

ECOM30004/90004 Time Series Analysis & Forecasting

Individual Assignment 1

Deadline: 3pm, Wednesday August 15, 2018
Submission method: Electronically via the submission link on the LMS
Word limit: 1000 words
Weight: 10% of marks for subject
Material covered: Mainly Lectures 1-3 and Tutorial 1

Section 1: Conceptual Questions (30 marks)

(1.1) Marks available: 10

Consider the following two structural break models:

(i)

$$y_t = \alpha_0 + \alpha_1 DI_t + U_{1t} \quad \text{where } U_{1t} \text{ is white noise}$$
$$DI_t = \begin{cases} 0 & \text{if } t \leq T_B \\ 1 & \text{if } t > T_B \end{cases} \quad \text{where } 1 < T_B < T$$

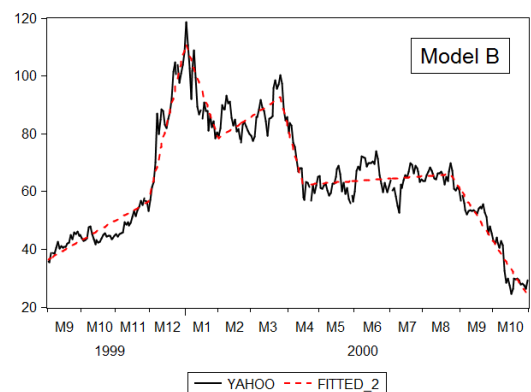
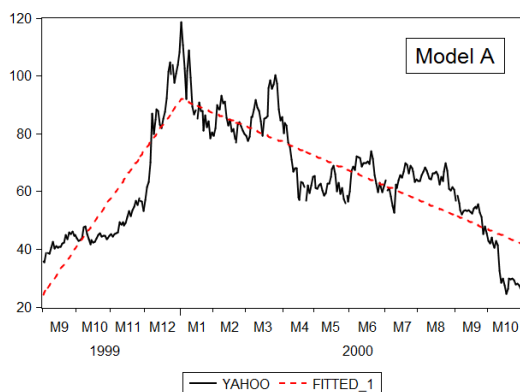
(ii)

$$y_t = \beta_0 + \beta_1 t + \beta_2 DT_t + U_{2t} \quad \text{where } U_{2t} \text{ is white noise}$$
$$DT_t = \begin{cases} 0 & \text{if } t \leq T_B \\ t - T_B & \text{if } t > T_B \end{cases} \quad \text{where } 1 < T_B < T$$

In each case, show explicitly how $E(y_t)$ changes due to the structural break. For each case, sketch a graph to show the type of behaviour exhibited by y_t and give an economic example of a situation when you might observe such a break in practice.

(1.2) Marks available: 20

Consider the graphs below which show the adjusted closing price for Yahoo shares traded on the NASDAQ and quoted in USD over the 296 trading days between September 1, 1999 and October 31, 2000 along with fitted values from two broken trend models.



The data was sourced from Yahoo Finance. Write out the general form of Models A and B separately (use general notation such as $T_{B,1}$, $T_{B,2}$ etc. to denote the break dates). Explain why Model B fits the data better than Model A. What will happen to the fit of the model as the number of structural breaks gets closer to the sample size? In what way is this type of frequently broken trend model inconsistent with the concept of deterministic trending behaviour?

Section 2: Empirical Questions (70 marks)

The Eviews workfile `asx_volume.wf1` contains data on the daily combined aggregate volume of shares traded on the Australian Stock Exchange (ASX) for the 200 largest companies. These are the constituents of the S&P/ASX 200 index. There are 4123 observations in the sample which starts on 31 March 2000 and ends on 3 August 2016. The data is not seasonally adjusted. The variable of interest is $Volume_t$ and is in units of thousands of shares traded daily.

(2.1) Marks available: 5

Start by plotting the log of the volume, $\log Volume_t$. Comment on any deterministic structure that is suggested by the graph.

(2.2) Marks available: 15

Properly specify and estimate an appropriate deterministic structure for $\log Volume_t$. In doing so, note that this is daily data. In this specification, you should allow for the possibility that there may be day-of-the-week effects. Denote the following dummy variables:

$$\begin{aligned} D1_t &= \begin{cases} 1 & \text{if day } t \text{ is a Monday} \\ 0 & \text{otherwise} \end{cases} \\ D2_t &= \begin{cases} 1 & \text{if day } t \text{ is a Tuesday} \\ 0 & \text{otherwise} \end{cases} \\ D3_t &= \begin{cases} 1 & \text{if day } t \text{ is a Wednesday} \\ 0 & \text{otherwise} \end{cases} \\ D4_t &= \begin{cases} 1 & \text{if day } t \text{ is a Thursday} \\ 0 & \text{otherwise} \end{cases} \\ D5_t &= \begin{cases} 1 & \text{if day } t \text{ is a Friday} \\ 0 & \text{otherwise} \end{cases} \end{aligned}$$

which define the business days of the week during which financial markets are open for trading. Furthermore, you should also allow for the possibility of a deterministic trend. Also, consider a particular event on October 31, 2011 which may have led to a structural break. This was the date that Chi-X Australia, an alternative trading platform for ASX listed securities, was launched as a competitor to the ASX. Specify an equation for $\log Volume_t$ and write it out in terms of population parameters. Then estimate the model and write out the estimated regression equation.

Note: When creating the day-of-the-week dummies in EViews, don't use "@seas(1), @seas(2), etc". This will create day-of-the-year dummy variables, not day-of-the-week dummies.

You can use the condition “if @weekday=i” in creating the dummies, where Monday is 1, Tuesday is 2, Wednesday is 3, Thursday is 4 and Friday is 5.

(2.3) Marks available: 15

Show the regression output for your estimated model and interpret in detail all of the key parameter estimates.

(2.4) Marks available: 10

Plot the regression residuals and the correlogram of the residuals from your estimated regression model. Describe these and comment on whether there is evidence of autocorrelation in the residuals?

(2.5) Marks available: 10

Given your findings regarding autocorrelation in the residuals, re-estimate your regression model using appropriate standard errors in order to conduct inference. Using these, comment briefly on the significance of the coefficient estimates in your model.

(2.6) Marks available: 10

Based on the regression results, what can you conclude about day-of-the-week effects? On average, is Monday trading volume significantly different in comparison to every other day? Explain your answer.

(2.7) Marks available: 5

Based on your inference, has there been a long-run effect due to the entry of Chi-X Australia? Explain your answer.