Stepping on a Rake

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Outline

History

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- A model to illustrate the point that in an equilibrium where monetary policy cannot control the price level, the response of the economy to a monetary tightening could be qualitatively very similar to that in an economy where it does control the price level.
- Monetary contraction produces recession and a *temporary* decline in inflation, followed by a higher level of inflation — as seemed to happen after monetary contractions in the 70's.

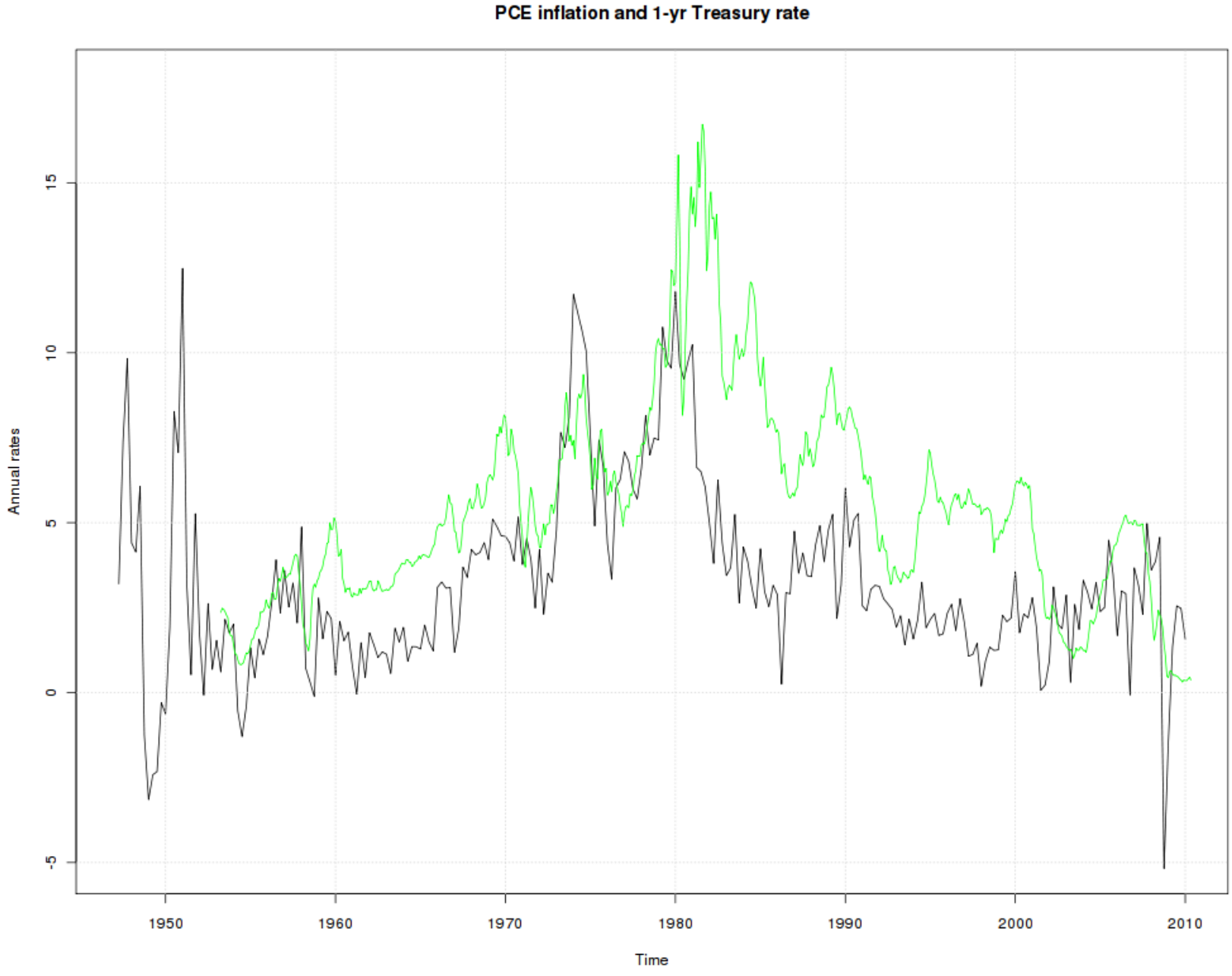
Implications from the models

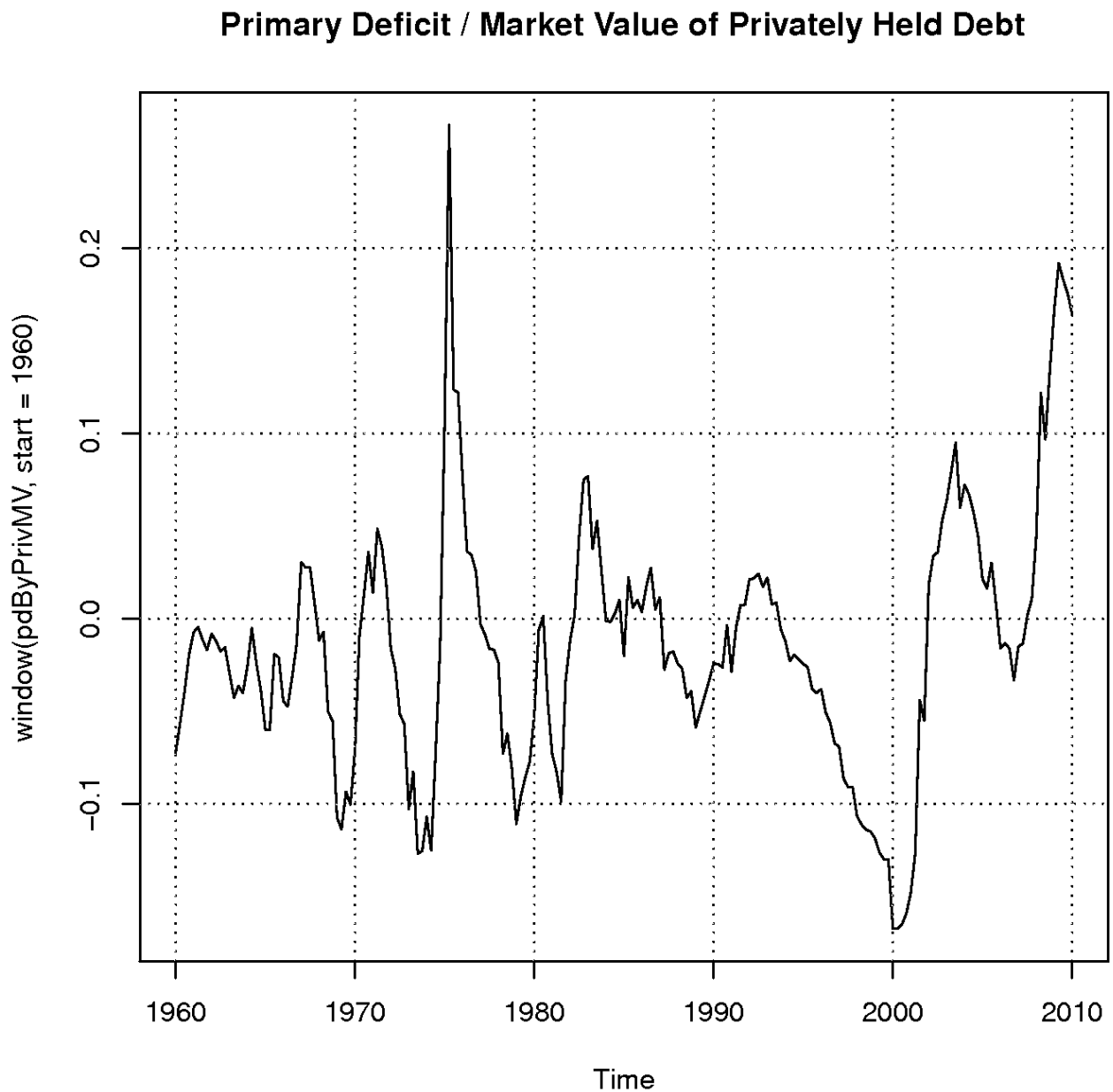
- There is no simple way, from looking at monetary policy alone, to be sure that fiscal policy is not impacting inflation: Despite fiscal dominance, interest rate policy may be capable of producing recessions.
- Reaction functions that satisfy the Taylor Principle do not preclude fiscal dominance. Even a fairly remote possibility of a regime of fiscal dominance can make fiscal disturbances have a direct impact on inflation.

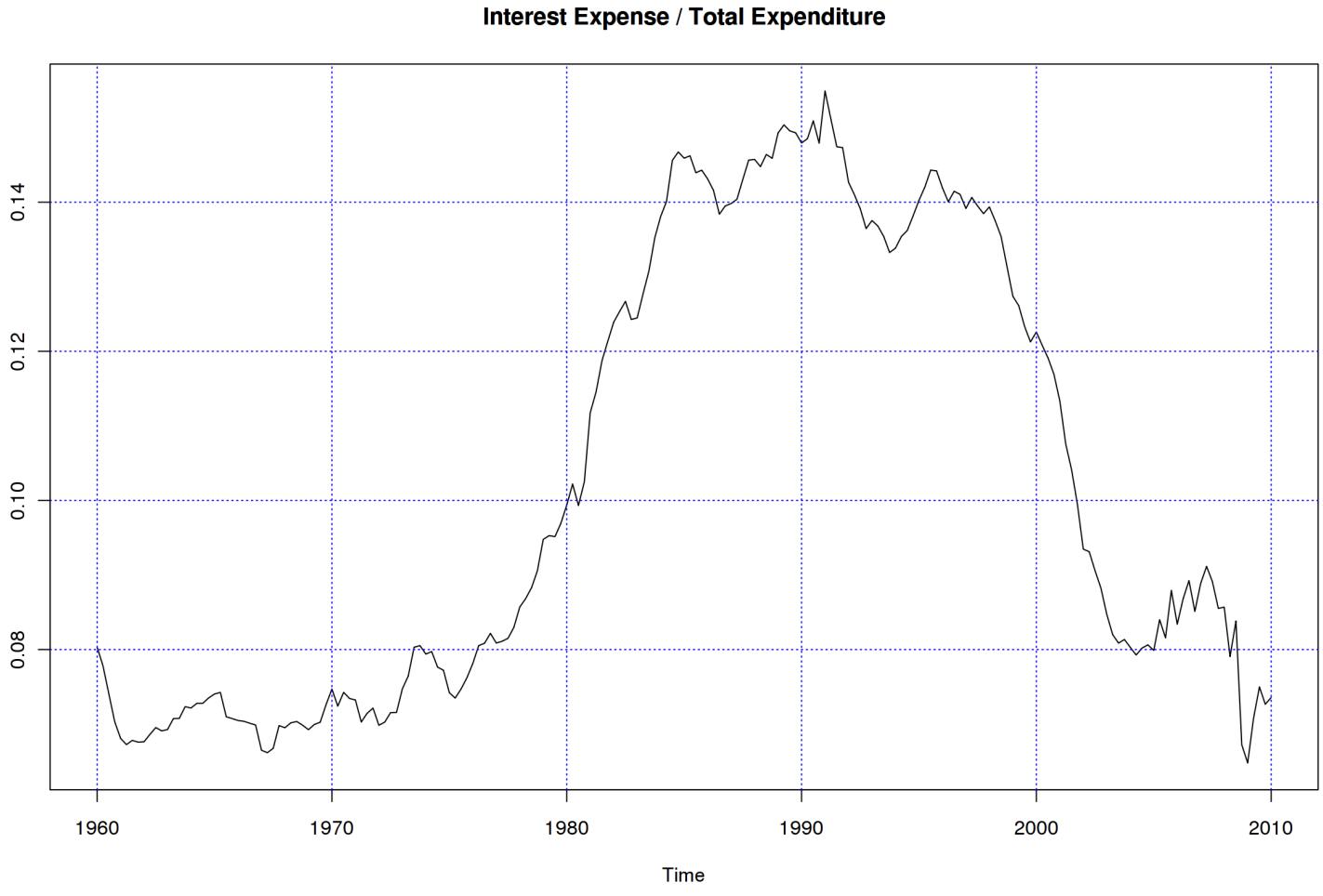
Possible conclusion

- Unstable fiscal policy may have played a role in the difficulty of controlling inflation with monetary policy in the 70's.
- Looking forward, it may once again be important to stabilize expectations about future fiscal policy.

Outline


PCE inflation and 1-yr Treasury rate
Annual rates
15
10
5
0
-5
1950
1960
1970
1980
1990
2000
2010
Time


Primary Deficit / Market Value of Privately Held Debt
window(pdByPrivMV, start = 1960)
0.2
0.1
0.0
−0.1
1960
1970
1980
1990
2000
2010
Time


Interest Expense / Total Expenditure
0.14
0.12
0.10
0.08
1960
1970
1980
1990
2000
2010
Time

What does the public know?

- Was the public sure in 1978-80 that interest rates would follow inflation upward *no matter how high*? If not, fiscal surprises were feeding in to the inflation process (i.e., were "natural rate shifters").
- Did bondholders know in 1978 when and how fiscal resources to provide them a competitive return were going to emerge? Might their views on this have been shifting?

Outline

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Why it works: a simple model

$$\max E\left[\sum_{t=0}^{\infty}\beta^t \log C_t\right] \text{ s.t.}$$

$$C_t(1+\gamma v_t)+\frac{B_t+M_t}{P_t}=\frac{R_{t-1}B_{t-1}+M_{t-1}}{P_t}+Y_t+g_t$$

$$v_t=\frac{P_tC_t}{M_t}$$

$$R_t=\beta^{-1}\left(\frac{P_tC_t}{P_{t-1}C_{t-1}}\right)^{\theta} \quad \text{Taylor Rule}$$

$$\frac{B_t+M_t}{P_t}=\frac{R_{t-1}B_{t-1}}{P_t}+g_t \quad \text{Gov't Budget}$$

$$g_t=g_0-\phi\frac{B_{t-1}}{P_{t-1}}+\varepsilon_t \quad \text{Fiscal Policy}$$

Why it works, II

FOC's produce

$$R_t = (1 - \gamma v_t^2)^{-1}$$

$$\left(\frac{1 - \gamma v_t^2}{\beta}\right)^{1-1/\theta} Z_t = E_t Z_{t+1} \qquad (*)$$

$$Z_t = \frac{(1 - \gamma v_t^2)^{1/\theta}}{1 + 2\gamma v_t}$$

NB: Z_t monotone decreasing in v_t. $(*)$ has a solution with constant Z (and hence constant v) and is locally unstable if $\theta > 1$ (the Taylor principle). We treat Y_t and ε_t as i.i.d.

But can we rule out the locally unstable paths as equilibrium solutions?

- The paths in which Z increases, and hence v decreases, can be ruled out. Once Z goes above its steady state, equilibrium requires that it be unbounded above, but this cannot happen even with $v \to 0$.
- The paths in which Z decreases, and hence v increases, cannot be ruled out. On these paths, v approaches a finite upper limit as $Z \to 0$, while R and P_t/P_{t-1} approach infinity. No feasibility constraint is violated if such a path persists forever, with ever accelerating inflation.

Same model, pure interest rate peg

- The stationary equilibrium has R, M, PC and PY constant.
- We have not used the government budget constraint or the fiscal rule. They simply determine a stationary time path for government debt.
- What if policy were not a Taylor-principle Taylor rule, but instead $R_t = \beta^{-1}$, i.e. a pure interest rate peg?
- What if, further, fiscal policy were to make the primary deficit (in equilibrium a surplus, if debt is positive) exogenous, but following the same stochastic process (as a function of Y_t and ε_t) as in the Taylor-principle Taylor rule?

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- Answer: Equilibrium is *exactly the same*.

Uniqueness

- The Taylor-principle Taylor rule equilibrium price level is not unique.
- This interest-rate peg equilibrium does deliver a unique price level.
- The unstable equation is no longer the Z equation, but the government budget constraint.
- Deflationary deviations in which real debt explodes upward are ruled out by transversality.
- Inflationary deviations in which real debt shrinks toward zero are ruled out as infeasible from the viewpoint of private agents — they would see themselves as having insufficient resources, in real bonds and discounted present value of Y, to support both the SRC level of C and the discounted value of current and future taxes g_t.
- So they would reduce their demand, reduce prices, bring the price level back to the equilibrium path.

Active-money/Active-fiscal?

- Uniqueness still holds even when we combine an exogenously fixed primary surplus with a Taylor-principle Taylor rule. The result is (except for a knife-edge special case) a unique, explosive, equilibrium.
- A shock to the policy rule that lowers the coefficient on inflation *reduces* inflation and its rate of growth.
- There is a way for the monetary authority to end the explosiveness: Lower the interest rate and keep it fixed.

Outline

Bare-bones flex-price FTPL

$$
\begin{aligned}
M \text{ policy :} \quad & \dot{r} = -\gamma(r-\rho) + \theta\dot{p} + \varepsilon_m \\
\text{Fisher}^\star \text{ :} \quad & r = \rho + \dot{p} \\
\text{Govt. Budg. Cnstr. :} \quad & \dot{b} = -b\dot{p} + rb - \tau \\
\text{Fiscal policy :} \quad & \dot{\tau} = \varepsilon_\tau \, .
\end{aligned}
$$

Implications of the bare-bones model

- If monetary policy pegs the interest rate, a surprise, permanent increase in the interest rate *increases* inflation, and has no other effect.
- A surprise, permanent increase in the primary surplus produces a downward, discontinuous jump in the price level, and no other effect.

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- These properties make the model look unrealistic to monetary policy-makers.
- However, one guesses that with sticky prices, the model might not be so unrealistic. This was probably first investigated by Eduardo Loyo in his PhD thesis.

Extending the model

- We'd like to add sticky prices, so that real activity is affected by nominal adjustments.
- To avoid forcing big, discontinuous price jumps, we'd like to have long government debt. This allows the value of outstanding debt to adjust in response to discontinuous changes in the long interest rate, which are more plausible than discontinuous changes in the price level.
- To get a continuous, instead of jump, response of output to shocks, we introduce habit in consumption via a quadratic penalty on $\dot{c}^2$.

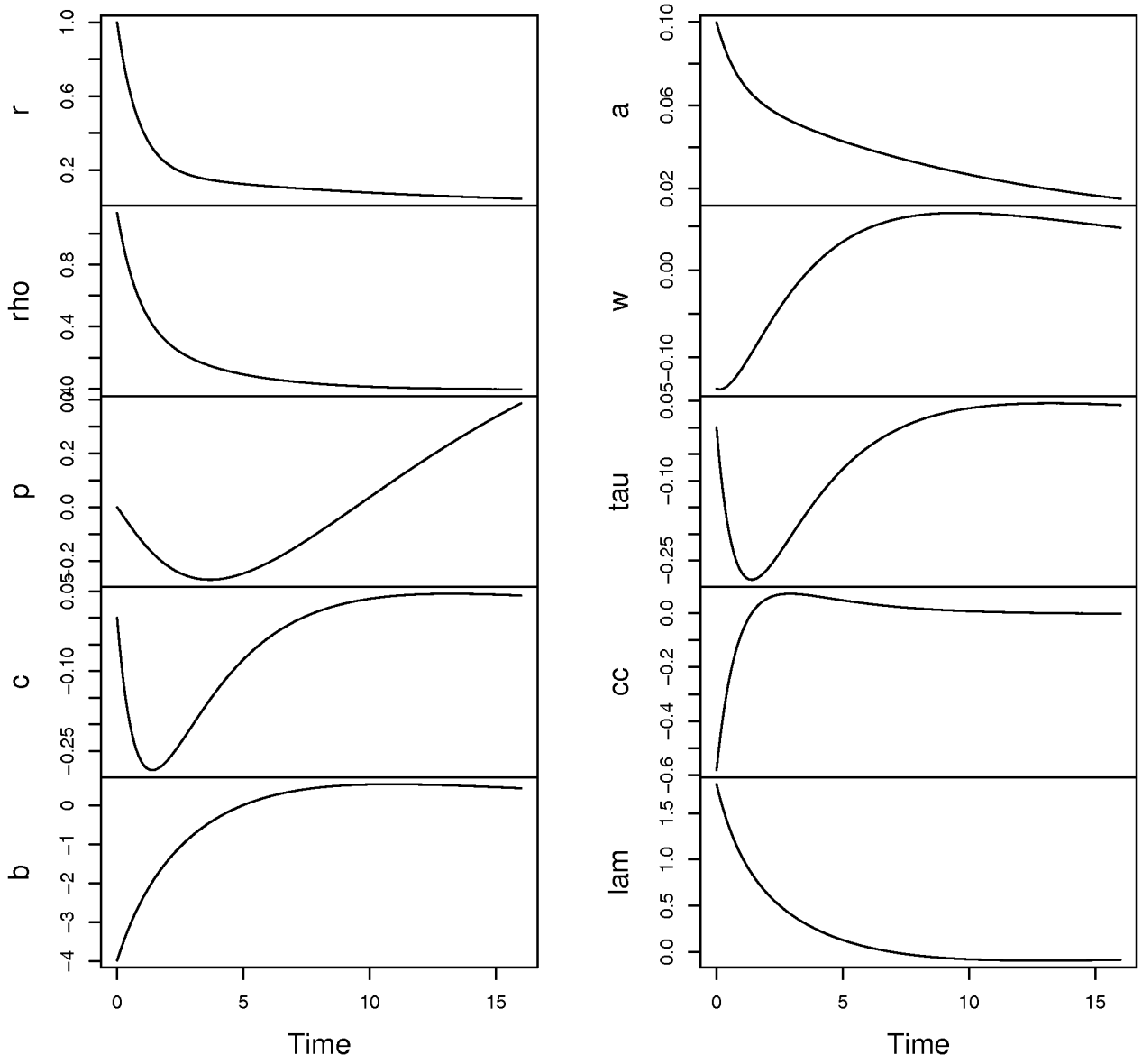
Stepping-on-a-rake model

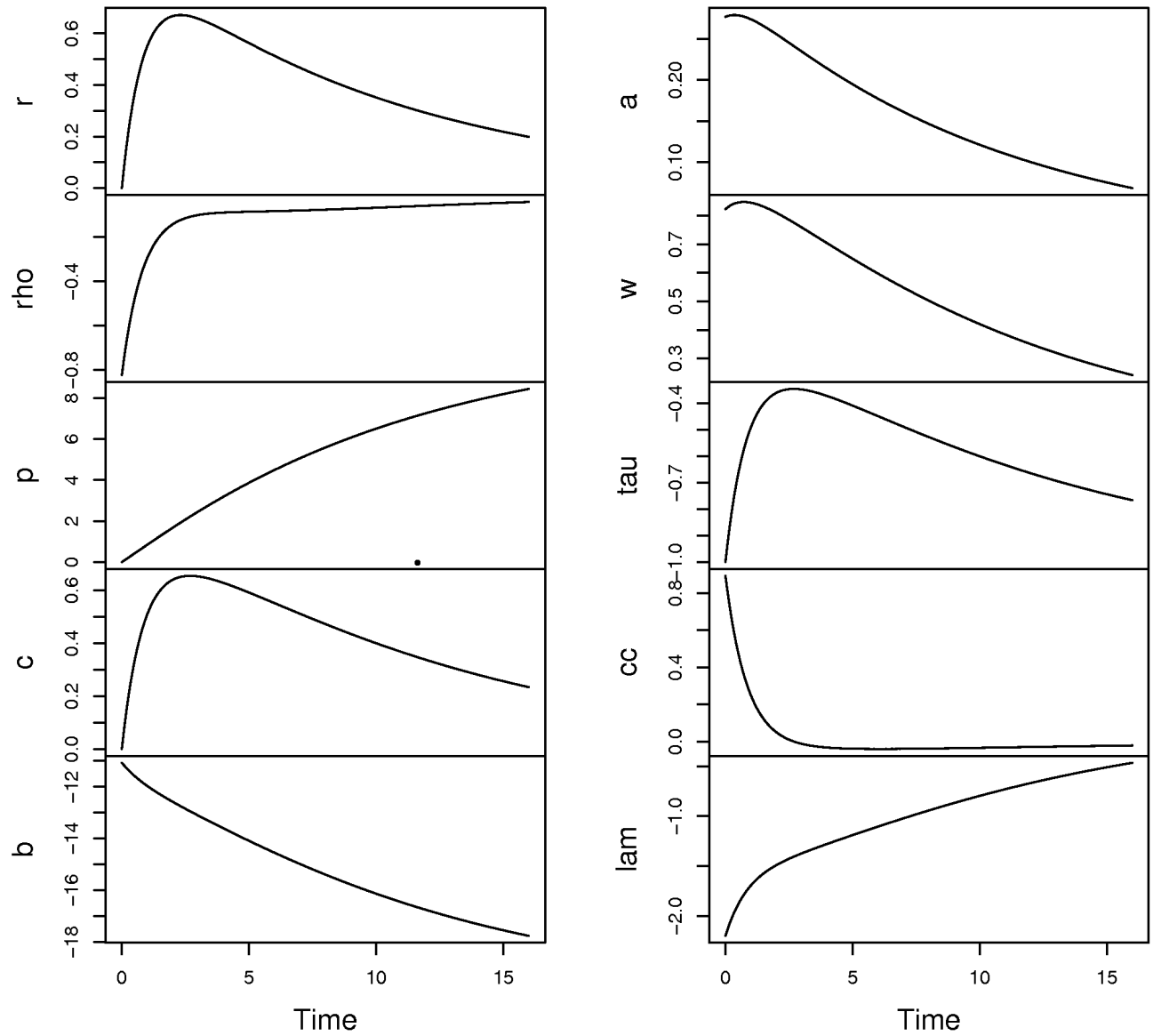
$$
\begin{aligned}
M \text{ policy}: &\quad \dot{r} = -\gamma(r - \bar{\rho}) + \theta\dot{p} + \phi\dot{c} + \varepsilon_m \\
\text{Fisher}^\star: &\quad r = \rho + \dot{p} \\
\text{IS}^\star: &\quad \rho = -\frac{\dot{\lambda}}{\lambda} + \bar{\rho} + \varepsilon_r \\
\text{Govt. Budg. Cnstr.}: &\quad \dot{b} = -b\dot{p} - b\frac{\dot{a}}{a} + ab - \bar{\tau} - \tau \\
\text{term struct.}^\star: &\quad r = a - \dot{a}/a \\
\text{Phillips curve}^\star: &\quad \ddot{p} = \beta\dot{p} - \delta c - \varepsilon_{pc} \\
\text{Fiscal policy}: &\quad \dot{\tau} = \omega\dot{c} + \varepsilon_\tau \\
\text{habit}^\star: &\quad \lambda = e^{-\sigma c} + \psi(\ddot{c} - \dot{c}^2)e^{-c}
\end{aligned}
$$

$\star$: forward-looking equation; a: consol rate; b: $B/(aP)$; P: the price level; B: the number of outstanding consols; λ: Lagrange multiplier on the consumer's budget constraint

Parameter values for impulse responses:

γ	θ	ϕ	σ	$\bar{\rho}$	$\bar{\tau}$	β	δ
0.20	0.208	0.10	2.00	0.05	0.10	0.50	1.00


Responses to Monetary Shock
r
rho
p
c
b
a
w
tau
cc
lam
Time
Time


Responses to Fiscal Shock
r
rho
p
c
b
a
w
tau
cc
lam
Time
Time

Fiscal/monetary interaction and the current crisis

- It is a sad fact that none of the policy models in use at central banks, to my knowledge, have complete and correct treatments of the wealth and valuation effects by which fiscal policy influences spending and inflation.

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- It is a sad fact that none of the policy models in use at central banks, to my knowledge, have complete and correct treatments of the wealth and valuation effects by which fiscal policy influences spending and inflation.
- As many have argued that the Fed *should* have done in the 30's, today's Fed is making risky interventions that have potential fiscal consequences.
- Several recent papers have developed the point that in a deflationary crisis, successful policy must create expectations of future inflation. This requires articulating and implementing an inflation target or goal, and requires that fiscal policy as well as monetary policy aim toward the target.
- We need more and better models of how fiscal policy and expectations of future fiscal policy affect inflation.