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# **Price level determination in general equilibrium**

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## **We need to start modeling fiscal-monetary interactions**

- The public's beliefs, as reflected in asset markets, clearly connect sustained deficits with inflation risk.
- The recent crisis, while its source was in unusual financial market disturbances, and while it has generated unusual monetary policy responses, has also generated very unusual fiscal policy responses.
- The recent US Fed balance sheet expansion has deliberately moved some risk onto the Fed and has involved the Fed negotiating unique transactions with particular private agents.

- Legislators recognize these as inherently fiscal dimensions of policy, and are accordingly (and unsurprisingly) threatening Fed independence.
- Therefore, as in Japan in recent years, the Fed must now look over its shoulder at the implications for its independence of any major policy action it might take, and markets understand this.

## Existing models punt

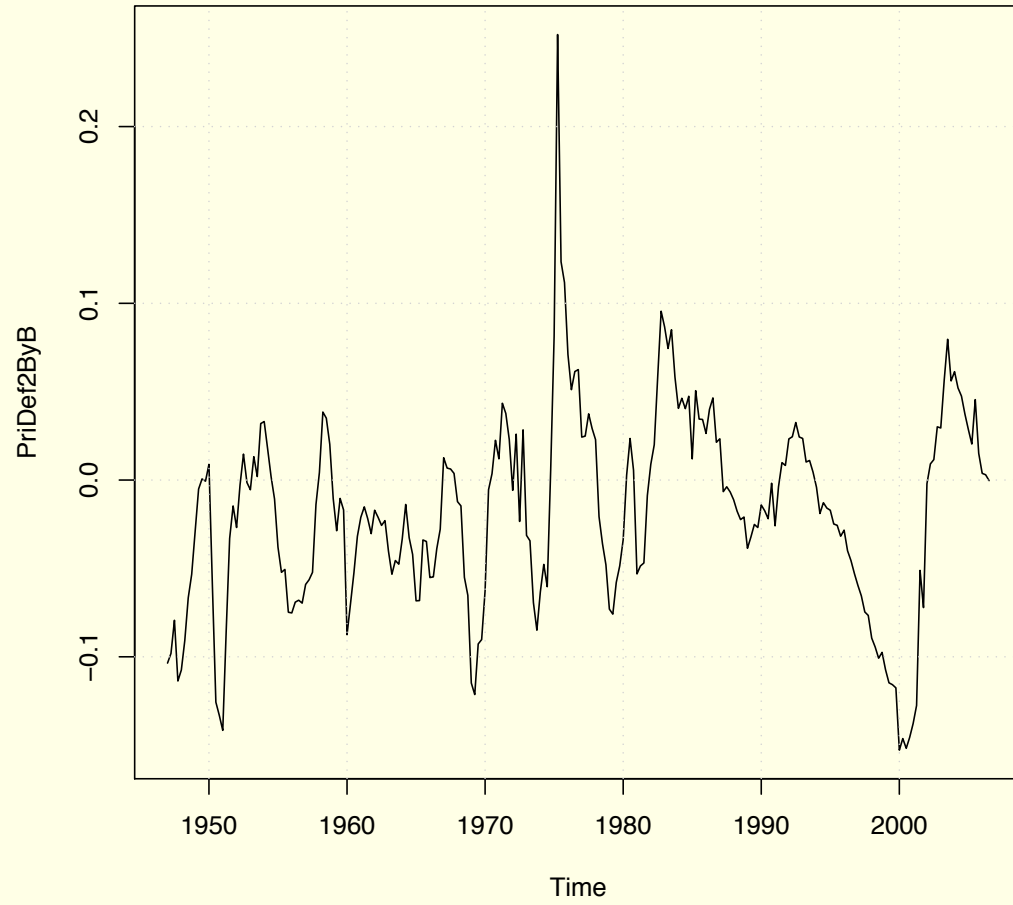
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- On the other hand, they typically include an exogenously drifting “inflation target” as an element of the monetary policy reaction function.
- The drift in the target explains most of the low frequency movement in inflation.
- This amounts to giving up any attempt to explain the broad outlines of inflation history — it rose in the 70’s because Arthur Burns wanted it to,

it came down in the 80's because Volcker and Greenspan Feds wanted it to.

- There is good reason to think that these low frequency movements in the target were influenced by the fiscal situation.



**Joint fiscal-monetary policy rhetoric essential to  
credibility**



## What to do about it

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- Stick with theory and calibration (i.e., sophisticated guesswork) (see Eggertsson)?
- Or try to get more detailed insight from the data. (i.e., in this case, more sophisticated guesswork).
- How to model and identify?

## Modeling fiscal policy

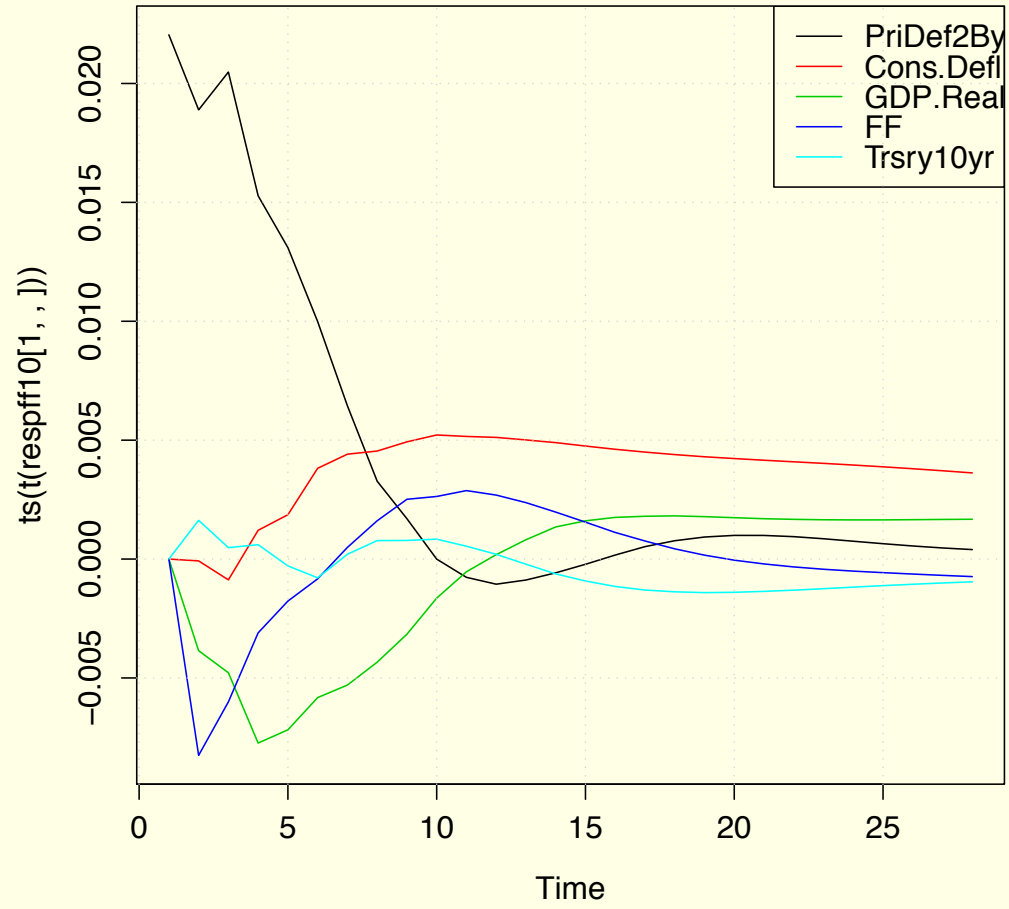
- Fiscal policy, in the sense of the path of the primary surplus, is persistent and variable.
- If agents can “see” the low-frequency component of fiscal policy, it will move their expectations around by large amounts while the direct effects on current fiscal variables are small.
- Rather than simply giving agents direct knowledge of fiscal variables  $k$  periods in advance, we make the primary surplus a state-space model with three components:
  - a mildly persistent component

- a large component that responds strongly and temporarily to the current level of output
- an AR component with two roots fairly close to one and small innovation: very persistent rate of growth; small shocks imply large revisions in beliefs about the future
- If agents see these components separately, we might hope to find periods when long run expectations about fiscal policy shift, which could show up in financial markets without much current change in “fiscal variables”.
- Shocks to this long run component of fiscal policy might then change long-short interest rate spreads immediately and produce both persistent changes in the inflation rate and persistent changes in the primary surplus.

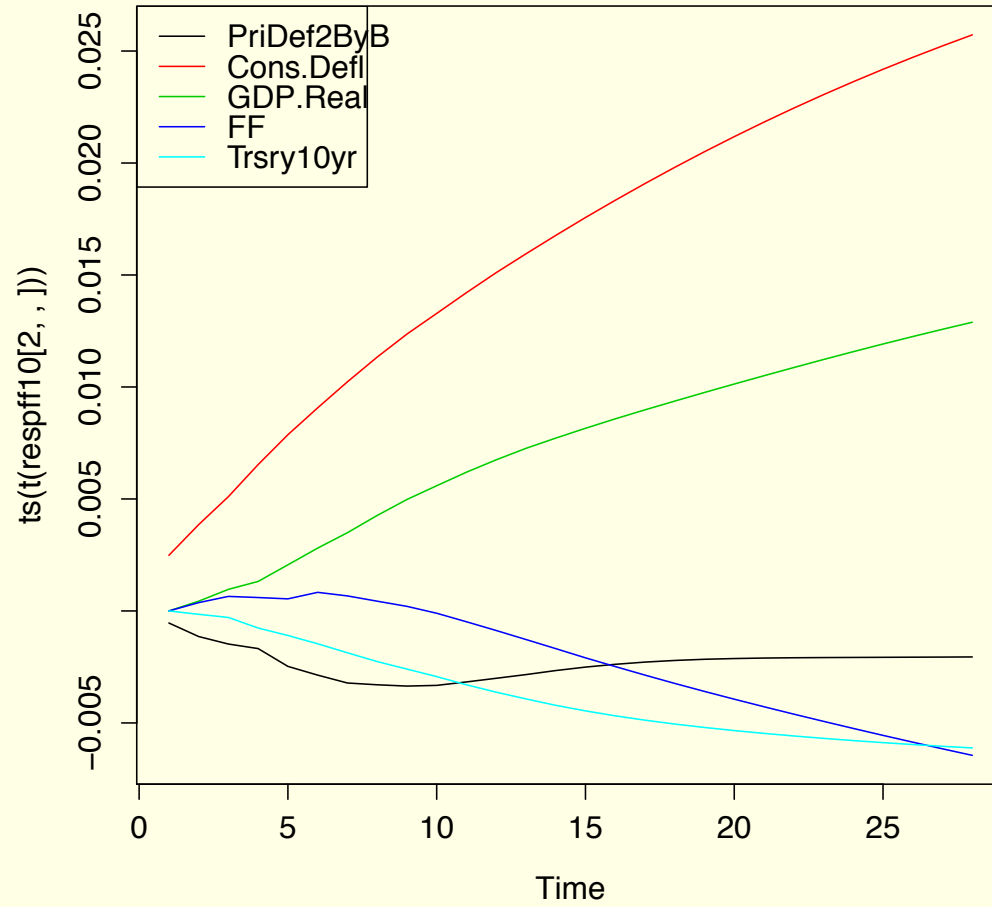
## **VAR evidence for the existence of this type of shock**

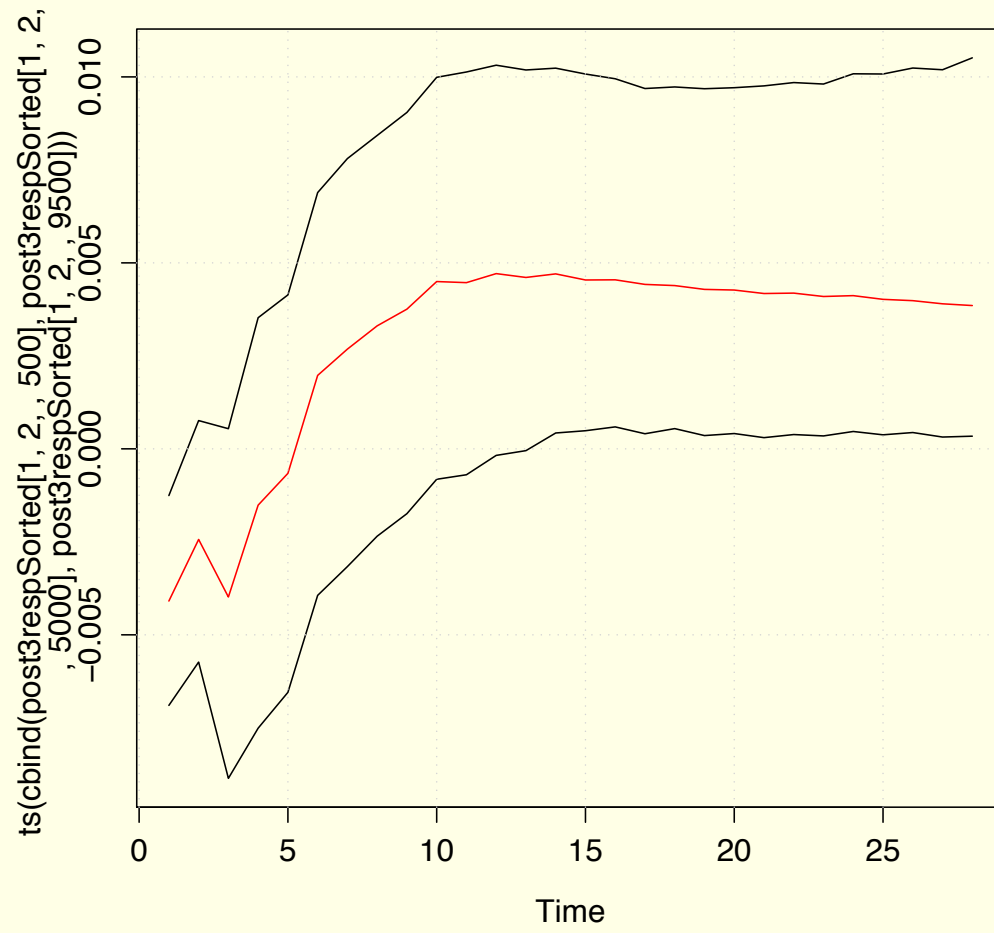
- This is a model fit to quarterly data from 1957-2005 on the primary deficit divided by market value of marketable Treasury debt, the consumption price deflator, real GDP, the federal funds rate, and the 10 year Treasury rate.
- Observe that there is one shock, the consumption deflator innovation (after contemporaneous correlation with the primary deficit variable is removed), that is the most important source of long run variation in both the primary deficit divided by gdp, and the price level.
- Long run effects are sometimes poorly estimated. But these are statistically fairly firm.

### Responses of PriDef2ByB



### Responses of Cons.defl







## **Modeling sensitivity of interest rate policy to the fiscal situation**

- Though we know that over long spans of time and across countries there is a dependence of monetary policy on the fiscal situation, the dependence is not an acknowledged component of monetary policy nowadays.
- Greenspan did occasionally suggest that interest rates could be lower if deficits were brought under control.
- The response might be nonlinear — When interest expense becomes a substantial proportion of the budget, the central bank is unlikely to ignore

the potential impact of interest rate changes on the budget, and at the same time legislators might be more willing to take painful restrictive actions.

## Model under construction

$$\text{M policy : } r_t = \gamma r_{t-1} + (1 - \gamma)\bar{\rho} + \theta(\pi_t - 1) + \nu_1 \left( \frac{c_t}{\bar{c}_{t-1}} - 1 \right) + \nu_2 b_t + \varepsilon_{m,t}$$

$$\text{IS}^* : \beta(1 + r_t) \left( \frac{c_{t+1}\bar{c}_{t+1}}{\bar{c}_t} \right)^{-\sigma_1} \frac{\lambda_{t+1}}{\pi_{t+1}} = \lambda_t c_t^{-\sigma_1}$$

$$\text{gbc : } b_t = \frac{b_{t-1}\bar{c}_{t-1}}{\pi_t \bar{c}_t} \left( a_{t-1} + \frac{a_{t-1}}{a_t} \right) - \bar{\tau} - \tau_t$$

$$\text{termstruc}^* : 1 + r_t = a_t + \frac{a_t}{a_{t+1}} - z_{a,t}$$

Phillips Curve\* :  $\pi_t = \pi_{t+1}^{\delta_1} \left( \frac{c_{t+1}}{\bar{c}_{t+1}} \right)^{\delta_2} (1 + z_{p,t})$

F policy :  $\tau = \phi_0 + \omega \frac{c_t}{\bar{c}_t} + \phi_1 b + z_{\ell t} + z_{s t} + \varepsilon_\tau$

$\lambda$  defn\* :  $\lambda_t = \beta \left( \left( \beta + \left( \frac{c_{t-1} \bar{c}_t}{c_t \bar{c}_{t-1}} \right)^{1-\sigma_0} \right)^{\frac{\sigma_0 - \sigma_1}{1-\sigma_0}} + \left( \beta \left( \frac{c_{t+1} \bar{c}_t}{c_t \bar{c}_{t+1}} \right)^{1-\sigma_0} + 1 \right)^{\frac{\sigma_0 - \sigma_1}{1-\sigma_0}} \right)$

growth :  $\bar{c}_t = \mu \bar{c}_{t-1} \cdot (1 + \varepsilon_{g,t})$

fiscal shocks :  $z_{\ell,t} = \alpha_\ell z_{\ell,t-1} + \varepsilon_{\ell,t}$        $z_{s,t} = \alpha_s z_{s,t-1} + \varepsilon_{s,t}$        $\alpha_\ell > \alpha_s$

**ts(t(result28\$impulse[c(1:3, 5:7), 4, ]))**

