Real-time Model Uncertainty in the United States: the FED from 1996-2003

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Discussion

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Interesting paper!

• Analyse important aspect of monetary policy in real time

• Not only data are revised, but also model

This has implication for assessment of the economy and for the formulation of optimal monetary policy

Model revisions may have larger impact than data revisions

– Nice !!!

– Huge task !!!

– Food for thought

– More of this will certainly come in the future (hopefully also from the ECB)

However ... I have one problem: the main result of the paper is a paradox!

Model based optimal policy rules worked better before the major model changes introduced in 2001 to capture the productivity boom. After the changes it does worse than the historical rule

How should we read this results?

Is model uncertainty such that model can become counterproductive? Should we get rid of models? What do policy makers know that modelers don't know?

This discussion tries to interpret this particular result of the paper

It has a reassuring conclusion ....

Consider 3 things in the paper:

1. The Rule (Taylor type)

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

rr_t^*: *equilibrium real interest rates/ "ad hoc"*
endogenous, "slowly changing" variable

$$rr_t^* = (1 - 0.05)rr_t^* + 0.05(r_t - \pi_t)$$

2. Major model change in 2001

Introduce a stochastic (variable) trend to model potential output y^* / response to productivity booms of the ninenties

productivity boom $\rightarrow$ Δy_t^* changes
modellers realize it and introduce stochastic trend

result $\rightarrow$ Δy_t^* become

- more correlated with cycle
- more volatile

Figure 1 and 2

Figure 1 Real-time 4-quarter non-farm potential output growth

Changes a lot in 2002

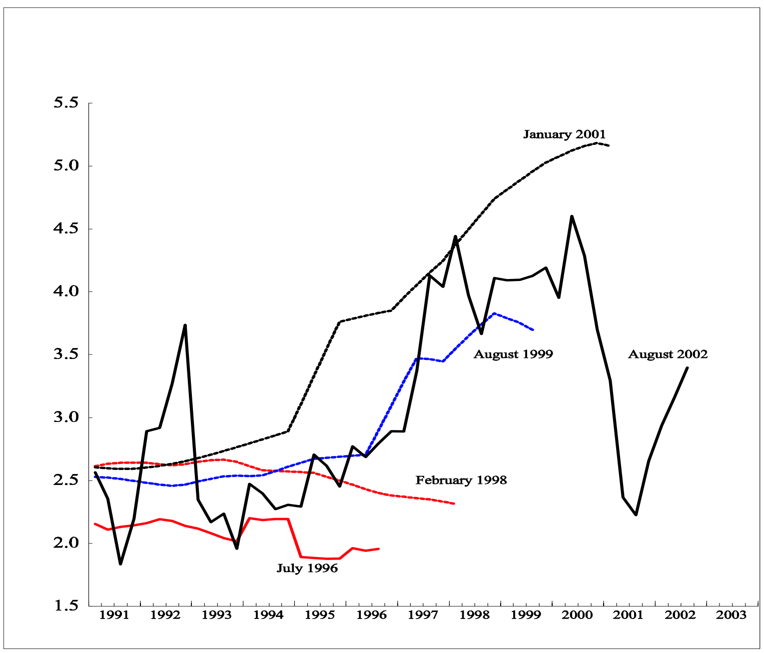
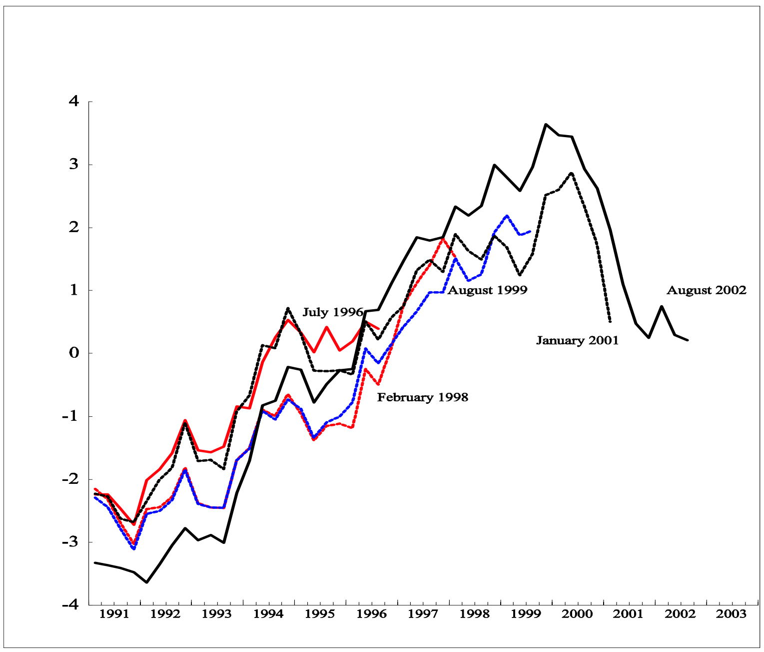


Figure 2

Real-time GDP output gaps

Do not change much!!!



3. Result on policy rule

Before 1997: Taylor type (ad hoc and optimal) rules do better than historical rules

2003 vintage: Optimal rule becomes worse that historical rule

$\rightarrow$ Tetlow: "Gap ($y_t - y_t^*$) and inflation (π_t) alone are not able to capture shocks to the growth rate of potential output (Δy_t^*) which in turn affect equilibrium real interest rate (rr_t^*)"

$\Delta y_t * \uparrow \Rightarrow rr_t * \uparrow$ **not reflected** in $y_t - y_t^*$ and π_t

$\Rightarrow$ Optimal Taylor type rules do not work, however historical policy does!!

Question:

what is the historical rule? Discretional/non model based or alternative rule not considered in the paper?

Put 1-2-3 together

Explore the conjecture that the historical rule is not Taylor type, but a rule (also simple) tracking the natural interest rate

A. Observe:

The equilibrium rate rr_t^* component of the rule should be a function of the rate of growth of potential output Δy_t^* and should change with the changes introduced in 2001 (stochastic trend)

This is not done in the paper where rr_t^* is just a smooth function

Should allow rr_t^* to change with Δy_t^*

$$rr_t^* = f(\Delta y_t^*)$$

B. Explore an alternative rule to Taylor

Telow/Taylor's rule

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

Consider two alternative fits:

1. Taylor fit

$$rr_t^* \approx \text{constant}$$

2. Growth Rate Rule fit

$$rr_t^* \text{ moves with } \Delta y_t^*$$

$\rightarrow r_t$ moves with BOTH output gap and Δy_t^*

To implement rule 2, (I don't have the model based Δy_t^*) I approximate $\Delta y_t^* + (y_t - y_t^*)$ by a $k = 8$ quarters moving average:

$$\frac{1}{k}\sum_{j=1}^{k}\Delta y_{t-j} = \mathsf{MA}_k(\Delta y_t)$$

Remark: Similar to Orphanides (1999) but motivation different: here we want to capture potential growth while Orphanides wants to get rid of measurement errors in Gap estimates

Empririics / the two alternative rules

- Data:

$\tilde{\pi}_t$	GDP deflator, annual inflation
$y_t - y_t^*$	Deviation of Real GDP from HP trend
Δy_t	Annualized Real GDP quarterly growth rate
r_t	Federal Funds Rate

- Parameters

Taylor rule: $\alpha_y = \alpha_\pi = .5$, $rr_t^* = 2$

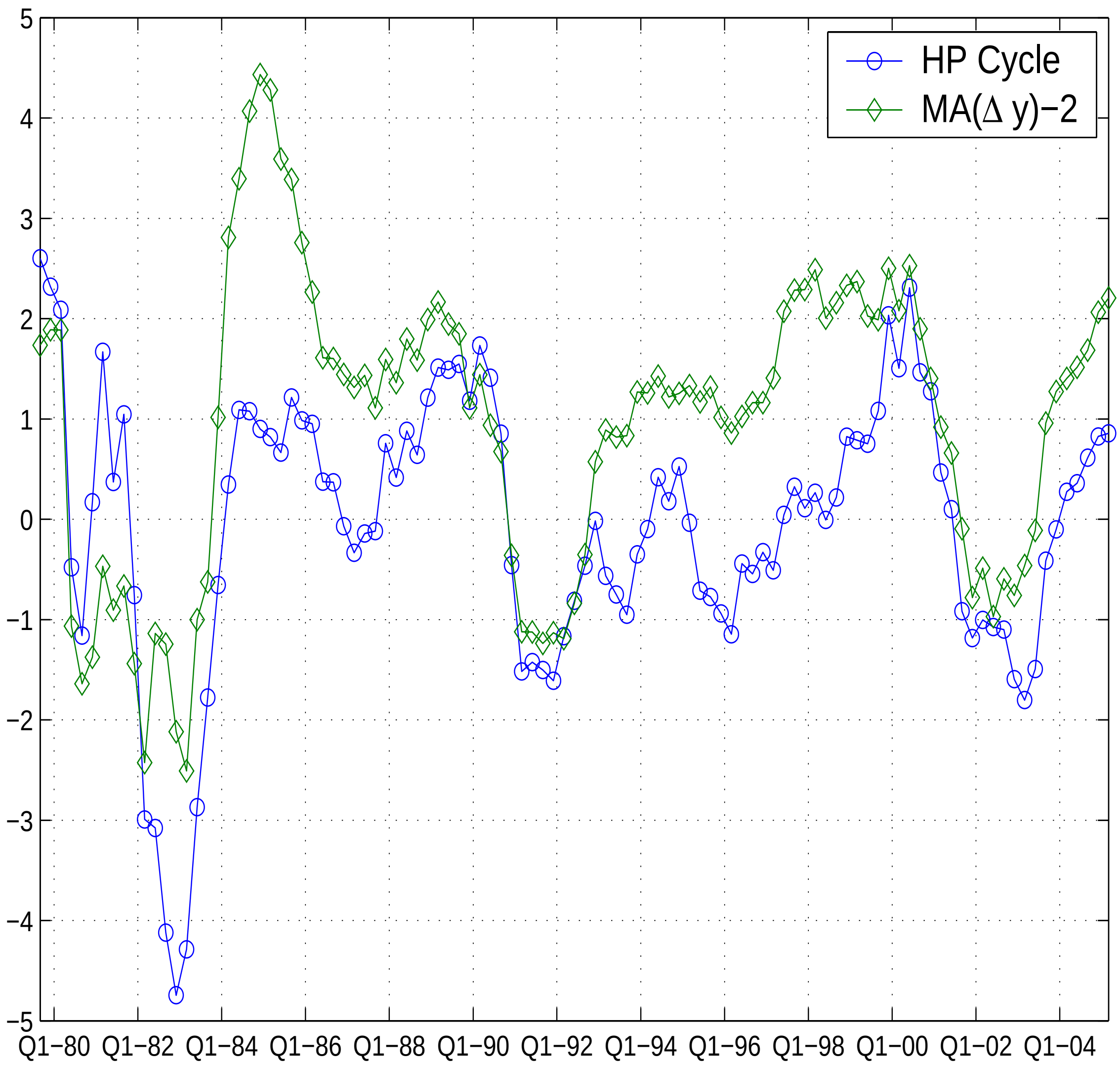
Growth rate rule: $\alpha_\pi = .5$, $k = 8$ quarters

- Sample

Volcker-Greenspan era: 1979Q3 - 2005Q1

Figure 3

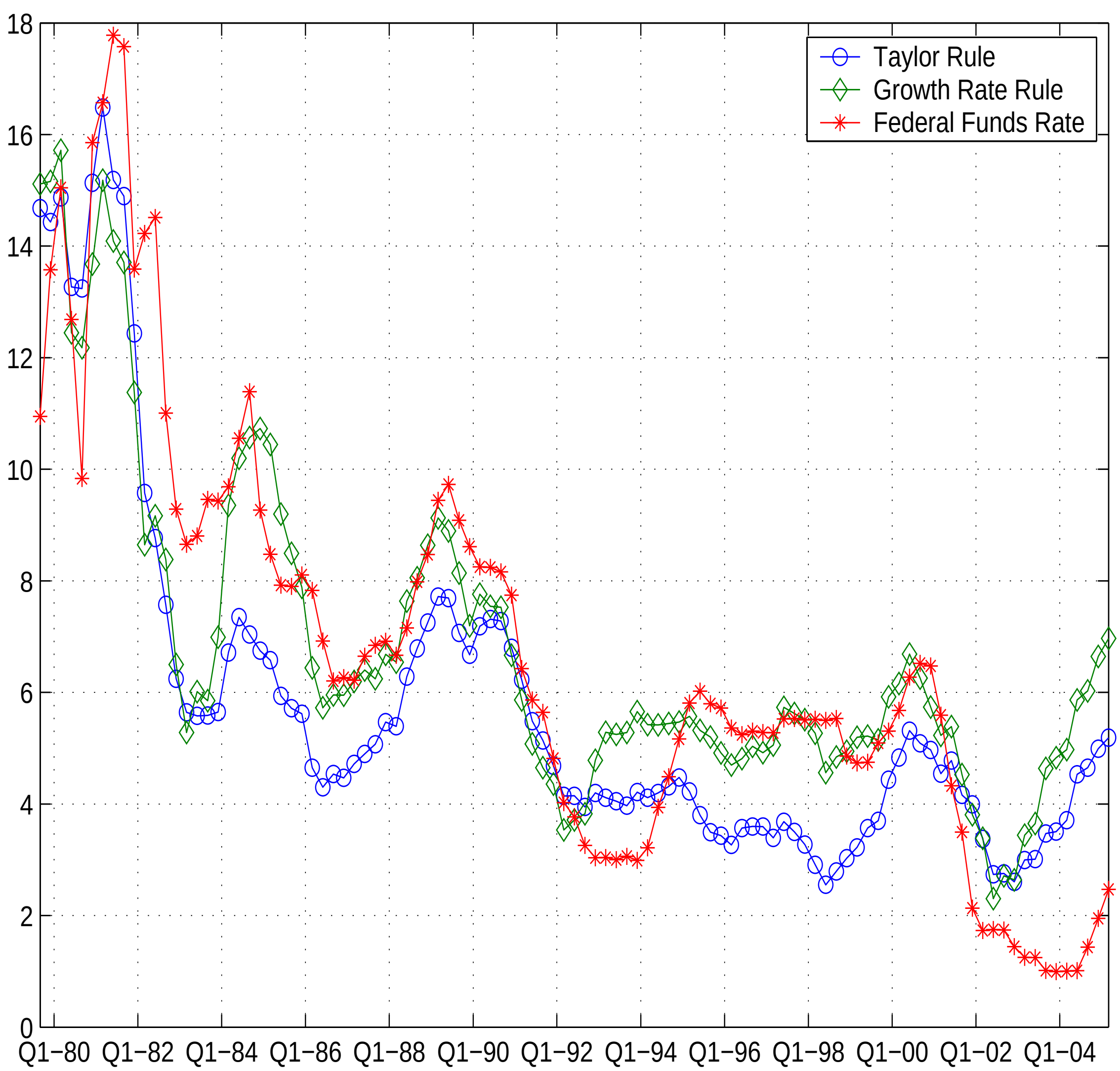
Gap and Growth



Very similar except in the period of productivity boom

Figure 4

Rules



During the period of productivity growth, the growth rate rule does better than Taylor

First conclusion

- The response of historical policy to the productivity boom can be captured by a simple rule – not considered in the exercise

- Simulations based on the FRB/US model do not capture it since the equation for the Equilibrium Real Rate of Interest is not compatible with the supply side of the model.

- Solution of the paradox? Model might be useful afterall

Lots of evidence points in that direction, however the rule should be tested on the FRB/US model (you should try)

Another piece of the puzzle and more evidence for my story

One result of the paper is that, after the model changes in 2001, the optimal response to output implied by the Taylor rule jumps up (it asks for more responsivness of policy to real/cyclical developments) $\alpha_y^* \uparrow$

My explanation:

(i) The paper mispecifies rr_{t^*} by omitting its reponsiveness to the higher volatility of the growth in potential output

$+$

(ii) The model changes induce an increase in the correlation between the output gap and the growth of potential output

$\downarrow$

(i)+(ii) lead to an increase in α_y^* (due to mis-specification in rr_t^*)

$\Rightarrow$ this observation further supports our conjecture that results are due to miss-specification of the policy reaction function.

More Evidence

Monetary Policy in Real Time, Giannone, Reichlin and Sala, NBER MAcroeconomic Annual, 2005:

• Pseudo-real time estimates based on a large data set.

• Estimate response two two exogenous shocks: permanent/technology and transitory in output

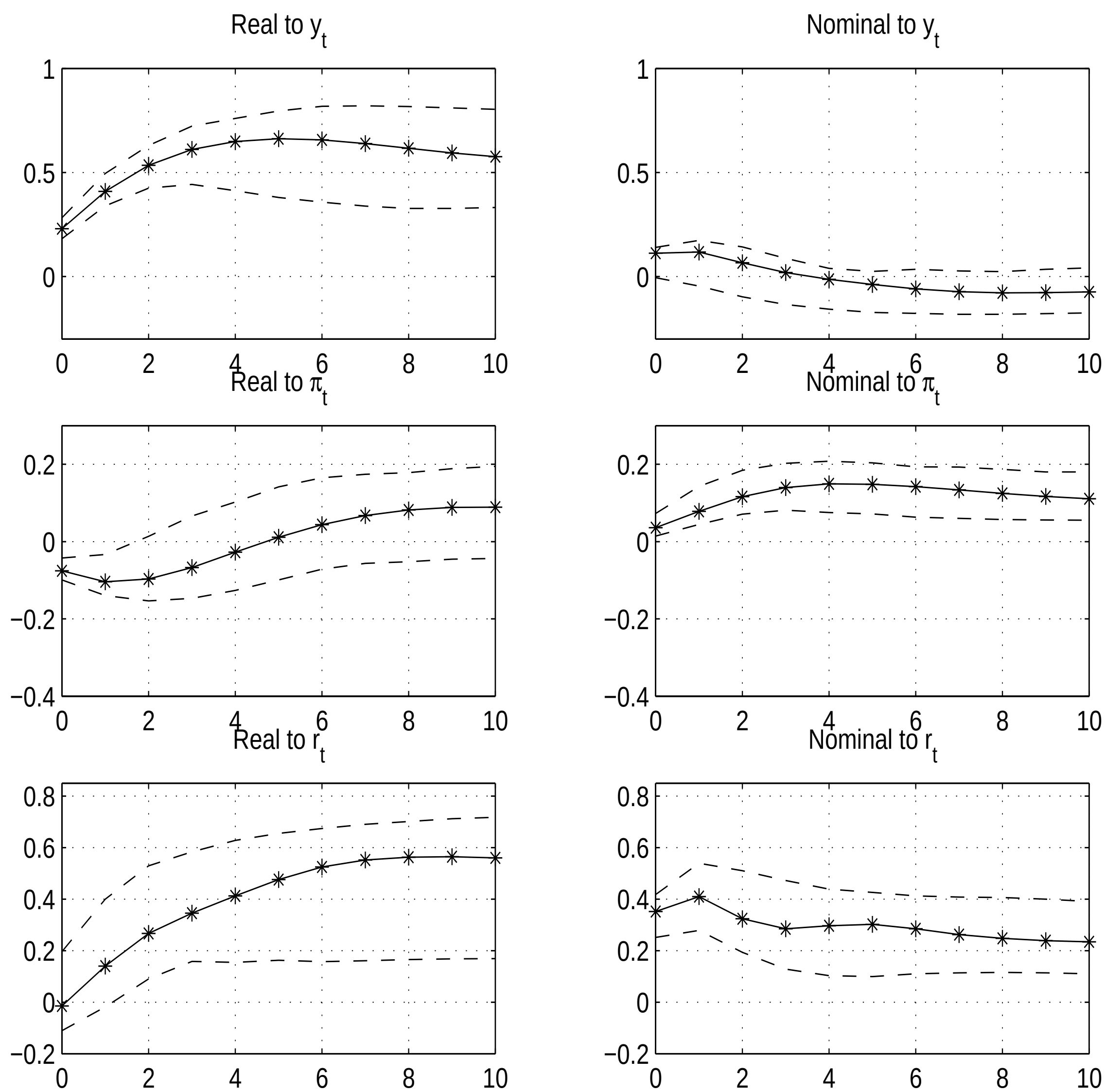
Results:

– nominal interest rate goes up persistently with the technology shock

– the real rate is correlated positively with and has the same shape of the permanent component of output

Figure 5

Impulse Response Functions from GRS, 2005



Implications

- Reacting to real/persistent shocks the FED is able to adjust to changes of the Natural Rate of interest.

- In "normal" periods this policy cannot be identified from traditional rules since permanent changes of output cannot be identified from changes of the output gap.

- Policy reactions to changes of the growth rate of potential output do not add any additional (discretional) dimension to the policy problem which can be still characterized by simple systematic behaviour.

Conclusions?

We might still learn from models after all ...