GDN course: Homework assignment #3

Cointegration

Data

Feel free to use my data (hw3.wk1 for TSP and hw3.xls for visual inspection of data). Remember to transform the data. Note that now the choice of the transformations depends not only on the behavior of the time series, but also on the tested long run relationship. So if you assumed a multiplicative relationship, you would apply a logarithmic transformation. I have assumed that the relationship exists between the variables in real terms and thus I suggest you transform my data into real terms using CPI, which is also available in my data set. I would like you to verify whether GDP and exports are cointegrated or, alternatively, whether GNI and consumption are cointegrated.

ADF test - I(1)?

First run the ADF test. Note that in order to assess if the time series is I(1), you must test both the series and its differences. If the series is I(1), then the series should contain a unit root (even when testing for trend stationarity) and its differences should be level stationary.

Cointegration - CI(1,1)?

If you cannot reject the null hypothesis of the unit root presence in the two chosen time series, you may test whether the series are cointegrated. First, you estimate the linear relationship between the two series by OLS. Then you run ADF on the residuals using the MacKinnon (1991) critical values. You can also use the critical values generated with the command CDF in the TSP code:

CDF(DICKEYF, NLAGS=the number of lagged differences included in your regression, NOB=the number of observations, NVAR=1 for simple ADF tests 2 for cointegration test, CONSTANT or NOCONSTANT, TREND or NOTREND).

Error Correction Model – *additional*

If the two time series are cointegrated, then at least one of the adjustment coefficients in the error correction model should be significant. The error correction model is estimated by OLS.

Granger Causality - *additional*

Testing for Granger causality boils down to performing the F-test on OLS regression. Note, however, that your time series are I(1) and thus the test for Granger causality should be performed on first differences.

VAR [1]

Use dataset money_dem.xls which contains monthly data on real US GDP (RGDP), nominal GDP (GDP), the money supply M2 and 3M rate on US Treasury bills. Construct the following variables:

dlrgdp=log(RGDP)-log(RDGP(-1)) ; price=GDP/RGDP;

dlrm2=log(M2/price)- log(M2(-1)/price(-1)) ; drs=tb3mo-tb3mo(-1)

1) Which specification of VAR for lagged dlrgdp, price, dlrm2, drs seems to perform better, the one with 12 lags or 8 lags?

- *(i)* Estimate VAR with 12 lags of dlrgdp, price, dlrm2, drs and with a constant.
- *(ii)* Calculate the multivariate AIC and SBC.
- *(iii)* Estimate VAR with 8 lags of dlrgdp, price, dlrm2, drs and with a constant.
- *(iv)* Calculate the multivariate AIC and SBC.
- *(v)* Compute the statistic for the maximum likelihood test.
- *(vi)* Which specification is preferred?

2) As an output of the VAR estimation you get will, among other things, the impulse response functions. Plot the impulse response functions for the VAR with 12 lags. Can you say what was the ordering for the Choleski decomposition?

Using command VAR in TSP do not forget that the only exogenous variable is the constant. For the tests statistics you may want to use the following variables stored after each estimation: @nob (# of observations), @ncid (# of coefficients), @covu (var-cov of the residuals). You may also find command LOGDET(x) useful. It computes the logarithm of the matrix determinant.

[1] Here I loosely follow task 9 from Ch 5, Enders, W. Applied Econometric Time Series.