

Course name: Econometrics 2b Time series data  
Course code: EC7404  
Examiner: Markus Jäntti  
Number of credits: 7.5 credits  
Date of exam: Thursday May 24, 2012  
Examination time: 5 hours (09:00-14:00)

**General Instructions:**

Please explain to me clearly what you are doing why!

When running tests, please state the null hypothesis; relate your test statistics to critical values and/or p-values, so that I can understand exactly how you have interpreted the results from your test and arrived at your conclusion. That is, tell me what you are testing, how you will test it, what the null hypothesis is, and how and why you interpret the results the way you do.

Download the data set called ExamData.txt from <http://dl.dropbox.com/u/12891699/ExamData.txt>. In this data set there are two groups of variables Y1 ... Y80 and X1 ... X80. You will be assigned a specific pair of variables shortly, e.g., Y2 & X2.

Load the data into **R** and make sure that you can read these series by looking at the data and by plotting some examples.

Once everyone has loaded the data, I will assign you a pair of variables, e.g., Y5 & X5. You must use these variables – or you will end up with the wrong answer and you will have to take the makeup exam in august. Be sure to note the variable number you have been assigned at the head of your answer.

You will work in a LaTeX, Sweave, Word or OpenOffice document (or some other text file). Put all text, graphs, etc. into this single file. At the top of this document, write your name and the # of the series that you have been assigned.

At the end of the exam time you will submit exam file (pdf, preferably, doc, odt or txt) to mondo, or by email to me at [markus.jantti@sofi.su.se](mailto:markus.jantti@sofi.su.se).

## Exam Questions:

**Y and X are Annual data.**

1. (max 10 points)

Test for the presence in  $X$  and  $Y$  of conditional heteroscedasticity.

2. (max 10 points)

Test  $X$  and  $Y$  for unit roots using the sequential, augmented Dickey-Fuller method. Explain each step, the test and the interpretation of the results. What is the order of integration of  $X$  and of  $Y$ ? Which one of the following “models” best describes  $X$  and  $Y$ ; (1) stationary, (2) trend stationary, (3) pure random walk, or (4) random walk with drift.

3. (max 20 points)

*Please note that you are allowed to refer to results from (2).*

Formulate and estimate a Autoregressive Distributed Lag (ADL) model using  $X$  and  $Y$ . The variable  $Y$  is what you should explain. Start with 4 lags in each variables. Use a general-to-specific approach to choose the appropriate number of lags using an information criterion. Generate one information criterion for each specification, and choose the specification with the lowest criterion.

What are the relevant diagnostic checks on the residuals? Does this model pass those standard tests?

Give the estimated impact multipliers from the estimated model. What is the long-run multiplier?

4. (max 20 points)

*Please note that you are allowed to refer to results from (2) and (3) to the extent relevant.*

Re-express the model you estimated in the previous question as a single-equation error-correction model (ECM). Use  $X$  and  $Y$  to construct and estimate the model in error correction form. The variable  $Y$  is what you should to try explain. Use a general-to-specific modeling strategy.

- (a) Begin by estimating an error correction model that includes four lags and include a linear time trend.
- (b) Reduce the model to include the appropriate number of lags using a series of  $t$ -tests. Is the time trend needed? Explain what you are doing and why? Confirm this reduction with an  $F$ -test.

- (c) Test for cointegration. Explain what you are doing and why?
- (d) Do the parameter estimates appear reasonable? Is this a spurious regression or can the estimates be given a meaningful interpretation.
- (e) If the variables are cointegrated: What is the cointegrating vector? How fast does the process adjust back to its equilibrium value?
- (f) Run a set of diagnostic tests on your model:
  - i. Autocorrelation
  - ii. Conditional heteroscedasticity
  - iii. Normality