# INFLATION DRIFT: MONETARY POLICY AND MACROECONOMIC STABILITY

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Prepared for
NBER Pre-conference "A
Retrospective on the Great Inflation"

February 29, 2008

# Abstract

To understand the origin and nature of the Great Inflation in the United States, we argue that it is necessary to view the US central bank as giving prominence to two objectives: the stabilization of economic activity and the avoidance of large period-to-period changes in short-term nominal interest rates. We portray the Federal Reserve as maintaining these objectives in the face of real developments that affect the level of output and the level of the natural real rate of interest, thus making inflation variable.

A baseline model of monetary policy makes the prediction that inflation contains a "permanent component" in the language of modern time series econometrics. Thus, the upward drift in US inflation from the 1960s to the early 1980s arises as a consequence of a series of adverse real shocks hitting the

1

economy and the central bank allowing inflation to randomly walk around.

This view embodies the idea that there was no "nominal anchor" for US monetary policy. Hence, by mid-1979 many in the US had come to believe that a very wide range of future inflation scenarios was possible. The volatile domestic and international situation at the time led to particularly volatile private sector beliefs evident in what we call "inflation scares" when these involved sharp increases in long-term expected inflation and long-term interest rates.

A fundamental incompatibility among central bank objectives--for low inflation, output stability, and financial stability as a "continuity of the short rate"-- was at the root of the problem. The time-varying resolution of this incompatibility accounts for the upward inflation drift punctuated on numerous occasions by short-lived periods of recession and disinflation.

# Overview

## I. NNS/NK Model Components
    i)   Forward-looking pricing
    ii)  Forward-looking aggregate demand
    iii) Central bank policy rule

## II. Central Bank Objectives
    i)   Low inflation
    ii)  Output gap stability
    iii) Financial stability as continuity
         of the short rate

## III. Fundamental Tension of Central Banking

## IV. Solution Procedure

## V. Solution Under Policy Rules

Policy Rule 1:
Inflation Stabilization and Output Gap Stabilization

Policy Rule 2:
Output Gap Stabilization with Continuity of
Short Rate

# VI. Shifting Policy Priorities
    i)  Business as usual
    ii)  Containing inflation
    iii) Deliberate disinflation

# VII. Using the Model to Understand the Great Inflation

# VIII. Implications for Inflation Drift and Monetary Instability Today

# I. NNS/NK Model Components

New Keynesian Pricing

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

Euler Equation

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

Fisher Equation

3) $R_t = r_t + E_t \pi_{t+1}$

Money Demand

4) $\Delta m_t^{\mathrm{d}} = a(y_t - y_{t-1}) + \pi_t$

Capacity Output

5) $\Delta y_t^* = \rho \Delta y_{t-1}^* + u_t$

Money Supply Rule

6) $\Delta m_t^{\mathrm{s}} =$
$\pi + \theta_1 u_t + \theta_2(y_{t-1} - y_{t-1}^*) + \theta_3 \Delta y_{t-1}^* + \theta_4 \pi_{t-1}$

Money Market Clearing

7) $\Delta m_t^{\mathrm{d}} = \Delta m_t^{\mathrm{s}}$

## II. Central Bank Objectives

Stabilize the output gap to make actual output conform to potential output: $y_t = y_t^*$

Target low inflation: $\pi_t = \pi \approx 0$

Maintain a "continuity of the short rate" to minimize one-period-ahead surprises in the evolution of the short-term nominal interest rate: $R_t - E_{t-1} R_t = 0$

## III. Fundamental Tension of Central Banking

Compatible pairs of central bank objectives

Pair 1: $z_t = y_t - y_t^*$ and $\pi_t = \pi \approx 0$

Pair 2: $z_t = y_t - y_t^*$ and $R_t - E_{t-1}R_t = 0$

$(\pi_t = \pi \approx 0, \; R_t - E_{t-1}R_t = 0$ incompatible$)$

--Resolution of the "fundamental tension of central banking" is central to understanding the rise and fall of inflation in the United States and elsewhere

--Central bank priorities shift over time depending on circumstances, reflecting a time-varying resolution of the fundamental incompatibility of central bank objectives

## IV. Solution Procedure

Determine "$\theta$" policy parameters in money supply rule (6) to satisfy compatible pairs of central bank objectives

Conjecture minimum state-variable solutions for $\pi_t$ and $z_t$

$$\pi_t = \Omega_{11} + \Omega_{12} z_{t-1} + \Omega_{13} u_t + \Omega_{14} \Delta y^*_{t-1} + \Omega_{15} \pi_{t-1}$$
$$z_t = \Omega_{21} + \Omega_{22} z_{t-1} + \Omega_{23} u_t + \Omega_{24} \Delta y^*_{t-1} + \Omega_{25} \pi_{t-1}$$

Use the method of undetermined coefficients to solve for $\Omega$ coefficients in terms of the four model parameters $h, \sigma, a$ and $\rho$, and the four "$\theta$" money supply rule policy parameters that satisfy the two compatible pairs of central bank objectives

## V. Solution Under Policy Rules

### Solution with Money Supply Rule 1
Output Gap and Inflation Stabilization
$(z_t = 0$ and $\pi_t = \pi \approx 0)$

5) $\Delta y^*_t = \rho \Delta y^*_{t-1} + u_t$

8) $\Delta m = \pi + a u_t + a \rho \Delta y^*_{t-1}$      (no $z_{t-1}$)

9) $\pi_t = \pi \approx 0$

10) $z_t = 0$

11) $R_t = r + \pi + \sigma\rho\Delta y_t^*$

## Solution with Money Supply Rule 2
### Output Gap Stabilization and Continuity of the Short Rate
$(z_t = 0$ and $R_t - E_{t-1}R_t = 0)$

Derive continuity of short rate restriction by writing Euler equation (2) in terms of $z_t$ and using Fisher equation (3) to write

12) $R_t = r + E_t\pi_{t+1} + \sigma[E_t z_{t+1} - z_t] + \sigma\rho\Delta y_t^*$

Substitute for $E_t\pi_{t+1}$ and $E_t z_{t+1}$ in (12) with conjectured solutions for $\pi_t$ and $z_t$, and use (5) to substitute for $\Delta y_t^*$ to find the restriction that achieves $R_t - E_{t-1}R_t = 0$

Objectives $z_t = 0$ and $R_t - E_{t-1}R_t = 0$ are achieved by money supply rule

13) $\Delta m_t = (a - \sigma\rho)u_t + a\rho\Delta y^*_{t-1} + \pi_{t-1}$,

which yields time series processes

14) $z_t = 0$

15) $\pi_t = -\sigma\rho u_t + \pi_{t-1}$

16) $R_t = r + \pi_t + \sigma\rho\Delta y^*_t$

5) $\Delta y^*_t = \rho\Delta y^*_{t-1} + u_t$

--Mechanics of Money Supply Rule 2:

i) $u_t \downarrow \Rightarrow m_t \downarrow$ makes $y_t = y^*_t \downarrow$

ii) $u_t \downarrow \Rightarrow r^*_t = \sigma E_t \Delta y^*_{t+1} = \sigma\rho\Delta y^*_t = \sigma\rho u_t \downarrow$

iii) $R_t - E_{t-1}R_t = 0 \Rightarrow E_t\pi_{t+1} \uparrow$ by $-\sigma\rho u_t \uparrow$

iv) $y_t - y_t^* = 0 \Rightarrow \frac{1}{h}[E_t\pi_{t+1} - \pi_t] = 0$

v) $\pi_t \uparrow$ by $E_t\pi_{t+1} \uparrow \Rightarrow \Delta m_t \uparrow$ by $-\sigma\rho u_t$

$\Rightarrow$ Net response of money growth to capacity output shock is $\Delta m_t = (a - \sigma\rho)u_t$ to stabilize output gap and maintain short rate continuity

$\Rightarrow$ By (iv), inflation is a random walk

$u_t < 0 \Rightarrow$ positive innovation to random walk inflation, negative shock to ex ante real interest rate returns gradually to $r$, there is no immediate innovation to short nominal interest rate, short nominal rate rises as negative shock to ex ante real short rate dissipates, longer-term nominal rates move up immediately with response that rises with maturity, long rates move up immediately with trend inflation

# VI. Shifting Policy Priorities

--Central bank manages incompatible priorities by switching among three regimes: "business as usual," "containing inflation," and "deliberate disinflation"

## Business as Usual--Money Supply Rule 2

--Central bank relatively indifferent to stochastic inflation trend when inflation is low and stable

--Priority on output gap stabilization and short rate continuity in such circumstances

--Follows Money Supply Rule 2, which we denote as "business as usual"

--Business as usual exposes trend inflation to capacity output shocks and allows inflation to drift randomly

--No stable nominal anchor, trend inflation subject to factors beyond the central bank's control...inflationary negative shocks to capacity output and deflationary positive shocks to capacity output

--Factors potentially influencing capacity output growth: productivity growth, investment, relative energy prices, terms of trade, taxes, regulations, defense purchases, tariffs, international capital controls, incomes policies, credit controls, financial market disturbances...

--Business as usual exposes trend inflation to shocks and fluctuating beliefs about factors potentially influencing capacity output growth mentioned above

--A sequence of positive innovations to trend inflation for whatever reason can cause beliefs to become hypersensitive to current and future factors believed to determine

trend inflation giving rise to volatile inflation expectations observed as "inflation scares" in long-term bond rates

--Business as usual passes shocks to inflation expectations through to actual trend inflation

--Increasingly volatile inflation expectations and long-term interest rates discourage investment, cause negative shocks to capacity output growth, and worsen the inflation scare problem

## Containing Inflation

--Shocks that cause inflation and expected inflation to drift upward far enough or fast enough, even from a relatively low trend, cause a central bank to shift priorities from "business as usual" to "containing inflation"

--Containing inflation means giving up short rate continuity and possibly raising short rates aggressively to stabilize inflation at the current trend with the objective of perpetuating current trend inflation

--If a central bank establishes credibility for stabilizing the current inflation trend $(\bar{\pi})$ and drops continuity of the short rate, then Money Supply Rule 1 can stabilize the output gap at $z_t = 0$ and stabilize inflation at $\bar{\pi} > \pi \approx 0$

--If the $\bar{\pi}$ inflation trend is challenged with an inflation scare such that $E_t \pi_{t+1} > \bar{\pi}$, then New Keynesian pricing equation (1)

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

indicates that monetary policy must "create a recession" to contain inflation at $\bar{\pi}$. The

central bank must contract output relative to capacity according to

$$17)\ y_t - y_t^* = \frac{1}{h}(\bar{\pi} - E_t\pi_{t+1}) < 0,$$

to block the pass-though of the inflation scare to actual inflation and "hold the line on inflation"

## Deliberate Disinflation

--If containing inflation becomes exceedingly costly at $\bar{\pi}$ due to a lack of credibility and extreme sensitivity of inflation expectations to discouraging beliefs about capacity output, then a central bank may adopt a priority for restoring credibility for *lower* trend inflation $\hat{\pi} < \bar{\pi}$ by pursuing "deliberate disinflation"

--Deliberate disinflation is more costly than containing inflation for two reasons:

(a) blocking the pass-through of expected inflation to actual inflation is more costly in lost output relative to capacity, since $\hat{\pi} < \bar{\pi}$, and (b) the central bank must create an output gap expected to persist (in the absence of a disinflation) to induce firms to slow the rate of price increase

--Deliberate disinflation is difficult to sustain in practice because it is associated with high short-term interest rates and recession

--Central bank inclined to abandon deliberate disinflation once credibility for a lower inflation trend $\hat{\pi} < \bar{\pi}$ is achieved, even if the lower inflation trend is far from zero

--Central bank inclined to revert to "business as usual" and follow Money Supply Rule 2 with priorities on output gap stability $z_t = 0$ and short rate continuity $R_t - E_{t-1}R_t = 0$

--Upward inflation drift returns with "business as usual" in the presence of negative shocks to capacity output

--Cycling of central bank priorities described above gives rise to "go and stop" policy in which upward inflation drift is interrupted periodically with episodes of contractionary monetary policy that contain inflation temporarily or deliberately reduce inflation temporarily

## VII. Using the Model to Understand the Great Inflation

--We employ NNS/NK model, shocks to capacity output, inflation scare shocks in bond markets, and shifts in Federal Reserve priorities to identify fundamental forces contributing to the upward and downward drift of inflation and associated instability of output and interest rates experienced during

the Great Inflation from the 1960s through the mid-1980s.

Our interpretation of the dynamics of the Great Inflation is as follows:

--Fed objectives for low inflation, output gap stability, and financial stability as a continuity of the short rate are incompatible

--Fed pursued "business as usual" when inflation was low, and made inflation a random walk

--If shocks to capacity output had been small, then inflation might have remained low

--Negative shocks to capacity caused trend inflation to drift upward on average

--At first, Fed was reluctant to abandon continuity of short rate

--Later, Fed was reluctant to create output gap to prevent rising inflation expectations from being passed through to actual inflation

--Fed shifted priorities to "containing inflation" or to "deliberate disinflation" on a number of occasions

--But Fed reverted to "business as usual" after restoring a measure of credibility for a lower inflation trend, only to see the gains against inflation lost shortly thereafter

--After enduring a series of inflation scares in the early 1980s, the Volcker Fed determined that the costs of aggressive interest rate policy actions and a "deliberate disinflation" were acceptable in light of the recurring recessions that would be needed to deal with inflation scares in the future

# VIII. Implications for
# Inflation Drift and
# Monetary Instability Today

--Inflation is relatively low and stable again today. And the Fed is pursuing "business as usual" in the sense that it appears to be *relatively* indifferent to the upward drift in inflation. Instead, the Fed is focused on managing interest rates to stabilize the output gap $z_t = 0$ against the credit crunch and the collapse of housing. Most of the time, interest rate policy maintains a continuity of the short rate $R_t - E_{t-1}R_t = 0$ in the sense that the "default" is not to disappoint short-rate expectations (often by not changing the intended federal funds rate) unless there is good reason to do otherwise, as in the dramatic 1 1/4 percentage point federal funds rate cut in late January.

--One can imagine that if the United States economy were subject to a continuing

sequence of negative shocks to capacity output today, the Fed could let trend inflation drift upward again over time.

--The <u>optimistic view</u> is that the Fed knows how *that* story ends, which should help the Fed break with continuity of the short rate early on if need be to keep inflation low.

--The <u>pessimistic view</u> is that the Fed has returned to a focus on short-term developments in financial markets. And the term structure indicates that market participants expect further cuts in interest rates, so that avoiding surprises will lead to even lower rates over the coming year. According to this view, the Fed will find it hard to produce such major expectation errors and will thus be slow to offset rising inflation in the near term.