
Eric Sims

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This paper: one negative result, one positive result

- Negative: structural VARs cannot recover noise shocks when agents face signal extraction problems
- Positive: noise shocks about underlying fundamentals matter quantitatively for fluctuations

This discussion:
- Negative result not whole story; focus on what one can do with a structural VAR
- Positive result not so positive, very fragile with respect to model structure
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A Simple Model with News and Noise

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- Natural rate assumption: \( \lim_{j \to \infty} E_t c_{t+j} = E_t a_{t+j} \)
- Implies that consumption only depends on \( x \)
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Agents observe innovations to \( s_t \) and \( a_t \), use Kalman filter to form estimates of unobserved states, and then set consumption according to a simple linear policy rule.
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Primitive disturbances: \( \epsilon \) ("permanent shock"), \( \eta \) ("transitory shock"), and \( \nu \) ("noise shock")
Impulse Responses to Primitive Shocks

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Discussion
Can a structural VAR approach recover these primitive disturbances?

- The agents generating the data can’t identify the primitive disturbances, nor can the econometrician.

The IRFs on previous page are not IRFs from the perspective of the agents’ information set.

There can be no expected reversion in consumption given the perfect smoothing FOC.

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A Structural VAR Approach

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What are the “Shocks” to the Agents?

- Agents don’t observe the primitive shocks

Problem: (1) and (2) are correlated. But there exists a natural orthogonalization: signal innovation orthogonal to productivity innovation is “news shock.”
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  - Signal innovation orthogonal to productivity is “news shock”.

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IRFs from Perspective of Agents

**IRF to A Innovation (Ordered First)***

- **Consumption**
- **Productivity**

**IRF to S Innovation Orthogonal to A**

- **Consumption**
- **Productivity**
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Estimate bivariate VAR with productivity and consumption

Order productivity first, consumption second in Choleski decomposition

This VAR recovers exactly (in large enough sample) shocks and IRFs from perspective of agents

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SVAR and Model Responses

IRFs of C: A ordered first

IRFs of C: C orthogonal to A

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Simulated Model

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Non-invertibility: there exists no rotation of VAR innovations which can recover structural shocks.

In a strict sense, yes: econometrician can’t observe permanent component of productivity. But neither can the agents in the economy. Situation better described as an invalid identifying restriction. There is no \textit{ex-ante} reversion to the “shocks” from the perspective of agents’ information sets in the model. Long run restrictions won’t work to identify noise shock.
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To say more about the role of noise, need to impose more structure
Authors estimate structural parameters of simple model.
Structural Estimation

- Authors estimate structural parameters of simple model
- Conclude that noise shocks matter – explain more than 70% of innovation variance of consumption and 50% at one year horizon
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  - But valid for a serious quantitative exercise?
- Justification is that simple model is a special case of New Keynesian model
New Keynesian Model

- Process for productivity, signal extraction problem same as before

Equations of model:

\[ E_t y_t + 1 = \pi_t + \nu_t \]

\[ E_t \pi_t + 1 = \left( \frac{1}{\theta} \right) \left( \frac{1}{\beta} \theta \beta \right) \theta m_t + \beta E_t \pi_t + 1 m_t = \left( 1 + \zeta \right) \left( y_t a_t \right) \]

\[ i_t = \phi \pi_t \phi > 1 \]
New Keynesian Model

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\[
\begin{align*}
E_{t}y_{t+1} &= y_{t} + i_{t} - E_{t}\pi_{t+1} \\
\pi_{t} &= \frac{(1 - \theta)(1 - \theta\beta)}{\theta}mc_{t} + \beta E_{t}\pi_{t+1} \\
mc_{t} &= (1 + \zeta)(y_{t} - a_{t}) \\
i_{t} &= \phi\pi_{t} \quad \phi > 1
\end{align*}
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As $\theta \to 1$, this model reverts to simple model. Why?
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Relation to Simple Model

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- $\theta \to 1 \implies \pi_t = \beta E_t \pi_{t+1}$
- $\beta < 1 \implies E_t \pi_{t+j} = 0 \quad \forall j \geq 0$

A constant real interest rate implies perfect consumption smoothing.
Relation to Simple Model

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Constant interest rate matters. Effectively “turns off” general equilibrium.
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News/noise about long run productivity = increase consumption by full amount of expected long run movement in productivity.
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But if interest rate not constant, it will (partially) choke off the increase in demand
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Allowing $\theta < 1 \implies$ real interest rate will move around $\implies$ news/noise will lead to smaller high frequency movements in consumption
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Most empirical evidence suggests $\theta \leq 0.8$ ($\theta \approx 0.8$ preferred estimate in Gali and Gertler (1999))
Responses with Calvo Parameter $= 1$

- **Permanent Shock**
- **Transitory Shock**
- **Noise Shock**

Graphs showing the responses of consumption and productivity under different types of shocks. The graphs illustrate how consumption and productivity change over time in response to different types of shocks (permanent, transitory, and noise). The axes are labeled with appropriate units and scales to represent the changes in consumption and productivity.
Responses with Calvo Parameter = 0.8

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Implications

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Implications

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- Also, responses to other two shocks more closely track movements in productivity
- General equilibrium forces at work
- As $\theta \to 0$, this economy functions as an endowment economy with $y_t = a_t$
Variance Decomposition

- Fraction of forecast error variance of consumption due to noise shocks:

<table>
<thead>
<tr>
<th>Horizon</th>
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It really matters for quantitative results what $\theta$ is. As $\theta$ moves away from 1, noise ceases to matter regardless of other parameters.
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- It really matters for quantitative results what $\theta$ is
- As $\theta$ moves away from 1, noise ceases to matter
  - True regardless of other parameters
In Section 5, authors conduct robustness exercise where $\theta \neq 1$.

They estimate $\kappa = 0.0011$ (Table 5). This is close to baseline results with $\theta = 1$, so estimation results on importance of noise shocks essentially the same.

How does this compare to other estimates in literature?

Gali and Gertler (1999): estimate slope of Phillips Curve in terms of marginal cost at 0.023.

Even if labor supply elasticity is $\infty$ (so $\zeta = 0$), $\kappa = 0.0011$ is less than $\frac{1}{20}$ the magnitude of GG’ s estimate!
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Estimate slope of Phillips Curve expressed in terms of output gap:

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Implications

- Suppose $\kappa = 0.0011$ and $\beta = 0.99$. The lower bound on $\theta$ is then 0.972. More plausible labor supply elasticity implies $\theta \approx 1$. 

The estimated model then has the following testable implications:

- Essentially no time series variation in either interest rates or inflation
- Average duration between price changes of 10 years or more

Both are clearly at odds with data (Bils and Klenow (2004) suggest average duration between price changes six months)

Bottom line: this parameterization of the model cannot be close to the true data generating process

Cannot conclude that noise shocks are an important source of fluctuations on the basis of estimating this model.
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Bottom line: this parameterization of the model cannot be close to the true data generating process.

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Discussion of Their Results

- Why are they getting these results?

Only observables from the data in their estimation are consumption and productivity growth. Model is really designed to explain inflation dynamics. Not modeling other shocks. No real rigidities. No capital.

Suggestions:
- Condition on more observables in estimation (include inflation).
- Model real rigidities explicitly.

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Maybe think about modeling noise explicitly on the firm side of the model