

The Great Inflation Drift*

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Abstract

A standard statistical perspective on the U.S. Great Inflation is that it involves an increase in the stochastic trend rate of inflation, defined as the long-term forecast of inflation at each point in time. That perspective receives support from two sources: the behavior of long-term interest rates which are generally supposed to contain private sector forecasts, and statistical studies of U.S. inflation dynamics. We show that a textbook macroeconomic model delivers such a stochastic inflation trend, when there are shifts in the growth rate of capacity output, under two behavioral hypotheses about the central bank: (i) that it seeks to maintain output at capacity; and (ii) that it seeks to maintain continuity of the short-term interest rate. The theory then identifies major upswings in trend inflation with unexpectedly slow growth of capacity output. We interpret the rise of inflation in the U.S. from the perspective of this simple macroeconomic framework.

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1 Introduction

Between 1952 and 1965, the annual average U.S. inflation rate ranged between zero and four percent. Over the next fifteen years, it rose systematically and substantially, twice peaking above 10 percent in 1975 and 1980.

What economic forces led to this increase? Any explanation of inflation dynamics must involve an understanding of how a central bank interacts with the private economy and the real shocks that hit it. We use two basic ideas about Federal Reserve behavior – that the U.S. central bank, like others around the world, was concerned with smoothing the path of short-term nominal interest rates and with maintaining a relatively small output gap – to explain why a time-varying inflation trend would have become part of the U.S. inflation process during this period and, more specifically, why there would have been a rise in trend inflation.

In adopting this approach, we abstain from incorporating other forces that arguably may be very important for the Great Inflation in the U.S. and other countries. First, we assume that there is a Phillips Curve which is vertical in the long run and that the central bank understands this structural feature of the economy as well as the level of capacity output at each point in time. Second, we assume that private agents understand the nature of the central bank's decision rules and the consequences that they have for the inflation process. Third, we assume that the central bank adopts fully credible policies. Other accounts of the rise of inflation in the U.S. highlight departures from these assumptions and, indeed, our prior investigation of the Volcker disinflation stressed the role of imperfect credibility and private sector learning during that episode.¹

In constructing our model and interpreting history, we view the U.S. central bank as typically giving prominence to two objectives, stabilization of economic activity and avoidance of large period-to-period changes in short-term interest rates. We portray the FRS as maintaining these objectives in the face of real developments that affected the level of output and the level of the real interest rate, thus making inflation variable. We show that a very simple modern macroeconomic model, which we take as embodying key elements in many contemporary models, makes the prediction that inflation contains a "stochastic trend component" in the language of modern time series econometrics. Thus, the upward drift in U.S. inflation from 1966 through 1979 arises as a consequence of a series of adverse real shocks hitting the macroeconomy and the central bank allowing inflation to randomly walk upward. This viewpoint explains, in one sense, how there would come to be no "nominal anchor" for U.S. monetary policy by August 1979 when Paul Volcker became Chairman of the Federal Reserve Board.

Since our model has a very simple form for trend inflation and since this form is one that has been long used to forecast inflation (Nelson and Schwert (1977)) and has recently been found to be quite successful vis-a-vis competitors (Stock and Watson

¹Goodfriend and King (2005).

(2007)), we are able to produce a detailed link between our theory and empirical work on inflation. We also see the inflation process as at times more complicated than our simple trend model, during intervals in which there is inflation-fighting by the central bank, and we discuss these in detail below. The idea that there are episodic components of inflation that are not described by the stochastic trend model, during which there are forecastable linkages between inflation and real activity, accords with further recent empirical work by Stock and Watson (2008).

The organization of the paper is as follows. In section 2, we describe the components of the model. In Section 3, we discuss monetary policy and motivate the inclination of central banks to pursue what we call "business as usual"—the stabilization of output at capacity and a continuity of the short-term nominal interest rate. In section 4, we derive equilibrium outcomes and show how "business as usual" gives rise to a stochastic inflation trend. In section 5, we discuss how alternative central bank operating rules could bring about "business as usual" outcomes. In section 6, we list the empirical implications of our hypothesis, and then turn to a detailed evaluation of the Great Inflation from the perspective of our model in section 7. A final section provides a brief conclusion.

2 Model Components

We work with a simple linear model that incorporates five components from modern macroeconomics: new Keynesian pricing, a real business cycle core, a Fisher equation, an Euler equation, and the term structure of interest rates.

2.1 New Keynesian Pricing

New Keynesian macroeconomics has developed a battery of models to explain price setting by forward-looking firms. The simplest of these models, embedding price adjustment opportunities along the lines of Calvo (1983), leads to a "new Keynesian pricing" equation that links inflation (π_t) and real output (y_t),

$$\pi_t = \beta E_t \pi_{t+1} + h (y_t - y_t^*). \quad (1)$$

In this expression, y_t^* is a measure of capacity output, so that $y_t - y_t^*$ is a measure of the output gap, and $E_t \pi_{t+1}$ is the expected inflation rate. The parameter h can be related to structural features such as the frequency of price adjustment, the elasticity of marginal cost with respect to output, and so forth.

As has been much stressed in the recent literature,² the new Keynesian approach indicates that the relevant measure of capacity output is the level of output that would prevail if nominal prices were flexible. That is, it is a level of output which can be modeled along the lines of real business cycle analysis and that therefore is

²See Goodfriend and King (1997), Goodfriend (2002), and Woodford (2003).

expected to fluctuate through time in response to a range of macroeconomic shocks, including productivity, government expenditures, tax rates, and energy prices.

We use a version of this model due to Woodford (2007) that allows for time-varying trend inflation, so that the inflation dynamics are written as

$$\pi_t = \bar{\pi}_t + \beta E_t[\pi_{t+1} - \bar{\pi}_{t+1}] + h(y_t - y_t^*) \quad (2)$$

where $\bar{\pi}_t$ is a time-varying trend rate of inflation, which satisfies

$$\bar{\pi}_t = \lim_{k \rightarrow \infty} E_t \pi_{t+k}. \quad (3)$$

That is, $\bar{\pi}_t$ is the stochastic trend rate of inflation in the sense of Beveridge and Nelson (1981).

This specification of new Keynesian pricing exhibits a short-run Phillips curve relationship, so that a monetary stimulus raises both inflation and real variables such as output and employment, if there are no changes in expected inflation.³ But, at the same time, there is no long-run Phillips curve relationship, so that a permanent increase in money growth and in inflation has no quantitatively significant effect on employment or output.

2.2 The Real Business Cycle Core

The model has a "real business cycle" core, in which macroeconomic activity would respond to a variety of real shocks in the absence of nominal frictions. Such a component is critical, we believe, on both the short-run and long-run fronts. Quarter-to-quarter, there are many changes in current and prospective real conditions that are important for output and the real interest rate. In the longer term, the evolution of economic activity is dominated by growth in productivity.

To model the RBC core of the economy, we assume that "capacity output" evolves according to

$$\Delta y_t^* = \rho \Delta y_{t-1}^* + \nu_t \quad (4)$$

which is a simple difference stationary stochastic process of the form estimated by Nelson and Plosser (1982), which allows for shocks to the level of economic activity and also to the expected growth rate.⁴ This simple specification cannot adequately capture the changes in trend productivity growth which we believe to have occurred

³The results on interest rate smoothing, output stabilization, and trend inflation variability also hold under two alternative specifications as originally derived in our November 2004 Carnegie-Rochester paper. These are a standard Calvo model with $\beta = 1$ and a model with lags as well as leads of inflation, in the style of Fuhrer and Moore, that involves no long-run inflation and output tradeoff. We use the specification in the main text as a third simple and modern specification that makes clear the richness of the connection.

⁴Our model does not distinguish between consumption and investment, a key aspect of RBC models.

over the post-war period, but it has the desirable property that it does let us approximate the comovement of output and the real interest rate in response to permanent shocks to the level of productivity within a more fully articulated model.

2.3 The Fisher Equation

There is a Fisherian relationship in the model that links the nominal interest rate (R_t) to the real interest rate (r_t) and expected inflation ($E_t\pi_{t+1}$). Such a specification is critical to understanding the evolution of the nominal interest rate in the U.S. and other countries. The Fisher equation is

$$R_t = r_t + E_t\pi_{t+1}. \quad (5)$$

In our study, this linkage will play a key role.

2.4 The Euler Equation

There is a transmission mechanism between real interest rates and real economic activity that includes additional expectational elements, because optimizing theories of consumption and investment suggest the importance of this feature and because both consumption and investment appear to be substantially influenced by expectations in the U.S. economy. Expectations are important determinants of aggregate demand and output in a model with Keynesian features, such as ours. According to modern consumption theory, the expected growth rate of consumption should be related to the real interest rate, which we write as

$$r_t = \sigma(E_t y_{t+1} - y_t) + r, \quad (6)$$

where $r > 0$ represents positive time preference. The "natural rate of interest" is defined as

$$r_t^* = \sigma(E_t y_{t+1}^* - y_t^*) + r \quad (7)$$

The capacity output process implies that the "natural rate of interest" evolves as

$$r_t^* = \sigma\rho\Delta y_t^* + r \quad (8)$$

so that we have built in a positive comovement of the real interest rate and output growth present in studies of RBC models with stochastic productivity trends.

2.5 The Term Structure of Interest Rates

The model contains the expectations theory of the term structure. While it has been criticized as an incomplete description of long-term yields, we think that the expectations theory nevertheless contains the essential features of bond-pricing for our

purposes. In our model, we include specifications of the real and nominal returns on a long-term discount bond, i.e., one with L periods to maturity. The first specification governs the real term structure,

$$r_{Lt} = \frac{1}{L} \sum_{j=0}^{L-1} E_t r_{t+j} + (r_L - r) = \sigma \frac{1}{L} (E_t y_{t+L} - y_t) + r_L \quad (9)$$

and the second specification governs the nominal term structure,

$$R_{Lt} = \frac{1}{L} \sum_{j=0}^{L-1} E_t R_{t+j} = r_{Lt} + \frac{1}{L} \sum_{j=1}^L E_t \pi_{t+j} \quad (10)$$

It is important to stress that longer-term yields reflect permanent variations, as these are dominant in such an expected future average. Accordingly, we will frequently employ the idea that variations in long-term nominal yields are dominated by "expected inflation trends."

3 Monetary Policy

We must specify the objectives of monetary policy in order to close the model. In this regard, Section 2A of the Federal Reserve Act says that "The Board of Governors of the Federal Reserve System and the Federal Open Market Committee shall maintain long run growth of the monetary and credit aggregates commensurate with the economy's long run potential to increase production, so as to promote effectively the goals of maximum employment, stable prices, and moderate long-term interest rates." In terms of our model, we translate the above mentioned goals into an "output gap stabilization objective" $y_t = y_t^*$, and "a low inflation objective" $\pi_t = \pi \approx 0$, noting that the low inflation objective takes care of the low long-term interest rate objective.

Interestingly enough, the original Federal Reserve Act of 1913 specified a different set of objectives: "to furnish an elastic currency, to afford a means of rediscounting commercial paper, and to establish a more effective supervision of banking in the United States." At the time, the United States was on the gold standard which itself maintained price stability, and the Federal Reserve was set up to provide financial stability. This it did, partly by improving banking supervision, and mostly by smoothing short-term interest rates. The period between the Civil War and the founding of the Federal Reserve was marked by a number of recessions associated with sudden, sharp, and sustained spikes in short-term interest rates. Interest rate spikes of over 10 percentage points occurred on eight occasions, five of which were associated with banking panics.⁵ By providing currency and bank reserves through

⁵Major banking panics occurred in 1873, 1884, 1893, and 1907.

its discount window or by buying securities in the open market, the Fed introduced a degree of continuity into short-term nominal interest rates and eliminated the kind of interest rate spikes seen earlier. Between 1890 and 1910, the three-month nominal time loan rate was quickly mean-reverting and highly seasonal. By contrast, between 1920 and 1933, the three-month nominal rate was close to a random walk.⁶

"Continuity of the short rate" quickly became and has remained a routine feature of monetary policy. Short rate continuity is today reflected in the Fed's use of an interest rate policy instrument rather than a bank reserves policy instrument, and in the fact that the Fed likes to prepare markets for federal funds rate target changes. Interest rate continuity is reinforced by the fact that maintaining a given policy stance often means keeping the federal funds rate target fixed for months, or more, at a time.⁷ Interest rate continuity is not mentioned explicitly, or even implicitly anymore, as an objective of the Federal Reserve partly because it is so widely accepted, and partly because until 1994 the Federal Reserve deliberately obscured its management of short-term interest rates to deflect public criticism for high interest rates produced periodically to control inflation.⁸ Nevertheless, the Federal Reserve maintains a degree of short rate continuity as a matter of routine practice. The "interest rate continuity objective" in our model is an attenuation by the central bank of one-period-ahead forecast errors in the short-term nominal interest rate, $R_t - E_{t-1}R_t$.

To sum up, we think of the central bank as having three fundamental objectives: output gap stabilization, interest rate continuity, and low inflation. Parallel advances in the theory and practice of central banking, including important lessons from the Great Inflation, teach that monetary policy best stabilizes the output gap, maintains low and stable interest rates, and sustains low inflation by putting a priority on price stability. However, that counterintuitive lesson was not understood before the Great Inflation. Our contention is that the failure of monetary policy in the Great Inflation was due, in part, to the inclination of central banks including the Federal Reserve to put stabilization of the output gap and continuity of the short-term interest rate ahead of price stability. This was understandable. Prior to the Great Inflation, inflation in the United States was relatively low. Protracted inflation had never before been a problem in the United States in peacetime. The importance of monetary policy for inflation and inflation expectations was not then recognized fully. And later, the Fed lacked confidence that tight monetary policy could bring inflation down at any politically acceptable cost. We denote "business as usual" as the inclination of central banks to pursue output gap stabilization and interest rate continuity. We work out the implications of business-as-usual monetary policy for understanding the Great Inflation in the balance of the paper.

⁶See Mankiw, Miron, and Weil (1987).

⁷See Goodfriend (1991), Meltzer (2003), and Poole (1991).

⁸Goodfriend (2003) and Meltzer (2003).

4 Equilibrium Outcomes with "Business as Usual"

In this section we characterize the equilibrium behavior of inflation, output, and interest rates in a macromodel that combines new Keynesian pricing, the real business cycle core, the Fisher equation, the Euler equation, the term structure of interest rates, and business-as-usual monetary policy. The macroeconomic model that we develop gives rise to a time-varying trend rate of inflation, a "stochastic trend" component to inflation in the language of modern time series econometrics.

4.1 Trend Inflation Variability

To analyze the evolution of trend inflation, we begin by noting that the "law of iterated expectations" implies that

$$\bar{\pi}_t = E_t \bar{\pi}_{t+1} \quad (11)$$

since $E_t \bar{\pi}_{t+1} = E_t [\lim_{k \rightarrow \infty} E_{t+1} \pi_{t+1+k}] = [\lim_{k \rightarrow \infty} E_t \pi_{t+1+k}] = \bar{\pi}_t$. This is a useful observation, as it allows us to write (2) as

$$\pi_t = (1 - \beta) \bar{\pi}_t + \beta E_t \pi_{t+1} + h (y_t - y_t^*) \quad (12)$$

Hence, with a fixed or slowly evolving inflation trend, inflation at each point in time should resemble that under (1). For example, inflation should depend importantly on expected future output gaps, as stressed in much recent literature,

$$\pi_t = \bar{\pi}_t + h \sum_{j=0}^{\infty} \beta^j E_t (y_{t+j} - y_{t+j}^*) \quad (13)$$

Yet, as we look across various periods of high and low inflation, the general level of inflation would be fully explained by the trend.

To explore the origins of the inflation trend, suppose that the central bank fully stabilizes the output gap as part of its business-as-usual practices. Zero output gaps at all dates imply that

$$\pi_t - \bar{\pi}_t = \beta (E_t \pi_{t+1} - E_t \bar{\pi}_{t+1}) \quad (14)$$

mechanically from (2). However, since $\bar{\pi}_t = E_t \bar{\pi}_{t+1}$, this condition is equivalently that

$$\pi_t = E_t \pi_{t+1} = \bar{\pi}_t \quad (15)$$

A striking feature of this simple model is that inflation is *only* the stochastic trend. We add a transitory component in Section 7.1 below. The simple model serves to stress that output stabilization delivers a stochastic trend in inflation.

Further, a well-known property of stochastic inflation trends is that their changes are unpredictable,

$$\bar{\pi}_{t+1} = \bar{\pi}_t + \varepsilon_{t+1} \quad (16)$$

with ε_{t+1} being a random shock – to be determined below – with the property that $E_t\varepsilon_{t+1} = 0$. In terms of the model characteristics which we stressed above, we note that the absence of a long-run trade-off means that a zero output gap is consistent with stochastically evolving trend inflation. Of course, zero trend inflation, or any other constant inflation trend, would imply a zero output gap. This would be the special case in which ε_t was always zero.

4.2 Innovations to the Inflation Trend

According to the derivation above, output gap stabilization makes trend inflation variability possible. The variability of innovations to trend inflation, however, is governed by the other half of "business as usual," the degree of interest rate continuity. To see why, define the central bank's "interest rate continuity" parameter ϕ , where $0 < \phi < 1$ so that the degree of continuity increases with ϕ . Full stabilization of the output gap implies that $r_t = r_t^* = \sigma\rho\Delta y_t^* + r$ according to (8). We can write the consequences for the one-period-ahead forecast error for the nominal interest rate in terms of the forecast error in the natural rate of interest

$$R_t = E_{t-1}R_t + (1 - \phi)(r_t^* - E_{t-1}r_t^*) \quad (17)$$

Fisher equation (5) and random walk inflation then imply that

$$E_t\pi_{t+1} - E_{t-1}\pi_{t+1} = -\phi(r_t^* - E_{t-1}r_t^*) \quad (18)$$

Hence, the innovation ε_t in the stochastic inflation trend evolves as

$$\varepsilon_t = -\phi\sigma\rho\nu_t \quad (19)$$

where $\sigma\rho\nu_t$ is the forecast error in the natural rate of interest, and ϕ controls the influence of shocks to capacity output ν_t on trend inflation. For instance, without any interest rate continuity ($\phi = 0$), there are no innovations to trend inflation and nominal interest rate forecast errors fully reflect forecast errors in the natural rate of interest. In this case trend inflation is constant over time at a level determined by historical conditions. With full interest rate continuity ($\phi = 1$), one-period-ahead nominal interest rate forecast errors are eliminated completely, since the ε_t innovation to expected inflation is the negative of the $\sigma\rho\nu_t$ innovation to the natural interest rate.

In ways that are reminiscent of Goodfriend (1987) and Barro and Broadbent (1997), the central bank's concern for smoothing the nominal interest rate produces nonstationarity in a nominal variable. However, in our context this nominal variable is the inflation rate rather than the price level. With output always at capacity and short-term nominal interest rate forecast errors at least somewhat attenuated, the central bank gives up control of long run inflation, allowing trend inflation to evolve through time as a random walk.

4.3 Comovement of Short-term Interest and Inflation

Under the inflation process derived above, the effect of a real interest rate innovation on the path of the nominal interest rate is given by

$$\begin{aligned}
 E_t R_{t+j} - E_{t-1} R_{t+j} & & (20) \\
 = [E_t r_{t+j}^* - E_{t-1} r_{t+j}^*] + [E_t \pi_{t+j} - E_{t-1} \pi_{t+j}] \\
 = [\rho^j - \phi] \rho \sigma \nu_t
 \end{aligned}$$

for $j = 0, 1, 2, 3, \dots$ and $0 < \rho < 1$, with the coefficient $[\rho^j - \phi] \rho \sigma$ combining both real rate and expected inflation effects.

With full interest rate continuity ($\phi = 1$) a surprise increase in the current real interest rate is matched by an offsetting decrease in trend inflation which leaves the current nominal short term interest rate unchanged. Future nominal short rates then move gradually lower as the real natural interest rate returns asymptotically to its steady state r and the nominal interest rate moves permanently lower by $\rho \sigma \nu_t$. With partial interest rate continuity ($0 < \phi < 1$), a rise in the real rate can lead nearby nominal rates to rise while far away nominal rates fall.

As long as "business as usual" pursues some degree of interest rate continuity, trend inflation should rise in periods when the real interest rate is surprisingly low. For example, surprisingly low productivity growth typically lowers real interest rates, employment and output in real business cycle models. More generally, many different kinds of real shocks could affect the real interest rate: according to our model such shocks would contribute to the variability of trend inflation.

4.4 Term Structure Implications

The nominal long-bond rate would reflect the inflation effects more promptly than the short-rate. According to (10), the response of the L period long rate is

$$R_{Lt} - E_{t-1} R_{Lt} = \frac{1}{L} \sum_{j=0}^{L-1} [E_t R_{t+j} - E_{t-1} R_{t+j}] \quad (21)$$

$$= \frac{1}{L} \sum_{j=0}^{L-1} \{ [E_t r_{t+j}^* - E_{t-1} r_{t+j}^*] + [E_t \pi_{t+j} - E_{t-1} \pi_{t+j}] \} \quad (22)$$

$$= \frac{1}{L} \sum_{j=0}^{L-1} [\rho^j - \phi] \rho \sigma \nu_t = \left[\frac{1}{L} \frac{1 - \rho^L}{1 - \rho} - \phi \right] \rho \sigma \nu_t$$

The long-term interest rate would be a better indicator of movements in trend inflation than the short-term interest rate, with $R_{Lt} - E_{t-1} R_{Lt}$ approximately $-\phi \rho \sigma \nu_t = \bar{\pi}_t - \bar{\pi}_{t-1}$ for very long term instruments.

5 Implementing "Business as Usual"

The consequences for inflation, output, and interest rates of "business as usual" were characterized in Section 4 without saying anything about how the central bank's priorities for output gap stabilization and interest rate continuity could be achieved. We have four objectives in this section. First, we want to understand how business-as-usual priorities might be implemented with an interest rate rule. Second, we want to understand implementation in terms of a money growth rule. Third, we want to explain how a central bank, unaware of the effect of its business-as-usual priorities on trend inflation, could produce inadvertently the rational expectations equilibrium characterized in Section 4. Fourth, we want to point out that business-as-usual practices are susceptible to sudden, severe inflation surges capable of subordinating output gap stability and interest rate continuity to a priority for stabilizing inflation.

5.1 Implementation with an Interest Rate Rule

The interest rate rule

$$R_t = \bar{\pi}_t + r_t^* + \Omega(\pi_t - \bar{\pi}_t) \quad (23)$$

can deliver business-as-usual outcomes under the "Taylor principle" condition $\Omega > 0$, as follows. The rule says that the central bank adjusts its nominal interest rate policy instrument R_t so that the real interest rate $R_t - \bar{\pi}_t$ responds to the gap between actual inflation and what is, in effect, a time-varying inflation target $\bar{\pi}_t$. In addition, the central bank adjusts $R_t - \bar{\pi}_t$ one-for-one with fluctuations in the natural real rate of interest r_t^* .

We start by describing how this rule might work practically in response to a change in economic conditions. Suppose a negative shock to capacity output $\nu_t < 0$ in equation (4) causes r_t^* to fall in equation (8). In order to implement interest rate continuity and attenuate the incipient fall in R_t , the central bank must increase $\bar{\pi}_t$ somewhat. The required increase in $\bar{\pi}_t$ will vary from $\sigma\rho\nu_t$ to zero as the central bank's "interest rate continuity" parameter ϕ varies from unity to zero. The increase in $\bar{\pi}_t$ makes the inflation gap negative at the initial π_t . If the response coefficient Ω is sufficiently large, so that $R_t - \bar{\pi}_t$ is very sensitive to the inflation gap, then equilibrium interest rate policy will push π_t arbitrarily close to $\bar{\pi}_t$. In fact, in this case the central bank responds to deviations of inflation from its time-varying inflation target sufficiently aggressively that these never take place. Instead, equilibrium inflation π_t jumps immediately and permanently by $\bar{\pi}_t - E_{t-1}\bar{\pi}_t = -\phi\sigma\rho\nu_t$. It follows from (23) that $R_t - \bar{\pi}_t = r_t^*$. Since inflation is a random walk in this case, $E_t\pi_{t+1} = \bar{\pi}_t$, we have that $R_t - E_t\pi_{t+1} = r_t^*$ and the real interest rate shadows perfectly the underlying natural real rate of interest so that $y_t = y_t^*$ and the output gap is stabilized fully.

Interest rate rule (23) is consistent with a unique, stable rational expectations equilibrium that we described above. Formally, combining interest rate rule (23) and

Fisher equation (5), using the fact that $\bar{\pi}_t = E_t \bar{\pi}_{t+1}$, we find that $E_t \pi_{t+1} - E_t \bar{\pi}_{t+1} = \Omega(\pi_t - \bar{\pi}_t)$. Then, the stable forward-looking solution is $\pi_t = \bar{\pi}_t$, the business-as-usual equilibrium we derived in Section 4.

5.2 Implementation with a Money Growth Rule

The money growth rule

$$\Delta m_t^S = (\alpha - \phi\sigma\rho)\nu_t + \alpha\rho\Delta y_{t-1}^* + \pi_{t-1} \quad (24)$$

delivers "business as usual" objectives in a model that includes equations (2) through (7) augmented to include money demand function $\Delta m_t^D = \alpha\Delta y_t + \pi_t$, money growth rule (24), and a money market equilibrium condition $\Delta m_t^D = \Delta m_t^S$.

Suppose initially that the central bank wishes only to stabilize the output gap and sets $\phi = 0$. To do so, the central bank would move the current money stock with $\alpha\nu_t$ so that money market clearing makes current aggregate demand y_t conform to movements in capacity output y_t^* at the going inflation rate. To stabilize the output gap in the future, the central bank must make future money growth conform to future movements in money demand at capacity output and initial trend inflation. The required future money growth is reflected in the $\alpha\rho\Delta y_{t-1}^*$ term in (24). Future money growth would mirror the return of capacity output growth to its long run growth path scaled by the income elasticity of money demand, α . In this case, the nominal interest rate would shadow the real natural rate associated with the shock ν_t . Monetary policy would stabilize the output gap fully and perpetuate the initial inflation trend.

If the central bank also seeks to implement interest rate continuity with $0 < \phi < 1$, it must attenuate one-period-ahead forecast errors in the nominal interest rate by making expected inflation covary negatively with the shock to capacity output ν_t . This the central bank can do by promising to make future money growth covary negatively with ν_t . Consider a negative shock to ν_t . Seeing higher money growth coming, firms expect inflation to rise, and higher expected inflation stabilizes the short nominal rate against the negative shock to the real rate. Assume that the money growth rule continues to make aggregate demand y_t conform to capacity y_t^* as outlined above. In this equilibrium, firms pass higher expected inflation through one-for-one to current inflation. The pass-through shows up as the $-\phi\sigma\rho\nu_t$ term in (24), which reflects the natural real interest rate innovation, $\sigma\rho\nu_t$ multiplied by the central bank's interest-rate-continuity parameter ϕ . The term reflects the effect of higher π_t on current money demand that the central bank must accommodate to continue to stabilize y_t at y_t^* . The lagged π_{t-1} term present in the money growth rule is there so that money growth in period $t+1$ and thereafter perpetuates the elevated period t inflation trend required to stabilize the output gap.

5.3 How "Business as Usual" Creates Inflation Drift

Is it possible that a central bank in pursuit of output gap stabilization and interest rate continuity could push an economy unknowingly into the equilibrium with stochastic trend inflation characterized in Section 4? This is an important question to ask because there is little evidence that central banks thought of themselves as deliberately managing inflation expectations with either an interest rate rule or a money growth rule to implement business-as-usual objectives. We answer the question in the affirmative below, showing how the public's incentive to form inflation expectations rationally acts in conjunction with the central bank's pursuit of output gap stabilization and interest rate continuity to push an economy inadvertently into the equilibrium characterized in Section 4. In such an equilibrium, the public's rational expectations drives the stochastic trend in inflation which the central bank happily accommodates in the pursuit of its business-as-usual priorities. The central bank need not be aware of its own role in creating inflation drift, and yet monetary policy, whether thought of as implemented with an interest rate rule or a money growth rule as above, can be understood *as if* the central bank deliberately manages inflation expectations to achieve its output gap and interest continuity objectives.

To understand how business-as-usual monetary policy inadvertently puts a stochastic trend in the inflation rate, imagine that initially the inflation rate is low and stable and is expected to remain so at $E\hat{\pi}$. Imagine also that the economy is subject to shocks to capacity output. And suppose that the sole objective of monetary policy is to stabilize the output gap, i.e., $\phi = 0$. In this case, the central bank would not distinguish between nominal and real interest rates; it would regard its management of the short term nominal rate as equivalent to management of the short term real interest rate. With no continuity restrictions, the central bank would move R_t so that $R_t - E\hat{\pi} = r_t^*$ at all times. For instance, the central bank would respond to a negative shock $\nu_t < 0$ to capacity output by matching the initial fall in the real natural rate r_t^* with its nominal interest rate policy instrument R_t and shadowing the real natural rate as it moved back gradually to its steady state level r , according to equations (4) and (8). If the central bank focused exclusively on stabilizing the output gap, there would be no reason for inflation to be destabilized. Inflation, inflation expectations, and trend inflation all would remain firmly anchored at $E\hat{\pi}$. The long-term interest rate would remain firmly anchored as well.

However, things change if in addition to stabilizing the output gap the central bank pursues a degree of interest rate continuity, i.e., $0 < \phi < 1$. Now the central bank would attenuate somewhat the initial response of R_t to ν_t . For instance, the central bank would respond to a negative shock $\nu_t < 0$ with an attenuated cut in R_t so that $R_t - E\hat{\pi} > r_t^*$. Interest continuity thereby would push current aggregate demand below current capacity output. To stabilize the output gap, the central bank would compensate for the insufficient contemporaneous interest rate cut by steering interest rate policy somewhat *below* real natural interest rates in the future. Doing that, however, pushes future aggregate demand *above* the path of future capacity

output.

All this presumes that inflation, expected inflation, and trend inflation are anchored at $E\hat{\pi}$. But there is a problem: steering future real interest rates below real natural rates pushes future aggregate demand above capacity output. And new Keynesian pricing implies that the prospect of negative expected future output gaps elevates future inflation. Hence, we no longer have a rational expectations equilibrium. Eventually, the public would catch on to the fact that a negative shock to capacity output would be followed by higher inflation. Rationally expected future inflation would rise with negative shocks to capacity output.

But this is not the end of the story. Elevated expected inflation $E_t\pi_{t+1}$ in response to $\nu_t < 0$ would deepen the contemporaneous real interest rate cut $r_t = R_t - E_t\pi_{t+1} < R_t - E\hat{\pi}$, for any given degree of interest rate continuity ϕ . A deeper real rate cut, in turn, would allow the central bank to steer interest rate policy closer to real natural rates in the future. In the limit, the economy would converge to a rational expectations equilibrium response in which expected inflation would rise enough to push the current real interest rate all the way down to the current real natural interest rate. At this point, the central bank would stabilize the output gap fully because its nominal interest rate instrument (adjusted for elevated expected inflation) would perfectly shadow the natural real interest rate. Moreover, with the output gap stabilized fully, actual and expected rates of inflation would rise initially, identically, and permanently in response to a shock to capacity output. So, we see how the central bank's commitment to business-as-usual priorities and the public's incentive to form expectations of inflation rationally push the economy into the equilibrium with stochastic trend inflation characterized in Section 4.

5.4 From "Business as Usual" to "Fighting Inflation"

Our model suggests that business-as-usual monetary policy can be sustained indefinitely with low and reasonably stable inflation if the shocks to capacity output are small, especially if the central bank implements relatively little interest rate continuity so that ϕ is not too large. Nevertheless "business as usual" exposes inflation to considerable variability if shocks to capacity output become large and happen to cumulate in one direction or another for a period of time. The public can tolerate a considerable range of inflation drift as long as it is relatively gradual and "orderly." As an operational matter, the central bank can continue to pursue business-as-usual objectives effectively as long as trend inflation does not drift too violently. However, a particularly severe series of cumulative negative shocks to capacity output has the potential to drive inflation, expected inflation, trend inflation, and the long-term interest rate all suddenly and sharply higher, even if all had been well-behaved for years. If inflation drifts upward too far, too fast in a "disorderly" manner, then "business as usual" may become unsustainable. The public may demand that inflation be contained and the central bank may be unable to execute stabilization policy effectively

in the absence of a "nominal anchor."

When such developments cause output gap stability and interest rate continuity to be subordinated to containing inflation, the central bank is forced to switch from "business as usual" to "fighting inflation." The central bank fights inflation by aggressively raising its nominal interest rate policy instrument above expected inflation in order to elevate longer-term real interest rates according to (9) to depress aggregate demand below capacity. According to new Keynesian pricing, given the expected rate of inflation, the central bank must sustain an output gap in order to make progress against inflation.⁹ Once inflation is stabilized, even without much if any reduction, pressure builds quickly for the central bank to revert to "business as usual" in order to close the output gap and stabilize interest rates again. Thus, our business-as-usual model of monetary policy predicts that a period of large, cumulative negative shocks to capacity output is likely to precipitate a cycling of monetary policy priorities with upward inflation drift interrupted periodically but temporarily by deliberately contractionary monetary policy.

6 Empirical Implications of "Business as Usual"

Our model of business-as-usual monetary policy has the following empirical implications that we put to work to help understand the Great Inflation in Section 7:

- i) Inflation is a random walk with a transitory component.
- ii) The random walk in inflation is driven by shocks to the growth of capacity output.
- iii) The variance of the permanent shock to inflation is directly related to the degree of interest rate continuity pursued by the central bank, the serial correlation in the growth of capacity output, and the variance of the shocks to capacity output growth, and inversely related to the intertemporal elasticity of substitution in consumption.
- iv) Short-term interest continuity leads to long-term interest rate random walking.
- v) Real interest rate and inflation rate innovations are negatively correlated due to interest rate smoothing.
- vi) Long-term interest rates lead short-term interest rates.
- vii) In addition to sharply rising inflation, episodes of "inflation fighting" should be preceded by 1) a series of particularly severe, cumulative negative shocks to the

⁹Goodfriend and King (2005) analyze the mechanics of "fighting inflation" in a closely related model.

growth of capacity output, 2) rising long-term interest rates, and 3) rising short-term interest rates that lag the rise in long-term rates.

viii) "Inflation fighting" that makes progress against inflation should precipitate a recession, after which pressure to return to "business as usual" should reverse these gains quickly in the presence of ongoing negative shocks to capacity output. Episodes of "inflation fighting" thereby contribute to the variability of the stochastic inflation trend.

ix) The powerful incentive for a central bank to pursue business-as-usual priorities when inflation is well behaved means that *low* inflation should inherit a stochastic trend from shocks to capacity output, though the variance of the stochastic trend may be small.

x) The marginal predictive content of the output gap for inflation should deteriorate in periods of low and stable inflation relative to periods of high and variable inflation interrupted periodically by "inflation fighting."

7 Understanding the Great Inflation

We draw on a variety of evidence to understand the Great Inflation in terms of our business-as-usual model of monetary policy. First, we show that the statistical time series model of US inflation identified and estimated by Stock and Watson (2007) is predicted by our model. Second, we use a measure of aggregate technology change for the United States constructed by Basu, Fernald, and Kimball (2006), together with Romer and Romer (1989) inflation-fighting dates, and time series for inflation and the term structure of interest rates, to show that these data behave as predicted by our model preceding periods when the Federal Reserve made "inflation fighting" a priority. Third, we emphasize that the attachment to "business as usual" predicts the "stop and go" character of monetary policy during the Great Inflation documented and studied by Shapiro (1994) in which the gains against inflation achieved during periods of fighting inflation were short-lived. Fourth, we explain why our model of monetary policy predicts the post-Great Inflation deterioration of predictive content of the output gap for inflation found by Atkeson and Ohanian (2001) and confirmed by Stock and Watson (2007).

7.1 A Statistical Time-Series Model of US Inflation

In their 2007 study of the statistical behavior of US inflation from the 1950s to 2004, Stock and Watson find that a "univariate inflation process is well described by an unobserved component trend-cycle model with stochastic volatility or, equivalently, an integrated moving average process with time-varying parameters."¹⁰ They report

¹⁰Stock and Watson (2007), page 3.

that the model explains a variety of recent forecasting puzzles and begins to explain some multivariate inflation forecasting puzzles as well. Their statistical model also happens to be predicted by our business-as-usual model of monetary policy as follows.

For heuristic purposes we utilized the new Keynesian pricing equation (2) without a shock term to highlight the random walk implication of our model: $\pi_t = \bar{\pi}_t$ and $\bar{\pi}_t = \bar{\pi}_{t-1} + \varepsilon_t$. However, standard practice is to add a white noise shock to the inflation equation, say η_t . Then, since η_t is unforecastable, the inflation solution becomes $\pi_t = \bar{\pi}_t + \eta_t$, where $\bar{\pi}_t = \bar{\pi}_{t-1} + \varepsilon_t$ under business-as-usual assumptions of output at capacity and interest rate continuity.

In purely statistical terms, the Stock and Watson finding of an apparent unit root in π_t , with negative first-order autocorrelations, and generally small higher-order autocorrelations of $\Delta\pi_t$ suggest that the inflation process is well described by the IMA(1, 1) process

$$\Delta\pi_t = (1 - \theta\mathbf{B})a_t, \quad (25)$$

where θ is positive, a_t is serially uncorrelated with mean zero and variance σ_a^2 , and \mathbf{B} is a backshift operator.

Stock and Watson point out that the IMA(1, 1) statistical model is observationally equivalent to an unobserved components model in which π_t has a stochastic trend τ_t and a serially uncorrelated disturbance η_t :

$$\pi_t = \tau_t + \eta_t, \quad \eta_t \text{ serially uncorrelated } (0, \sigma_\eta^2) \quad (26)$$

$$\tau_t = \tau_{t-1} + \varepsilon_t, \quad \varepsilon_t \text{ serially uncorrelated } (0, \sigma_\varepsilon^2), \quad (27)$$

where $\text{cov}(\eta_t, \varepsilon_j) = 0$ for all j .

Thus, our theoretical model implies the statistical model of inflation identified by Stock and Watson, and we can interpret aspects of their statistical analysis from the perspective of our model.

Stock and Watson report IMA(1, 1) parameters and the implied unobservable components parameters, as well as a variety of other statistics estimated using quarterly U.S. inflation data from the 1950s to 2004 for a variety of inflation indexes. Broadly speaking, the findings are similar for all the indexes. For our purposes, the main findings are these: (1) inflation is driven by a random walk component τ_t plus a transitory component η_t , (2) a time-varying estimate of the standard deviation of the permanent innovation $\sigma_{\varepsilon,t}$ is 0.5 (percentage points at an annual rate) in the 1950s through the mid-1960s, rises sharply to a peak of 1.4 in the mid-1970s, falls gradually back below 0.5 by the mid-1980s, and settles below 0.2 after the mid-1990s, (3) a time-varying estimate of the standard deviation of the transitory innovation $\sigma_{\eta,t}$ is around 0.5 from the 1950s to 2004.

>From this statistical perspective, the Great Inflation is a story about the "Great Inflation Drift" in the sense that the elevated variance of inflation during the great inflation is entirely due to large increases in the variance of the innovation of the stochastic trend component driving inflation. Importantly, Stock and Watson point

out that although the estimated variance of the permanent innovation in inflation diminished in statistical and economic importance since the mid-1980s, it remains nonzero in that confidence intervals for the largest AR root continue to include one.

Stock and Watson's statistical model of the inflation process supports several empirical predictions of our model listed in Section 6. First, U.S. inflation is characterized parsimoniously, and consistently as a random walk with a transitory component. This is in keeping with our view that "business as usual" has been the predominant mode of monetary policy behavior, and that it induces a stochastic trend in inflation in the presence of shocks to capacity output. Second, the increased variability of inflation during the Great Inflation does show up as an increase in the variability of the innovation in the stochastic trend component, as our model of monetary policy predicts. Third, inflation through 2004 still appears to contain a small stochastic trend even after having been stabilized at a low rate for a decade as our model predicts, since a central bank has a particularly strong incentive to pursue business-as-usual priorities when inflation is well behaved, and shocks to the growth of capacity output will always occur even if more subdued, more offsetting, and more benign than at other times.

7.2 Factors Precipitating "Inflation Fighting"

Romer and Romer (1989) document that since World War II the Federal Reserve tightened monetary policy decisively to fight inflation on six occasions beginning respectively in October 1947, September 1955, December 1968, April 1974, August 1978, and October 1979. Only two significant increases in unemployment were not preceded by Fed action to fight inflation. One occurred in 1954 after the Korean War and the second occurred in 1961, after the Fed tightened monetary policy to improve the international balance of payments. The two earliest Romer dates were part of a series of Fed policy actions through the mid-1960s that kept inflation relatively low on average. We are interested in the remaining four Romer dates, those that occurred during the Great Inflation.

We interpret Romer dates as instances when the Federal Reserve switched from "business as usual" to "fighting inflation." Our model predicts that periods of "business as usual" preceding Romer dates should exhibit (1) sharply rising inflation, (2) a sequence of severe cumulative negative shocks to the growth of capacity output, (3) rising long term interest rates, and (4) rising short-term interest rates lagging long rates. To check whether the Romer dates are precipitated as predicted, we employ an annual time series measure of technology change in the United States constructed by Basu, Fernald, and Kimball (2006) that controls for aggregation effects, varying utilization of capital and labor, nonconstant returns, and imperfect competition. We utilize the BFK series in conjunction with data on inflation and the term structure of interest rates, all shown in Figures 1 through 5 at the back of the paper, to check whether the evidence supports the predictions of our model for each of the Romer

dates in the Great Inflation. Broadly speaking, the evidence is consistent with the predictions of our model.

7.2.1 December 1968:

Inflation averaged about 1.5% at an annual rate in the first half of the 1960s, and surged at the start of the Great Inflation in 1965 to around 3% at the end of 1966. Inflation stabilized briefly in the first half of 1967, after the Federal Reserve tightened monetary policy briefly, but surged again to around 4.5% by the first Romer date of the Great Inflation in December 1968. A number of explanations have been offered to explain the start of the Great Inflation, e.g., excessive Federal spending to finance the Vietnam buildup, insufficient Federal Reserve independence, and a willingness to tolerate higher inflation in the belief that it might bring unemployment down according to the Phillips curve.¹¹ Our interest, however, is to check whether the December 1968 switch to "fighting inflation" is preceded, in addition to the sharp rise in inflation, by the three other factors predicted by our business-as-usual model of monetary policy. As predicted, BFK technology growth slows sharply and cumulatively in 1969. The 10 year government bond rate moved up from 4% at the end of 1966 to nearly 6% at the end of 1968, indicating that 2 percentage points of the inflation surge prior to December 1968 was regarded as permanent. Finally, starting at 4% at the end of 1966, the federal funds rate clearly lagged the 10 year rate but caught up prior to December 1968.

7.2.2 April 1974:

Inflation rose sharply from around 3% in mid-1973 to nearly 10% by the April 1974 Romer date, exacerbated by the first oil shock and the relaxation of price controls. Again, BFK technology growth slows sharply and cumulatively in the period preceding the Romer date in 1974. The 10 year bond rate moved up from about 6% in late 1972 to about 7.5% in April 1974, reversing the decline in the 10 year rate achieved by the previous period of inflation fighting triggered by the December 1968 Romer date, and indicating that only 2 percentage points of the surge in inflation was then regarded as permanent. Finally, starting from around 4% in late 1972, the federal funds rate only briefly lagged the 10 year rate on the way up. The funds rate passed the bond rate in 1973 and reached around 10% by April 1974.

7.2.3 August 1978:

By early 1977, inflation settled at around 6% as a result of the "inflation fighting" begun in April 1974. Inflation began to move up once more in 1978, however, rising to around 7% by the August 1978 Romer date. Once more, BFK technology growth slows sharply and cumulatively in the period preceding the Romer date. The 10 year

¹¹For instance, see Meltzer (2005) and references contained therein.

bond rate had fallen back to around 7.5% in mid-1977 as a result of the "inflation fighting" begun in April 1974. The 10 year rate then rose sharply by around 1 percentage point to around 8.5% by the 1978 Romer date, indicating that 1 percentage point of the upward inflation drift was regarded as permanent. Finally, starting from around 5% in mid-1977, the federal funds rate lagged the rising long rate, and again caught up around the Romer date.

7.2.4 October 1979:

The period from August 1978 to the Romer date of October 1979 saw inflation surge from 7% to around 9.5%. And again, as predicted by our model, BFK technology growth in 1979 was surprisingly weak, lengthening the period of surprisingly slow growth of technology that preceded the August 1978 Romer date. The 10 year rate moved up by another 1 percentage point to October 1979, indicating that 1 percentage point of the inflation surge was regarded as permanent. In this case, starting roughly in line with the 10 year rate in August 1979, the federal funds rate actually led the long rate up as part of the inflation-fighting policy actions undertaken in the wake of the August 1978 Romer date. The Federal Reserve moved the federal funds rate above the long-term interest rate to 13.5% in October 1979.

7.3 Stop and Go Monetary Policy

Looking at the record before and after Romer dates, there is a recurrent pattern highlighted previously by Shapiro (1994). It is clear that the Romer dates initiate periods of inflation fighting in that they are all preceded by sharply higher inflation and followed by sharply higher short term interest rates engineered by the Fed relative to long term interest rates. Nevertheless, within two or three years inflation is no lower than when the period of "inflation fighting" began, indicating that these inflation-fighting episodes were meant to contain inflation or that they were aborted attempts at reducing the inflation rate. For instance, the pattern is evident with respect to the inflation-fighting periods initiated by the December 1968 and April 1974 Romer dates. The Fed initiated recessions in 1970 and 1973-75 as part of its inflation-fighting actions. And these recessions brought down inflation, trend inflation, and long bond rates. However, these gains were reversed within a few years.

Our model of monetary policy predicts that "stop and go" policy should be an integral part of a period of protracted inflation driven by recurring cumulative negative shocks to technology such as we saw in the Great Inflation. According to the model, business-as-usual priorities exposed the US economy to upward inflation drift due to unexpectedly slow growth of technology during the Great Inflation years. On a few occasions, a series of especially large, cumulative negative shocks to technology pushed inflation, expected inflation, and long-term interest rates up sharply and precipitated a period of "inflation fighting." The model predicts that inflation, inflation expectations, and long term interest rates could be brought down *only* by creating

a protracted recession, that is, by creating an output gap of enough size and duration to induce a disinflation in line with new Keynesian pricing. Thus, the model predicts that the stabilization of inflation would create pressure for monetary policy to end the recession and return to "business as usual." The return to "business as usual" would expose the economy once more to upward inflation drift in the presence of unexpectedly slow growth of technology. Our view then, is that the attachment to business-as-usual priorities is central to understanding the tremendous output and employment volatility of the Great Inflation, as well as its intractability and longevity.

7.4 Predictive Content of the Output Gap for Inflation

A striking statistical finding emphasized by Atkeson and Ohanian (2001) and confirmed by Stock and Watson (2007) is that the marginal predictive content of output-gap variables for inflation has deteriorated dramatically since 1984. Specifically, Atkeson and Ohanian compare the accuracy of inflation forecasts augmented with three different output-gap variables to a naive forecast that at any date inflation will be the same over the next year as it has been over the last year. They find that none of the forecasts is more accurate than the naive forecast, which is essentially a random walk forecast of inflation. Stock and Watson (2007) investigate the marginal predictive content of output-gap variables for inflation in more detail by augmenting a benchmark univariate forecasting model with a variety of measures and specifications of gap variables, and by comparing the marginal predictive content of the gap variables for two sample periods—a Great Inflation sample period from 1970 to 1983, and a Great Moderation sample period from 1984 to 2004.

Stock and Watson report that the relative performance of the gap forecasts deteriorated substantially from the first period to the second. For example, during the 1970-1983 period at the four-quarter horizon, an inflation forecast augmented with an unemployment rate gap outperformed a univariate inflation autoregression benchmark with a relative mean square forecast error of 0.88. But during the 1984-2004 period it performed worse than the benchmark with a relative MSFE of 1.48. They report that the change in relative performance is even larger at the eight-quarter horizon. The deterioration of output-gap forecasts is found for all activity predictors examined. The poor performance of gap variables is not simply a consequence of failing to allow for a time-varying NAIRU or time-varying potential GDP. Finally, Stock and Watson report that the Atkeson and Ohanian naive (random walk) forecast substantially improves upon the above-mentioned forecasts at the four- and eight-quarter horizons in the 1984-2004 period, but not at shorter horizons and not in the first period.

We regard the changing informativeness of the output gap for future inflation as important evidence in support of our business-as-usual model of monetary policy. Given the incentive to pursue business-as-usual priorities when inflation is low and stable, and to allow inflation to drift around, we would have expected the output gap

to have much less predictive content for inflation during the Great Moderation than during the Great Inflation. Even though "business as usual" was also the predominant mode of Federal Reserve behavior during the Great Inflation, the Fed was then forced into "fighting inflation" on four Romer-date occasions. The output gap had great predictive content for inflation during the "inflation fighting" episodes because the Federal Reserve then deliberately created output gaps to contain inflation and bring it down. Thus, on the basis of our model one would not be surprised by Stock and Watson's finding that the Great Inflation sample period displays predictive content of output gaps for inflation far in excess of that evident during the Great Moderation.

8 Conclusion

The Great Inflation in the United States can be characterized statistically as a period in which a highly-volatile stochastic inflation trend exhibited fifteen years of predominantly positive innovations. We showed that a simple textbook macroeconomic model implies that a stochastic inflation trend arises if the central bank seeks to maintain output at a capacity level which varies through time, and also places weight on continuity of the short-term interest rate. Both of these features were, we believe, important components of Federal Reserve behavior. In our model, rising inflation results from a combination of "bad policy" and "bad luck". The presence of stochastic trend inflation results from bad policy, which perpetuates inflation shocks. Our model identifies the source of the shocks as surprisingly slow productivity growth and, more generally, factors unexpectedly slowing the growth of capacity output. We found evidence of bad luck in that productivity growth was indeed surprisingly and especially slow during episodes of sharply rising inflation during the period.

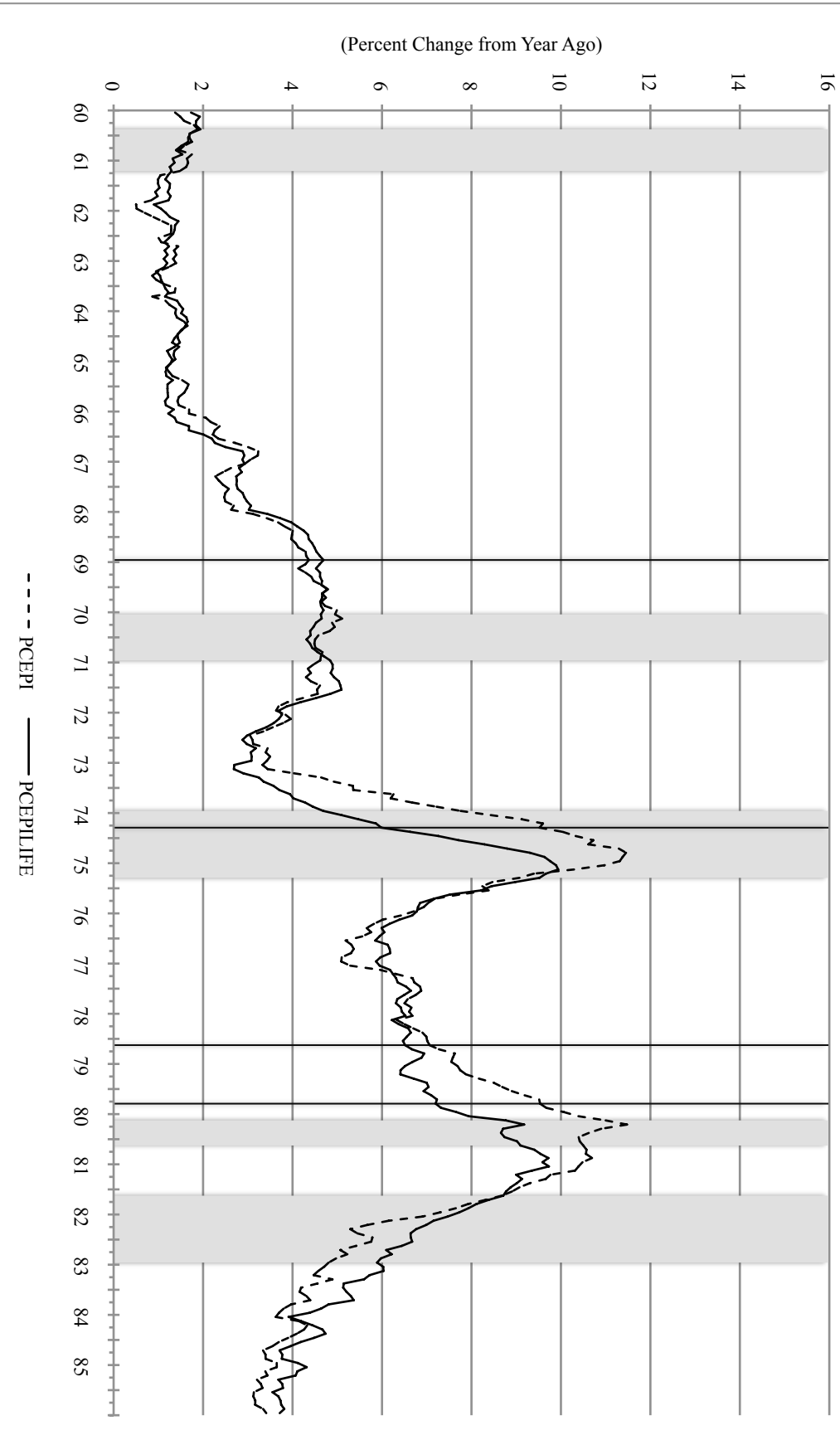
One reason for studying the Great Inflation is to prevent a recurrence of it. Our interpretation of the period suggests that a preoccupation with short-term interest rates and with maintaining output at capacity would, in the presence of adverse real shocks, combine to produce another period of inflation drift with similarly adverse consequences for employment and output.

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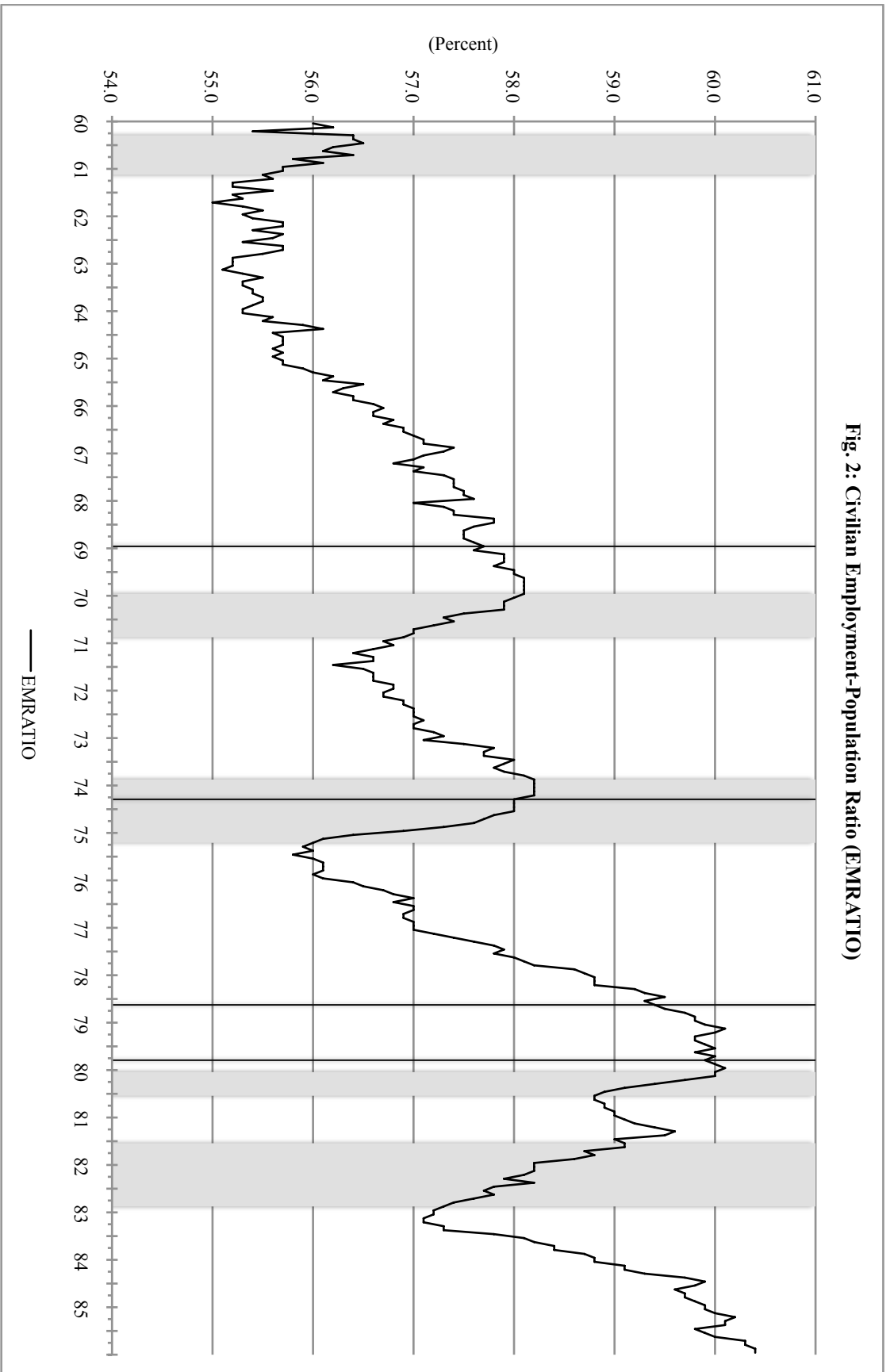
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Fig. 1: Personal Consumption Expenditures: Chain-type Price Index (PCEPI) and Consumption Expenditures: Chain-Type Price Index Less Food and Energy (PCEPILIFE)



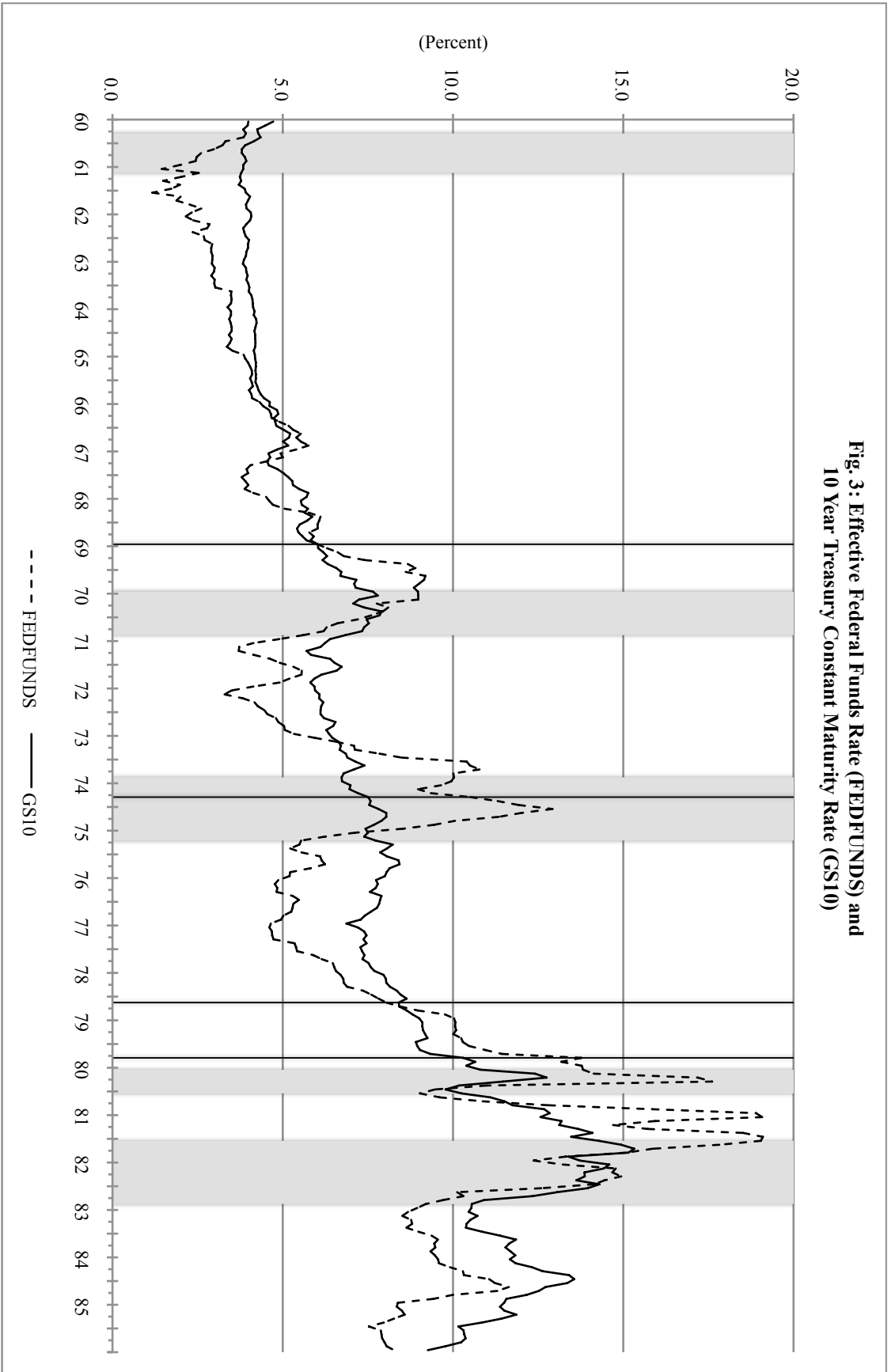
* Notes: Vertical lines indicate "Romer dates".
 Shaded areas indicate NBER recessions.
 Dates are under 1st Month of Year; tick marks are every 3 months.

Fig. 2: Civilian Employment-Population Ratio (EMRATIO)



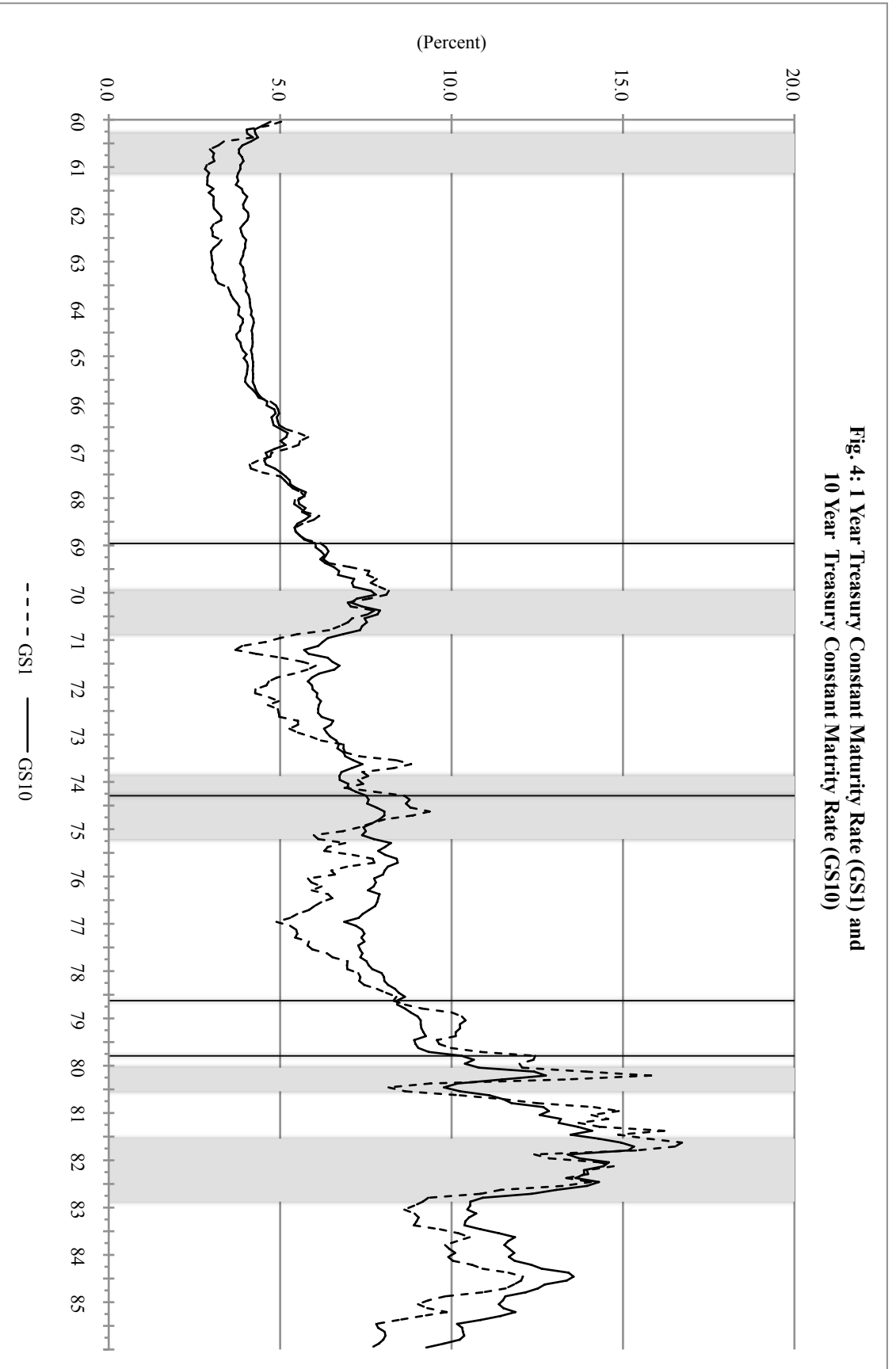
* Notes: Vertical lines indicate "Romer dates".
Shaded areas indicate NBER recessions.
Dates are under "1st Month of Year"; tick marks are every 3 months.

Fig. 3: Effective Federal Funds Rate (FEDFUNDS) and 10 Year Treasury Constant Maturity Rate (GS10)



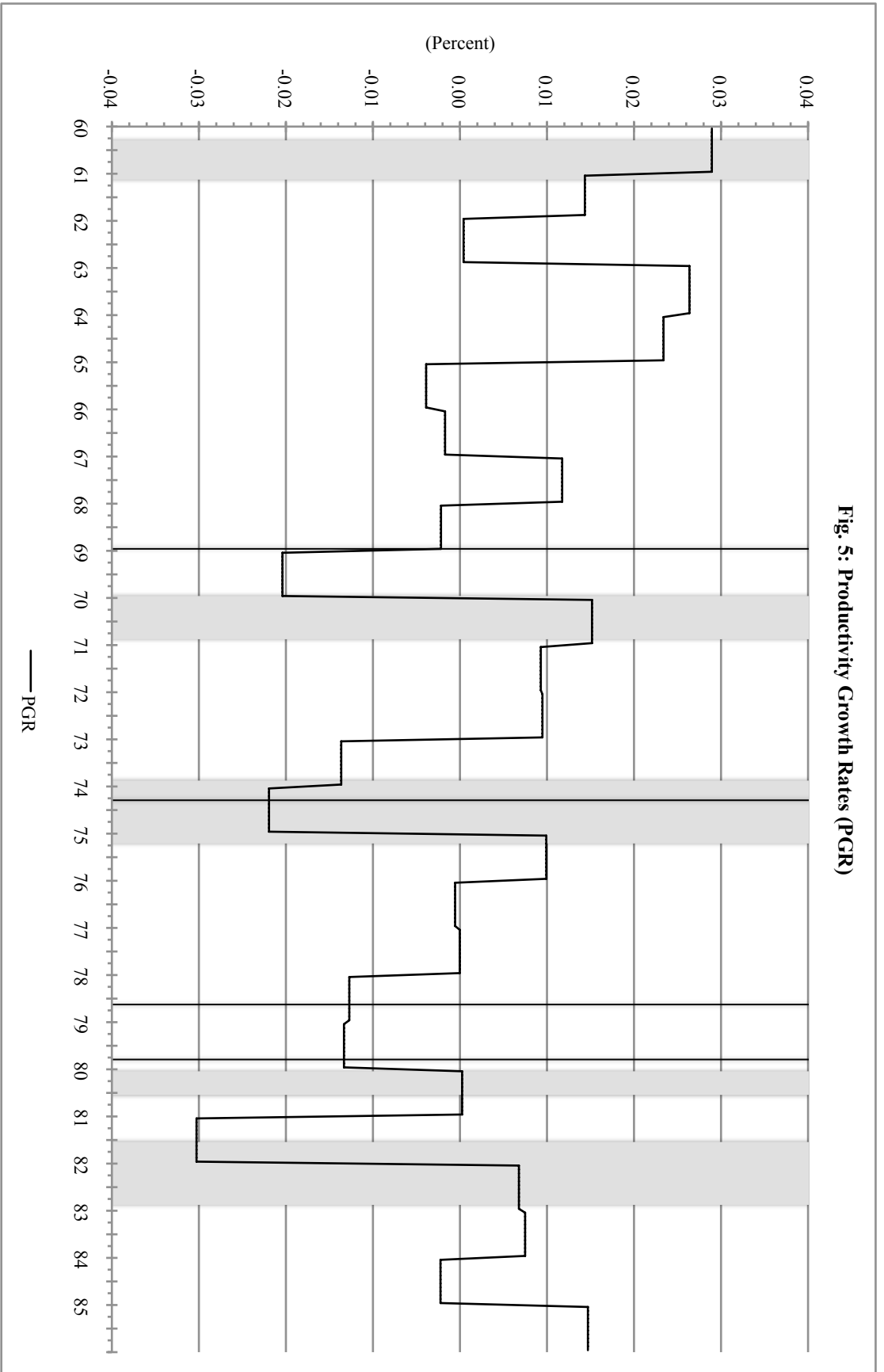
* Notes: Vertical lines indicate "Romer dates".
 Shaded areas indicate NBER recessions.
 Dates are under 1st Month of Year; tick marks are every 3 months.

**Fig. 4: 1 Year Treasury Constant Maturity Rate (GS1) and
10 Year Treasury Constant Maturity Rate (GS10)**



* Notes: Vertical lines indicate "Romer dates".
Shaded areas indicate NBER recessions.
Dates are under 1st Month of Year; tick marks are every 3 months.

Fig. 5: Productivity Growth Rates (PGR)



* Notes: Vertical lines indicate "Romer dates".
Shaded areas indicate NBER recessions.
Dates are under 1st Month of Year; tick marks are every 3 months.