

Exam in: ECON 5101/9101: Advanced Econometrics - Time series

Exam period: 6 May - 13 May, 2014

This is a home exam.

Guidelines:

Submit your exam answer electronically to the e-mail adress
submissions@econ.uio.no.

Last day for submissions of answers is 13 May 2014. Kindly submit before 16:00.

Written text should be in the pdf or doc(x) formats. Data files should be in Eviews, Microsoft Excel, PcGive or Stata format. Remember to also submit *Declaration Form for Portfolio assessment/take home exam* which you find on the course web page (<http://www.uio.no/studier/emner/sv/oekonomi/ECON5101/v14/>). This should be submitted as a separate document.

IMPORTANT: Use your candidate number both as the name of the file you submit, and as the author name in the file, do NOT use your own birth-name. You find the number on the student-web. If you have problems, contact Tone Enger. Do not write you name in the answer document.

Question A

Please find in the accompanying Excel-file, two exchange rate series, (Swiss franc vs. Euro (CHF/EUR) and Euro vs. USD) – registered every Wednesday from 06.01.1999 to 03.08.2006 (i.e., weekly data for 400 weeks).

Such series sometimes exhibit volatility tendencies (usually analyzed by Arch/Garch modeling). You may ignore such tendencies (if present at all) in this problem.

1. Describe the two series and their first differences by plots and comment.
2. Determine (empirically) an Arima-model for the CHF/EUR series, and discuss the residuals of the model that you end up with. [Hint: In Oxmetrics-PcGive you can use *Other Models/Non-Linear Models*, see e.g., Chapter 9.6 in the *Pc-Give 14 Volume I* manual, which has been posted on the course page. Arima models can also be estimated directly in PcGive under *Models for Time-Series/ARFIMA* (In the dialogue set the radio button to “fixed d-parameter” and set “d at 0” or “d at 1”.)]
3. (a) Simulate two completely independent $I(1)$ series (length 300 units), $\{x_t\}, \{y_t\}$. [Hint: Integrate two independent white noise series.] Estimate the cross correlation function [Hint: Use e.g., the “xcorr” command in Stata. Ox-Metrics users may find the file “xcorr.fl” (posted with the exam question set) to be of help.] both between $\{x_t\}$ and $\{y_t\}$ and between their first differences. Comment on the result.

- (b) Now introduce dependencies. Let $\{e_{1t}\}, \{z_t\}$ be two independent white noise series (length 302). Put (e.g.) $e_{2t} = e_{1t-1} - 2e_{1t-2} + z_t$. Let $\{y_t\}$ and $\{x_t\}$ be series obtained by integrating $\{e_{1t}\}$ and $\{e_{2t}\}$ respectively. Estimate the two cross-correlation functions as in (a) and comment.
4. Discuss the cross-correlation structure between the CHF/EUR and the EUR/USD-series.
 5. Use your univariate time series model of CHF/EUR from question 2 to estimate the dynamic multipliers for the CHF/EUR series, and the long term effect for the first difference.
 6. Re-estimate your model using data up to the end of 2005 only. Then forecast the first 36 weeks of 2006 and compare with the observed values.

Question B

Assume the three dimensional VAR(1):

$$(1) \quad \mathbf{w}_t = \Phi \mathbf{w}_{t-1} + \boldsymbol{\varepsilon}_t, \quad t = 1, 2, \dots, T,$$

where \mathbf{w}_t is the 3×1 vector

$$\mathbf{w}'_t = (x_t, y_t, z_t)$$

Φ is a 3×3 matrix with coefficients, and $\boldsymbol{\varepsilon}_t$ is the 3×1 vector with Gaussian disturbances, $\boldsymbol{\varepsilon}_t \sim IN(\mathbf{0}, \Omega)$. The initial values in \mathbf{w}_0 are interpreted as given numbers (not stochastic).

Φ is given as

$$\Phi = \begin{pmatrix} \phi_{11} & \phi_{12} & \phi_{13} \\ \phi_{21} & \phi_{22} & \phi_{23} \\ \phi_{31} & \phi_{32} & \phi_{33} \end{pmatrix}$$

while the covariance matrix Ω is

$$\Omega = \begin{pmatrix} \omega_{11} & \omega_{12} & \omega_{13} \\ \omega_{21} & \omega_{22} & \omega_{23} \\ \omega_{31} & \omega_{32} & \omega_{33} \end{pmatrix}$$

1. Assume that the system is characterized by cointegration. What does this imply for the eigenvalues of the matrix Φ ?
2. Let $\boldsymbol{\alpha}$ denote the matrix with adjustment coefficients and $\boldsymbol{\beta}$ the matrix with cointegration parameters. Use the relationship

$$\mathbf{\Pi} = \boldsymbol{\alpha}\boldsymbol{\beta}'$$

to express the ϕ_{ij} coefficients by the α_{ij} and β_{ij} parameters.

Show that if the number of cointegration vectors (r) is 1, the rank of $\mathbf{\Pi}$ is 1.

3. What does $\text{rank}(\mathbf{\Pi}) = 1$ imply for the eigenvalues of Φ ?
4. Set $\phi_{31} = \phi_{32} = 0$ and $\phi_{33} = 1$, and keep $r = 1$ as above.

- (a) What are the consequences of the restrictions for the exogeneity of z_t ?
 - (b) What is the “common trends” representation of the system in this case?
5. Continue with the case of $\phi_{31} = \phi_{32} = 0$, $\phi_{33} = 1$ and $r = 1$.
- (a) Specify the conditional equilibrium correction model for $\Delta \mathbf{w}'_{1t} = (\Delta x_t, \Delta y_t)$, conditional on Δz_t .
 - (b) Specify the conditional equilibrium correction model for Δx_t , conditional on Δy_t and Δz_t . Under which assumptions can β be estimated efficiently in this conditional model?

Question C

Obtain a series for CHF/USD (Swiss franc vs. USD) by transforming the exchange rate data used in Question A. Investigate whether there is evidence for cointegration between the logarithms of CHF/USD and EUR/USD. Depending on your findings, suggest a dynamic econometric model for the first differences of the logarithms of CHF/USD and EUR/USD.

Read this before preparing your written answer: Estimation results can be pasted from a result window and into your document. You do not need to use time to typeset tables. But the variables (including any transformations) should be clearly explained in the accompanying text. The same applies to figures: Graphs should be easy to read and should be provided with a caption (figure text), but need not have “publishing quality”. It is important that your own empirical results are easy to reproduce from the data set, by reading the variable definitions and the explanation of data transformations that you should give. Documentation in the form of batch files (.fl) (do-files in Stata) may be efficient, although this is not required.