ECON7350: Applied Econometrics for Macroeconomics and Finance

Tutorial 11: Multivariate Processes - I/II

At the end of this tutorial you should be able to:

- Use R to construct an adequate set of VAR(p) models;
- Use R to forecast one of the variables generated by a VAR(p) process;
- Derive a structural VAR from a reduced form VAR using the Cholesky factorisation;
- Use R to obtain inference on dynamic relationships from an identified SVAR;
- Use R to obtain inference on Granger causality.

Problems

The data file `money_dem.csv` contains quarterly observations for the following variables from 1959Q1 to 2001Q1:

- `RGDP`: real US GDP;
- `GDP`: nominal GDP;
- `M2`: money supply;
- `Tb3mo`: three-month rate on US treasury bills.

Using this sample, we will work with the following variables:

- Log Real GDP: $\text{lrgdp}_t = \ln \text{RGDP}_t$;
- GDP Deflator: $\text{price}_t = \text{GDP}_t/\text{RGDP}_t$;
- Log Real Money Supply: $\text{lrm2}_t = \ln(\text{M2}_t/\text{price}_t)$;
- Short-term Interest Rate: $\text{rs}_t = \text{tb3mo}_t$.

1. Consider forecasting lrgdp_t using a VAR(p) model of the multivariate process $\{\mathbf{x}_t\}$, where $\mathbf{x}_t = (\text{lrgdp}_t, \text{lrm2}_t, \text{rs}_t)'$.

   (a) Construct and adequate set of VAR(p) models.

   (b) How many intercept and slope coefficients need to be estimated for each VAR(p) in the adequate set?

   (c) Check the stability of each estimated VAR(p) model. How does this affect forecasting?

   (d) Forecast lrgdp_t for 12 quarters past the end of the sample. Plot the point estimates along with 95% predictive intervals. Interpret the results.

2. Analyse the dynamic relationships between lrgdp_t, lrm2_t and rs_t. For all VAR specifications relevant to this question please use $p = 8$.

   (a) Using the Cholesky decomposition, compute the IRFs for all the possible orderings of the system and study the responses. Are the responses sensitive to ordering? Choose the most reasonable ordering and explain your answer.

   (b) Using the ordering chosen in Part (a), compute the FEVDs and comment on your findings.

   (c) Obtain inference on Granger causality among lrgdp_t, lrm2_t and rs_t.