Discussion of Blanchard, L'Hullier, and Lorenzoni (2009): "News, Noise, and Fluctuations: An Empirical Exploration"

Eric Sims

University of Notre Dame

July 2009

Overview

- This paper: one negative result, one positive result

Overview

- This paper: one negative result, one positive result
  - Negative: structural VARs cannot recover noise shocks when agents face signal extraction problems

Overview

- 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

Overview

- 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:

Overview

- 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

Overview

- 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

A Simple Model with News and Noise

- Process for productivity: $a_t = x_t + z_t$.

A Simple Model with News and Noise

- Process for productivity: $a_t = x_t + z_t$.
- x is permanent component and z is transitory: $\Delta x_t = \rho \Delta x_{t-1} + \epsilon_t$ and $z_t = \rho z_{t-1} + \eta_t$

A Simple Model with News and Noise

- Process for productivity: $a_t = x_t + z_t$.
- x is permanent component and z is transitory: $\Delta x_t = \rho \Delta x_{t-1} + \epsilon_t$ and $z_t = \rho z_{t-1} + \eta_t$
- Model without capital; perfect consumption smoothing: $c_t = E_t c_{t+j}$ $\forall\ j \geq 1$

A Simple Model with News and Noise

- Process for productivity: $a_t = x_t + z_t$.
- x is permanent component and z is transitory: $\Delta x_t = \rho \Delta x_{t-1} + \epsilon_t$ and $z_t = \rho z_{t-1} + \eta_t$
- Model without capital; perfect consumption smoothing: $c_t = E_t c_{t+j}$ $\forall\ j \geq 1$
- Natural rate assumption: $\lim_{j \to \infty} E_t c_{t+j} = E_t a_{t+j}$

A Simple Model with News and Noise

- Process for productivity: $a_t = x_t + z_t$.
- x is permanent component and z is transitory: $\Delta x_t = \rho \Delta x_{t-1} + \epsilon_t$ and $z_t = \rho z_{t-1} + \eta_t$
- Model without capital; perfect consumption smoothing: $c_t = E_t c_{t+j}$ $\forall\ j \geq 1$
- Natural rate assumption: $\lim_{j \to \infty} E_t c_{t+j} = E_t a_{t+j}$
- Implies that consumption only depends on x

Signal Extraction Problem

- Agents observe level of productivity, but don't observe permanent component, only a noisy signal: $s_t = x_t + v_t$

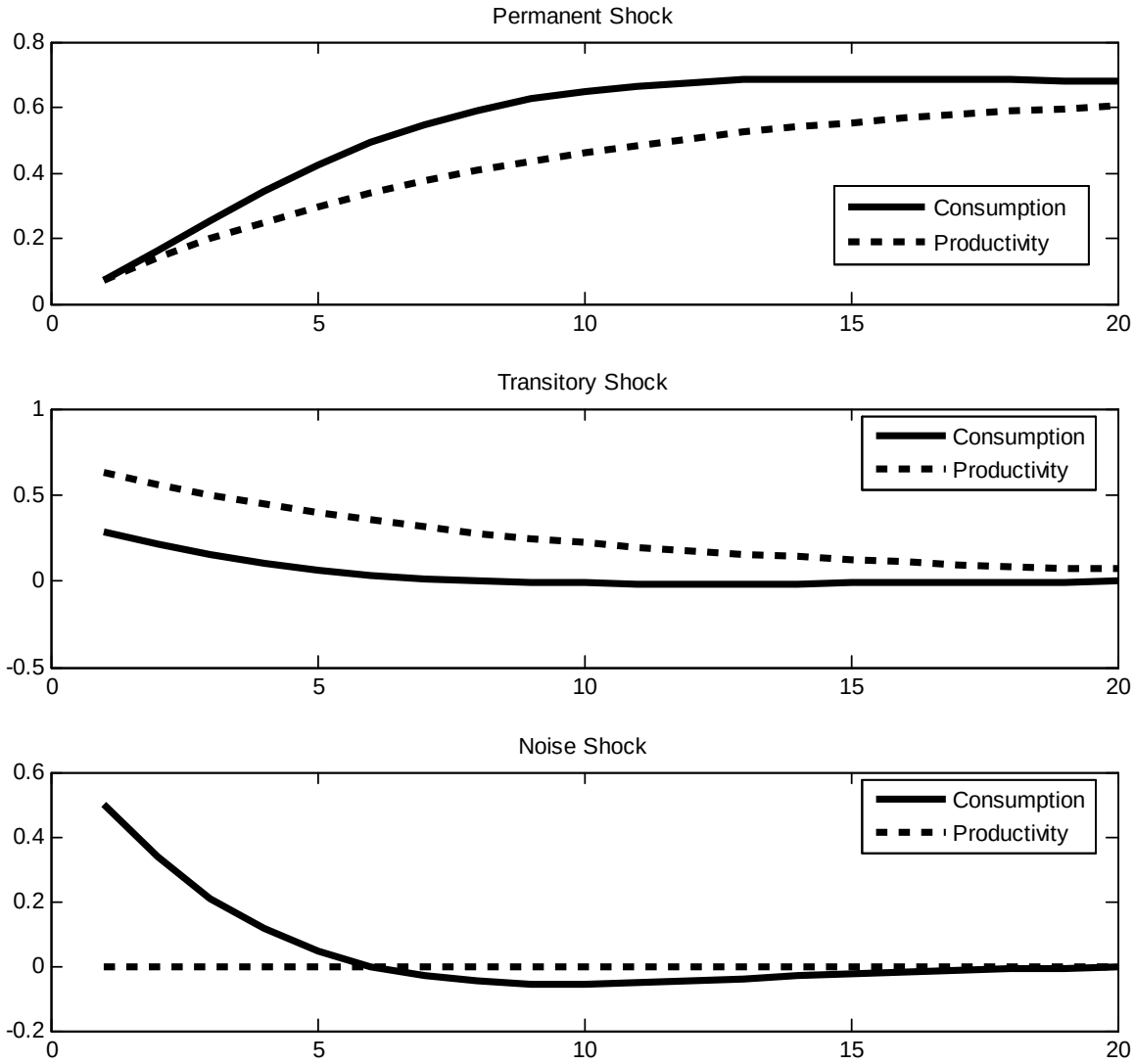
Signal Extraction Problem

- Agents observe level of productivity, but don't observe permanent component, only a noisy signal: $s_t = x_t + v_t$
- 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

Signal Extraction Problem

- Agents observe level of productivity, but don't observe permanent component, only a noisy signal: $s_t = x_t + v_t$
- 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
- Primitive disturbances: ϵ ("permanent shock"), η ("transitory shock"), and v ("noise shock")

Impulse Responses to Primitive Shocks



A Structural VAR Approach

- Can a structural VAR approach recover these primitive disturbances?

A Structural VAR Approach

- Can a structural VAR approach recover these primitive disturbances?
  - No

A Structural VAR Approach

- Can a structural VAR approach recover these primitive disturbances?
  - No
- Why not?

A Structural VAR Approach

- Can a structural VAR approach recover these primitive disturbances?
  - No
- Why not?
  - The agents generating the data can't identify the primitive disturbances $\Longrightarrow$ the econometrician can't either

A Structural VAR Approach

- Can a structural VAR approach recover these primitive disturbances?
  - No
- Why not?
  - The agents generating the data can't identify the primitive disturbances $\Longrightarrow$ the econometrician can't either
- The IRFs on previous page are *not* IRFs from the perspective of the agents' information set

A Structural VAR Approach

- Can a structural VAR approach recover these primitive disturbances?
  - No
- Why not?
  - The agents generating the data can't identify the primitive disturbances $\Longrightarrow$ the econometrician can't either
- 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

A Structural VAR Approach

- Can a structural VAR approach recover these primitive disturbances?
  - No
- Why not?
  - The agents generating the data can't identify the primitive disturbances $\Longrightarrow$ the econometrician can't either
- 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
  - Long run restriction cannot identify noise shock

What are the "Shocks" to the Agents?

- Agents don't observe the primitive shocks

What are the "Shocks" to the Agents?

- Agents don't observe the primitive shocks
- Rather, they observe (1) an innovation to the current level of productivity and (2) an innovation to the signal about the permanent component of productivity

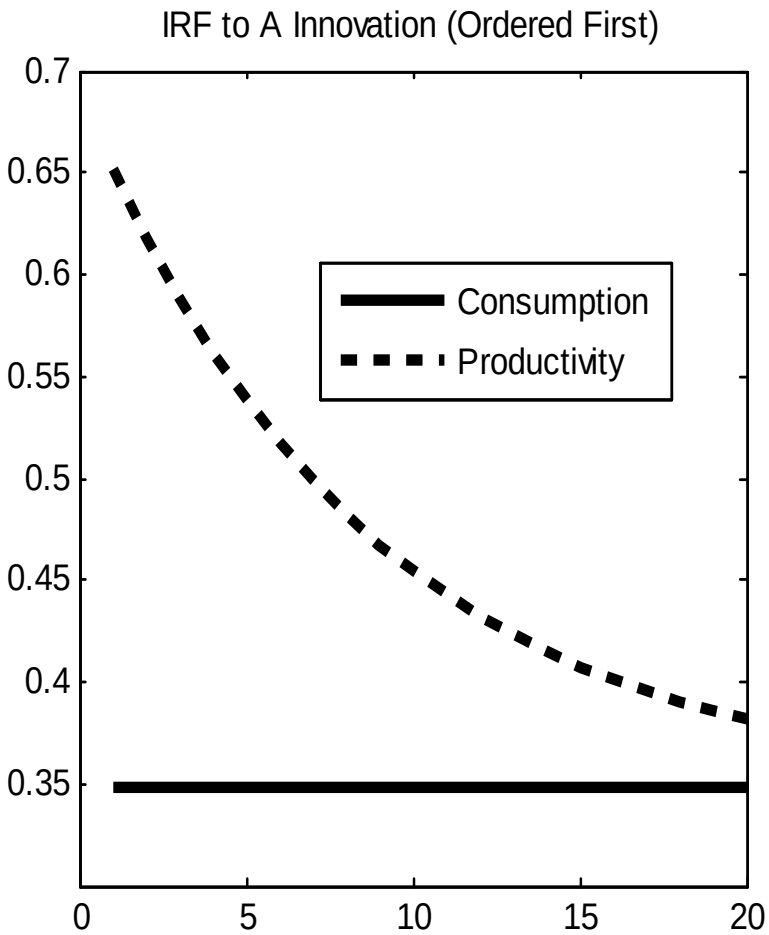
What are the "Shocks" to the Agents?

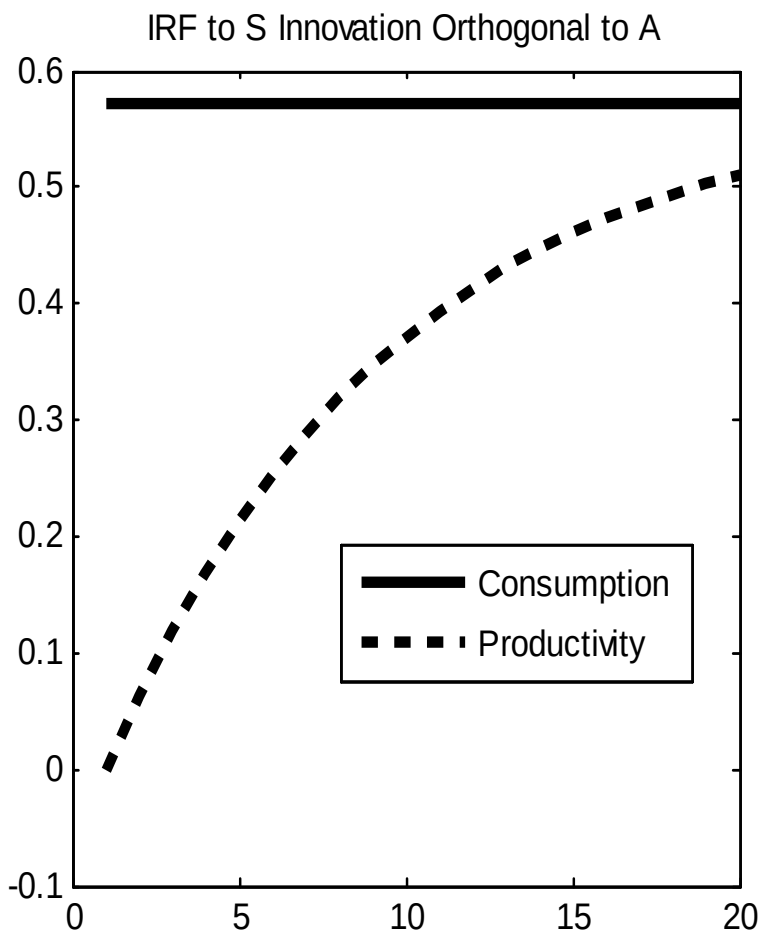
- Agents don't observe the primitive shocks
- Rather, they observe (1) an innovation to the current level of productivity and (2) an innovation to the signal about the permanent component of productivity
- Problem: (1) and (2) are correlated. But there exists a natural orthogonalization: signal innovation orthogonal to productivity innovation

What are the "Shocks" to the Agents?

- Agents don't observe the primitive shocks
- Rather, they observe (1) an innovation to the current level of productivity and (2) an innovation to the signal about the permanent component of productivity
- Problem: (1) and (2) are correlated. But there exists a natural orthogonalization: signal innovation orthogonal to productivity innovation
    - Signal innovation orthogonal to productivity is "news shock"

IRFs from Perspective of Agents





A Structural VAR Approach

- Can a structural VAR identify shocks and IRFs from the perspective of the agents in the model?

A Structural VAR Approach

- Can a structural VAR identify shocks and IRFs from the perspective of the agents in the model?
  - *Yes!*

A Structural VAR Approach

- Can a structural VAR identify shocks and IRFs from the perspective of the agents in the model?
  - *Yes!*
  - Can identify shocks even without observing signal

A Structural VAR Approach

- Can a structural VAR identify shocks and IRFs from the perspective of the agents in the model?
  - *Yes!*
  - Can identify shocks even without observing signal
- Estimate bivariate VAR with productivity and consumption

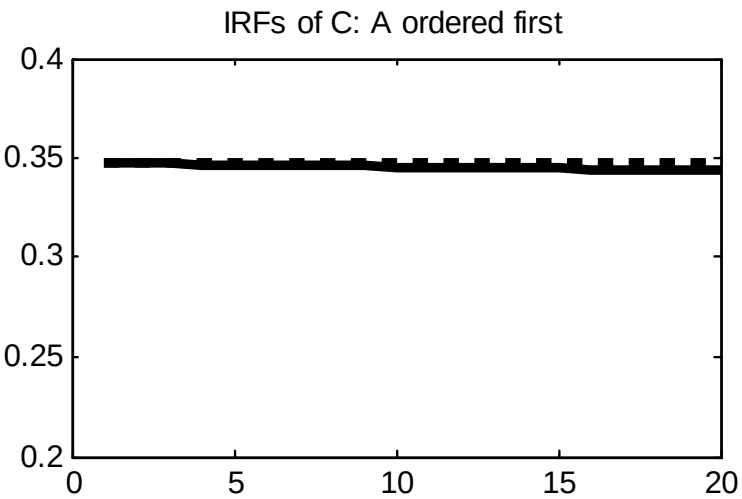
A Structural VAR Approach

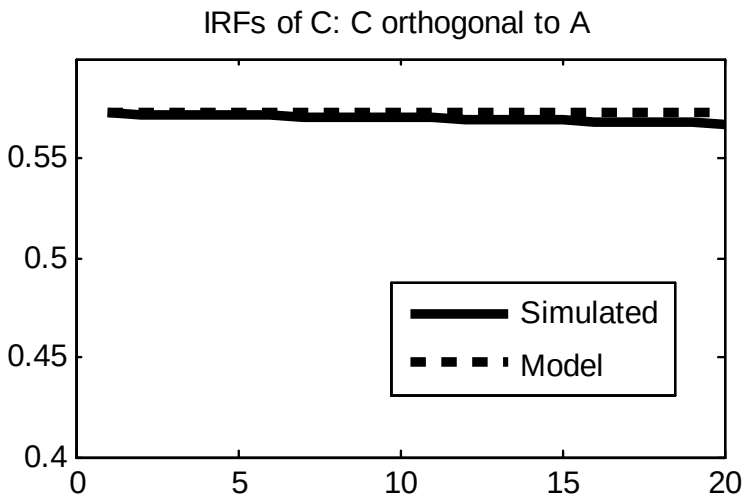
- Can a structural VAR identify shocks and IRFs from the perspective of the agents in the model?
  - *Yes!*
  - Can identify shocks even without observing signal
- Estimate bivariate VAR with productivity and consumption
  - Order productivity first, consumption second in Choleski decomposition

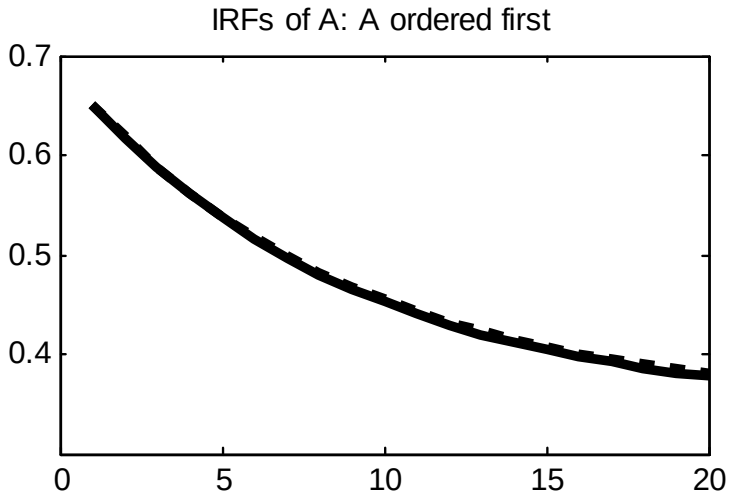
A Structural VAR Approach

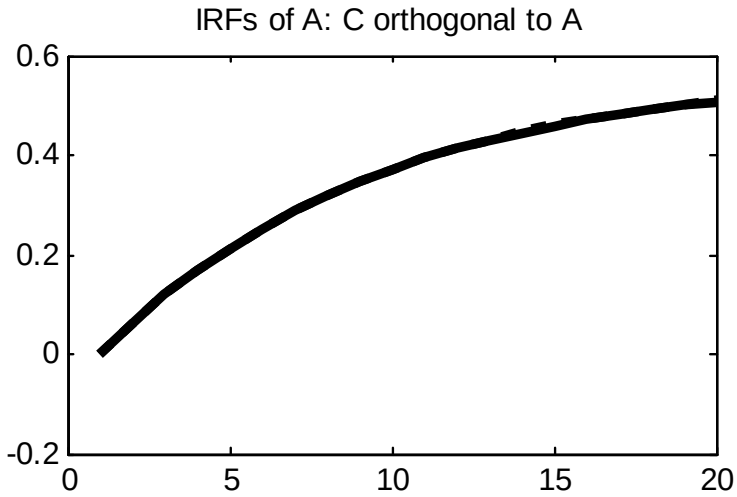
- Can a structural VAR identify shocks and IRFs from the perspective of the agents in the model?
  - *Yes!*
  - Can identify shocks even without observing signal
- Estimate bivariate VAR with productivity and consumption
  - Order productivity first, consumption second in Choleski decomposition
  - This VAR recovers *exactly* (in large enough sample) shocks and IRFs from perspective of agents

SVAR and Model Responses









Invertibility

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

Invertibility

- Non-invertibility: there exists no rotation of VAR innovations which can recover structural shocks
  - Can occur when econometrician can't observe some state variables

Invertibility

- Non-invertibility: there exists no rotation of VAR innovations which can recover structural shocks
  - Can occur when econometrician can't observe some state variables
- Is this situation a non-invertibility?

Invertibility

- Non-invertibility: there exists no rotation of VAR innovations which can recover structural shocks
  - Can occur when econometrician can't observe some state variables
- Is this situation a non-invertibility?
  - In a strict sense, yes: econometrician can't observe permanent component of productivity

Invertibility

- Non-invertibility: there exists no rotation of VAR innovations which can recover structural shocks
  - Can occur when econometrician can't observe some state variables
- Is this situation a non-invertibility?
  - In a strict sense, yes: econometrician can't observe permanent component of productivity
  - *But neither can the agents in the economy*

Invertibility

- Non-invertibility: there exists no rotation of VAR innovations which can recover structural shocks
  - Can occur when econometrician can't observe some state variables
- Is this situation a non-invertibility?
  - 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

Invertibility

- Non-invertibility: there exists no rotation of VAR innovations which can recover structural shocks
  - Can occur when econometrician can't observe some state variables
- Is this situation a non-invertibility?
  - 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 *ex-ante* reversion to the "shocks" from the perspective of agents' information sets in the model

Invertibility

- Non-invertibility: there exists no rotation of VAR innovations which can recover structural shocks
  - Can occur when econometrician can't observe some state variables
- Is this situation a non-invertibility?
  - 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 *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

Bottom Line

- Not possible to use long run restrictions to identify noise shocks

Bottom Line

- Not possible to use long run restrictions to identify noise shocks
  - VAR is an *ex-ante* exercise; noise is only revealed *ex-post*

Bottom Line

- Not possible to use long run restrictions to identify noise shocks
  - VAR is an *ex-ante* exercise; noise is only revealed *ex-post*
  - Noise not a structural explanation for "demand shocks"

Bottom Line

- Not possible to use long run restrictions to identify noise shocks
  - VAR is an *ex-ante* exercise; noise is only revealed *ex-post*
  - Noise not a structural explanation for "demand shocks"
- But can identify "shocks" and IRFs from the perspective of agents

Bottom Line

- Not possible to use long run restrictions to identify noise shocks
  - VAR is an *ex-ante* exercise; noise is only revealed *ex-post*
  - Noise not a structural explanation for "demand shocks"
- But can identify "shocks" and IRFs from the perspective of agents
  - In particular, SVAR can identify "news shocks" about future

Bottom Line

- Not possible to use long run restrictions to identify noise shocks
  - VAR is an *ex-ante* exercise; noise is only revealed *ex-post*
  - Noise not a structural explanation for "demand shocks"
- But can identify "shocks" and IRFs from the perspective of agents
  - In particular, SVAR can identify "news shocks" about future
- To say more about the role of noise, need to impose more structure

Structural Estimation

- 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

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
- The simple model is highly stylized

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
- The simple model is highly stylized
  - Good for intuition

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
- The simple model is highly stylized
  - Good for intuition
  - But valid for a serious quantitative exercise?

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
- The simple model is highly stylized
  - Good for intuition
  - 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

New Keynesian Model

- Process for productivity, signal extraction problem same as before
- Equations of model:

$$
\begin{aligned}
E_t y_{t+1} &= y_t + i_t - E_t \pi_{t+1} \\
\pi_t &= \frac{(1-\theta)(1-\theta\beta)}{\theta} mc_t + \beta E_t \pi_{t+1} \\
mc_t &= (1+\zeta)(y_t - a_t) \\
i_t &= \phi \pi_t \quad \phi > 1
\end{aligned}
$$

Relation to Simple Model

- As $\theta \longrightarrow 1$, this model reverts to simple model. Why?

Relation to Simple Model

- As $\theta \to 1$, this model reverts to simple model. Why?
  - $\theta \to 1 \Longrightarrow \pi_t = \beta E_t \pi_{t+1}$

Relation to Simple Model

- As $\theta \to 1$, this model reverts to simple model. Why?
  - $\theta \to 1 \Longrightarrow \pi_t = \beta E_t \pi_{t+1}$
  - $\beta < 1 \Longrightarrow E_t \pi_{t+j} = 0 \quad \forall\, j \geq 0$

Relation to Simple Model

- As $\theta \to 1$, this model reverts to simple model. Why?
  - $\theta \to 1 \Longrightarrow \pi_t = \beta E_t \pi_{t+1}$
  - $\beta < 1 \Longrightarrow E_t \pi_{t+j} = 0 \quad \forall\ j \geq 0$
  - $\pi_t = 0 \Longrightarrow i_t = 0 \quad \forall\ t \Longrightarrow r_t = 0$

Relation to Simple Model

- As $\theta \to 1$, this model reverts to simple model. Why?
  - $\theta \to 1 \Longrightarrow \pi_t = \beta E_t \pi_{t+1}$
  - $\beta < 1 \Longrightarrow E_t \pi_{t+j} = 0 \quad \forall\ j \geq 0$
  - $\pi_t = 0 \Longrightarrow i_t = 0 \quad \forall\ t \Longrightarrow r_t = 0$
  - A constant real interest rate implies perfect consumption smoothing

News, Noise, and General Equilibrium

- Constant interest rate matters. Effectively "turns off" general equilibrium

News, Noise, and General Equilibrium

- Constant interest rate matters. Effectively "turns off" general equilibrium
- News/noise about long run productivity = increase consumption by full amount of expected long run movement in productivity

News, Noise, and General Equilibrium

- Constant interest rate matters. Effectively "turns off" general equilibrium
- News/noise about long run productivity = increase consumption by full amount of expected long run movement in productivity
- But if interest rate not constant, it will (partially) choke off the increase in demand

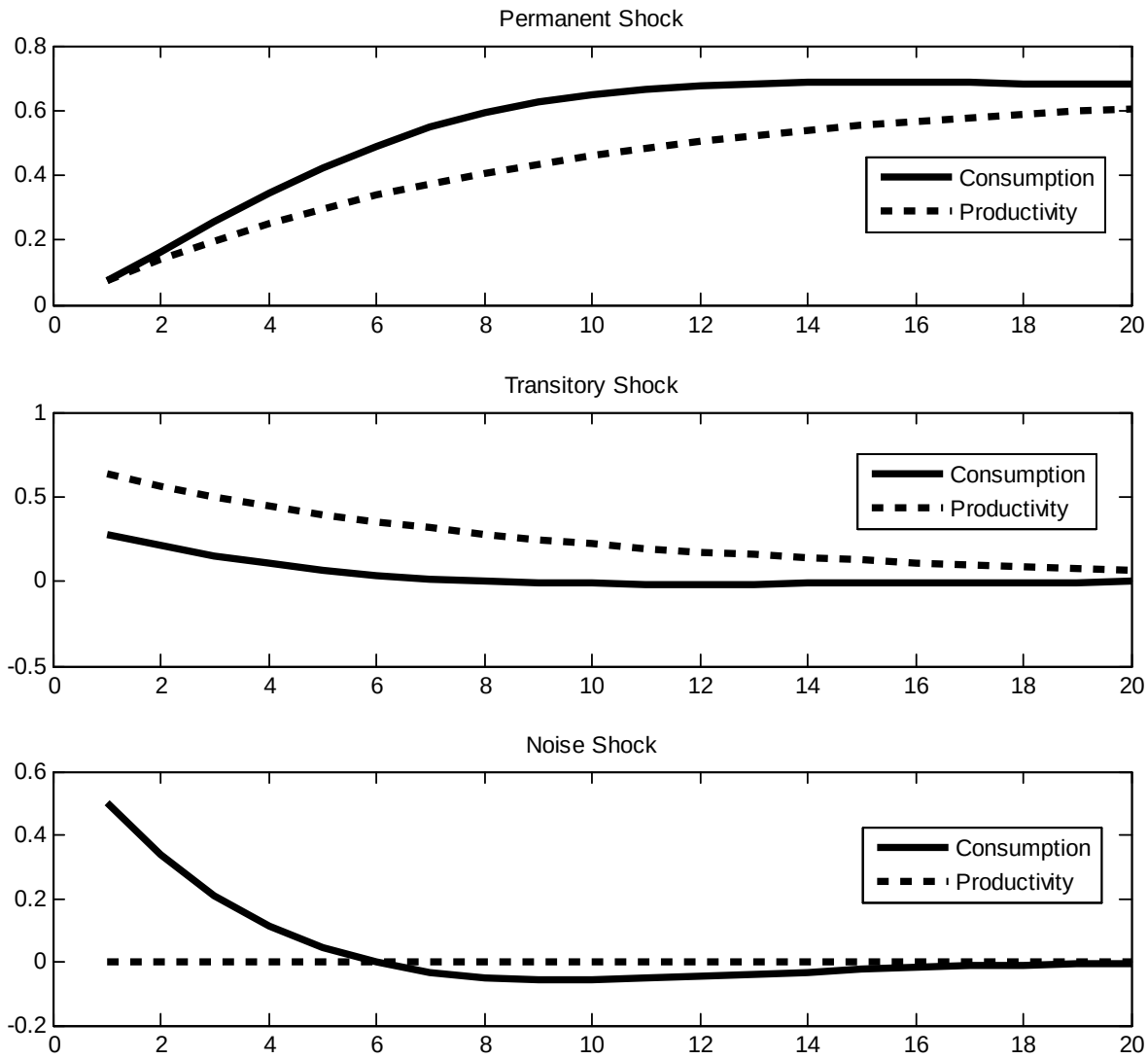
News, Noise, and General Equilibrium

- Constant interest rate matters. Effectively "turns off" general equilibrium
- News/noise about long run productivity = increase consumption by full amount of expected long run movement in productivity
- But if interest rate not constant, it will (partially) choke off the increase in demand
- Allowing $\theta < 1 \Longrightarrow$ real interest rate will move around $\Longrightarrow$ news/noise will lead to smaller high frequency movements in consumption

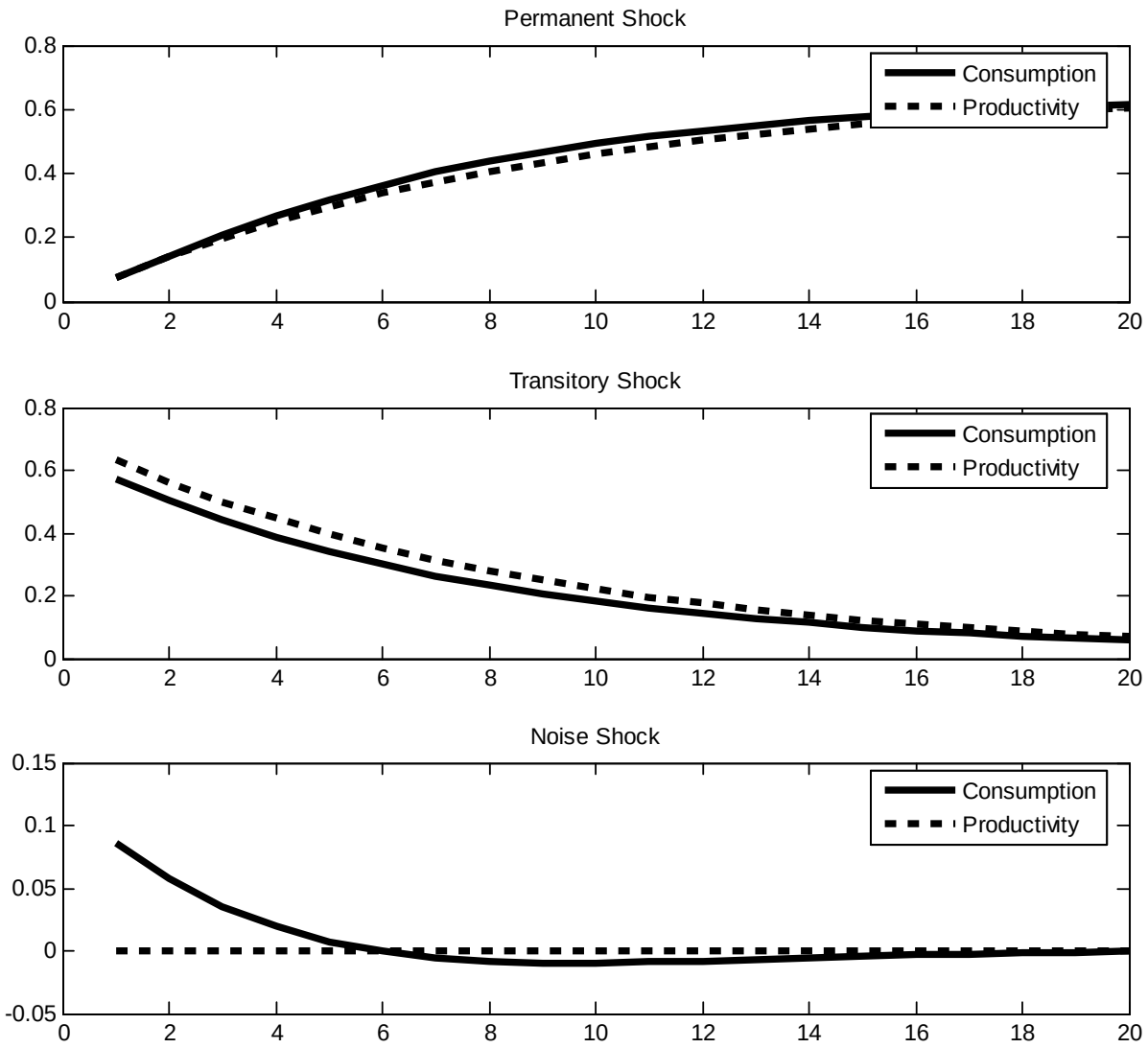
News, Noise, and General Equilibrium

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

Responses with Calvo Parameter = 1



Responses with Calvo Parameter = 0.8



Implications

- A more plausible value of θ significantly reduces the impact effect of noise

Implications

- A more plausible value of θ significantly reduces the impact effect of noise
  - Impact jump in consumption $\approx \frac{1}{5}$ as big

Implications

- A more plausible value of θ significantly reduces the impact effect of noise
  - Impact jump in consumption $\approx \frac{1}{5}$ as big
  - Also, responses to other two shocks more closely track movements in productivity

Implications

- A more plausible value of θ significantly reduces the impact effect of noise
  - Impact jump in consumption $\approx \frac{1}{5}$ as big
  - Also, responses to other two shocks more closely track movements in productivity
    - General equilibrium forces at work

Implications

- A more plausible value of θ significantly reduces the impact effect of noise
  - Impact jump in consumption $\approx \frac{1}{5}$ as big
  - Also, responses to other two shocks more closely track movements in productivity
    - General equilibrium forces at work
    - As $\theta \longrightarrow 0$, 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:

Horizon	$\theta = 1$	$\theta = 0.9$	$\theta = 0.8$	$\theta = 0.7$
$h = 1$	0.747	0.197	0.021	0.003
$h = 4$	0.529	0.111	0.011	0.002
$h = 8$	0.227	0.054	0.006	0.001

Variance Decomposition

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

Horizon	$\theta = 1$	$\theta = 0.9$	$\theta = 0.8$	$\theta = 0.7$
$h = 1$	0.747	0.197	0.021	0.003
$h = 4$	0.529	0.111	0.011	0.002
$h = 8$	0.227	0.054	0.006	0.001

- It *really matters* for quantitative results what θ is

Variance Decomposition

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

Horizon	$\theta = 1$	$\theta = 0.9$	$\theta = 0.8$	$\theta = 0.7$
$h = 1$	0.747	0.197	0.021	0.003
$h = 4$	0.529	0.111	0.011	0.002
$h = 8$	0.227	0.054	0.006	0.001

- It *really matters* for quantitative results what θ is
- As θ moves away from 1, noise ceases to matter

Variance Decomposition

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

Horizon	$\theta = 1$	$\theta = 0.9$	$\theta = 0.8$	$\theta = 0.7$
$h = 1$	0.747	0.197	0.021	0.003
$h = 4$	0.529	0.111	0.011	0.002
$h = 8$	0.227	0.054	0.006	0.001

- It *really matters* for quantitative results what θ is
- As θ moves away from 1, noise ceases to matter
  - True regardless of other parameters

Robustness

- In Section 5, authors conduct robustness exercise where $\theta \neq 1$.

Robustness

- In Section 5, authors conduct robustness exercise where $\theta \neq 1$.
- Estimate slope of Phillips Curve expressed in terms of output gap:

$$\kappa = (1+\zeta)\frac{(1-\theta)(1-\theta\beta)}{\theta}$$

Robustness

- In Section 5, authors conduct robustness exercise where $\theta \neq 1$.
- Estimate slope of Phillips Curve expressed in terms of output gap:

$$\kappa = (1+\zeta)\frac{(1-\theta)(1-\theta\beta)}{\theta}$$

- 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

Robustness

- In Section 5, authors conduct robustness exercise where $\theta \neq 1$.
- Estimate slope of Phillips Curve expressed in terms of output gap:

$$\kappa = (1+\zeta)\frac{(1-\theta)(1-\theta\beta)}{\theta}$$

- 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?

Robustness

- In Section 5, authors conduct robustness exercise where $\theta \neq 1$.
- Estimate slope of Phillips Curve expressed in terms of output gap:

$$\kappa = (1+\zeta)\frac{(1-\theta)(1-\theta\beta)}{\theta}$$

- 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.

Robustness

- In Section 5, authors conduct robustness exercise where $\theta \neq 1$.
- Estimate slope of Phillips Curve expressed in terms of output gap:

$$\kappa = (1+\zeta)\frac{(1-\theta)(1-\theta\beta)}{\theta}$$

- 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 ∞ (so $\zeta = 0$), $\kappa = 0.0011$ is less than $\frac{1}{20}$ the magnitude of GG's estimate!

Implications

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

Implications

- Suppose $\kappa = 0.0011$ and $\beta = 0.99$. The lower bound on θ is then 0.972. More plausible labor supply elasticity implies $\theta \approx 1$
- The estimated model then has the following testable implications:

Implications

- Suppose $\kappa = 0.0011$ and $\beta = 0.99$. The lower bound on θ is then 0.972. More plausible labor supply elasticity implies $\theta \approx 1$
- The estimated model then has the following testable implications:
  1. Essentially no time series variation in either interest rates or inflation

Implications

- Suppose $\kappa = 0.0011$ and $\beta = 0.99$. The lower bound on θ is then 0.972. More plausible labor supply elasticity implies $\theta \approx 1$
- The estimated model then has the following testable implications:
  1. Essentially no time series variation in either interest rates or inflation
  2. Average duration between price changes of 10 years or more

Implications

- Suppose $\kappa = 0.0011$ and $\beta = 0.99$. The lower bound on θ is then 0.972. More plausible labor supply elasticity implies $\theta \approx 1$
- The estimated model then has the following testable implications:
  1. Essentially no time series variation in either interest rates or inflation
  2. 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 $\approx$ six months)

Implications

- Suppose $\kappa = 0.0011$ and $\beta = 0.99$. The lower bound on θ is then 0.972. More plausible labor supply elasticity implies $\theta \approx 1$
- The estimated model then has the following testable implications:
  1. Essentially no time series variation in either interest rates or inflation
  2. 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 $\approx$ six months)
- *Bottom line:* this parameterization of the model cannot be close to the true data generating process

Implications

- Suppose $\kappa = 0.0011$ and $\beta = 0.99$. The lower bound on θ is then 0.972. More plausible labor supply elasticity implies $\theta \approx 1$
- The estimated model then has the following testable implications:
  1. Essentially no time series variation in either interest rates or inflation
  2. 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 $\approx$ 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

Discussion of Their Results

- Why are they getting these results?

Discussion of Their Results

- Why are they getting these results?
  - Only observables from the data in their estimation are consumption and productivity growth

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

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

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

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

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:

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)

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

Extensions

- This model of noise essentially works through a wealth effect

Extensions

- This model of noise essentially works through a wealth effect
- Really difficult to produce business cycle behavior through this channel

Extensions

- This model of noise essentially works through a wealth effect
- Really difficult to produce business cycle behavior through this channel
  - General equilibrium makes it difficult for noise to do much at high frequencies

Extensions

- This model of noise essentially works through a wealth effect
- Really difficult to produce business cycle behavior through this channel
  - General equilibrium makes it difficult for noise to do much at high frequencies
  - Learning makes noise not persistent enough

Extensions

- This model of noise essentially works through a wealth effect
- Really difficult to produce business cycle behavior through this channel
  - General equilibrium makes it difficult for noise to do much at high frequencies
  - Learning makes noise not persistent enough
  - Will produce negative aggregate comovement in a model with capital

Extensions

- This model of noise essentially works through a wealth effect
- Really difficult to produce business cycle behavior through this channel
  - General equilibrium makes it difficult for noise to do much at high frequencies
  - Learning makes noise not persistent enough
  - Will produce negative aggregate comovement in a model with capital
- Maybe think about modeling noise explicitly on the firm side of the model