Discussion of
The Optimal Monetary Policy Response to Shifts in Trend MFP Growth: A DGE Analysis
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1. What They Do

- Ambitious research program composed of several papers
- Specify a complex multi-sector equilibrium model with rigidities
- Explore how monetary policy behavior affects the impacts of various technology shocks
  - permanent versus temporary
  - aggregate versus sector-specific
  - levels versus growth rates
- Calibrate and estimate model parameters
  - assess fit by comparing responses to 2 kinds of shocks
- Show nature of monetary policy rule matters for economy's response to technology
- Plan to use welfare analysis to select among rules

2. Some Features of the Model

- Multi-sector
  - 2 final goods sectors with idiosyncratic technology shocks
  - 1 materials goods sector with economy-wide technology shocks
- Permanent and transitory components to technology shocks
- Differentiated materials goods and labor
- Capital accumulation
- Variable capital utilization rates
- Costly adjustment of capital stock
- Habit formation in consumption

- Costly adjustment of prices
  - both levels and growth rates
- Costly adjustment of wages
  - both levels and growth rates
- "Learning" about changes in technology growth rates
- In addition to 6 technology shocks, also shocks to
  - preferences over leisure
  - discount factor
  - elasticity of substitution among materials inputs
  - elasticity of substitution among labor inputs
  - monetary policy rule

3. Empirical Method

- Combine calibration with estimation
- Identify 2 of the model's 11 shocks in a VAR
- Use responses of 9 variables to the 2 shocks as moments to match with model parameters
- These are *conditional moments*
  - depend on identifying assumptions in the VAR

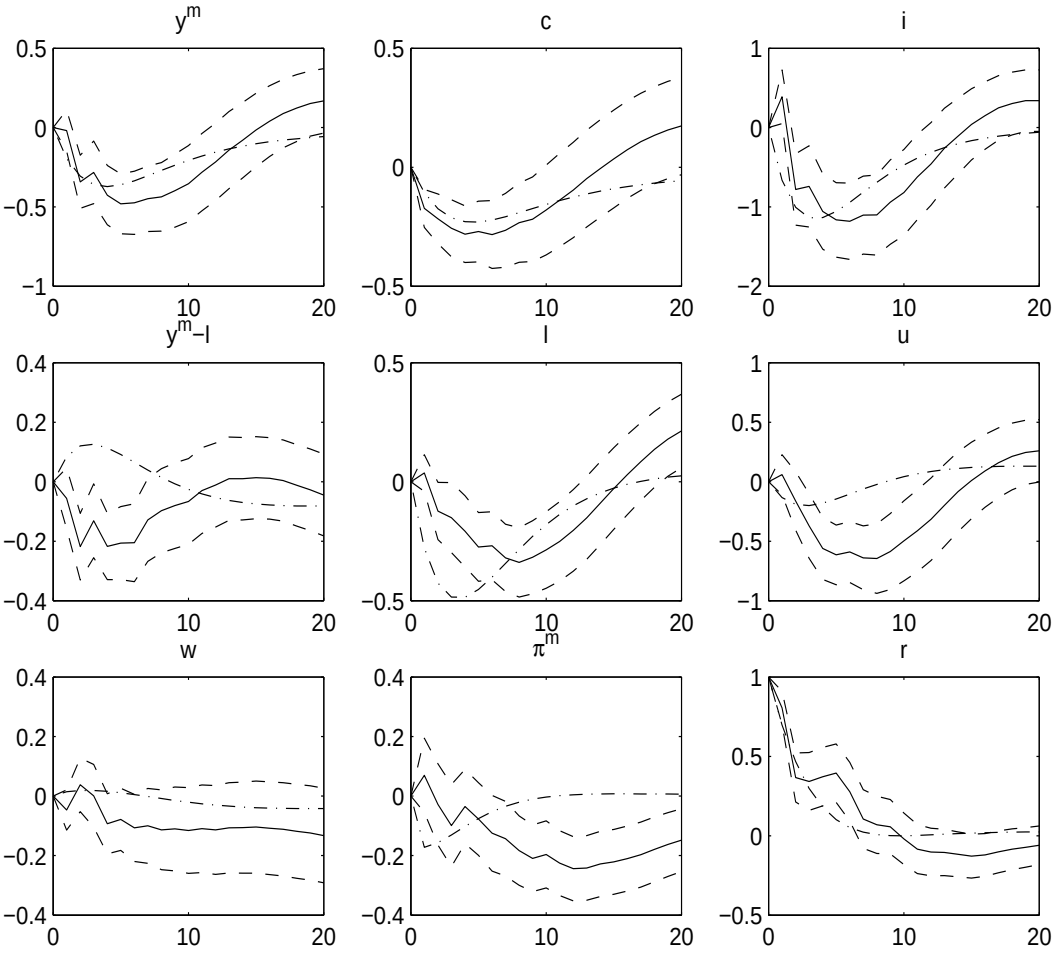
- Pluck out 1 of the 6 technology shocks
  - identifying assumption: permanent shocks to technology are the only one that permanently affect labor productivity
  - this assumption also applies to permanently technology shocks in final goods sector
  - label VAR shock a permanent shift in materials productivity
  - why this one?
  - need more evidence the shock is what the authors claim it to be
    - how do relative prices respond?
    - how does sector-specific employment respond?

- Monetary policy: conventional recursivity assumption
- Policy rule is

$$r_t = f(y_t^m, l_t, \pi_t^m, u_t, w_t, c_t, p_t^c, i_t, p_t^k, \Omega_{t-1}) + \varepsilon_t^r$$

- Fed responds to all current real variables, price levels, wages, and inflation
- Fed does not respond to *any* information from
  - financial markets
  - credit markets
  - banking sector
- Large parts of Fed's Greenbook devoted to this information
- Figure 1: very inertial responses of inflation
  - policy's impacts appear only after $1\frac{1}{2}$ years
  - biggest impacts after 3 years

Figure 1: VAR and Model Impulse Responses to a Funds Rate Shock



Notes: The solid lines show the impulse responses implied by the VAR following a one percent funds rate shock. The dashed-dotted lines show the impulse responses implied by the model to the same shock under the assumption that the contemporaneous response of all variables other than the funds rate is zero. The dashed lines are one standard error confidence intervals around the VAR responses.

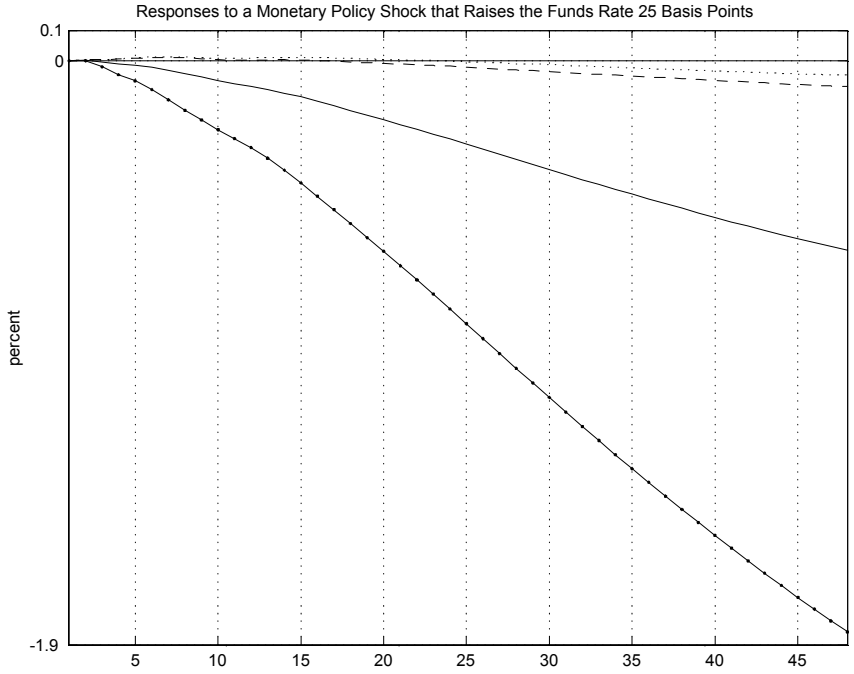
- Simultaneity between r and M can matter
- Some examples
- Leeper-Roush estimate system

$$\textbf{MP}: \qquad r_t = f(M_t, Z_t, \Omega_{t-1}) + \varepsilon_t^{MP}$$

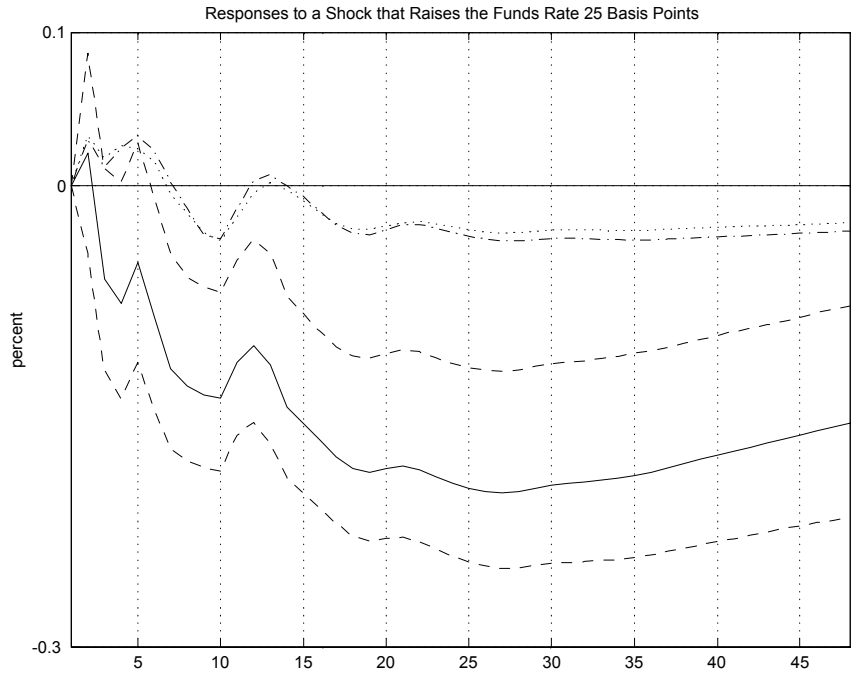
$$\textbf{MD}: \qquad M_t = g(r_t, P_t, y_t, \Omega_{t-1}) + \varepsilon_t^{MD}$$

- Compared to recursive schemes:
  - inflation responses much less intertial and larger
  - output responses much larger

- Responses of price level: price level predetermined
  - simultaneous system: solid with dashed error bands
  - recursive systems: dotted and dotted/dashed



- Responses of annual inflation: price level predetermined
  - simultaneous system: solid with dashed error bands
  - recursive systems: dotted and dotted/dashed



- "Agnostic" identification schemes that put restrictions on shapes and signs of response functions
  - Uhlig, Faust, Canova
  - P not predetermined
  - several examples from Uhlig's work

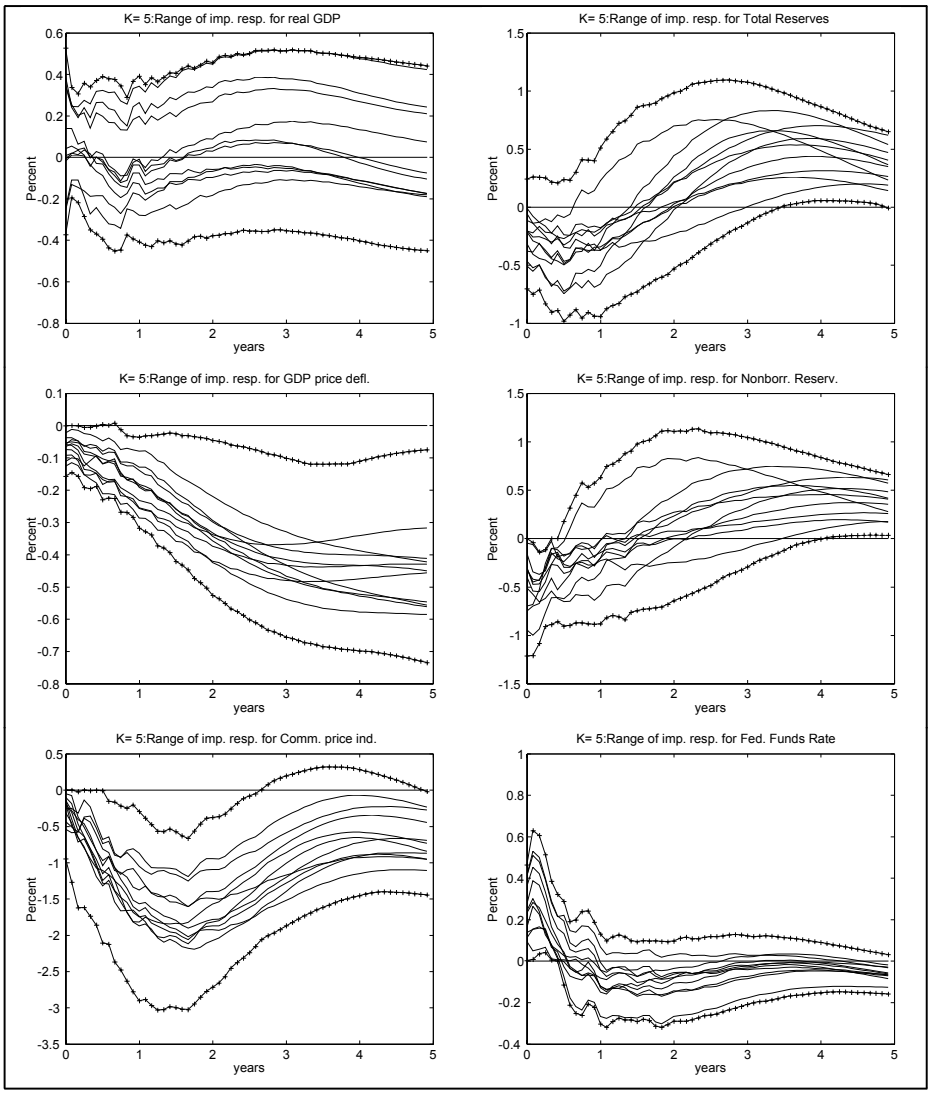


Figure 2: *This figure shows the possible range of impulse response functions when imposing the sign restrictions for $K = 5$ at the OLSE point estimate for the VAR.*

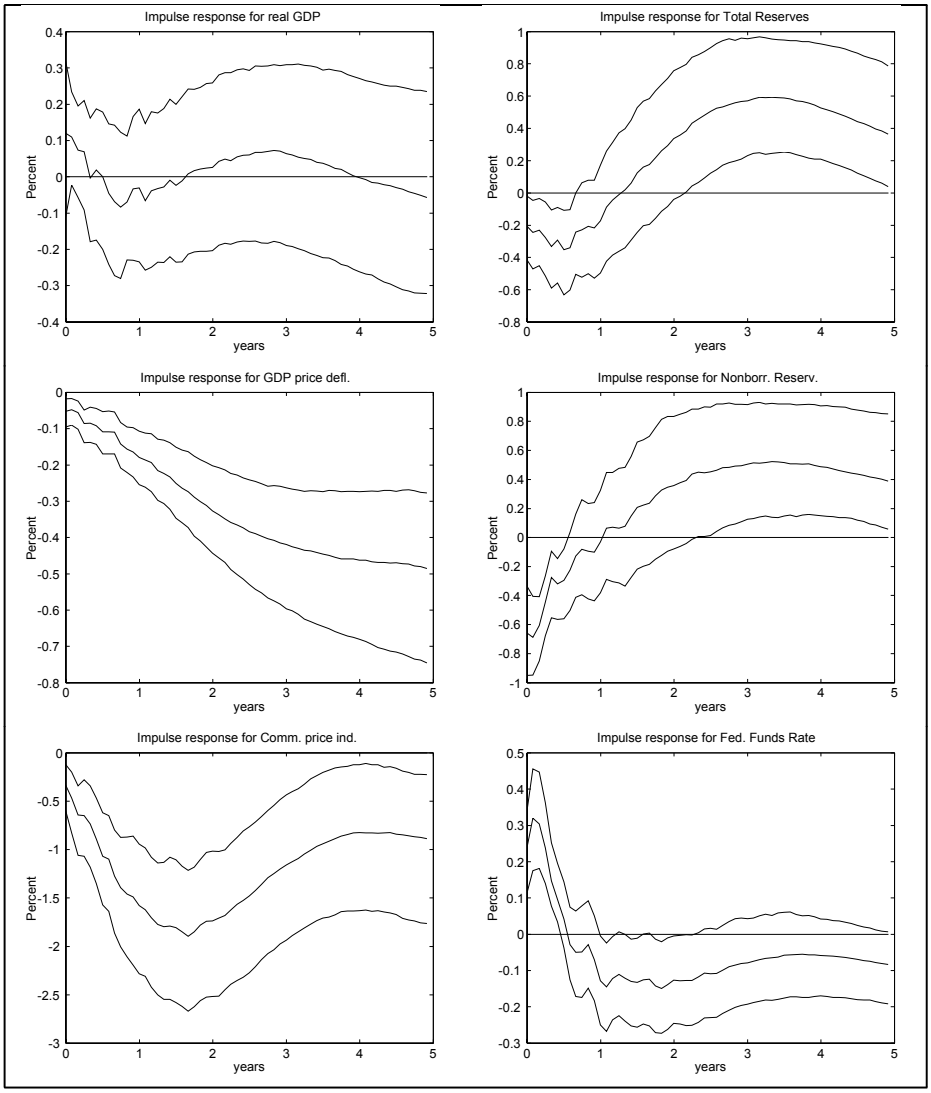


Figure 5: *Impulse responses to a contractionary monetary policy shock one standard deviation in size, using the pure-sign-restriction approach with* $K = 5$. *I.e., the responses of the GDP price deflator, the commodity price index and nonborrowed reserves have been restricted not to be positive and the federal funds rate not to be negative for months* $k, k = 0, \ldots, 5$ *after the shock. The error band for the real GDP impulse response is a* ± 0.2 *interval around zero: while consistent with the textbook view of declining output after a monetary policy shock, it is also consistent with e.g. monetary neutrality.*

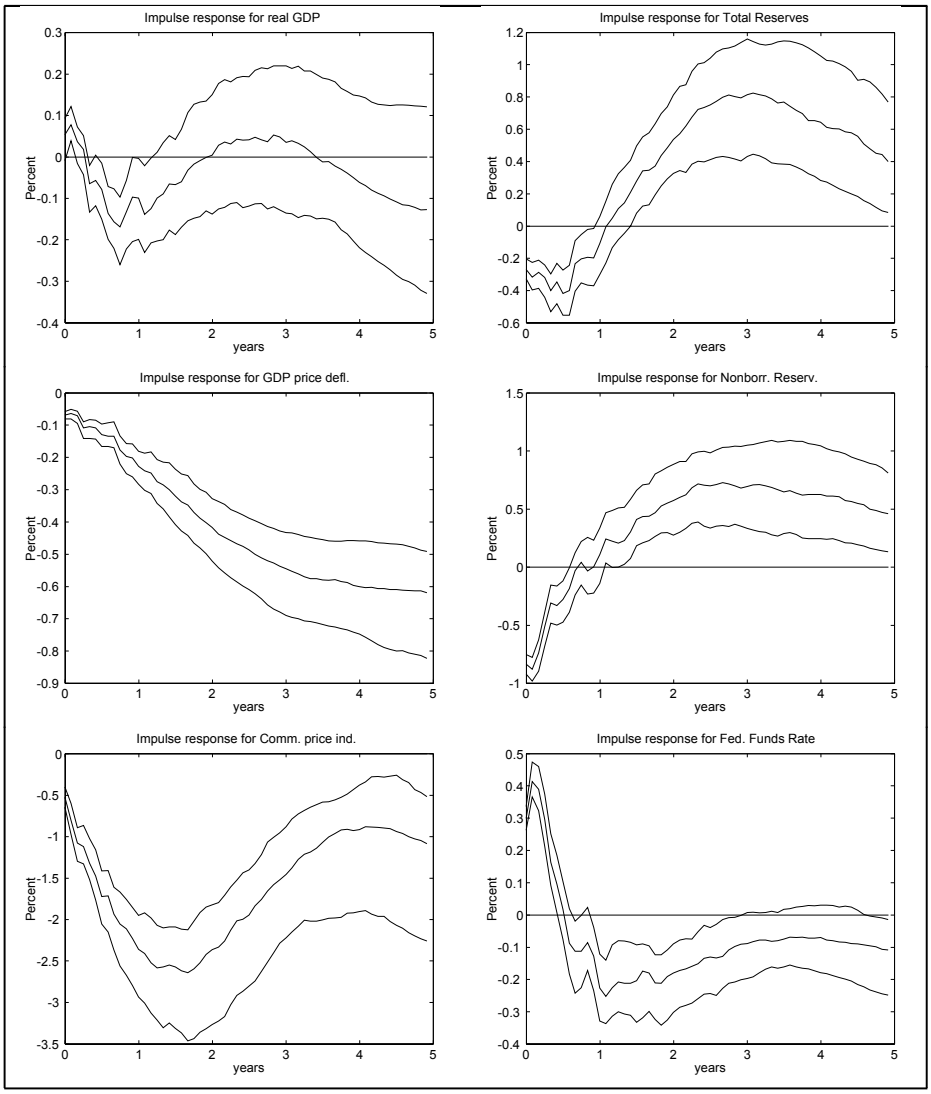


Figure 7: *Impulse responses to a contractionary monetary policy shock one standard deviation in size, using the penalty-function approach with* $K = 5$*. I.e., the responses of the GDP price deflator, the commodity price index, nonborrowed reserves and the negative of the Federal Funds Rate have been penalized for positive values and slightly rewarded for negative values in the months* $k, k = 0, \ldots, 5$ *following the shock: the shock was identified by minimizing total penalties. The error bands are now much sharper . While the real GDP response is still within the* ± 0.2 *interval around zero estimated before, there now seems to be a piece between one and 12 month, showing a conventional response.*

4. Afghanistan Revisited

- ELW declare empirical victory after matching responses to 2 shocks
- Too soon
- How about some assessment of model fit?
  - are responses to the other 9 shocks sensible?
  - check overidentifying restrictions
  - compare model time paths to actual
  - examine model residuals
  - what do the estimated shock processes look like?
  - what do estimates imply about relative importance of various shocks?
- Assessment necessary before moving on to welfare analysis

- What's wrong with maximum likelihood?
  - easy to deceive oneself about quality of results when ignore most of the model's implications for the data
  - why not at least "partial" MLE: select a subset of data for forming likelihood function

5. Other Comments

- Money appears in VAR but not in theoretical model
- Unclear how learning is implemented
  - what information set do agents use to make decisions?
  - what role is the learning mechanism playing?
- Not clear how in the theory the identifying assumptions for technology shocks reconciled with those for monetary policy shock
- Welfare analysis with *ad hoc* price adjustment mechanism?
  - *ad hoc* adjustments okay for small perturbations in policy
  - to justify price adjustment mechanism, welfare difference must be small
  - if welfare analysis important, perturbations not small and adjustment mechanism dubious