

Some Implications of Mismeasurement for Model Uncertainty and Monetary Policy

Measurement '08

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This presentation is based on:

- “Real-time Model Uncertainty in the United States: the Fed, 1996-2003” *JMCB* 2007 (with Brian Ironside)
- “Real-time Model Uncertainty in the United States: ‘Robust’ policies put to the test” unpublished manuscript, 2008.
- Miscellaneous table scraps

Disclaimer!

The views in this presentation are those of the author only and are not necessarily shared by the members of the Board of Governors or the staff.

A word on Fed information security rules

- Greenbook forecast materials are subject to a 5-year embargo. Only materials dated 2002 or earlier can be shown.
- FRB/US model historical databases are not subject to the embargo (although the forecasts are.)

Introduction : objectives

- Examine evolution of views as captured by the changing structure of the FRB/US model of the U.S. economy.
- Uncover changes in model properties
- Link those changes to the real-time data
- Take a look at contentious period in recent monetary history: the *zero-lower bound scare* of 2003-4.

Introduction: methodology

- 44 FRB/US databases
- 30 FRB/US model vintages used for forecast purposes from July 1996 to Nov. 2003
- Examine real-time model multipliers
- Examine real-time optimal Taylor rules
- Look at what an estimated Taylor rule would have prescribed in 2003-4.

Introduction: findings

- Revisions to the underlying data have been extensive
- Thus, revisions to the latent variables have also.
- Changes in model properties have been economically important.
- Changes in the coefficients in optimized Taylor rules have been remarkable.
- These changes have important implications for policy design.

First up: the data

- A view of the data by vintage
- We look at revisions and ‘backcasts’ of:
 - PGDP inflation
 - potential output growth
 - the output gap
- A glimpse at the forecast record as a driver of changes in potential output:

Figure 1
Real-time 4-quarter PGDP inflation: 1991-2003

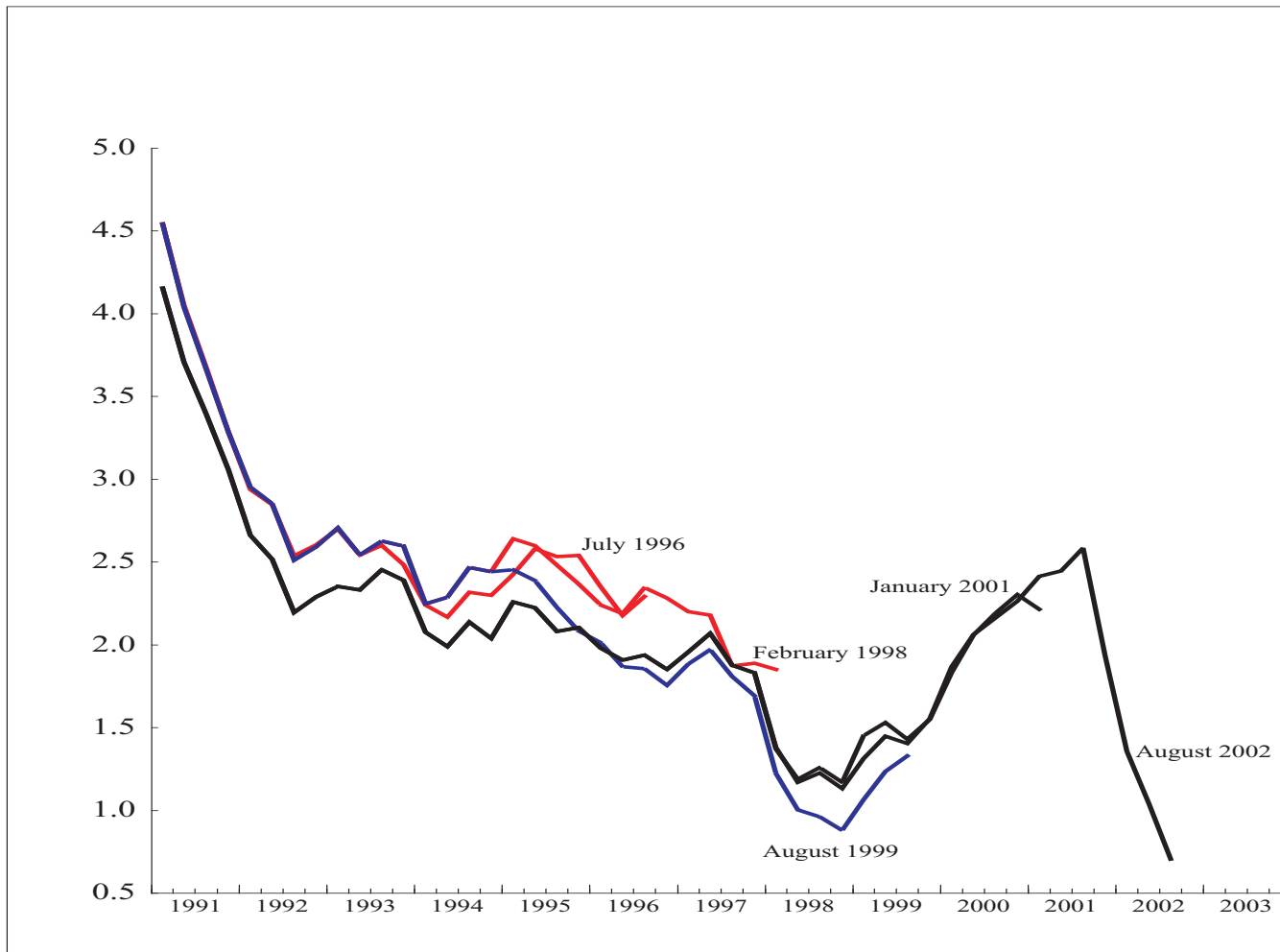


Table 1 : Selected FRB/US forecasts
(four-quarter ahead GDP growth)

	Forecast	final	difference
July 1996	2.2	4.8	2.6
July 1997	2.0	3.7	1.7
Aug. 1998	3.0	4.4	1.4
Aug. 1999	3.2	3.6	0.4

...isn't any statistical evidence...

“The staff were skeptical, and they didn’t mind saying so. For example at the August 1996 meeting, [Director of Research] Mike Prell bluntly told the Committee: ‘There simply isn’t any statistical evidence to suggest that productivity is taking off’,”

-- Lawrence Meyer (2004), *A Term at the Fed*, p. 125.

Figure 2
Real-time 4-quarter growth in Non-farm potential output:
1991 - 2003

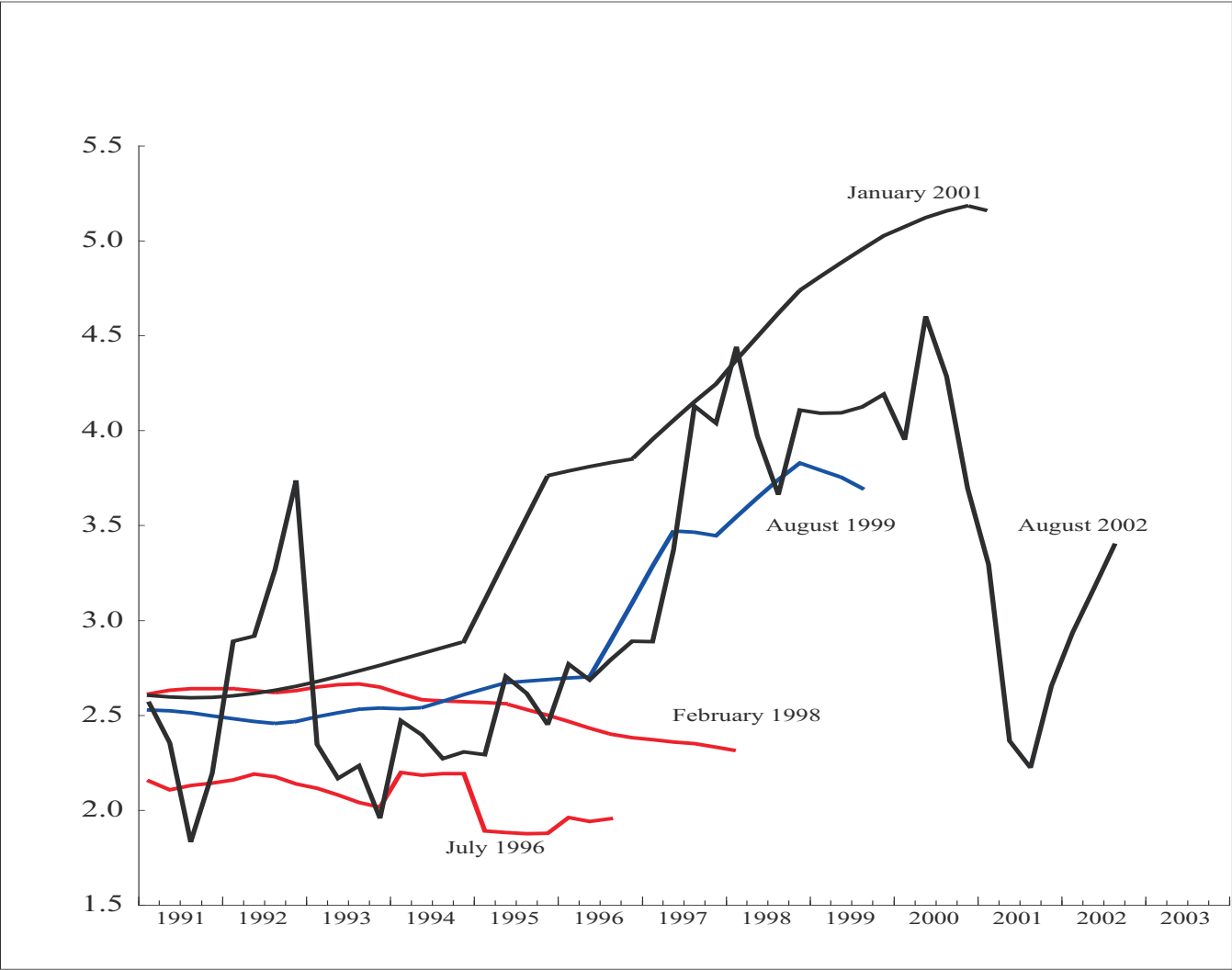
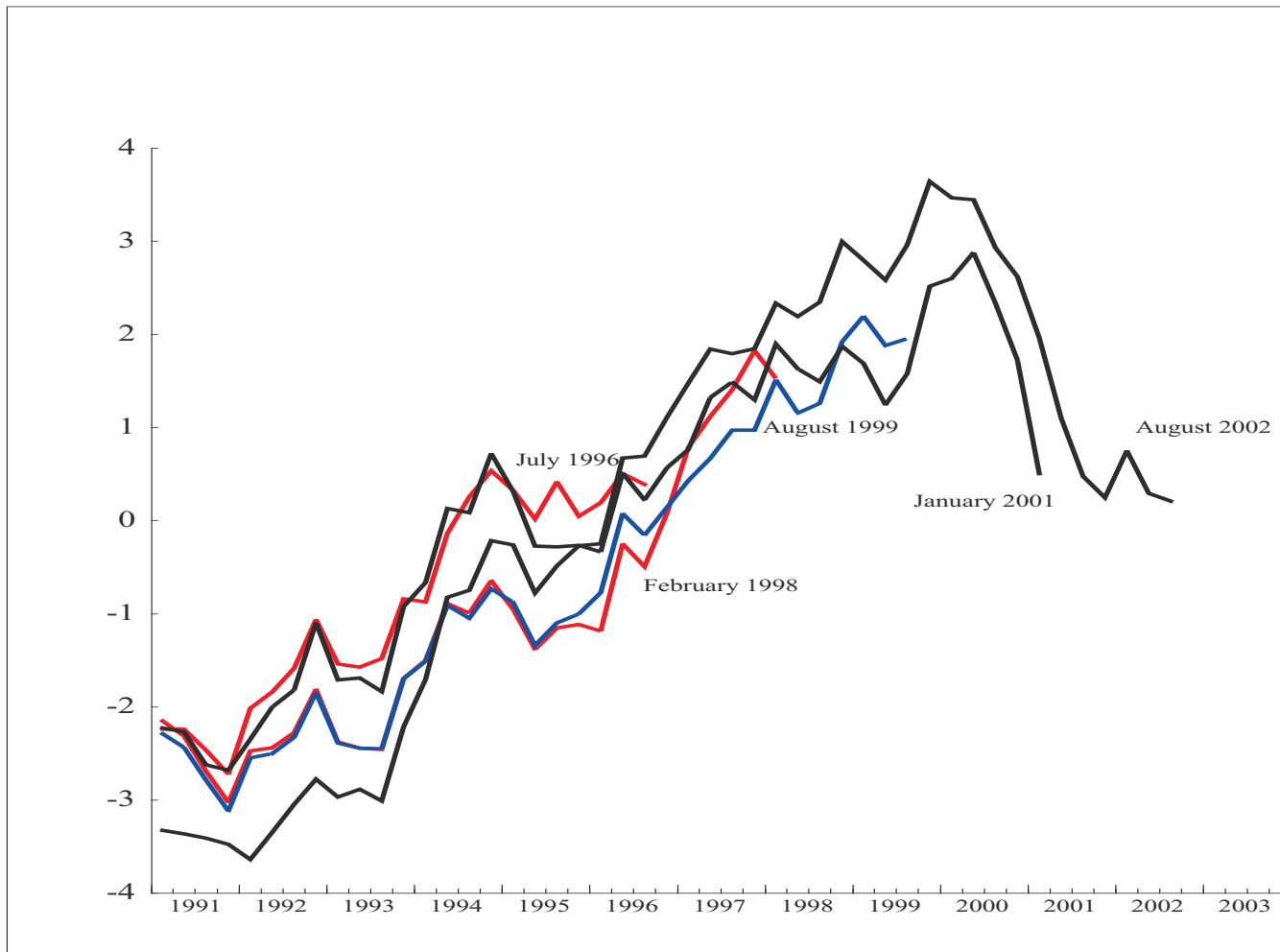


Figure 3
Real-time output gaps: 1991 - 2003



Real-time multipliers

- Response after 8 quarters (usually) of unemployment to a given shock
- Funds rate held at baseline (with one exception)
- Dashed line is the *ex post* multiplier
 - November 2003 model
 - Only the baseline data changes
- Solid line is the real-time multiplier
 - model, coefficients and baseline all change at every date

Figure 4
5-year employment sacrifice ratio
(1996:Q3 - 2003:Q4)

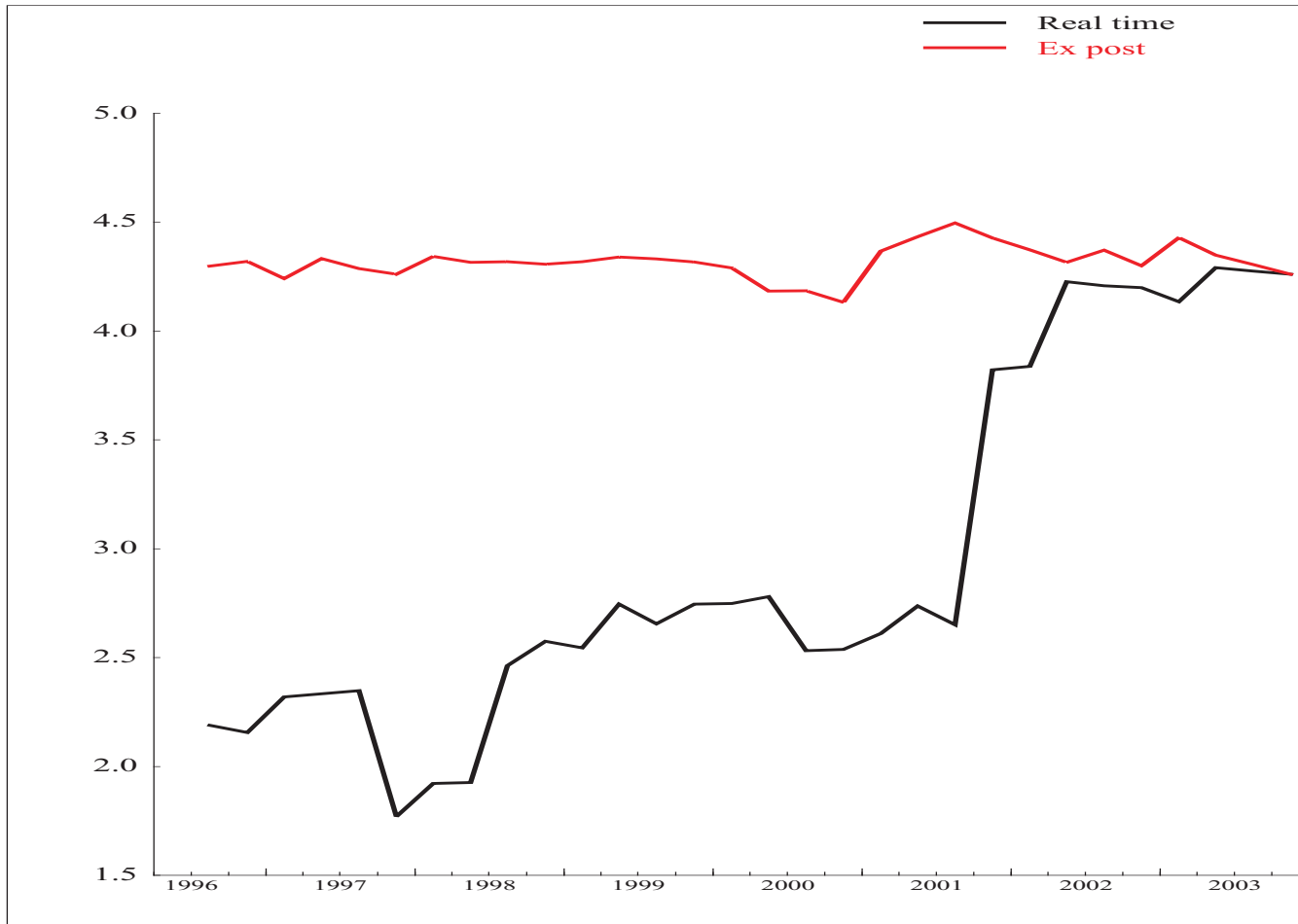


Figure 5
Persistent 100-basis-point funds rate increase

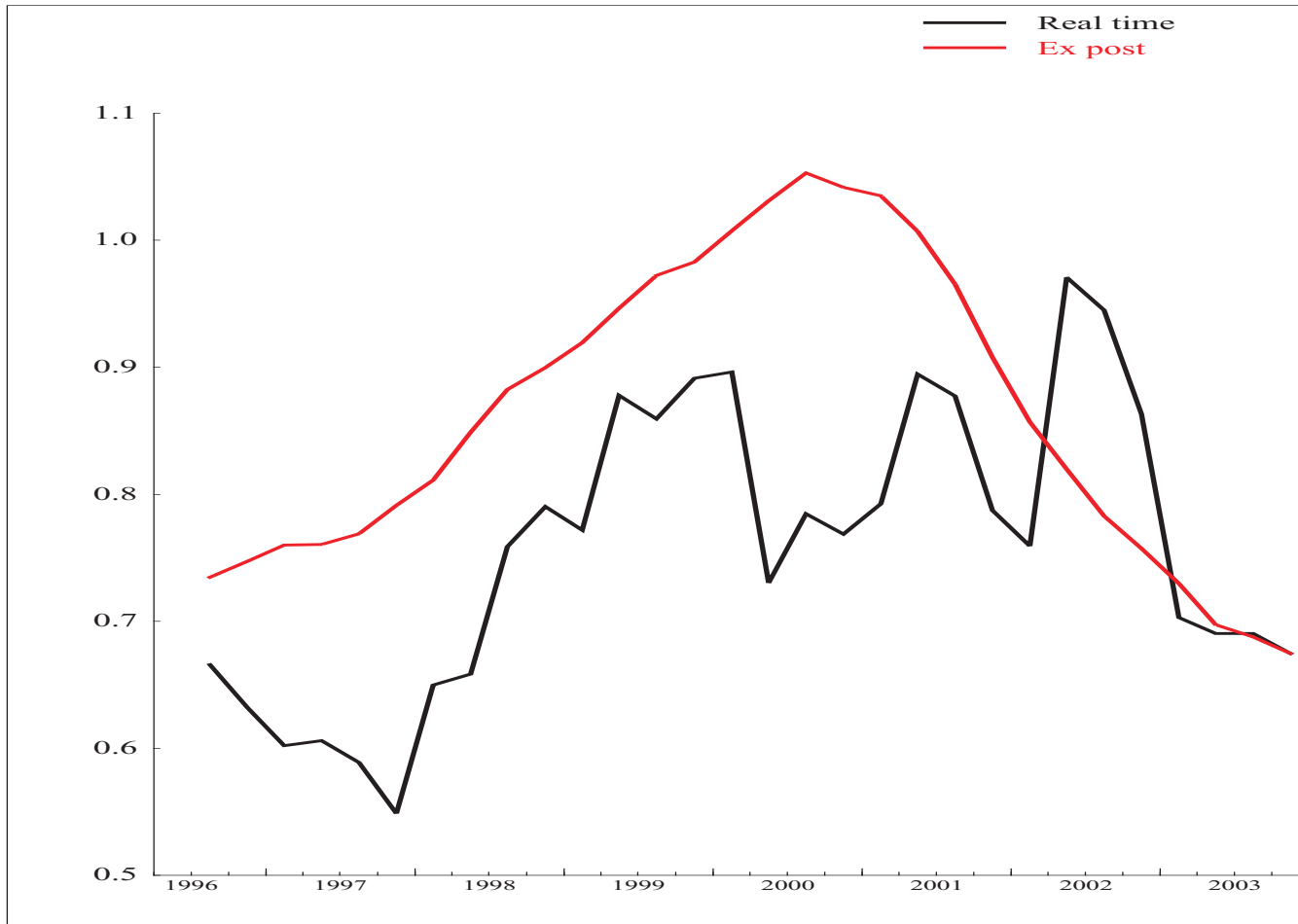
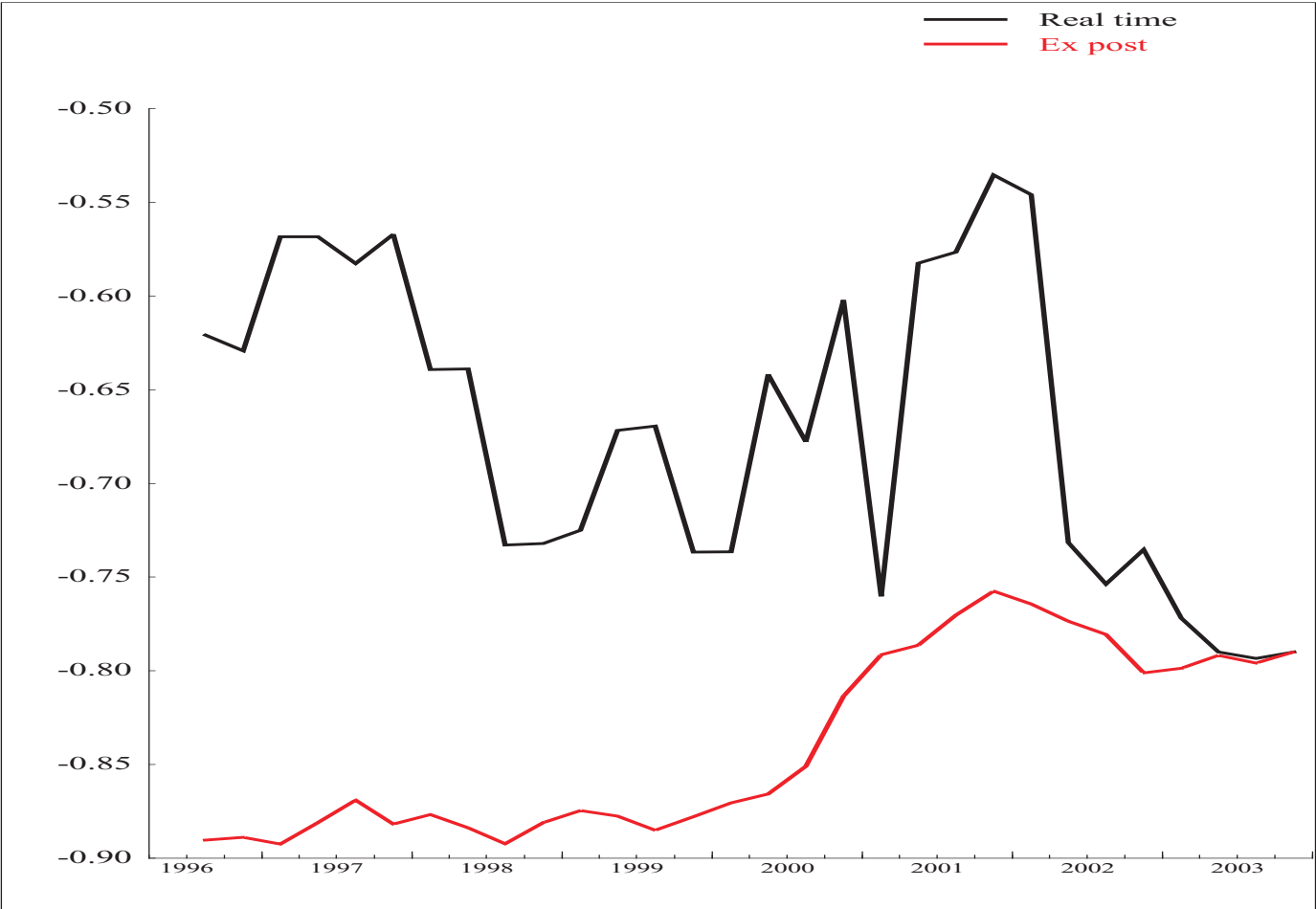


Figure 6
Persistent 1-percent-of-GDP government spending shock



Conclusions from Multipliers

- In many cases multipliers differ considerably by model vintage
- The only *ex post* multipliers that differ over time relate to the non-linearities in the stock market
- Questions like “what would the sacrifice ratio have been in 1997?” now differ.

Optimized Taylor rules

- Traditional 2-parameter Taylor rules

$$R_t = rr_t + \tilde{\pi}_t + \alpha_\pi (\tilde{\pi}_t - \pi^*) + \alpha_y (y_t - y_t^*)$$

- Loss function penalizes equally squared deviations of the output gap, inflation and the change in the funds rate

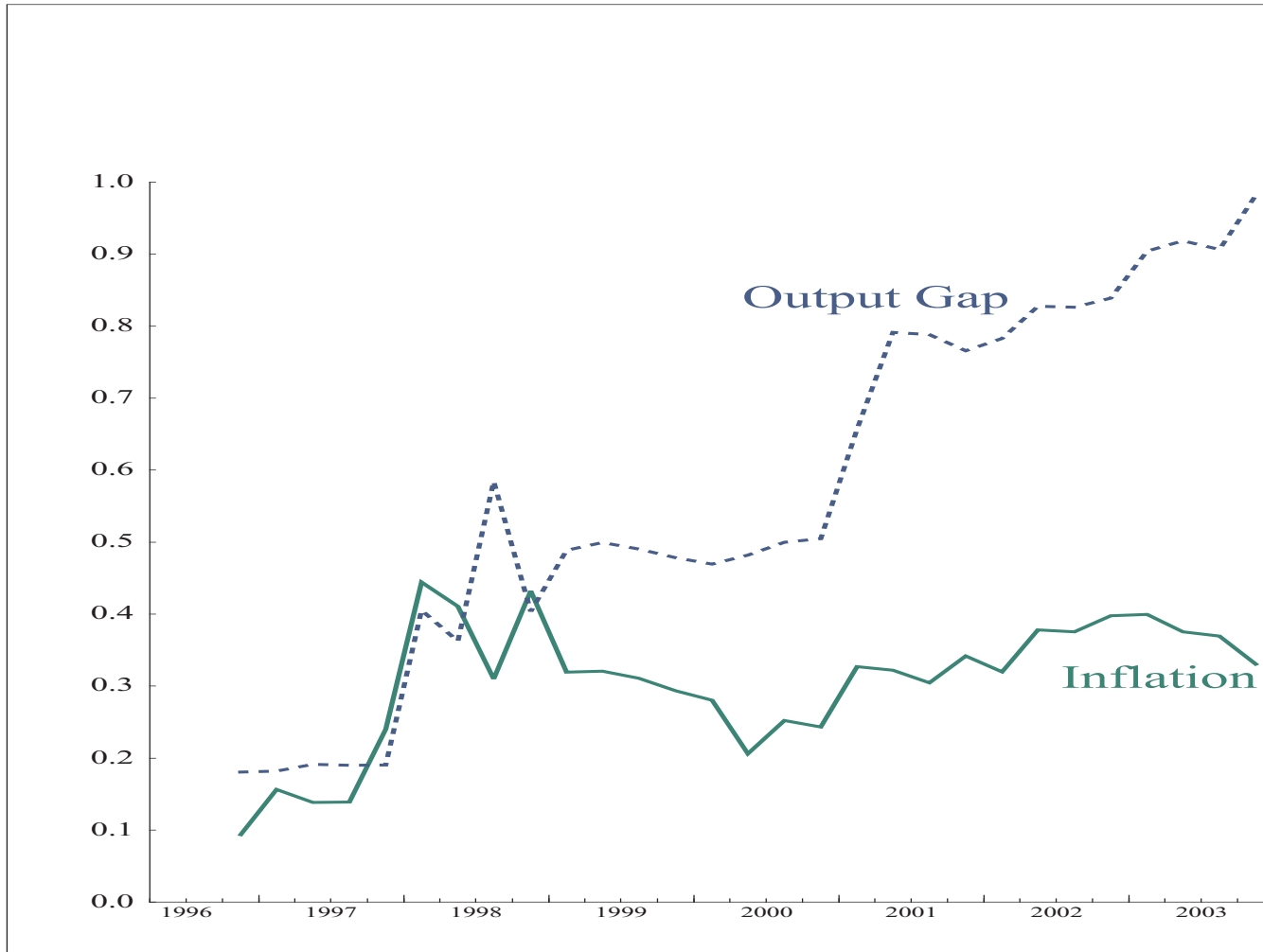
$$\underset{\langle \alpha_j \rangle}{MIN} \sum_{i=0}^T \beta^i [(\pi_{t+i} - \pi^*)^2 + \lambda_Y (y_{t+i} - y_{t+i}^*)^2 + \lambda_{\Delta r} (\Delta r)^2]$$

Optimized Taylor rules (continued)

- Grid search the optimal coefficients with stochastic simulation to find *ex ante* optimal rules
- Use real-time model, coefficients, shock sets and baselines.

Figure 9

Optimized Taylor rules by vintage



Results: *ex ante* optimal Taylor rules

- Remarkably low, stable feedback coefficients on inflation
- Feedback on the output gap generally rises over time
- Large climbs in the output gap feedback associated with the inclusion of a new investment block and a new supply side in the model

An episode in history

- With very low inflation, the prescribed level of the funds might be below zero—which is infeasible.
- The *zero-lower bound* (ZLB) scare:
 - the historical, real-time data;
 - *ex post* data;
 - Taylor rule, estimated with real-time data
 - the same Taylor rule, with *ex post* data

An unwelcome development...

"As you know, core prices by many measures have increased very slowly over the last six months. With price inflation already at a low level, substantial further disinflation would be an unwelcome development..."

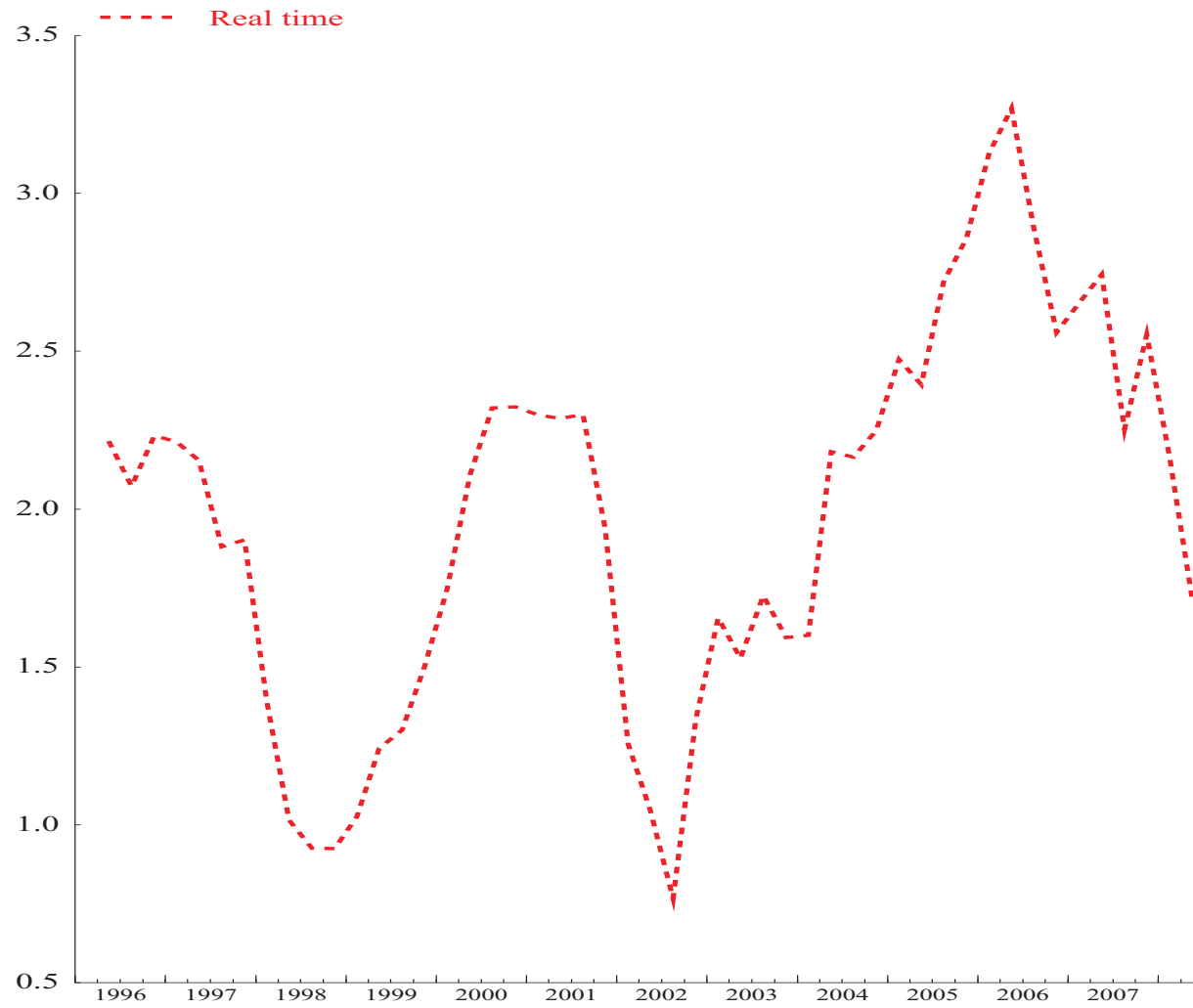
-- Alan Greenspan before the House Committee on Financial Services, April 30, 2003

Corrosive, deflationary spiral...

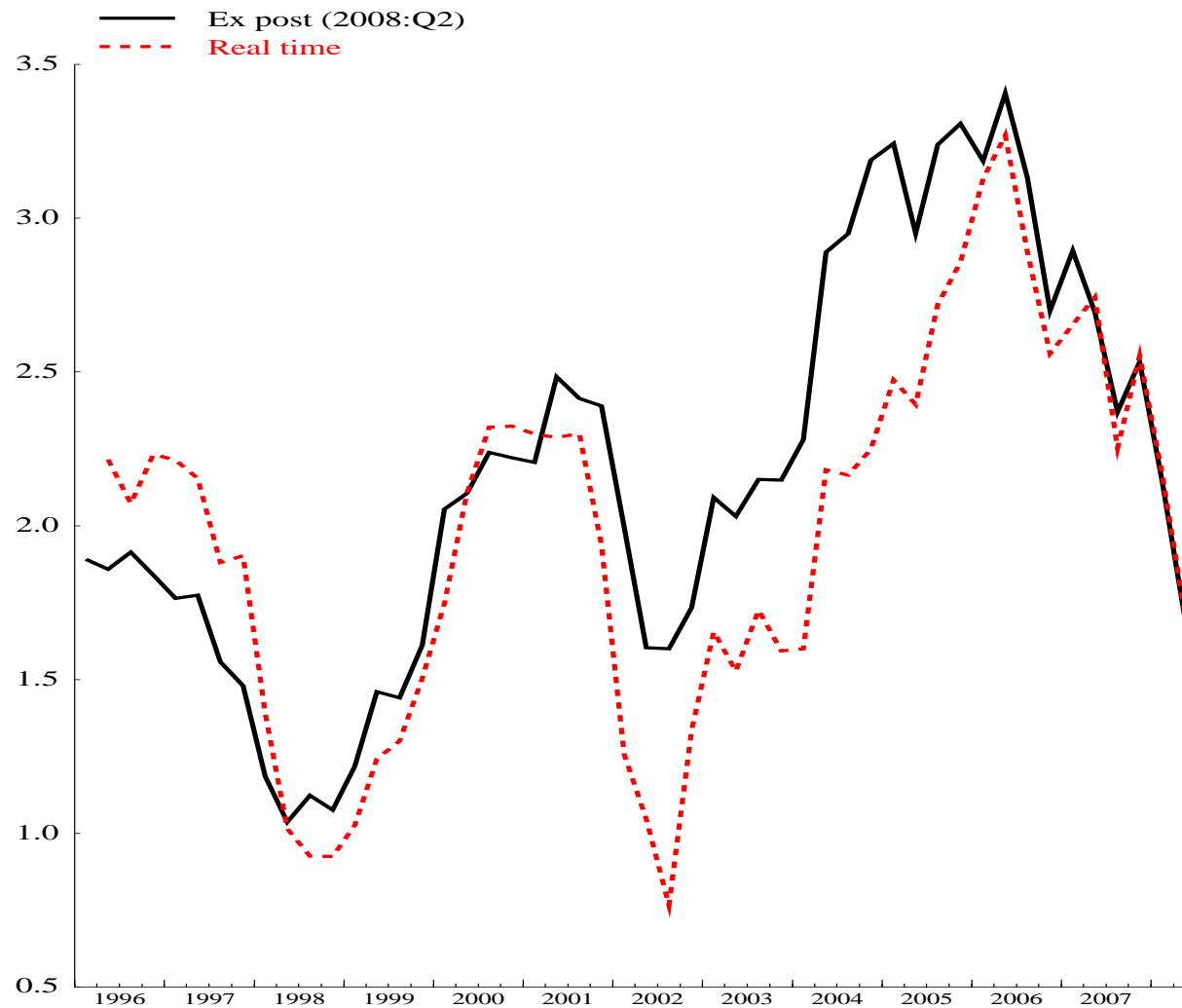
".. [W]e face new challenges in maintaining price stability, specifically to prevent inflation from falling too low...[T]here is an especially pernicious, albeit remote, scenario in which inflation turns negative...engendering a corrosive deflationary spiral..."

-- Alan Greenspan before the House Committee on Financial Services, July 15, 2003

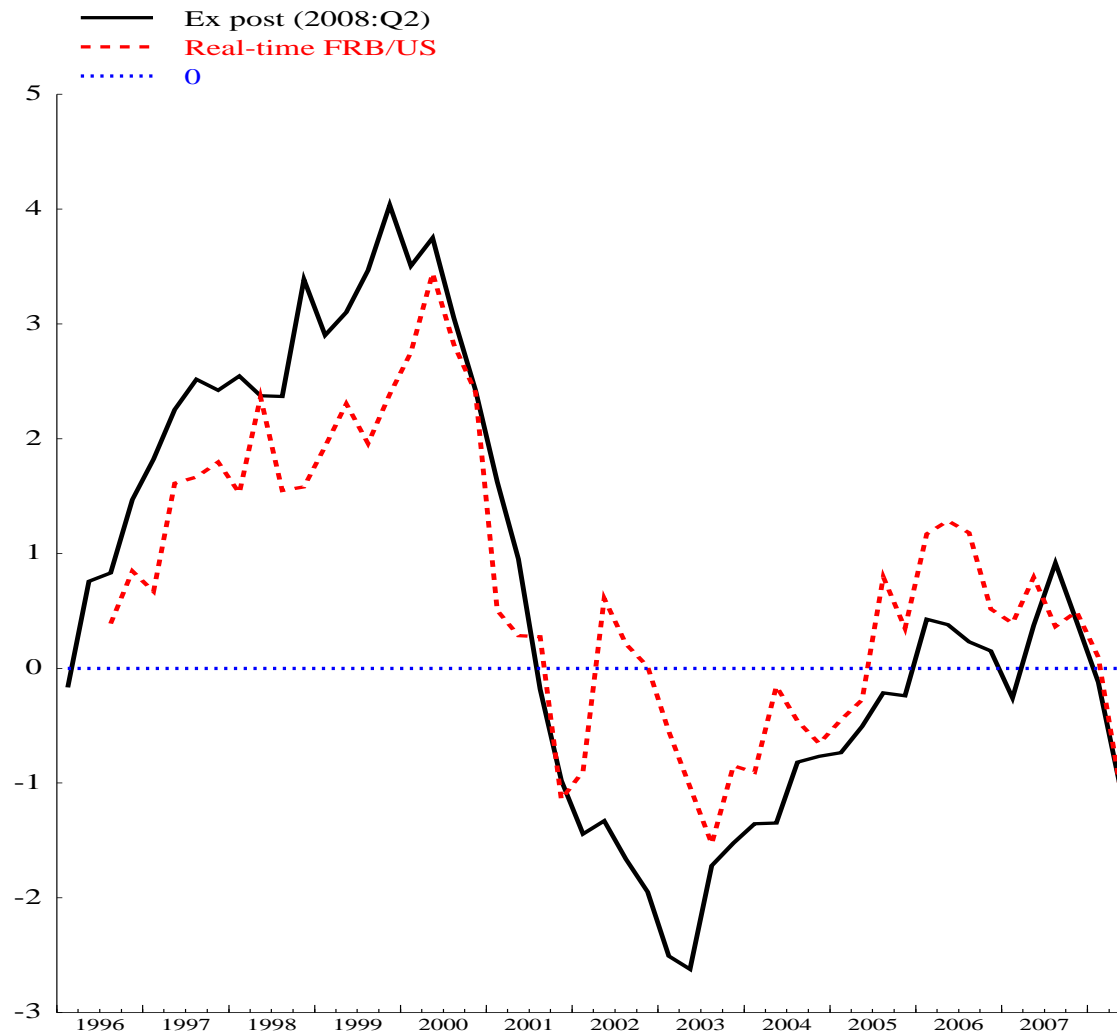
4-quarter PGDP inflation in real time



PGDP inflation in real time and *ex post*



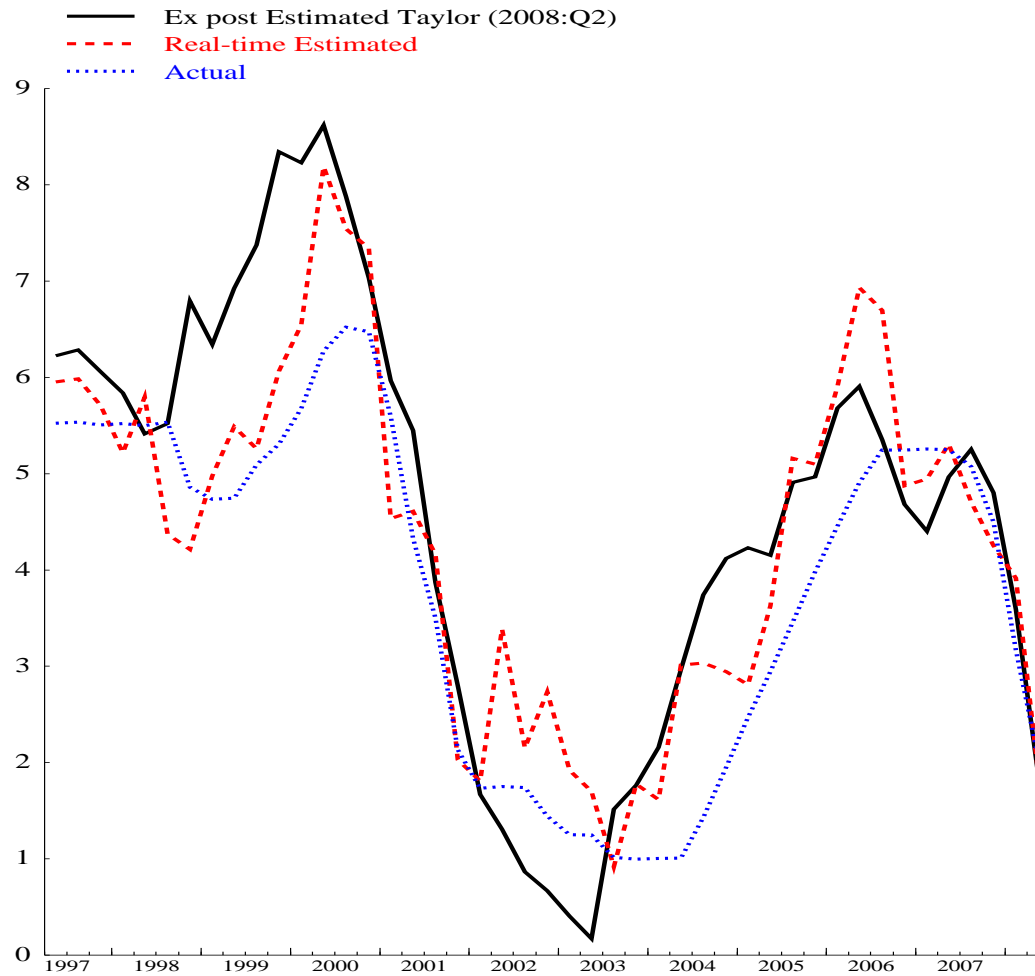
FRB/US output gap in real time and *ex post*



Estimated Taylor rule

- Using the real-time data from 1985:Q1 to 2002:Q4, estimate Taylor rule coefficients.
- Examine the prescribed funds rate settings
 - **Given the real-time data;**
 - **Given the *ex post* data;**
 - **Compare with the actual funds rates**

Real-time and *ex post* estimated Taylor rules



Concluding remarks

- Revisions to the data are remarkably large in magnitude
- The measurement of the raw data has important implications for the interpretation of history and for modeling
- Errors in real-time measurement may have important implications for real-time policy as well.