Macroeconometrics

Paris School of Economics

Catherine Doz
Juan Pablo Ugarte Checura

Homework
2024-2025

Instructions

The homework consists of analyzing two or three time-series of your choice. You must submit your selected series to the TA before April 27 for approval. The final report and R code must be sent by email to juan.ugarte@psemail.eu by **May 25**. You are required to work in pairs, either within your group or with members from other groups. The final report must not exceed **12 pages**.

Exercise 1: Univariate analysis

1. Plot each time-series in levels before applying any transformations, clearly indicating data sources
2. Conduct unit root and stationarity tests for each series
3. Identify and estimate candidate AR(p) and ARMA(p,q) models using the ACF and PACF. Which model would you choose according to information criteria? Comment the results
4. For one of the series, plot the in-sample and out-of-sample forecasts from your best model. Comment the results

Exercise 2: Multivariate analysis

1. Select the optimal lag length for your multivariate model
2. Estimate the model and verify that the residuals satisfy standard properties
3. Plot the in-sample and out-of-sample forecasts for one of the series
4. Using the Cholesky decomposition, explain the reasoning behind your chosen ordering of variables
5. Show the orthogonalized impulse response functions for your system
6. Modify the ordering of the variables and comment how this affects your results

General advice

Choose time-series that are likely to yield interesting and interpretable results. For instance:

- GDP and unemployment (Okun's Law)
- GDP and exports/imports
- GDP and trade balance (J-curve)
- Exchange rate and inflation differential (Purchasing Power Parity)
- Exchange rate and interest rate differential (Interest Rate Parity)
- Interest rate, industrial production, and inflation

Please make sure to:

- Avoid variables that are clearly cointegrated, such as consumption and income, as they exhibit strong long-term relationships
- Use monthly, quarterly, or annual data, as high-frequency tends to be excessively noisy
- Use seasonally adjusted series and avoid structural breaks, possibly by selecting an appropriate sub-sample
- Ensure you have at least 50-60 observations

You are encouraged to be creative in your choice of variables and data sources. Try to go beyond standard macroeconomic indicators from the U.S. Explore other countries, sectors, or unconventional datasets that could lead to interesting results. You might consider commodity prices, financial stress indexes, uncertainty or sentiment data, or sectoral production, among others.