Macroeconometrics project

Summary

The purpose of this project is to study the performance of empirical methods for business cycle analysis and forecasting. The two main classes of models used for this purpose in research and policy environments alike are the Dynamic Factor Model (DFM[1]) and Vector Autoregressions (VAR[2]). Accordingly, I aim to conduct a simple exercise where I compare the forecasting performance of these two popular models for the real GDP growth of the euro area. In particular, I will use similar versions of the models where I have mixed frequencies (i.e., quarterly and monthly) and an unbalanced panel of data (i.e., ragged edges). Further, I specify the same medium-size model with 15 variables[3] for both models and perform estimation using Bayesian techniques. The models will be similar in spirit to Camacho and Perez-Quiros (2010) for the DFM and to Schorfheide and Song (2015) for the VAR.

The analysis will consist of providing point forecasts (i.e., median and several percentiles of the posterior distribution) for the euro area real GDP growth over the short term. Then, I will contrast the forecasting ability of these two models by comparing them with the ECB official macroeconomic projections for the euro area growth (December 2023 BMPE and March 2024 MPE[4]). Finally, I will compare the in-sample forecast performance of the models (compare the RMSE). This exercise will shed light on whether there are relevant differences between the DFMs and VARs in terms of forecasting and whether they are able to provide similar growth forecasting profiles as the ones from professional models used in the ECB to conduct macroeconomic projections.

Scope

Target: euro area real GDP growth *(quarter-on-quarter percentage growth rates)*

Variables:

Mnemonic	Variable	Sector	Type	Frequency
GDP	Real GDP	Activity	Hard	Q
PMI	Composite output PMI	Activity	Soft	M
ESI	Economic sentiment	Activity	Soft	M
IP	Industrial production manufacturing	Activity	Hard	M
RS	Retail sales	Activity	Hard	M
EMP	Unemployment rate	Activity	Hard	M
EEXP	Extra-euro area exports	Activity	Hard	M
CPI	Consumer prices	Prices	Hard	M
REER	Real effective exchange rate	Prices	Hard	M
COM	Commodity spot aggregate	Prices	Hard	M
CISS	Sovereign stress	Financial	Hard/Soft	M
EQTY	EURO STOXX 50	Financial	Hard	M
INT	Short-term interest rate & shadow rate[5]	Financial	Hard/Soft	M
EPU	Economic policy uncertainty[6]	Other	Soft	M
SBI	Supply-bottleneck[7]	Other	Soft	M

[1] The DFM was firstly introduced by Geweke (1977), and it is extensively used for nowcasting and short-term forecasting in policy institutions.
[2] The VAR was firstly introduced by Sims (1980), and it is extensively used for short-term forecasting and conditional forecasting in policy institutions.
[3] Depending on the estimation feasibility with many variables I may reduce the number of variables for the purpose of this exercise.
[4] The March 2024 MPE is expected to be published in the Governing Council meeting of 7 March 2024.
[5] The variables is constructed as a combination of 1-month Euribor as proxy for the ECB policy rate and the shadow rate of Wu-Xia (2017, 2020) between 09/2008-08/2022 to capture the unconventional monetary policies after the Global Financial Crisis.
[6] Simple average among DEU, FRA, ITA, ESP to approximate the euro area region.
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Models:

(1) Mixed-frequency Bayesian DFM with unbalanced panel
(2) Mixed-frequency Bayesian VAR with unbalanced panel

Analysis:

- Point forecasts of target variable
- Comparison to ECB Dec-2023 BMPE and Mar-2024 MPE
- Forecast performance comparison between models (in-sample, RMSE metric)

References

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Schorfheide, Frank, and Dongho Song. "Real-time forecasting with a mixed-frequency VAR." Journal of Business & Economic Statistics 33, no. 3 (2015): 366-380.

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