Fiscal Foresight: Analytics and Econometrics presented by Eric Leeper

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October 2008

Misspecification

- Large amount of material in this paper
- covers identification of fiscal policy by ex ante and ex post methods
- shows the problems with both very explicitly
- Focus in comments on misspecification
  - This is an example couched specifically in the guise of the implications of Fiscal Foresight
  - The insights can be applied more generally to empirical VAR methods

Identification of Shocks

We interpret VAR representations as identifying the true shocks to variables

- In structural form it is convenient to write

$$B(L)y_t = \epsilon_t$$

- Normalising on the main diagonal of $B(0)$ allows us to 'name' shocks as a 1 unit shock to an error in one equation has a one-to-one correspondence with a contemporaneous increase in a particular element of y_t. Thus we end up with a 'GDP' shock etc.

- Assuming that there is negligible measurement error, specification error

Identification of Fiscal Shocks

- A VAR representation does not represent the true shocks when there is fiscal foresight

$$y_t = M(L)\epsilon_t$$

- To have a Wold representation we need (inside the unit circle)

$$\det(M(z)) \neq 0$$

- Leeper et al show that this condition is violated - for a simple model
    - condition hinges on the parameter θ, which is a non-linear of parameters each of which are clearly less than 1.

Identification of Fiscal Shocks

- Empirical solution exists by reforming the MA representation using a Blaschke factor (which has the property that its component matrices form the identity matrix, so $B_1 B_2 = I$)

$$y_t = M(L) B_1 B_2 \epsilon_t$$

so that we can recombine

$$y_t = M^*(L) \epsilon_t^*$$

Clearly the original shocks, ϵ_t, **cannot** be recovered from the recombined shocks ϵ_t^*

The Issues in Current Empirical Work

- The non-recovery of the true underlying shocks is a model misspecification problem
- eg1: assume the wrong lag structure:

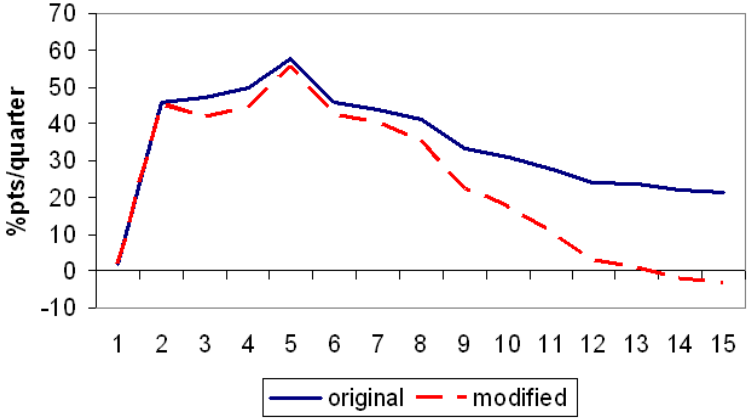
$$
\begin{aligned}
true &: \quad A_0 y_t = A_1 y_{t-1} + A_2 y_{t-2} + \varepsilon_t \\
true &: \quad y_t = M(L)\varepsilon_t \\
estimated &: \quad y_t = B_1 y_{t-1} + \varepsilon_t^* \\
estimated &: \quad y_t = M^*(L)\varepsilon_t^*
\end{aligned}
$$

- eg2: assume use wrong variable set:

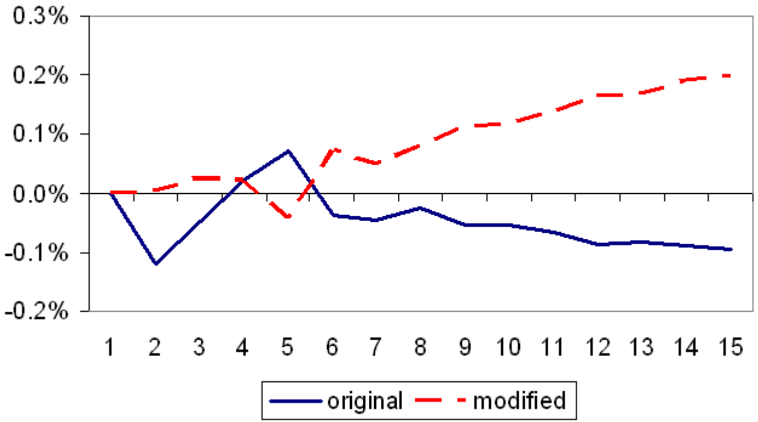
$$
\begin{aligned}
estimated &: \quad x_t = B_1 x_{t-1} + B_2 x_{t-2} + \varepsilon_t^+ \\
estimated &: \quad x_t = M^+(L)\varepsilon_t^+
\end{aligned}
$$

in each case we do not identify the true underlying ε_t from the estimated system.

Inflation Response to a shock to error in GNE equation: slightly modified models



Taxation Response to a shock to error in Short rate equation: slightly modified model



Identifying Fiscal Policy Shocks

- The problem is one of when does behaviour modification occur and how do we identify it. Some options:
    - (i) anticipate the effects on balance of probability when discussion begins?
    - (ii) anticipate the effects when legislation is passed?
    - (iii) anticipate the effects when changes are enacted?
    - (iv) anticipate future offsetting dynamics resulting - for example with debt
- Consider the current TARP (aka bail-out) program for the US banking sector, which is a fiscal package with implications for future debt and taxation schemes. Policy makers presumably hope:
    - (i) applies and takes in most of the effects of (ii) and (iii) and that (iv) is dampened.
    - if same sort of package, $+15\%$ of current g were applied to our model, GDP stimulus of 2% pa.

Identifying Fiscal Policy Shocks

- Leeper paper shows precisely this (key is comparing eqn 8/9 and 13)
  - the theoretical model shows that effects of shock to tax rates (on capital accumulation) impact most in **earliest** period

$$k_t = ...B(\varepsilon_{\tau,t-1} + \theta\varepsilon_{\tau,t}) \tag{1}$$

  - a corresponding VAR representation would have

$$k_t = ...B(\theta\varepsilon^*_{\tau,t-1} + \varepsilon^*_{\tau,t}) \tag{2}$$

Identifying Fiscal Policy Shocks

- There is a relationship between ε_t and ε_t^* given in (14) which reconciles this.

eg if $\theta = 0.2$ then effect of shocks

1. with fiscal foresight $\varepsilon_{\tau,t-1} + 0.2\varepsilon_{\tau,t}$
2. in a VAR $0.2\varepsilon^*_{\tau,t-1} + \varepsilon^*_{\tau,t}$
3. but from (14)
   $0.2\varepsilon^*_{\tau,t-1} + \varepsilon^*_{\tau,t} = 0.2\varepsilon_{\tau,t} + \varepsilon_{\tau,t-1} - 0.77\varepsilon_{\tau,t-2} - 0.15\varepsilon_{\tau,t-3}$

so the discounting of the news is not straightforward

What is the fundamental problem?

- Identifying the true fiscal shocks
  - When is the shock occuring
  - How can we instrument for it
  - Data: theory is in tax rates, data is in taxation revenue
- Are structural models going to do better?
  - data problems are the same
  - perhaps in determing timing of shock?

What to do next?

- These are practical model misspecification problems
- Need to formulate some means of specifying the form of fiscal foresight
  - perhaps interaction of theory and empirics can be used as a tool
  - if we could postulate a reasonable form for the foresight we can use that (eg eqn 14 gives us one example)
  - it will be complex, but potentially very valuable given the size of the effects in the paper