UNIVERSITY OF CAMBRIDGE
Judge Business School

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Contest Quiz 2
Question Sheet

Due Date : Tue, 6 Mar 2012, 11:59pm

In this quiz we will review concepts of stationarity covered in the first two lectures.

Question 1

Load the data for Exercise 1. This data set contains 7 time series, each of which has 240 observations. Each time series is stored in a column of the data frame, meaning that to access the *i*th series you can use the R command `ts7.dat[,i]`.

This question asks you to identify whether each time series is either (A) stationary, (B) deterministic non-stationary, or (C) stochastic non-stationary. For time series 1 to 7, enter your solution (either A, B or C) in parts (a) to (g) of the online solution form.

Question 2

Load the data for Exercise 2. This gives the annual domestic sales and advertising of Lydia E. Pinkham Medicine Company: both in thousands of dollars. 1907-1960. (Pankratz, 1991).

We would like to determine whether the first difference of the sales time series is stationary by performing an augmented Dickey-Fuller test. For all questions in this exercise set the lag order equal to `ar(ts, method="mle")$order + 1`, where `ts` is the time series. In the questions that follow, perform all tests at the 5% significance level.

a) Report the value of the Dickey-Fuller statistic using an ADF test including both intercept and trend.

b) Whether or not you found the series in (a) to be stationary or non-stationary, perform a test for the significance of the trend term. What is the value of the appropriate statistic?

c) Regardless of your answer to (b), calculate the value of the Dickey-Fuller statistic using an ADF test without the trend.

d) Whether or not you found the series in (c) to be stationary or non-stationary, perform a test for the significance of the intercept term. What is the value of the appropriate statistic?

e) Regardless of your answer to (d), calculate the value of the Dickey-Fuller statistic using an ADF test without the intercept and trend.

f) Which of the following is true:
(A) The series is stationary (B) The series is non-stationary

g) What is the earliest stage (a, b, c, d, or e) at which you can arrive at your answer in part (f)?

h) Now report the value of the Dickey-Fuller statistic at the FINAL stage (after considering whether it is appropriate to drop the trend and/or intercept terms ONLY where necessary) for the first difference of the advertising time series.

i) Which of the following is true of the advertising time series:
(A) The series is stationary (B) The series is non-stationary

Question 3

Load the data for Exercise 3. This is a series of the U.S. quarterly unemployment rate and real GDP from 1948 to 2004. In the questions that follow, perform all tests at the 5% significance level.

a) What is the minimum lag order that you should choose for this time series?

b) Perform an augmented Dickey-Fuller test for the unemployment rate time series, setting the lag order equal to 6. Report the value of the Dickey-Fuller statistic at the FINAL stage (after considering whether it is appropriate to drop the trend and/or intercept terms ONLY where necessary).

c) Repeat the above for the real GDP rate time series.

d) Which of the following is true:
(A) Both series are stationary (B) Unemployment is stationary, real GDP is non-stationary
(C) Unemployment is non-stationary, real GDP is stationary (D) Both series are non-stationary

Now generate new variables representing the approximate percentage change in unemployment rate (`chgUn` say) and real GDP (`chgGDP` say) from one period to the next by taking the first difference of the logged original value.

e) Perform an augmented Dickey-Fuller test for the `chgUn` time series. Set the lag order equal to `ar(ts, method="mle")$order + 2`, where `ts` is the appropriate time series. Report the value of the Dickey-Fuller statistic at the FINAL stage (after considering whether it is appropriate to drop the trend and/or intercept terms ONLY where necessary).

f) Repeat the above for the `chgGDP` time series.

g) Which of the following is true:
(A) Both series are stationary (B) Unemployment is stationary, real GDP is non-stationary
(C) Unemployment is non-stationary, real GDP is stationary (D) Both series are non-stationary