Term paper: 1st stage

Analyse and forecast the real GDP and inflation

Tools for Modern Macroeconometrics, IES FSV UK

Setup

Download the time series of real GDP and consumer price index (or an equivalent index, such as HICP) of your interest. Use as long sample and as high frequency as possible.

1) Transform all series using logs.

2) While seasonally adjusted real GDP series is often available, price indices are not. Therefore, use seasonal adjustment to extract seasonal fluctuations from the time series of the price index and save the seasonally adjusted price index.

3) Transform the log of real GDP and the seasonally adjusted log price index into period-on-period percentage changes and year-on-year percentage changes. Verify there's no seasonal effect in m-o-m transformed series using spectrum or periodogram. Assess if there are any structural breaks and perform adequate stationarity tests. Which order of integration do these time series have?

4) Estimate the best linear models (AR, MA, ARMA, ARIMA) that fit the series. Use the Box-Jenkins step-by-step approach. Make forecasts for a two-year horizon. How do the forecasts derived from the year-on-year series differ from the m-o-m/q-o-q series? Are these forecasts consistent?

5) Estimate the output gap from the log of real GDP using the Hodrick-Prescott filter and Hamilton's regression filter. Compare spectra of first differences, y-o-y differences, and q-o-q differences. Perform a stationarity test and make forecasts of the two output gaps.

For presentations:

- Short data information: Country, sample.
- Plots of logs of your original series and series transformed into period-on-period percentage changes and year-on-year percentage changes + their spectra.
- Outputs of stationarity tests + interpretation.
- ARIMA model: how did you decide about the number of lags and plots of ACF/PACF of your series (so that we can evaluate your results). Include diagnostics of residuals.
- Figures with forecasts + short interpretation.
- The plot of output gaps derived from the Hodrick-Prescott filter and Hamilton's regression filter + comparison of spectra + forecast.

For term paper: Data description, description of modeling choices for univariate forecasts, resulting univariate forecasts, and their evaluation.

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`