SVAR Analysis and Estimation

1. Retrieve with R the same three time series from the previous problem set.

2. Define $y_t = (p_t^{com}, er_t, p_t^c)'$ and estimate a VAR for $\Delta \log y_t$. Select the lag length using information criteria. In addition, impose zero constraints on the coefficients to prevent feedback from the local variables to p^{com} and re-estimate the model. Use only an effective sample starting in January 2004 and ending in December 2019.

3. Based on the reduced form parameter estimates found earlier, now obtain the underlying structural parameters by imposing recursive short-run identification restrictions. Recover the impact matrix P and check whether it is a valid decomposition of the covariance matrix of the reduced form residuals, Σ_e. Discuss the economic implications of this identification scheme.

4. Using the structural VAR from the previous exercise, estimate the response of the system to a unit impulse of each individual shock and plot the results.

5. Compute the associated forecast error variance decomposition for all variables. Use a stacked bar chart to summarize your results.

6. Find the structural residuals and perform a historical decomposition to disentangle the influence of each shock and the deterministic steady-state in the evolution of all three variables. Plot the results and comment on the decomposition of er^c and p^c.

7. Based on the cumulative impulse response estimates, provide an approximation to the exchange-rate pass-through to consumer prices (ERPT), according to the following formula

$$\epsilon_h = \frac{\Delta_h p^c}{\Delta_h er^c} \approx \frac{\text{CSIRF}_h^{u^{er}}(\Delta \log p^c)}{\text{CSIRF}_h^{u^{er}}(\Delta \log er)}$$

where $\Delta_h z_{t+h} = z_{t+h} - z_{t-1}$ and $\text{CSIRF}_h^{u^x} y$ is the cumulative response of variable y to a unit impulse of shock u^x at horizon h.

8. Conduct inference on your results in **4**, **5** and **7** by way of re-sampling. In particular, use the residual based non parametric bootstrap to construct confidence intervals for your point estimates. Use fixed initial values for each bootstrap replication of the data set.[1] Use the standard percentile confidence bands to construct the bootstrap confidence intervals

$$CI_{PER} = [\hat{\xi}^*_{1-\gamma/2}, \hat{\xi}^*_{\gamma/2}]$$

where $\hat{\xi}^*_{1-\gamma/2}$ and $\hat{\xi}^*_{\alpha/2}$ are the respective critical points defined by the $1-\gamma/2$ and $\gamma/2$ quantiles of the distribution of $\hat{\xi}^*$, γ is the confidence level and $\hat{\xi}$ is the point estimate of

[1] For example, employ the values from the year 2003 as initial conditions in every replication.

interest. Comment on the results and discuss whether it is appropriate or not to apply this methodology to historical decompositions (as in **6**).

9. (**Optional**). Can you take into account the uncertainty with respect to the lag order in the bootstrap design?

10. So far, only models with variables in log. differences were employed. Re-estimate the ERPT with the full sample (Jan-04 to Dec-19) but using a VAR with the variables in log. levels instead. Modify the formula in **7** accordingly and provide confidence intervals using the bootstrap. Compare the results with those of the system in log. differences. Discuss the benefits or drawbacks of this approach.