# Near-Rationality and Inflation in Two Monetary Regimes

by
Laurence Ball

San Francisco Fed/Stanford Institute for Economic
Policy Research Conference
**Structural Change and Monetary Policy**
March 3–4, 2000

Comments by Jeff Fuhrer

Federal Reserve Bank of Boston

## Overview

- This paper addresses **A Big Question** for macro today: What puts the persistence in inflation?
- A few candidates:
  - Wage and price-setting "machinery" (e.g. contracts)
  - Sluggish expectations
  - Monetary policy shifts, imperfect credibility
  - Learning?
  - Some interaction among these
- This paper makes a contribution to this debate, focusing on expectations (or the interaction of expectations and monetary regime)
- **Ball's paper boiled down:** use the lags of inflation as expectations in an expectations-augmented Phillips curve $\rightarrow$ it fits!

**Nits on Terminology**

- Distinguish "Backward-Looking" (BL) from "Naive" ($\pi_t^e = \pi_{t-1}$) from "Random Walk" ($\pi_t = \pi_{t-1} + \epsilon_t$) from "Multivariate Backward-Looking" (as in VARs) from "Restricted Multivariate Backward-Looking" (i.e. restricted linear structural models, RE or otherwise)

- Ball: if Fed adopts price-level targeting, inflation has negative serial correlation, so "firms with BL expectations" would make big errors $\rightarrow$ BL not "near-rational".

- Looking backwards in that case could still be OK, but it would depend on *how* you look backwards. Wouldn't want to use the AR coefficients from the inflation-targeting regime.

- Similar argument for early vs. late period

**Stationarity of inflation and nominal interest rates**

- Post-1960 period: "policy has accommodated shocks to inflation, leading the shocks to have permanent effects."

- Really? Inflation today is $\approx 2\%$. Inflation in 1980 averaged almost 14%; by 1984 it averaged 4%. This doesn't look permanent.

- If inflation stationary, then nominal rates also stationary (barring permanent and large shifts in equilibrium real rate).

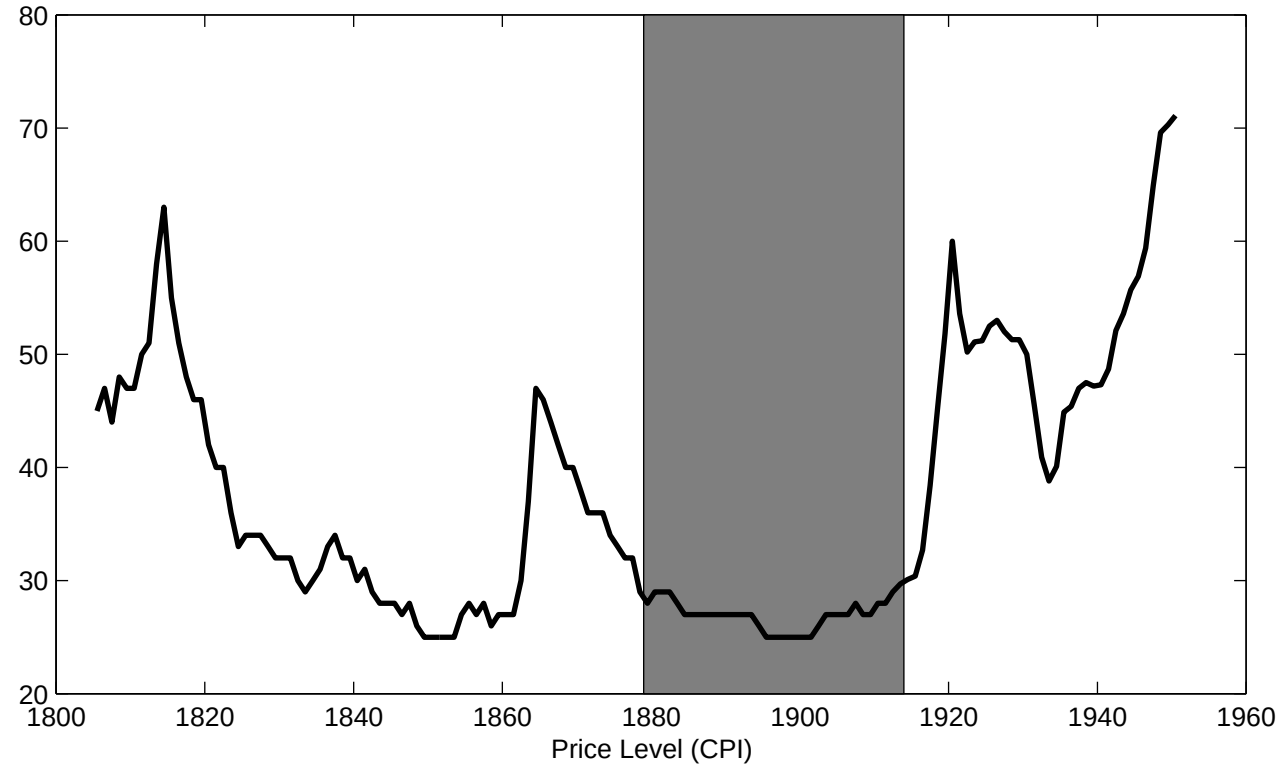
**How Representative is the Early Period?**
**(Persistence is common)**

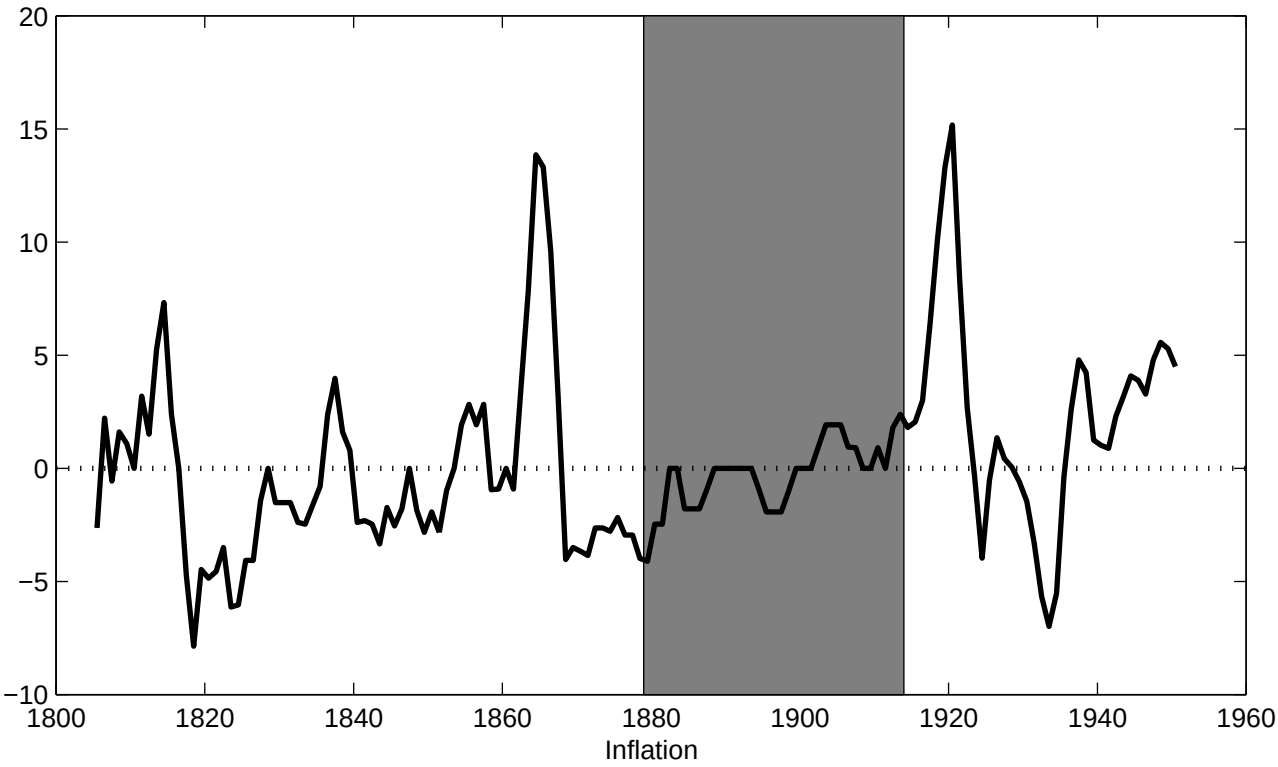
- Look at longer stretch of price series (chart 1)
- 1879-1914 is a very quiet period for prices–more of an aberration?
- Inflation persistence is a feature for *many* periods of history that differ with regard to M-policy—not just post-1945.
- If I estimate simple univariate models on earlier or later periods, I get:

| Period | Sum of AR Coeffs. (*p*-value) |
|---|---|
| 1846-1960 | .51 (.000) |
| 1918-1940 | .54 (.004) |
| 1860-1879 | .58 (.008) |
| 1810-1840 | .31 (.09) |

- Need to explain why persistence is so common, across other monetary regimes, wars, Great Depression, etc.

## Price Level and Inflation



## Testing and Impulse Responses

- Take the model that comprises equations (7) and the output equation (ignore constants)

$$\begin{aligned} \pi_t &= b_1\pi_{t-1} + b_2\pi_{t-2} + (1-w)v/w y_t + vd_1 y_{t-1} + vd_2 y_{t-2} \\ y_t &= d_1 y_{t-1} + d_2 y_{t-2} \end{aligned}$$

- The restricted reduced-form is

$$\begin{aligned} \pi_t &= b_1\pi_{t-1} + b_2\pi_{t-2} + (v/w)d_1 y_{t-1} + (v/w)d_2 y_{t-2} \\ y_t &= d_1 y_{t-1} + d_2 y_{t-2} \end{aligned}$$

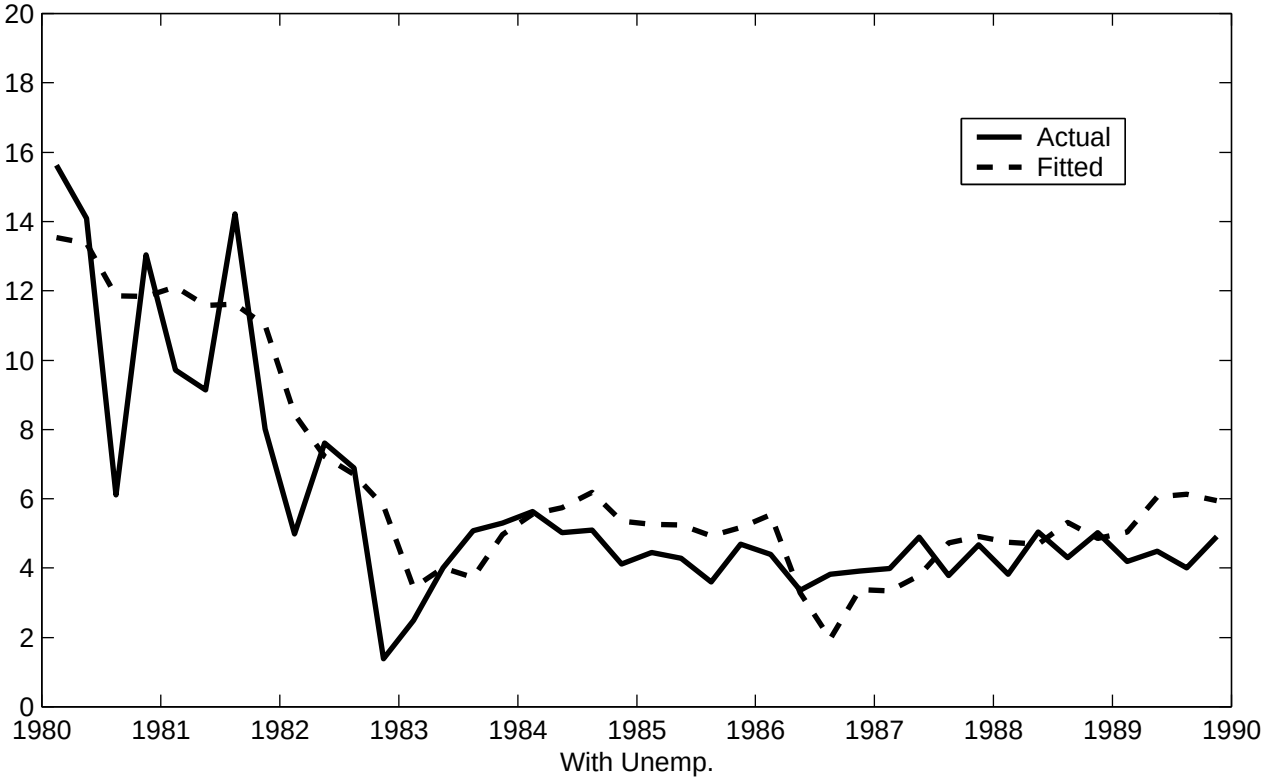
- Compared to the VAR, this equation imposes $7$ constraints: the VAR has $12$ free parameters, the structural model has $5$ ($v/w$, $b_1$, $b_2$, $d_1$, $d_2$).
- Ball tests only the inflation equation, taking OLS estimates of $b$'s and $d$'s as given.
- Should estimate these jointly (à la Sargent, Flavin).
- Why is the interest rate in the VAR? No role for it anywhere in the structural model, so falsely adds "restrictions" to the structural model.

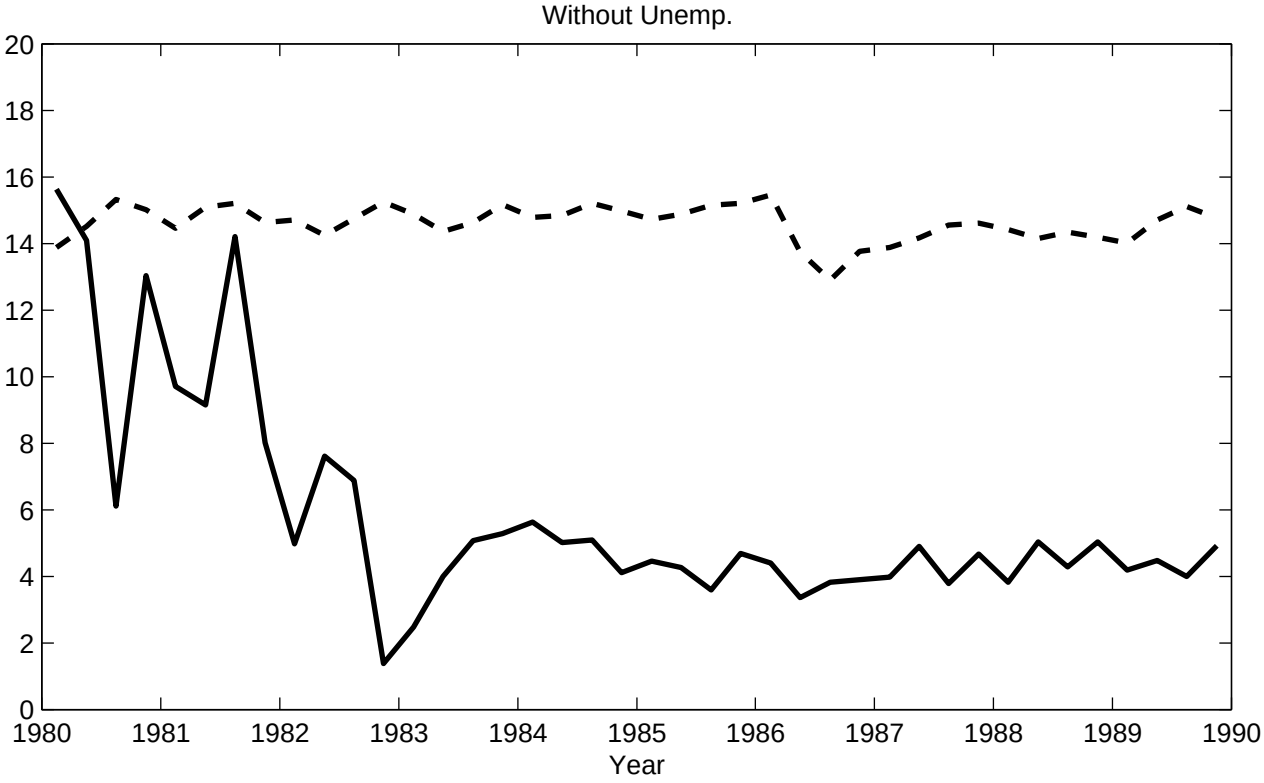
- My tests of the restrictions imposed by Ball's model show (for post 1960 quarterly data only):
  - **With funds rate in RF equations:** $p$-value=$3.6 \times 10^{-5}$.
  - **Imposing OLS estimates of lag coefficients:** $p$-value = $1.4 \times 10^{-5}$ (matters little)
  - **Excluding funds rate from RF:** No rejections at 10% level or worse.
- So test results depend on method you use, and whether you include the funds rate in the VAR.
- **Impulse responses:** to compare with VAR, should use the restricted reduced-form above, ordered, orthogonalized, and shocked to put on comparable grounds with VAR.

**How Important is Multivariate Information?**

- Ball's result is interesting: forecast errors reduced, but not greatly, by inclusion of information other than lagged inflation. (This has been observed in traditional Phillips curves for decades.)
- Still, effect of output (or unemployment) on inflation is statistically very strong: for quarterly data, 1960-1999, (controlling for lagged inflation and oil prices), $p-$value for output gap is $1 \times 10^{-5}$, unemp. $5 \times 10^{-10}$. Stock and Watson also document this correlation. (Chart 2) *Something* important there.
- Are errors in univariate equations relatively larger during, say "Great Disinflation" or the "Great Inflation" period, as compared with tranquil mid-1980s through 1990s?
- Some evidence bearing on this question might be a nice addition to the paper.

## Unemployment Drives Inflation in Phillips Curve
### Dynamic Simulations



**Haven't We Been Here Before?**
**and, The Lucas Critique**

- MANY models used to use these simple univariate expectations proxies.
- We abandoned them, as Larry points out, because of fear of the Lucas critique. They always "fit" fairly well. Stability?
- But since the RE models haven't worked so well of late, we go back to them.
- **Larry's results support Lucas critique:** using the same univariate expectations model across different regimes would lead to breakdown of model.
- **Paper should test stability of the "near-rational" models**, to see if they are subject to the LC.
- Shameless Self-Promotion: Estrella-Fuhrer (2000) paper does this.

**What Hath Ball Wrought?**

- In different historical episodes, the univariate process for inflation can be quite different.

- But the question is why? Ball's results don't allow us to discriminate among explanations. A model with RE would imply a different univariate process for inflation under different monetary regimes, such as gold standard versus modern policy.

- If we plug a good univariate time-series model for inflation into an inflation equation like

$$\pi_t = \pi_t^e + \gamma y_t$$

  we get a pretty good fit for inflation. Hmmm. Shocking? Looks just like old-style Phillips curves.

- **So what does this tell us about expectations formation?** Or the source of inflation persistence?

**To Sum Up: What have we learned?**

- Univariate models of inflation forecast pretty well.
- Univariate models of inflation differ across periods.
- **But this doesn't explain *why* inflation behaves differently in different periods.** Or why it's persistent or not in any period.
- Persistence (or lack of) could arise because: inflation expectations differ, monetary policy regimes differ, mix of shocks differs, fiscal policy regimes differ, or all of these and more (all are consistent with Larry's results).
- If differences arise because of differences in monetary policy regime, then **The Lucas critique applies in full force.**
- In fact, Ball's paper provides a great demonstration of the LC: you'd do very poorly to use the same univariate process for inflation expectations across different monetary regimes.

- If agents **knew** the best univariate model in each era, they might form reasonable expectations.

- But apparently the best model shifts over time.

- How do they get to know the new best model? Sounds like **LEARNING**.

- Maybe learning is a key avenue for this research.

- **Identification:** Ball's exercises are a promising start, but haven't yet identified anything about expectations behavior, or sources of persistence.