Macro II

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Purpose

- Vector Auto Regression – purpose
  1. Data description – provide benchmark for macro models.
     - Impulse-responses.
     - Variance decomposition
  2. Forecasting – provide good forecasts, better than many other methods.
  3. Structural interpretation and policy evaluation. What is, e.g., the impact of a increase in the fed funds rate?

VAR

- Vector Auto Regression – "explain" data in a regression on lagged variables of itself. Example

$$x_t \equiv \begin{bmatrix} \pi_t \\ y_t \\ i_t \end{bmatrix}$$

- A (reduced form) VAR is then

$$x_t = \mathbf{B}_1 x_{t-1} + \mathbf{B}_2 x_{t-2} + ... \begin{bmatrix} u_{1,t} \\ u_{2,t} \\ u_{3,t} \end{bmatrix} \tag{1}$$

$$\mathbf{B}_1 = \begin{bmatrix} b_{1,11} & b_{1,12} & b_{1,13} \\ b_{1,21} & b_{1,22} & b_{1,23} \\ b_{1,31} & b_{1,32} & b_{1,33} \end{bmatrix}$$

- By including sufficiently many lags, we can always make u_t uncorrelated over time.

Non-reduced form

- The shocks in the reduced form are usually correlated and not directly interpretable. A combination of different shocks. For example, a change in the interest rate may be a shock, a response to an inflation shock or to an unemployment shock in unknown proportions.
- The response to such a shock is not a measure of the effects of monetary policy – the true underlying shocks are not identified (cf. demand and supply shocks).
- Cannot estimate a model where everything contemporaneously depends on everything with imposing some structure.
- A way to identify is to put structure on contemporaneous relations by using assumptions (based on theory). The first to be used was the triangular recursive.

Triangular example

- Example with inflation, unemployment and interest rate. Assume inflation does not respond any of the other variables contemporaneously, output responds to inflation and the interest rate to both (Taylor rule). Implies
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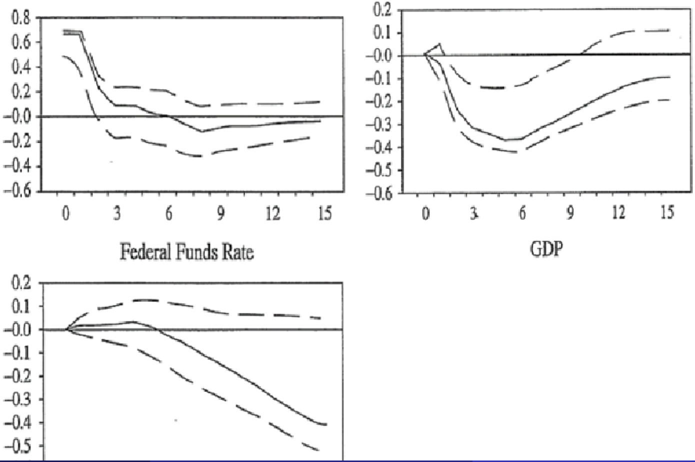
$$
\begin{bmatrix} \pi_t \\ y_t \\ i_t \end{bmatrix} = \begin{bmatrix} 0 & 0 & 0 \\ b_{0,21} & 0 & 0 \\ b_{0,31} & b_{0,32} & 0 \end{bmatrix} \begin{bmatrix} \pi_t \\ y_t \\ i_t \end{bmatrix}
$$

$$
+\mathbf{B}_1 x_{t-1} + \mathbf{B}_2 x_{t-2} + ... \begin{bmatrix} \varepsilon_{1,t} \\ \varepsilon_{2,t} \\ \varepsilon_{3,t} \end{bmatrix}
$$

- Estimation by e.g., OLS leads to uncorrelated errors – every equation error is what *cannot* be explained by variables ordered above.

Identification

- The recursive assumption identifies the three shocks as inflation shock, output shock and monetary policy shock.
- Immediately we also get response over time to these shocks, e.g., the effect of monetary policy.



WARNING

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- Shocks and impulse-response depends on identification, here the recursive structure. E.g., Caldara (2011) on fiscal multipliers.
- Other identifying schemes are also used
  - more structural, from theory or assumptions on e.g., Taylor rule,
  - assumption that some shocks have no impact in long run (Blanchard-Quah),
  - sign restrictions on responses.