Exercise: Forecasting EA GDP

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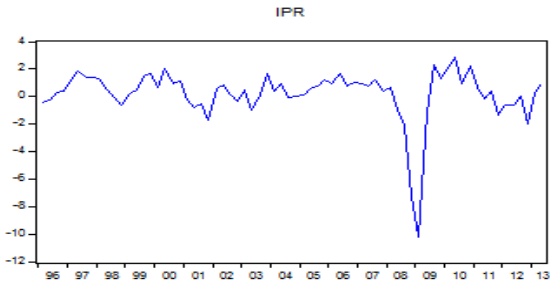
Data

Get the data and do the appropriate transformations to have at hand the following stationary time series:

- Y_t quarterly EA17 GDP growth rate
- ipr_t quarterly EA17 IP growth rate
- sr_t quarterly growth rate of the Eurostoxx (stock returns)
- su_t quarterly growth rate of the EA ESI (survey)
- pr_t quarterly EA17 inflation

Plot all the series


Y
96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11 12 13


IPR
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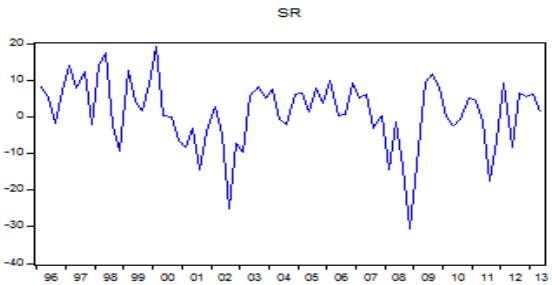
SR
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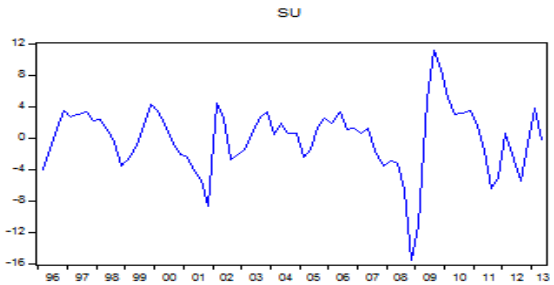
SU
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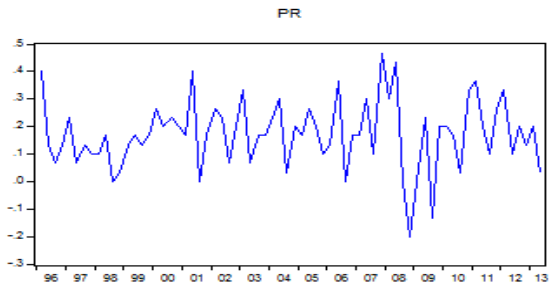
PR
96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11 12 13

Estimation

Objective: Explain quarterly GDP growth (Y_t) by industrial production growth (ipr_t), stock prices growth (sr_t), European Sentiment Index growth (su_t) and inflation rate (pr_t).

The general model to estimate is the following:

$$Y_t = \alpha + \beta X_t + \varepsilon_t$$

Estimate the 3 models below:

1. Model 1 : $X_t = (ipr_t, su_t, pr_t, sr_t)$
2. Model 2 : $X_t = (ipr_t, su_t, sr_t)$
3. Model 3 : $X_t = (ipr_t, su_t)$

Which model to choose over the sample 1996q1 - 2013q2?

Forecasting Euro Area GDP

Objective: GDP forecasting based on the estimated model.

Split the sample into an estimation sample: 1996q1 - 2006q4 and a forecasting sample: 2007q1- 2013q2.
What are the estimation results over 1996q1 - 2006q4?

Let's consider a new model $\rightarrow$ Model 4: $X_t = (ipr_t, pr_t, sr_t)$
Estimate M4 over the estimation sample

Static forecasts over 2007-2013
Forecasts are carried out using parameters estimated until 2006q4
Forecasts are carried out conditioning on the true values of future explanatory variables
What is the best model in terms of forecast accuracy? (MAE and RMSFE

Recursive Forecasting for Euro Area GDP

A recursive forecast accounts for each new data over the sample 2007q1- 2013q2 in order to account for parameter evolution over time, especially during the Great Recession.
A 1-step ahead forecast is carried out each time a new data is integrated.

For the 4 previous models, carry out a comparison between static and recursive forecasts
What is the best approach? What does it mean?

Mis-specification

- Let's consider Model 2 with ipr_t, su_t and sr_t as regressors (Industrial prod., Survey, Stock prices)
- *Check for homoskedaticity using Breusch-Pagan-Godfrey test. Alternatively a White test can be used*
- *Check for autocorrelation in the residuals using Durbin-Watson and LM/Portmanteau tests*
- *Check for Normality of residuals using the Jarque-Bera test.*

Test for a break

- *Check for a break using a Chow test in 2001q1,2001q2 and 2007q3*
- *Check for a break using a Chow forecast test in 2012q3*
- *Use a Bai-Perron test for multiple breaks with unknown dates to identify potential break dates*

Recursive tests for a break

- *Plot the recursive residuals with confidence bands to identify periods of break dates*
- *Plot the recursive coefficient with confidence bands to identify periods of break dates*
- *Plot the recursive one-step forecast test to identify periods of break dates*

Estimation with breaks

- *Create a dummy series that takes 1 from 2007q3 to 2012q4 to account for the Great Recession*
- *Create a dummy series that takes 1 from 2000q1 to 2001q4 to account for the dotcom recession*
- *Estimate a change in regime (break in mean) for each of the 2 periods*
- *Estimate both a change in mean and a change in slope (break in elasticities) for each of the 2 periods*
- *Comments?*

Static forecasting with breaks

- *Consider 1996-2010q4 as the new estimation sample and 2011q1-2013q2 (10 quarters as the new forecasting sample)*
- *Re-estimate Model 2 over this new sample as well as Model 2 with a break in mean during the dotcom recession*
- *Compare the forecasts from both models (assuming exogeneous variables are known over the forecasting sample) based on MAE and RMSE criteria*
- *Comments?*

Recursive forecasting with breaks

- *Repeat the previous forecasting exercise that compares Model 2 and Model 2 with a break in mean but for recursive 1-step-ahead forecasts*
- *Comments?*
- *Repeat the same exercise but with the Leading Indicator Model that accounts for the same set of variables as in Model 2. Comments?*