Term paper: 3rd stage

Analyse propagation of macroeconomic shocks: Checking the robustness of your results.

Tools for Modern Macroeconometrics, IES FSV UK

Setup

Any solid empirical analysis shall not limit to just one set of results. Careful estimation of alternative models is needed to check the robustness of the outcomes so that the results can be considered credible. Therefore, the purpose of the final assignment is to investigate the sensitivity of the results from stage 2 on transformations of variables and estimation methods.

1) VAR *in levels*. Use the same time series as in stage 2, but do not use log differences to transform them into growth rates. Rather, estimate the VAR in log levels (logarithms of real GDP, prices, and other variables which grow over time at relatively stable growth rates). Select the appropriate number of lags using information criteria, estimate the model, infer impulse responses of real GDP and prices to the structural shocks of interest. Provide forecasts for a two-year horizon.

Note: In the case of countries with clear trends in inflation rates where the VAR in with growth rates suggested second differences (Argentina, Turkey...), use growth rates instead of VAR in levels.

2) *Vector Error Correction Model*. Use the Johansen procedure to test whether there is a cointegration in your vector of variables. Then, estimate the VECM with the appropriate number of cointegrating vectors, and present impulse responses, and forecasts - as for VAR in levels. How do they differ from VAR model? Focus on impulse responses of variables to the interest rate shock.

Note: If cointegration is not present, try to include the money supply in your dataset and estimate the VECM representing the money demand (see the lecture) in the country from your last problem set. If still no cointegration is present, estimate the VECM assuming there is one cointegrating vector.

3) *Bayesian* VAR. Estimate the BVAR variant of your VAR model from stage 2. Use Include at least four lags. Use Minnesota prior with hierarchical prior incorporated in the BVAR package.

- Compare the resulting IRFs and the respective confidence intervals with the IRFs of your previous VAR model. Are there any differences between the models? Did BVAR change your previous conclusions?
- Get forecasts, and compare them with your VAR model.

4) *Local projections.* Re-estimate the impulse responses of your VAR model from stage 2 with local projections. Compare the results.

For presentations:

- Impulse responses of VAR in levels.
- Outputs and interpretations of the Johansen test.
- Impulse responses of VECM model.
- Diagnostic plots + impulse responses of BVAR model.
- Impulse responses estimated by local projections.
- Comparison of forecasts: VAR from stage 2, VAR in levels, VECM, BVAR.

For term paper:

Stage 1: Data description, description of modeling choices for univariate forecasts, resulting univariate forecasts, and their evaluation.
Stage 2: Motivation for estimation of the two articular shocks. Variables are used, transformations, lag length, and ordering. Impulse responses of the two identification schemes. Forecasts and comparison with univariate forecasts.
Stage 3: Motivation for extensions: VAR in levels, controlling for cointegration, BVAR, and local projections. Results of cointegration tests. Brief description of prior for the BVAR. Impulse responses from VAR in levels, VECM, BVAR, and local projections and their comparison with VAR models. Forecasts from VAR in levels or VECM, depending on which are more credible and from the BVAR model.

Recommended R packages

- For retrieving data, see Guidelines.
- Easy plots of time series: `forecast` (function `autoplot`), `xts` (function `plot.xts`)
- Unit root tests: `urca`
- Seasonal adjustment: `seasonal` (works only with time series as ts objects, but `tsbox` library can easily convert time series from one format to another.
- Autocorrelation functions, spectrum, and periodogram are included in the `stats` library (default in R).
- ARIMA models: `forecast` (good for estimation, post-estimation diagnostics, forecast; note we are asking for the Box-Jenkins estimation procedure, not automatic lag length selection).
- HP filter: `mFilter`
- Hamilton's regression filter: `neverhpfilter`
- For VAR modelling see the seminars: `vars` for estimation and forecasting, `svars` or user-defined functions for impulse responses and other graphical outputs, `VARsignR` for sign restrictions.
- For cointegration, BVAR and local projections: `urca`, `BVAR`, `BMR`, `lpirfs`.