STOCKHOLM UNIVERSITY
Department of Economics

Course name:	Econometrics 2b Time series data
Course code:	EC7404
Examiner:	Markus Jäntti
Number of credits:	7.5 credits
Date of exam:	Friday August 17, 2012
Examination time:	5 hours (09:00-14:00)

General Instructions:

Please explain clearly what you are doing and 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 `mondo` under

Resources → Datasets → `ExamData_2012-08.txt`

In this data set, there are two groups of variables, Y1 ... Y20, and X1 ... X20. 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.

You will be assigned you a pair of variables, e.g., Y2 & X2. You must use the variables that have been assigned to you.

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.

On a separate list, you should write your name and the # of the series that you have been assigned. You will also need to show your identification and that you have paid your student union fees at that time.

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`.

Exam Questions:

Y and X are Quarterly data.

1. *(max 10 points)*

   Test for the presence in X and Y of seasonal variation.

2. *(max 20 points)*

   Please note that you are allowed to refer to results from (1).

   Test X and Y for unit roots. Please explain your choice of testing strategy, each step of the procedure you apply, the tests themselves and the interpretation of the results. What is the order of integration of X and of Y?

3. *(max 20 points)*

   Please note that you are allowed to refer to results from (1) and (2). These still hold (by construction) even though you are using 4 less observations.

   Use the Box-Jenkins ARIMA methodology to forecast to make a forecast of the last 4 quarters of both Y and X using the first 196 observations of Y. Put a 95% confidence interval on your forecast. Calculate the root mean squared error (RMSE) of your forecast.

4. *(max 30 points)*

   Please note that you are allowed to refer to results from (1), (2) and (3).

   Use all observations of X and Y in order to construct a well-specified, single equation, error correction model. The variable Y is what you should to try explain. Use a general-to-specific modeling strategy.

   (a) Begin by estimating the following "General" error-correction model:

$$\begin{aligned}\Delta Y_t =& \alpha + \sum_{j=1}^{8} \beta_j \Delta Y_{t-j} + \sum_{l=1}^{8} \gamma_l \Delta X_{t-l} + \delta_1 Y_{t-1} + \delta_2 X_{t-1} + \\ & \lambda_2 Q_2 + \lambda_3 Q_3 + \lambda_4 Q_4 + \theta t + \epsilon_t\end{aligned} \tag{1}$$

   Q_2, Q_3 and Q_4 are seasonal/quarter dummies and t is a linear time trend (and indexes time). α, $\beta_1, ..\beta_8$, $\gamma_1, ..\gamma_8$, δ_1, δ_2, $\lambda_2, \ldots, \lambda_4$ and θ are parameters.

(b) Now reduce the model using a series of t-tests. Explain what you are doing and why? Confirm this reduction with an F-test. Explain what you are doing and why?

(c) Test for cointegration. Explain what you are doing and why? Can we interpret the parameters of the model in a meaningful way, or is this a spurious regression?

(d) If the model is cointegrated: What is the cointegrating vector? How fast does the process adjust back to its equilibrium value?

(e) Run a set of diagnostic tests on your model:

i. Serial autocorrelation
ii. Conditional heteroscedasticity (i.e., ARCH/GARCH and so on)
iii. Normality
iv. Parameter constancy

(f) Re-estimate the model you have arrived at leaving out the last four observations. Use the estimated parameters to predict the last four observations on Y and give the estimated confidence interval for the prediction. If need be, use the predicted values of X from question (3). Explain what you are doing and why?