Course 2: Model based identification / Structural VARs
Topics in Empirical Macroeconomics and Finance, Econ 221

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Monetary Policy -> Fiscal Policy

- Few things are more endogenous than monetary policy.

- Why do we study it so much?

- Official view:
  - ▶ Post 1970s consensus that aggregate demand management should be managed by monetary policy. However: that has not stopped governments from changing taxes!
  - ▶ Monetary policy faces a time inconsistent problem, thus should be managed by independant central banks. This gives an important role to "experts" (economics PhDs).

- Cynical view:
  - ▶ Many grants for economic research come from central banks.
  - ▶ This is the one thing that economists control.
  - ▶ Monetary policy seems very complicated, so it seems to make sense to delegate it to experts.

Question: What is the fiscal multiplier?

- Ramey (2016) provides an excellent summary of the literature.

There is a very large literature:

- Blanchard and Perotti (2002) found low multipliers.

- Mertens and Ravn (2013) found much larger multipliers.

- Romer and Romer (2010) based on a narrative approach find multipliers close to 3.

Framework

- Blanchard and Perotti (2002) consider

$$v_t^T = \theta_G \sigma_G e_t^G + \theta_Y v_t^Y + \sigma_T e_t^T,$$
$$v_t^G = \gamma_T \sigma_T e_t^T + \gamma_Y v_t^Y + \sigma_G e_t^G,$$
$$v_t^Y = \zeta_T v_t^T + \zeta_G v_t^G + \sigma_Y e_t^Y.$$

where the observables are the following:

- T_t is Log Real Federal Tax Revenues per capita,

- G_t is Log Real Federal Government depending on Final Goods per capita,

- Y_t is Log Real GDP per capita.

Framework

- The following 9 parameters thus need to be estimated: θ_G, θ_Y, σ_G, σ_T, σ_Y, γ_T, γ_Y, ζ_T, ζ_G . Now let's try to write the residuals in the following form:

$$v_t = \mathcal{D}e_t$$

Or, expanding the matrices:

$$\left[\begin{array}{c} v_t^T \\ v_t^G \\ v_t^Y \end{array} \right] = \left[\begin{array}{ccc} d_{11} & d_{12} & d_{13} \\ d_{21} & d_{22} & d_{23} \\ d_{31} & d_{32} & d_{33} \end{array} \right] \left[\begin{array}{c} e_t^T \\ e_t^G \\ e_t^Y \end{array} \right]$$

- Using Blanchard and Perotti (2002)'s methodology:

$$\left[\begin{array}{ccc} 1 & 0 & -\theta_Y \\ 0 & 1 & -\gamma_Y \\ -\zeta_T & -\zeta_G & 1 \end{array} \right] \left[\begin{array}{c} v_t^T \\ v_t^G \\ v_t^Y \end{array} \right] = \left[\begin{array}{ccc} \sigma_T & \theta_G\sigma_G & 0 \\ \gamma_T\sigma_T & \sigma_G & 0 \\ 0 & 0 & \sigma_Y \end{array} \right] \left[\begin{array}{c} e_t^T \\ e_t^G \\ e_t^Y \end{array} \right]$$

$$\Rightarrow \quad \mathcal{D} = \left[\begin{array}{ccc} 1 & 0 & -\theta_Y \\ 0 & 1 & -\gamma_Y \\ -\zeta_T & -\zeta_G & 1 \end{array} \right]^{-1} \left[\begin{array}{ccc} \sigma_T & \theta_G\sigma_G & 0 \\ \gamma_T\sigma_T & \sigma_G & 0 \\ 0 & 0 & \sigma_Y \end{array} \right]$$

Framework

- The variance covariance matrix of reduced form residuals:

$$\mathbb{E}\left[v_t v_t'\right] = \mathcal{D}\mathcal{D}'$$

provides 6 independent restrictions on parameters, defining matrix $\mathcal{D}$. On the other hand, assumptions are made about decision lags and the effects of output on taxes due to automatic stabilizers:

  - $\gamma_Y = \gamma_T = 0$ based on decision and recognition lags
  - $\theta_Y = 2.08$ based on OECD estimates.

- Only 6 numbers are used to: θ_G, σ_G, σ_T, σ_Y, ζ_T, ζ_G. Using the R file blanchard-perotti.R, one gets the following estimates:

$$\theta_G = -0.116, \quad \sigma_G = 0.050, \quad \sigma_Y = 0.082,$$
$$\sigma_T = 0.058, \quad \zeta_T = -1.585, \quad \zeta_G = 0.254.$$

Requirement: Use R ! (with tidyverse)

- So that we are all on the same page, I will teach you R Statistical Software as we go along. As well as the basics of applied econometrics.

- **R statistical software**, which you may download on the UCLA website: `http://cran.stat.ucla.edu/`. You may download the latest release (2018-03-15, Someone to Lean On) which is version 3.4.4. For Mac OSX: `http://cran.stat.ucla.edu/bin/macosx/R-3.4.4.pkg`. For Windows: `http: //cran.stat.ucla.edu/bin/windows/base/R-3.4.3-win.exe`.

- I also recommend that you download **R studio** or another Graphical User Interface to make using R more pleasant !

- We'll also be using the package suite "tidyverse", including "dplyr" and "ggplot2", by Hadley Wickam. Here is a tutorial:
  - ▸ `https://suzan.rbind.io/2018/01/dplyr-tutorial-1/`
  - ▸ `https://suzan.rbind.io/2018/01/dplyr-tutorial-2/`
  - ▸ `https://suzan.rbind.io/2018/02/dplyr-tutorial-3/`
  - ▸ `https://suzan.rbind.io/2018/04/dplyr-tutorial-4/`

Bibliography I

Blanchard, Olivier and Roberto Perotti, "An Empirical Characterization of the Dynamic Effects of Changes in Government Spending and Taxes on Output," *The Quarterly Journal of Economics*, 2002, *117* (4), 1329–1368.

Mertens, Karel and Morten O. Ravn, "The Dynamic Effects of Personal and Corporate Income Tax Changes in the United States," *American Economic Review*, June 2013, *103* (4), 1212–1247.

Ramey, V. A., "Chapter 2 - Macroeconomic Shocks and Their Propagation," in John B. Taylor and Harald Uhlig, eds., *Handbook of Macroeconomics*, Vol. 2, Elsevier, January 2016, pp. 71–162.

Romer, Christina D. and David H. Romer, "The Macroeconomic Effects of Tax Changes: Estimates Based on a New Measure of Fiscal Shocks," *American Economic Review*, June 2010, *100* (3), 763–801.