ECOM30004/90004 Time Series Analysis & Forecasting

Individual Assignment 2

Deadline:	3pm, Wednesday September 12, 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 4-10 and Tutorials 2-5

Section 1: Conceptual Questions (40 marks)

(1.1) Marks available: 20
Consider the following model

$$
\begin{aligned}
Y_t &= \beta_0 + U_t \\
U_t &= V_t + 2V_{t-1}
\end{aligned}
$$

where $V_t \sim i.i.d.(0, \sigma^2)$.

(a) The MA(1) model above for U_t is not invertible. Explain why this is the case.

(b) Find an equivalent invertible MA(1) representation for U_t. In what sense is this equivalent to the original MA(1) model above? Explain your reasoning.

(c) Invert the model into an AR(∞) representation. Show your workings.

(1.2) Marks available: 20
This question is concerned with the decomposition of mean squared error (MSE) of forecasts from Lecture 11 and which is reported in the forecast evaluation output from EViews. In this question, you should work in terms of the population MSE of a forecast which is given by:

$$MSE = E(y_{T+h} - \hat{y}_{T+h|T})^2$$

where y_{T+h} is the actual value of the series at time $T + h$ and $\hat{y}_{T+h|T}$ is the forecast made at time T. From this, prove that the following relationship holds:

$$E(y_{T+h} - \hat{y}_{T+h|T})^2 = \left[E(y_{T+h}) - E(\hat{y}_{T+h|T})\right]^2 + [\sigma_y - \sigma_{\hat{y}}]^2 + 2\,[1 - \rho_{y,\hat{y}}]\,\sigma_y\sigma_{\hat{y}}$$

where σ_y denotes the population standard deviation of y_{T+h}, $\sigma_{\hat{y}}$ denotes the population standard deviation of $\hat{y}_{T+h}$ and $\rho_{y,\hat{y}}$ denotes the population correlation between y_{T+h} and $\hat{y}_{T+h}$.

Section 2: Empirical Question (60 marks)

Using the empirical example on aggregate volumes of shares traded on the Australian Stock Exchange (ASX) from the first assignment, build a full univariate time series model for log $Volume_t$ using the Box-Jenkins method to select an appropriate ARIMA(p, d, q) model. In doing this, you can start with the deterministic structure you developed in that assignment or the deterministic structure from my suggested solutions which is contained in the "volume_broken" equation object of the EViews workfile `asx_volume_solutions.wf1`. Write out your chosen ARIMA model in full in terms of population parameters and then in terms of the estimated regression equation. Show how you arrived at your chosen specification and why you have concluded that it is the preferred model. Develop a set of at least 2 candidate models which yield approximate white noise residuals and then select the preferred model in an appropriate manner.