ES20069 / ES20159 Semester 2 Project

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Instructions

There are 6 questions. You must **answer all 6 questions**. Marks awarded to each question are specified in brackets.

Clearly show all workings for each answer. The word limit of the project is **1500 words**. Any EViews output that is used to get to the answer should be included in the results. EViews output will not go towards the word count.

Submission deadline: **midday April 22**.

Please submit your document to moodle in pdf format and use **candidatenumber_ES20069** as the title.

1. Explain whether or not the following equations are covariance stationary:

   (a) $Y_t = Y_{t-1} + 5 + \epsilon_t,$ $\quad \epsilon_t \sim iid(0,1)$ [5 marks]

   (b) $Y_t = 0.7Y_{t-1} + \epsilon_t - \epsilon_{t-1},$ $\quad \epsilon_t \sim iid(0,1)$ [5 marks]

   (c) $Y_t = 0.5t + \epsilon_t + 1.8\epsilon_t,$ $\quad \epsilon_t \sim iid(0,1)$ [5 marks]

2. Consider the following model [10 marks]

   $$Y_t = \alpha + \phi_1 Y_{t-1} + (\phi_1 - \phi_2)Y_{t-1} + \epsilon_t, \quad \epsilon_t \sim iid(0,1)$$

   Suppose $\phi_1 = \phi_2 = \phi$ and $|\phi| < 1$. Then, which of the following statements are true:

   Make sure to show your workings clearly and give a reason for your answer.

   (a) The model is not covariance stationary and $E(Y_t) = \frac{\alpha}{\phi}$

   (b) The model is covariance stationary and $E(Y_t) = \frac{\alpha}{1-\phi}$

   (c) The model is not covariance stationary and $E(Y_t) = \frac{\phi}{\alpha}$

   (d) The model is covariance stationary and $E(Y_t) = \frac{\phi}{1-\alpha}$

3. Suppose the data is generated by the following equations

   $$Y_t = \epsilon_t$$

   $$\epsilon_t = \sigma_t z_t$$

   $$\sigma_t^2 = \gamma + \alpha_1 \epsilon_{t-1}^2 + \alpha_2 \epsilon_{t-2}^2 + \beta \sigma_{t-1}^2$$

   $$z_t \sim iid(0,1)$$

   (a) What is the conditional mean of Y_t? [5 marks]

   (b) The standardised residuals are given by $\frac{Y_t - E(Y_t)}{\sqrt{Var(Y_t)}}$. What is the time series model for the standardised residuals? (State clearly the name of this type of time series model) [10 marks]

2

4. Suppose $Y_t = Y_{t-1} + \epsilon_t$ and let $Z_t = 2Y_t + w_t$, $X_t = Y_t + v_t$, where $v_t, w_t, \epsilon_t \sim$ iid N(0,1) and independent of each other.

(a) Show that Z_t and X_t have a unit root. [5 marks]

(b) Show that Y_t and Z_t are cointegrating and that also X_t and Z_t are cointegrating and show the cointegrating factors [5 marks]

(c) What is the Error Correction Model for Y_t and Z_t? [10 marks]

5. The file realgdp.xls contains real GDP for the US from quarter 1 in 1947 to quarter 1 in 2007. Import the file in to EViews and answer the following questions:

(a) Take the log of the series and show the graph. [2 marks]

(b) Show the correlogram for the log of real GDP series. What does it imply about the type of time series model? [3 marks]

(c) Calculate the growth of real GDP by taking the first difference of log real GDP and use the Box – Jenkins methodology to estimate and forecast the "best" ARMA model(s). (Use 2004 Q1 : 2007 Q3 as the out of sample for forecasting future values). Clearly outline all steps as discussed in the lectures. Explain clearly the null hypothesis for any test you do and your conclusion. [15 marks]

6. The file logyc.xls contains quarterly data on log consumption and log income for the UK for the period 1986 to 2015. Import the file into EViews and answer the following questions:

(a) Transform each series so that you have the growth in log consumption and log income.

Estimate a VAR model and perform all the necessary diagnostic tests. (Note: use the AIC criteria when determining the number of lags). [10 marks]

(b) Plot the impulse response functions assuming a one standard deviation shock to the change in log(income) and interpret the graphs. [5 marks]

(c) Test whether the growth of log income granger causes the growth in log consumption. [5 marks]