^n_{S,t}) + (1-\gamma)(\hat{Y}_t - \hat{Y}^n_{F,t})$$

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[1] The more common form of (4) is $\hat{Y}_t = E_t \hat{Y}_{t+1} - \sigma\left[\hat{r}_t - (E_t \hat{B}_{t+1} - \hat{B}_t) \right]$.

Equation (8) is the NK Phillips curve. The κ_1 and κ_2 constants express preference parameters and the degree-of-price-stickiness parameter. The variable $\hat{x}_{F,t}$ is the relative price of the good in the sticky-price sector in terms of the good in the flexible-price sector. As in Clarida, Gali, and Gertler (1999), (8) adds a markup shock (μ_t). $\hat{\Pi}_{S,t}$ is inflation in the sticky-price sector.

$$(8) \quad \hat{\Pi}_{S,t} = \kappa_1(\hat{Y}_t - \hat{Y}^n_{S,t}) + \beta E_t \hat{\Pi}_{S,t+1} + \frac{1-\gamma}{\gamma}\kappa_2 \hat{x}_{F,t} + \mu_t$$

Equation (8) can also be written as (9).

$$(9) \quad \hat{\Pi}_{S,t} = \frac{1}{\gamma}\kappa_1 \hat{G}_t + \beta E_t \hat{\Pi}_{S,t+1} + \mu_t$$

Solving (9) forward yields (10).

$$(10) \quad \hat{\Pi}_{S,t} = \frac{1}{\gamma}\kappa_1 E_t \sum_{i=0}^{\infty}\left(\beta^i \hat{G}_{t+i} + \mu_{t+i}\right)$$

The Phillips curves (8) and (9) are derived under the assumption that the central bank has an inflation target of zero. Inflation then measures deviations from price stability. The μ_t arise out of changes in the extent of monopoly power (the markup) of firms in the sticky-price sector (Blanchard and Gali 2007). These markup shocks affect the monopoly power of firms without affecting real marginal cost (Blanchard and Gali 2007, 39) and Woodford (2003, 451-2). They do not reflect inflation shocks coming from the flexible-price sector.

As illustrated by (9), in the absence of markup shocks, if the central bank maintains price stability in the sticky-price sector so that $\hat{\Pi}_{S,t} = 0$ and $E_t\hat{\Pi}_{S,t+1} = 0$, it also maintains the aggregate output gap ($\hat{G}_t$) equal to zero. Blanchard and Gali (2007) characterized this combination of price stability and a zero aggregate output gap as "divine coincidence," a model characteristic first noted in Goodfriend and King (1997). Equation (11) is a monetary policy rule that produces this result.[2]

$$(11) \quad \hat{R}_t = \hat{r}^n_t + \alpha_t \hat{\Pi}_{S,t}$$

The rule (12), which includes (11) as a special case, introduces the term $\alpha(\hat{\Pi}_{S,t} - \hat{\Pi}^{nz}_{S,t})$ as a way of marking departures of the policy rule from the divine-coincidence benchmark (11). With (11), the central bank moves its inflation target ($\hat{\Pi}^{nz}_{S,t}$) in order to counter markup shocks.

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[2] $R_t = \psi\pi_t$ with $\psi > 0$ is a rule that also achieves the divine-coincidence result, assuming an inflation target of zero. Divine coincidence is an expression of the monetarist hypothesis that if the central bank maintains monetary (nominal) stability the price system will work well to ameliorate cyclical fluctuations.

(12) $\hat{R}_t = \hat{r}_t^n + \alpha(\hat{\Pi}_{S,t} - \hat{\Pi}_{S,t}^{nz})$

Blanchard and Gali (2007) examined the implications of the NK model for policy. The elimination of price stickiness and firm monopoly power provides a norm for the "welfare-maximizing" level of output. There is also a level of output assuming "price-flexibility-only" that eliminates just the friction of price stickiness and yields a lower level of welfare. Shocks that shift both the "welfare-maximizing" and the "price-flexibility-only" level of output equally leave (11) as the optimal policy rule, which implements divine coincidence by stabilizing the price level in the sticky-price sector. With shocks to tastes and technology, the central bank should stick with this baseline rule that keeps the aggregate output gap equal to zero by maintaining price stability in the sticky-price sector.

In principle, a positive markup shock offers an opportunity for the central bank to intervene in the operation of the real economy. By expanding the wedge between price and marginal cost for firms with monopoly power, the increase in monopoly power retracts the price-flexibility-only level of output without affecting the welfare-maximizing level of output. A policy of maintaining price stability requires the central bank to create a negative output gap. In principle, the central bank can produce an optimal amount of inflation and output variability. It can improve welfare by exploiting a Phillips-curve trade-off.

As a way of highlighting the issue of optimal policy, it is useful to add (13), a money demand function.

(13) $m_t - p_t = y_t - \eta\, i_t$

The log of nominal money is m_t, the log of the price level is p_t, and the semi-elasticity of money demand with respect to the interest rate is η.

In order to prevent changes in the price level, the central bank must follow a rule that causes nominal money, m_t, to grow in line with real money demand, $y_t - \eta\, i_t$. The divine-coincidence characteristic of the NK model elucidates that rule. With an interest rate target, nominal money is demand determined. The rule (11) disciplines that nominal demand to equal $\hat{Y}_t^n - \eta\, r_t^n$.[3]

In a world of stable money demand, monetarists argue that sustained monetary decelerations or accelerations arise out of a monetary policy based on the rule (12) when the rule (11) is appropriate. Money then is an independent source of disturbance to the economy. At least through the 1970s, Keynesians held that the money stock changed in response to aggregate nominal and real demand and that monetary policy was just one generally insignificant determinant of that demand.[4]

[3] Friedman (1960) formulated his k-percent rule for low, stable money growth at a time when there existed a monetary aggregate stably related to nominal output and when potential output grew steadily. In this world of stable velocity (stable real money demand and low interest-inelasticity of real money demand), the monetarist hypothesis was that a k-percent rule would implement divine coincidence by both keeping real variables at their natural values and providing for price stability.

[4] The reference to traditional Keynesian views should be understand as referring to the elementary IS-LM model exposited in Samuelson (1967).

4. Using the model to determine whether the world is Keynesian or monetarist

The NK model is general enough to encompass monetarist and Keynesian views. The aggregate-demand relationship (4), the NK Phillips curve (9) without the markup shock, and the policy rule (11) constitute a monetarist model. Equation (4) expresses the ability of households to borrow and lend in an unconstrained way in order to smooth their consumption optimally across time. Apart from the monopoly power of firms, the only friction in the model is the inability of firms in the sticky-price sector to set prices each period. The divine-coincidence implication of the model follows: the central bank should pursue an objective of price stability in the sticky-price sector in order to maintain a zero output gap.

Translated into the policy propositions in Friedman's 1960 *A Program for Monetary Stability*, the central bank should limit itself to the control of trend inflation. It should let market forces determine real interest rates and, by extension, other real variables. Allowing inflation from the flexible-price sector to pass through into headline inflation is a prerequisite for permitting the price system full rein to control relative prices.

The aggregate-demand relationship (4), the NK Phillips curve (9) with markup shocks, and the policy rule (11) constitute a monetarist model. Keynesians stress the importance of the shocks to the aggregate-demand relationship—the $\left(E_t \hat{B}_{t+1} - \hat{B}_t \right)$— Keynes' animal spirits. Sudden changes in this shock from positive to negative cause fluctuations in the business cycle. Keynesians add financial frictions to their models so that shifts from excessive optimism about the future to excessive pessimism destabilize the economy. Speculative excess with its associated accumulation of debt turns into a financial crash with painful deleveraging.

The first pass in choosing between the monetarist and Keynesian version of the NK model as the appropriate description of reality is to associate historical time periods with the alternative rules (11) and (12) and examine how well the particular rule worked in terms of realized macroeconomic stability or instability. What happened when policy makers opted either for the Keynesian or monetarist model? Of course, controversy remains. Even if policy makers choose the Keynesian model and it is the correct one, shocks can overwhelm the stabilizing properties of the rule.

Unfortunately, because the Fed uses the language of discretion rather than articulating its actions in the context of a rule, identification of the rule is challenging. If one knew the structure of the economy in sufficient detail in order to estimate the natural values of real variables and if one knew the structural form of the rule, one could estimate a model and derive the parameters of the rule. Monetarists challenge the idea that economists will ever know enough about the structure of the economy to identify the natural values of variables. Moreover, the FOMC has never organized its policy discussions around analytical procedures in the sense of attempting to reach consensus on variables like the natural rate of interest or the output gap. Instead, FOMC procedures have the characteristic of a procedure that searches in a systematic way for the natural rate of interest.

William McChesney Martin characterized these procedures as "lean-against-the-wind" (LAW). Examination of a wide variety of information about the policy process including records of meetings, speeches, and the intellectual and political environment that has shaped policy makers' understanding of and approach toward policy yields a basic generalization about these procedures. In

a measured, persistent way, the FOMC raises the policy rate above its prevailing value when output grows at a sustained rate in excess of potential (rates of resource utilization are increasing and the unemployment rate is falling), and conversely in the case of sustained economic weakness.

As a first pass, because positive growth gaps are associated empirically with optimism about the future while negative growth gaps are associated with pessimism about the future, LAW procedures indicate the appropriate direction of movement in the interest rate. If output is growing unsustainably fast, then the real interest rate must rise in order to increase the incentive to save (transfer resources to the future). Beyond this first pass, at FOMC meetings, participants report on a wide variety of anecdotal information gleaned from contacts with the business community. The FOMC uses this sort of information as confirming evidence about its assessment of household sentiment toward the future. Does above trend growth translate into optimism about the future that causes households to want to take on debt and transfer consumption from the future into the present? Based on these LAW procedures, the FOMC chooses the interest rate target and the accompanying message to financial markets about the likely persistence of that target.[5]

In giving content to these LAW procedures in terms of the model, it is helpful to rearrange (6) and to classify the second term on the right-hand-side as positive or negative. Equation (14) shows the positive case.

$$(14) \quad \hat{r}_t - \hat{r}_t^n = \frac{1}{\sigma}\left(E_t \hat{G}_{t+1} - \hat{G}_t \right) > 0$$

The case of persistent above-trend growth corresponds to a value of the right-hand-side of (14) in which the output gap is increasing. That is, the growth in the gap is positive. Intuitively, if the growth gap is positive, households are "optimistic" about the future and they want to transfer consumption from the future to the present. The real rate of interest must increase, that is, $\hat{r}_t$ must be "high" relative to $\hat{r}_t^n$. Conversely, if the growth in the gap is negative, households are "pessimistic" about the future and want to transfer consumption from the present to the future. The real interest rate must decrease, that is, $\hat{r}_t$ must be "high" relative to $\hat{r}_t^n$.

The assumption that allows application of the model to historical experience is that the unfettered operation of LAW corresponds to the policy rule (11). Departures from (11) represented by (12) occur when the central bank puts inertia into changes in the funds rate with respect to growth gaps in order to create an output gap. Illustration of the difference in policies represented by (11) and (12) occurred most dramatically with the change in policy from the period of aggregate-demand management that prevailed prior to the 1980s to the subsequent period known as the Great Moderation. Put loosely, prior to the 1980s, the FOMC followed a policy of alternating monetary contraction and monetary stimulus termed stop-go as a consequence of the way in which it introduced inertia into the movements in the funds rate implied by its LAW procedures.

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[5] In the model, R_t should be understood as the level of the term structure of interest rates. The FOMC sets the level through the way in which it changes its funds rate target, the way in which it communicates persistence in those changes.

More precisely, in the event that inflation was the main concern, the FOMC raised the funds rate persistently until the economy weakened and then maintained a cyclically high level of rates while the economy weakened. Although the FOMC does not use the language of trade-offs, it was attempting to create a negative output gap in order to lower inflation. At cyclical troughs, central banks maintained a cyclically low level of rates while the economy strengthened in order to speed the decline in the magnitude of a negative output gap. At present, the interest-sensitivity of money demand that arose after deregulation of interest-rate ceilings in 1980 implies that money moves countercyclically and thus offers false signals about the degree of stimulus of monetary policy. Nevertheless, cyclical inertia in the central bank's policy rule continues to measure monetary disturbances imparted to the real economy.

What imparted the distinctive character to LAW procedures subsequent to the disinflations of the early 1980s was how central banks created a stable nominal anchor. The commitment to maintain the expectation of low, stable inflation required communication of a commitment to effect whatever cumulative increase in the policy rate was required in response to above-trend growth in output in order to prevent trend inflation from rising above target.[6] Hetzel (2006; 2008a, Ch. 13-15 and 21; and 2008b) termed these procedures, which accompanied the Great Moderation, "lean-against-the-wind with credibility," or LAW with credibility. With them, central banks did not respond to fluctuations in inflation by creating output gaps.

The NK model explains how central banks controlled inflation after the disinflations of the early 1980s without recourse to Phillips curve trade-offs instead relying on the way in which rules shape the behavior of forward-looking agents. In the 1980s, central banks moved to the control of trend inflation through creation of an environment of nominal expectational stability that conditioned the way in which firms set prices for multiple periods. They conditioned that price setting through aligning the expectation of inflation of firms in the sticky-price sector with the inflation target.

5. Funds rate inertia and recession[7]

Inertia in declines in the funds rate target in response to deteriorating economic activity signals the monetary shocks that precipitate recession. In the post-Treasury/Fed Accord period, this this inertia appeared as a departure from the standard implementation of LAW procedures. The LAW characteristic of monetary policy began after the 1953 recession. Both Arthur Burns, who was chairman of the Council on Economic Advisers in President Eisenhower's first term, and William McChesney Martin, who was FOMC chairman, believed that the inflation that emerged after 1956 arose because of the slowness with which the FOMC raised interest rates in the recovery from the 1953 recession. Because of its concern for inflation, the FOMC kept short-term interest rates unchanged as the economy weakened before the August 1957 cyclical peak. Concerned about balance of payments outflows, prior to the April 1960 cyclical peak, the FOMC kept short-term interest rates unchanged despite deterioration in the economy.

The period known as stop-go began in 1965 when the political system pressured the Fed not to raise interest rates under the belief that to do so would thwart its desire to stimulate the economy through the 1964 tax cuts. After a brief move toward contractionary monetary policy in 1966, the FOMC backed off in return for the promise that President Johnson would submit a tax increase to

[6] See Goodfriend (1993) on inflation scares.

[7] The material is this section summarizes Hetzel (2008).

Congress. The Keynesian members of the Board of Governors supported this policy in the context of the reigning "optimal policy mix" view of the time.

The period of stop-go monetary policy from 1965 until its demise with the Volcker disinflation demonstrated a clear pattern of cyclical funds rate inertia relative to real GDP growth with resulting procyclical money growth. At cyclical peaks, the funds rate remained elevated while GDP growth declined and money growth fell. At cyclical troughs, the funds rate remained low while GDP growth rose and money grow increased (see Hetzel 2008a, Chs. 23-24).

FOMC chairmen Arthur Burns and G. William Miller retained LAW, but imparted cyclical inertia to the funds rate changes implied by those procedures. As a result, they were slow to raise the funds rate after cyclical troughs out of concern for high unemployment, and they were slow to lower the funds rate after cyclical peaks out of concern for high inflation. Monetarists criticized this inertia as producing procyclical money growth (Poole 1978, 105) while Keynesians supported it as desirable interest-rate smoothing.[8] The view that powerful cost-push factors drove inflation combined with the belief that a high "sacrifice ratio" rendered socially costly the control of inflation through "high" unemployment caused Burns and Miller to allow inflation to drift upward across the business cycle (Hetzel 2008a, Ch. 1, 8 and 11). The result was to destroy the nominal anchor they had inherited. The expectation that inflation would fluctuate around a low level with periods of relatively high rates followed by periods of relatively low rates disappeared. By summer 1979, inflationary expectations had become unmoored as expectation of trend inflation drifted with real and inflation shocks.

In the Volcker-Greenspan era, the FOMC largely remained focused on eliminating the association in the bond markets created during stop-go of strong real growth and inflation. That discipline required eliminating cyclical inertia in the funds rate. However, in two episodes, the Volcker-Greenspan FOMCs reintroduced that inertia with two mini go-stop cycles. In each episode, the go phases reflected a reluctance to raise the funds rate in response to strong real growth due to a

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[8] A succinct survey of Keynesian views over time is contained in the document "Current Economic Comment by District," which was circulated prior to FOMC meetings and was the predecessor of the Beige book. First District (Boston) comments concentrated on advice offered by Keynesian economists. For example, the March 9, 1977 Redbook reported:

[Paul] Samuelson...is concerned that money growth may be insufficient to maintain the pace of the recovery....It is best that monetary policy be ready to accommodate exogenous price increases....This is no time to put the economy through another wringer.... [D]on't meet irrational apprehensions by sacrificing real growth....[M]oney growth may have to exceed stated targets in 1977; otherwise, the risks of jeopardizing real growth in 1978 are considerable.

[Robert] Solow...would be "appalled" if rising interest rates jeopardized even this modest growth performance. Only if inflation were increasing rapidly at the end of the year, should tighter monetary policy lead to increasing interest rates. It would take another recession to push inflation below the 5 to 6 percent range, and that is more than a depressed economy should pay.

[Otto] Eckstein believes that..."Monetary policy should let economy move into a period of stimulus...." Until there is evidence that fiscal policy threatens an unmanageable boom, the Federal Reserve should accommodate growth. This may require that the money aggregates exceed upper bounds.

concern that the foreign exchange value of the dollar would rise. The first episode followed the Louvre Accord in early 1987 and the second case followed the Asia and Russia crisis in fall 1998 (Hetzel 2008a, Chs. 14, 17-19). Each time, with a lag, inflation began to rise and with the rise in inflation the FOMC responded with significant funds rate increases.

6. A graphical overview of monetary policy in recession

The intuition behind the monetarist identification scheme that pointed to monetary policy as the impetus to cyclical fluctuations was that central bank interference with the operation of the price system was the analogue of price fixing in goods markets. Maintaining interest rates below the natural rate requires monetization of excess supply in the bond market, that is, money creation through bond purchases by the central bank. Maintaining interest rates above the natural rate requires demonetization of excess demand, that is, money destruction through bond sales by the central bank. Historically, the resulting fluctuations in money predicted cyclical fluctuations. However, with the interest-sensitivity of money demand that developed after the phasing out of interest rate ceilings with the 1980 Monetary Control Act, the monetary aggregates began to behave countercyclically and thus gave misleading signals as to the appropriate behavior of the funds rate target.

While the evident signs of interference with the price system in the form of monetary emission and absorption have disappeared, the interference flagged by attempts to manipulate output gaps remains. One can still identify robust monetarist correlations building on Friedman (1984, 27):

> Rising concern about inflation, and growing recognition of the role played by monetary growth in producing inflation, led Congress in 1975 to require the Federal Reserve to specify targets for monetary growth…. In practice, it continued to target interest rates, specifically the federal funds rate, rather than monetary aggregates, and *continued to adjust its interest rate targets only slowly and belatedly* to changing market pressure. The result was that the monetary aggregates tended on average to rise excessively, contributing to inflation. However, *from time to time, the Fed was too slow in lowering rather than raising the federal funds rate*. *The results were* a sharp deceleration in the monetary aggregates and *an economic recession*. (italics added)

In terms of the NK model with the policy rule (11) assumed to implement the divine-coincidence result, price fixing by the central bank derives from inertia imparted to LAW procedures in order to create a negative output gap. Departure from (11) in favor of (12) signals an attempt to exploit a Phillips curve relationship. The following offers a graphical overview of monetarist robust correlations from this perspective.

Figures 1 and 2 show M1 growth rates plotted as a step function. Friedman and Schwartz (1963), who produced the first such graph, highlighted the reduction in the steps prior to business cycle peaks. For illustrative purposes, Figure 3 shows that the weakening of economic activity that precedes cyclical peaks is associated with the declines in the steps of the M1 step function. Figure 4 shows the persistence of that pattern in the post-1981 period. Figures 5 and 6 show how consumption falls off relative to intra-cycle trend prior to cycle peaks. Figure 7 shows how the FOMC maintains the nominal and real interest rates at cyclically high levels going into cyclical downturns despite the weakening economy.

Figures 8 and 9 show the consistency of this pattern of downward rate inertia entering recessions. Going into recessions, inflation (the sold line) is at a cyclical high. Examination of FOMC transcripts shows that the priority of the FOMC at these times is to reduce inflation (Hetzel 2008, 2012). Over the course of the recession, the real rate declines but only slowly. With the exception of the recovery from the July 1981 to November 1982 cyclical contraction, during the economic recovery short-term real interest rates fall to zero.[9]

Since 1981, monetary deceleration is no longer a reliable indicator of monetary contraction because of the interest-sensitivity of money demand and the consequent countercyclical behavior of money. However, the attempts by the FOMC to create a negative output gap in order to reduce inflation remain a reliable indicator. As shown in Figures 8 and 9, consumption starts falling off from trend (the dashed line) well before the cyclical peak while the real interest rate remains at cyclical highs. This pattern, which correlated with monetary deceleration before the 1980s, remains a persistent characteristic of recession.

The December 2007 to June 2009 cyclical contraction displayed relatively low real interest rates once the cyclical peak had occurred. At the time, then FOMC Chairman Bernanke (2009) interpreted the low level of interest rates (near zero after the December 2008 FOMC meeting) as evidence of expansionary monetary policy. Based on this assessment, he discounted the efficacy of monetary policy and advocated credit policy based on a panoply of programs intended to revive the flow of credit to specific sectors of the economy. The underlying assumption was that dysfunction in credit markets was preventing funds from flowing from savers to investors with viable investment projects.[10]

However, the subsequent behavior of inflation has contradicted the assumption that monetary policy was expansionary. As shown in Figure 10, core PCE (personal consumption expenditures) inflation averaged just above 2 percent from 2005 through 2008. With recovery from the December 2007 to June 2009 recession, it initially rose back to 2 percent but then declined to around 1.3 percent in early 2015. Figure 11 offers some insight into the decline in core inflation.

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[9] The Economic Recovery Tax Act of 1981 along with the prospect of reduced inflation, which would reverse the way that inflation interacted with a tax code not indexed for inflation to raise sharply corporate tax rates, reduced expected corporate taxes (Hetzel 2008, 147-9). The revival of corporate investment presumably kept real interest rates at cyclical highs during the economic recovery. Along with the failure of the near-zero level of interest rates after December 2008 to revive inflation, this instance illustrates the monetarist criticism of inferring the stance of monetary policy from the level of interest rates.

[10] Earlier, Aoki (2001) had argued that the central bank should implement a policy designed to achieve divine coincidence by pursuing price stability in the sticky-price sector of the economy in order to stabilize the aggregate output gap. As part of allowing the price system to determine relative prices, it should allow fluctuations in headline inflation originating in the flexible-price sector to pass through to the price level. His analysis is in the spirit of Friedman (1960) who emphasized the considerable noise in inflation and rejected the idea of targeting it directly. Hetzel (2013) applied the Aoki model to the back-to-back recessions in the Eurozone starting in 2008Q2. The argument is that the recessions resulted from an attempt by the European Central Bank to create a negative output gap in the sticky-price sector in order to keep headline inflation, which was pushed by two commodity price shocks, at two percent.

As a first pass look at inflation in the flexible-price sector and in the sticky-price sector, Figure 11 shows goods and services inflation. Inflation in the flexible-price sector associated with goods inflation is heavily influenced by commodity prices, which depend upon the strength in the world economy and the consequent demand for commodities. Based on the behavior of services inflation, the Great Recession lowered the expectation of trend inflation in the sticky-price sector from somewhat above 3 percent to 2 percent. Headline inflation is a weighted-average of inflation in the sticky-price sector and flexible-price sector. It became negative in 2009 (Figure 10). With the recovery in the world economy after the cyclical trough in June 2009, the increase in commodity prices pushed headline inflation to 2 percent in 2012. However, weakness in the world economy then lowered commodity prices and pushed headline inflation down to around 1.3 percent. Independent of this interpretation, the level of inflation below the FOMC's 2 percent target contradicts the assumption that monetary policy was expansionary from 2008 onward.

7. Concluding comment

At the heart of the movement of economics from institutional economics to neoclassical economics after World War II is the assumption that assignment of causality in observed correlations requires a model. The birth of modern macroeconomics in the 1970s came from models with forward-looking agents and the associated replacement of adaptive expectations with rational expectations. As articulated by Lucas (1976 [1981] and 1980 [1981]), models with forward-looking agents impose the discipline on the policy maker of communicating using the language of rules.

Congress has delegated to the Federal Reserve System the responsibility to design and implement the monetary regime. The legislative language exhorting the Fed to achieve "maximum employment" and "stable prices" lacks substance. No one believes that one can go from that language to a blueprint for the monetary regime. Hopefully, the FOMC will come to understand the next frontier of transparency as communication of the nature of the monetary regime in terms of a model and a rule. The FOMC will then move beyond debating individual policy actions to talking about policy in terms of a model with an optimal rule.

Appendix: Real Rate of Interest

This appendix is reproduced from Hetzel (2012, 203). The short-term real interest rate is the difference between the commercial paper rate and Greenbook inflation forecasts made by the staff of the Board of Governors before FOMC meetings. The commercial paper rate is for prime nonfinancial paper placed through dealers (A1/P1). The dates for the interest rates match the publication dates of the Greenbooks. Because observations correspond to FOMC meetings, they occur irregularly within the year and starting in 1979 the frequency is less than twelve times per year.

From 1966 through 1970, the inflation forecast series is for the implicit GNP deflator. From 1971 through March 1976, the inflation forecast series is for the GNP fixed-weight index. Thereafter, until January 1980, the series used is for the gross business product fixed-weight index. From January 1980 until February 1986, the gross domestic business product fixed-weight index excluding food and energy is used. Thereafter, until January 2000, the CPI excluding food and energy is used. From January 2000 onward, the personal consumption expenditures chain-weighted index excluding food and energy is used.

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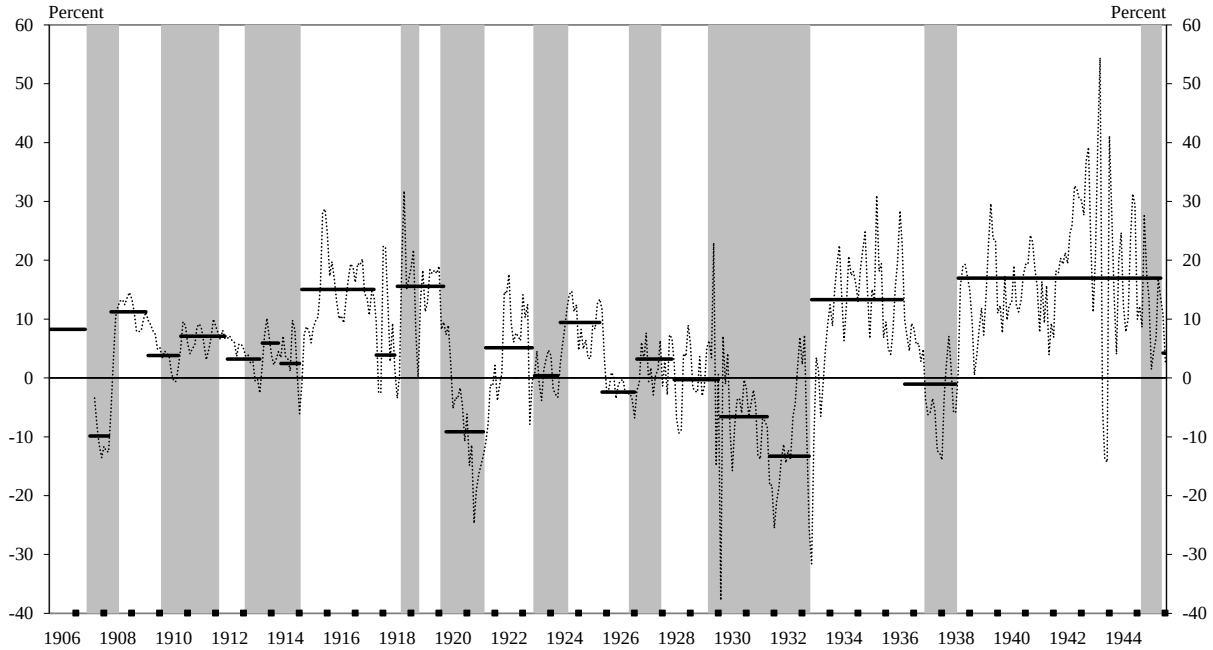
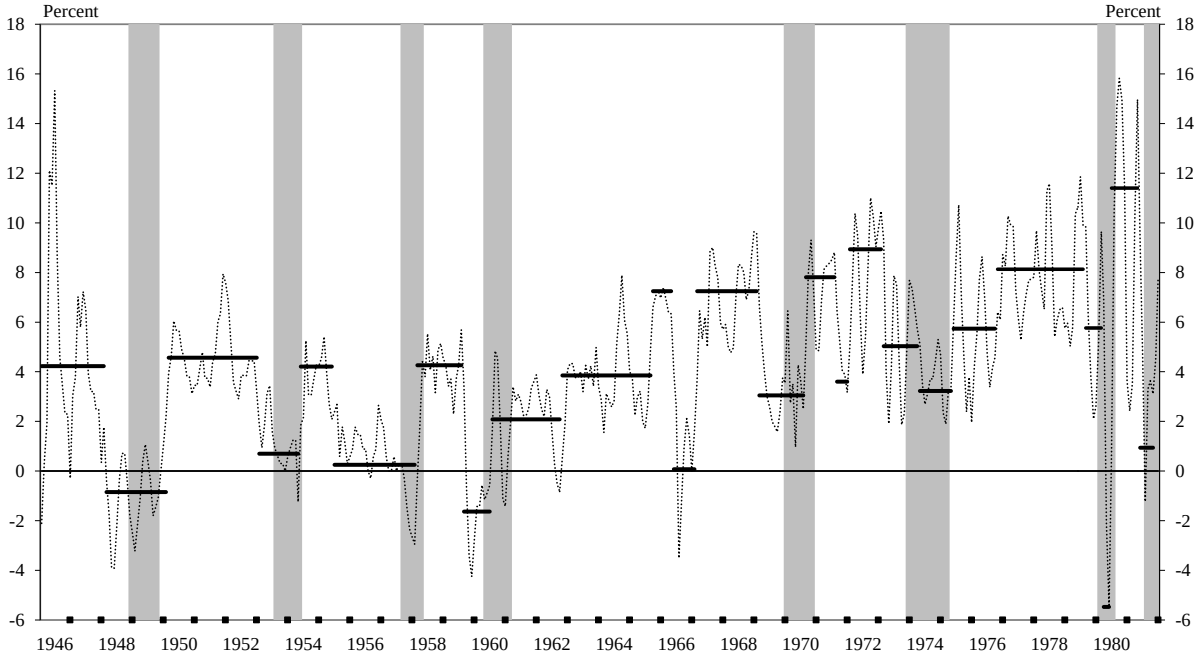
Figure 1
M1 Step Function and Recessions: 1906-1945



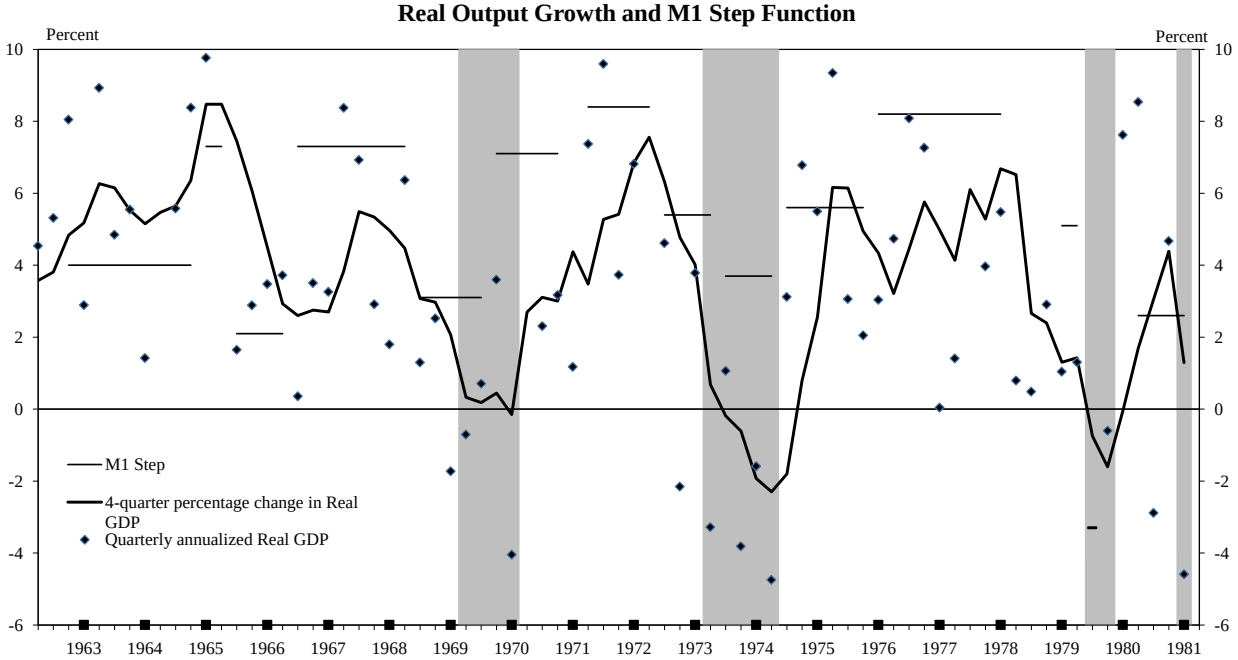
Notes: Series are a three-month moving average of the annualized monthly money growth rates and a step function fitted to monthly annualized growth rates of money. Step function before May 1907 uses annual growth rates based on June observations of M2 from 1900-1907. Observations for money from June 1900 to May 1914 are for M2; observations from June 1914 to December 1945 are for M1. Data are from Friedman and Schwartz (1970). Shaded areas indicate NBER recessions. Heavy tick marks indicate December.

Figure 2
M1 Step Function and Recessions: 1946-1981



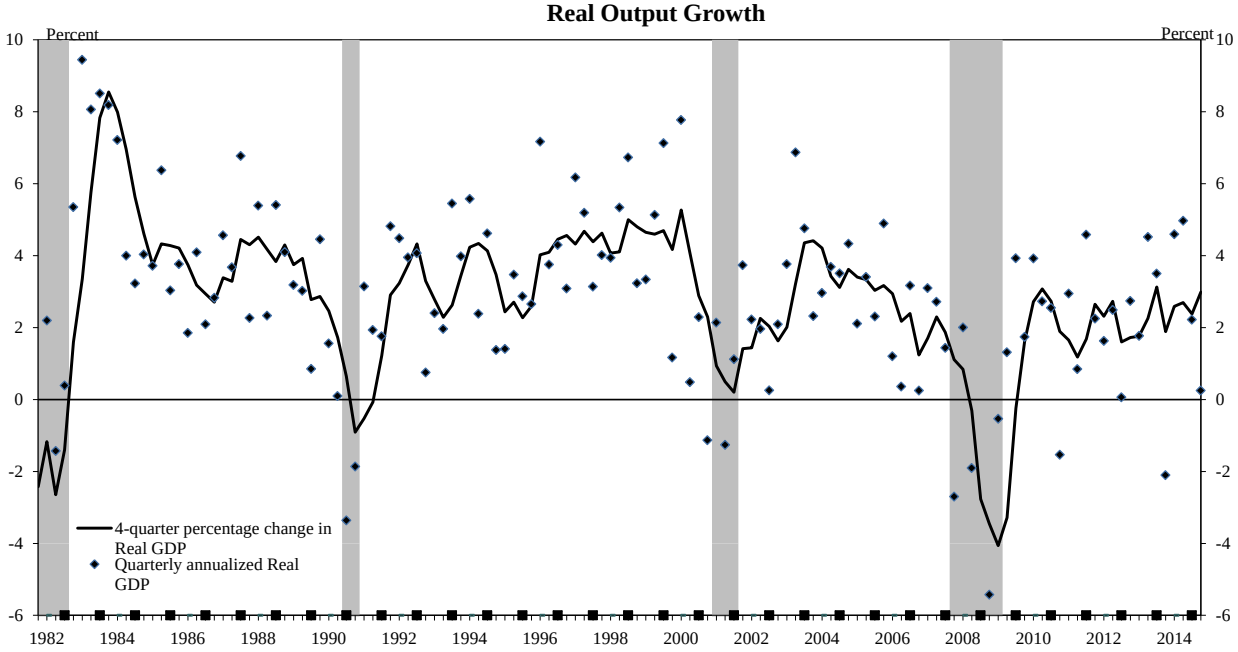
Notes: Series are a three-month moving average of the annualized monthly money growth rates and a step function fitted to monthly annualized growth rates of money. Data on money (M1) from January 1946 to December 1958 from Friedman & Schwartz (1970). From January 1959 to December 1980 data from Board of Governors. January 1981 to December 1981 M1 is "shift-adjusted M1" (Bennett 1982). Shaded areas indicate NBER recessions. Heavy tick marks indicate December.

Figure 3
Real Output Growth and M1 Step Function



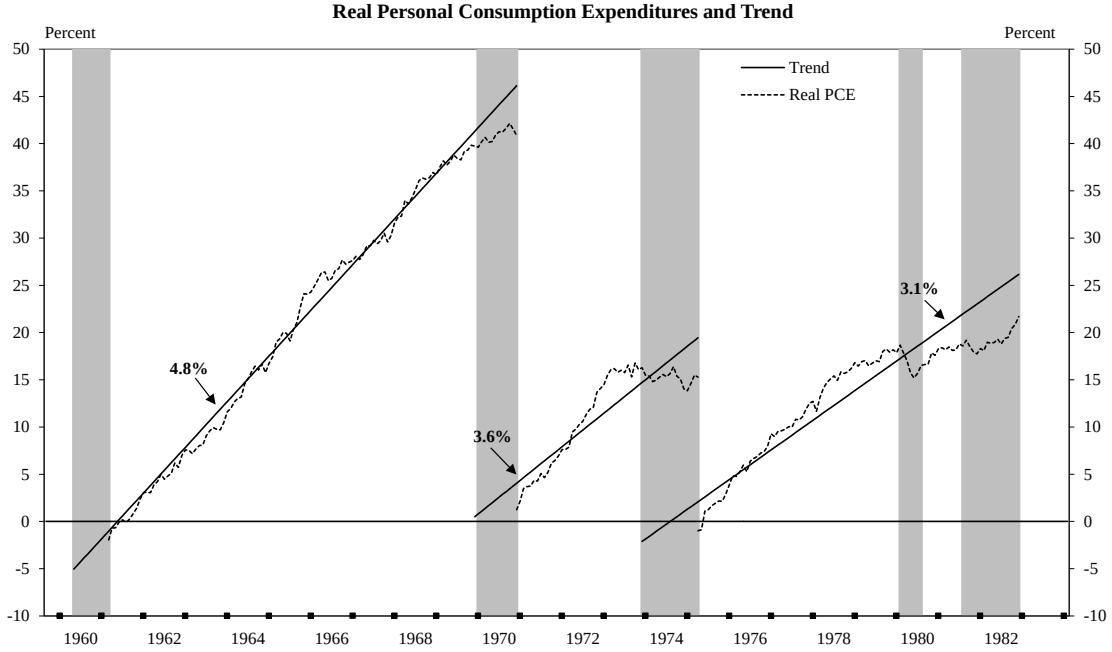
Notes: The M1 steps are an average of the annualized quarterly M1 growth rates. In 1981, M1 is "shift adjusted" (Bennett 1982). Reproduced from Hetzel (2008b, Figure 23.1). Heavy tick marks indicate fourth quarter. Shaded areas indicate NBER recessions.

Figure 4
Real Output Growth



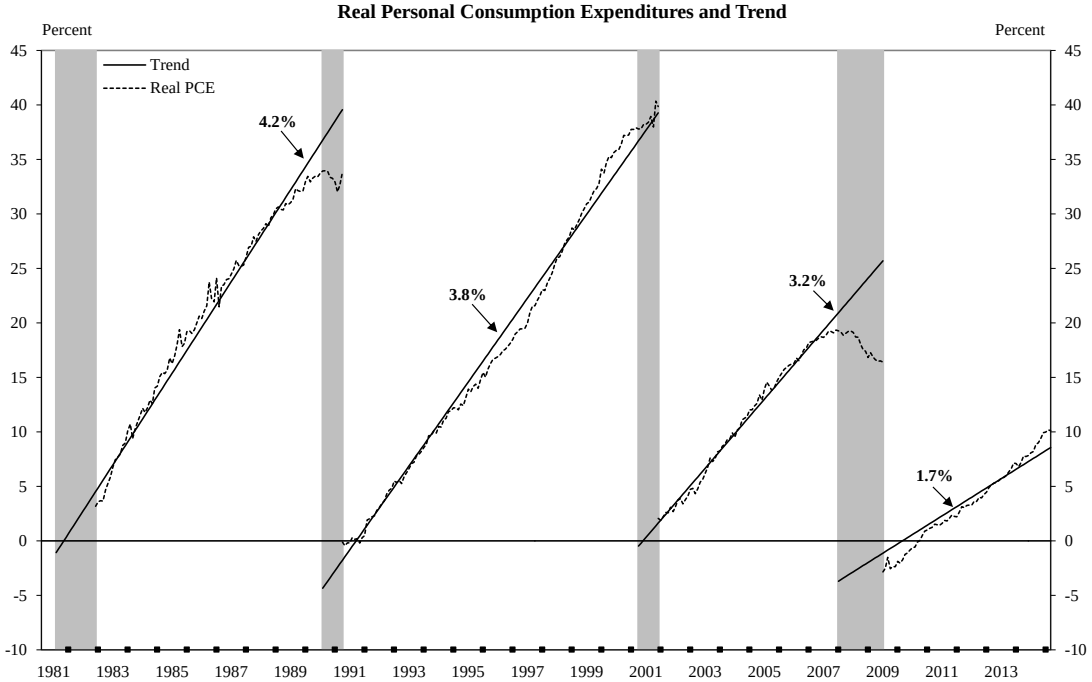
Notes: The M1 steps are an average of the annualized quarterly M1 growth rates. Heavy tick marks indicate fourth quarter. Shaded areas indicate NBER recessions. Source: Haver Analytics.

Figure 5
Real Personal Consumption Expenditures and Trend



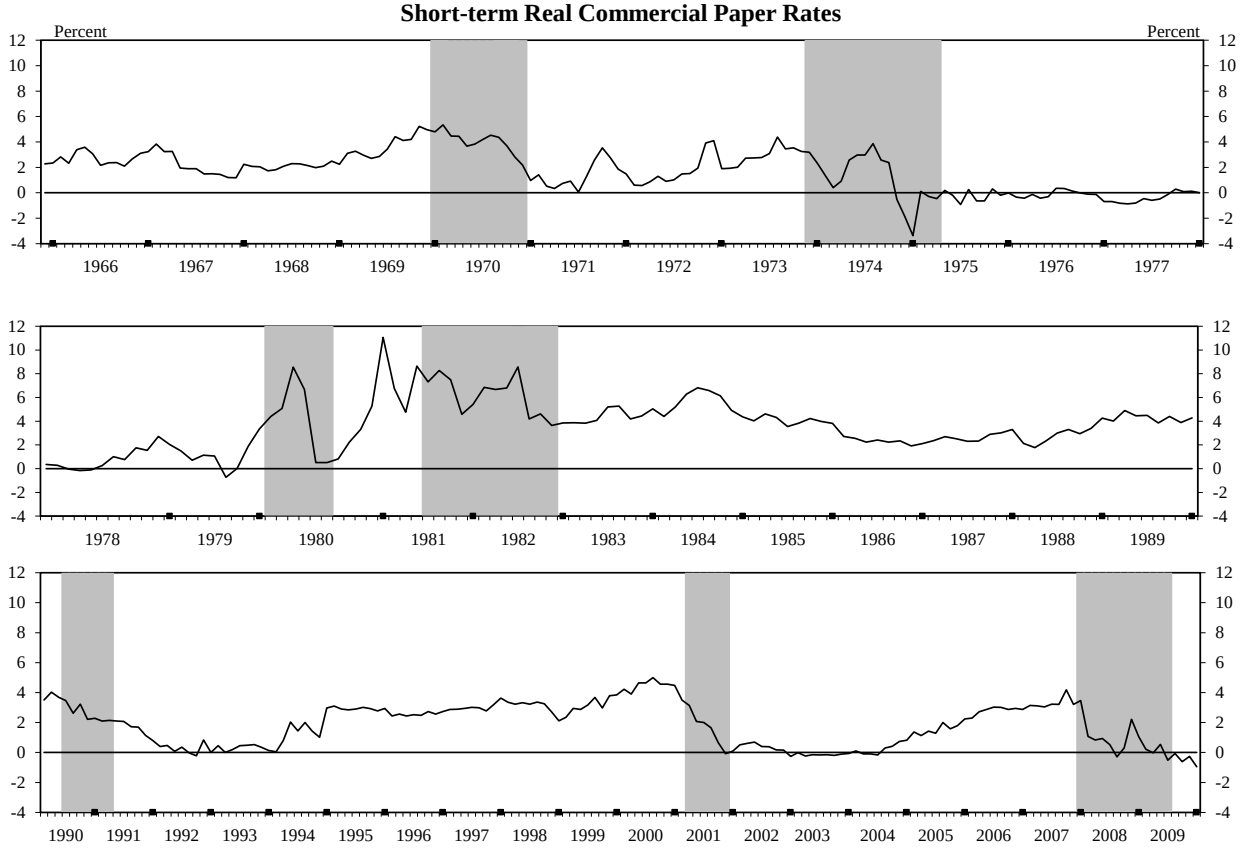
Notes: Observations are the natural logarithm of monthly observations of real personal consumption expenditures normalized using the value at the prior business cycle peak. Trend lines are fitted to these observations between peaks in the business cycle. The trend lines are extended through the subsequent recession. Data from the Commerce Department via Haver Analytics. Shaded areas indicate NBER recessions. Heavy tick marks indicate December.

Figure 6
Real Personal Consumption Expenditures and Trend



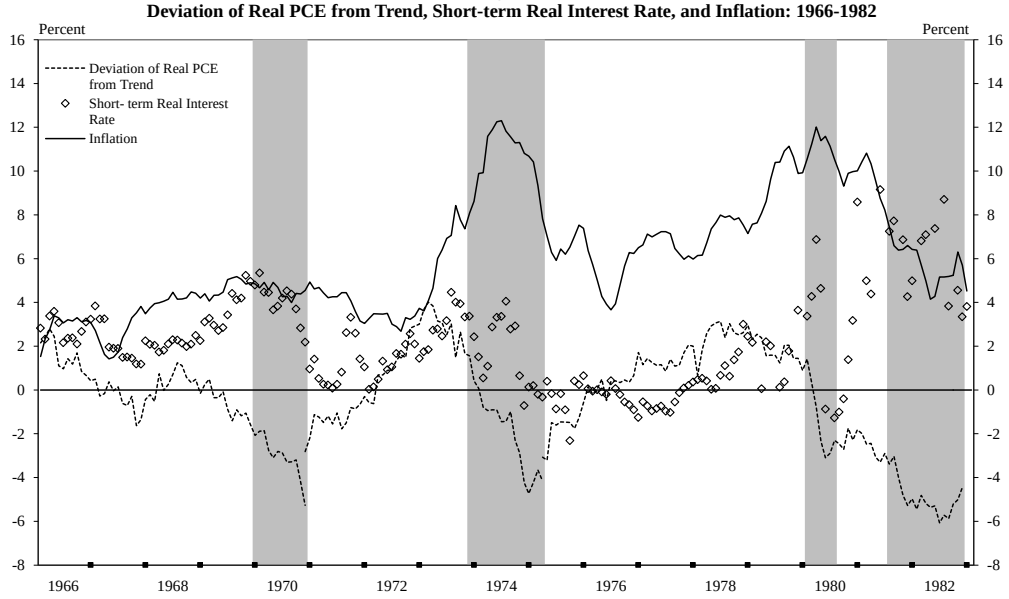
Notes: Observations are the natural logarithm of monthly observations of real personal consumption expenditures normalized using the value at the prior business cycle peak. Trend lines are fitted to these observations between peaks in the business cycle. The trend lines are extended through the subsequent recession. Data from the Commerce Department via Haver Analytics. Shaded areas indicate NBER recessions. Heavy tick marks indicate December.

Figure 7
Short-term Real Commercial Paper Rates



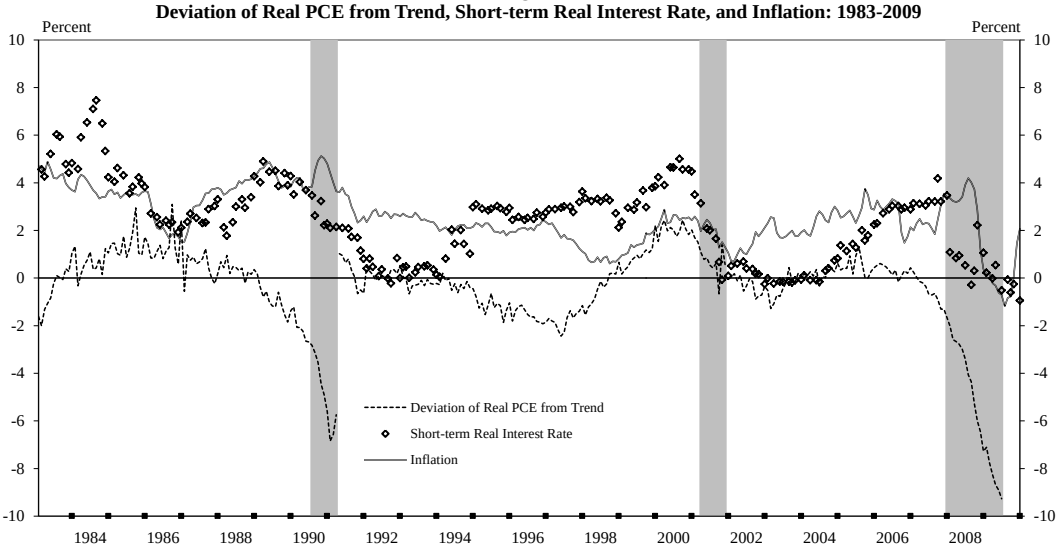
Notes: The real interest rate series is the commercial paper rate minus core inflation forecasts made by the staff of the Board of Governors before FOMC meetings. For a description of the series, see "Appendix: Real Rate of Interest." Shaded areas indicate recessions. Heavy tick marks indicate December FOMC meeting.

Figure 8
Deviation of Real PCE from Trend, Short-term Real Interest Rate, and Inflation: 1966-1982



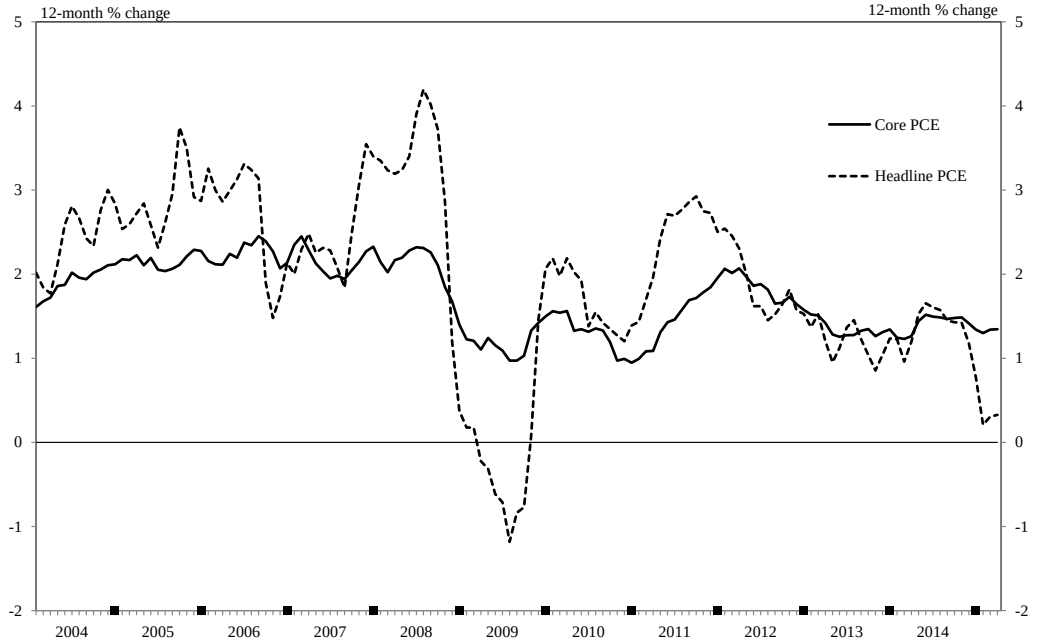
Notes: "Deviation of Real PCE from Trend" is the difference between the actual values and trend lines shown in Figure 8.3. Inflation is twelve-month perecentage changes in the personal consumption expenditures deflator. The "Short-term Real Interest Rate" is the commercial paper rate minus the corresponding inflation forecast made by the staff of the Board of Governors. It is the real interest rate series labelled "Overall Inflation Forecast" shown in Figure 11.2. Data from the Commerce Department via Haver Analytics. Shaded areas indicate NBER recessions. Heavy tick marks indicate December.

Figure 9
Deviation of Real PCE from Trend, Short-term Real Interest Rate, and Inflation: 1983-2009



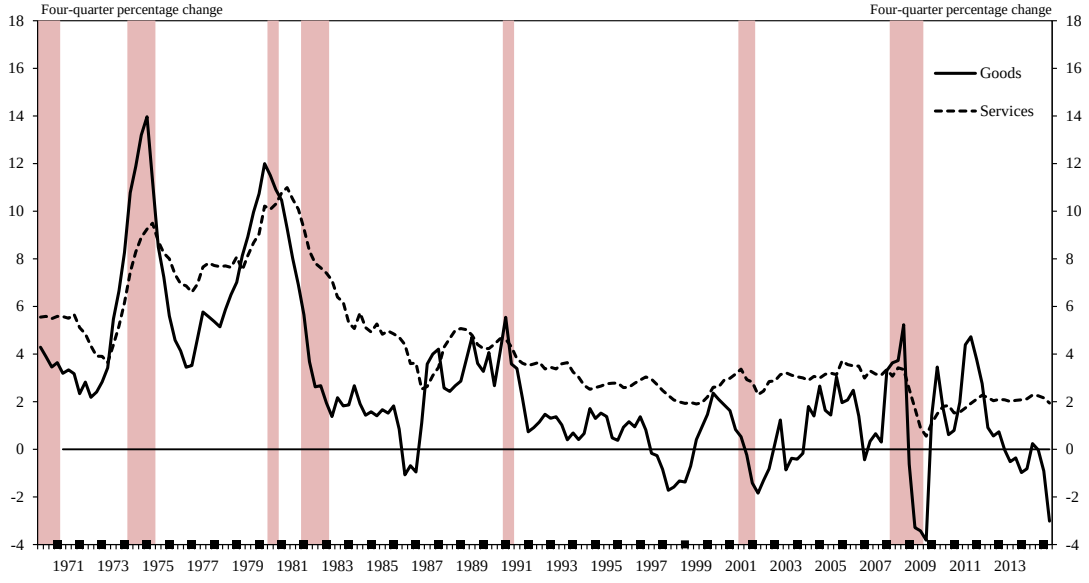
Notes: For the series "Deviation of Real PCE from Trend," observations are calculated using the natural logarithm of monthly observations on real personal consumption expenditures (PCE) normalized using the value at the prior business cycle peak. Trend lines are fitted to these observations and the trend line is extended through the subsequent recession. Deviation of real PCE from trend is the difference between the actual values and trend lines. Inflation is twelve-month percentage changes in the personal consumption expenditures deflator. The real interest rate is the commercial paper rate minus the corresponding inflation forecast made by the staff of the Board of Governors. It is the real interest rate series labelled "Overall Inflation Forecast" series in Figure 11.2. Data on PCE and the PCE deflator from Commerce Department via Haver Analytics. Shaded areas indicate NBER recessions. Heavy tick marks indicate December.

Figure 10
Headline PCE and Core PCE



Notes: Heavy tick marks indicate December. Source: Bureau of Economic Analysis via Haver Analytics.

Figure 11
PCE Goods and Services Inflation



Note: Heavy tick marks indicate fourth quarter of year. Recessions are defined by the NBER. Source: Bureau of Economic Analysis.