

MA4030 - Assignment 2

Question 1

The data set given in Assignment2Data-MA4030 Minitab file consists of sizes of the particles deposited in a drying chamber over time.

Analyze the set of data and determine the time series model which best fits the data. In deciding the form of the model combine the following:

- (i) The time series plot
- (ii) ACF, PACF plots of the appropriate data
- (iii) Visual analysis of residuals
 - (a) Histogram
 - (b) Probability plot
 - (c) PACF and ACF plots for residuals
- (iv) Estimates for least squares fit
- (v) Ljung-Box Test for Randomness of residuals

Question 2

The time series $\{X_t\}$ is an ARMA(1,2) process given by $X_t = 0.8X_{t-1} + Z_t + 0.7Z_{t-1} + 0.6Z_{t-2}$

where $\{Z_t\}$ is a process of white noise with zero mean and constant variance σ^2 . Assume that Z_t is independent of X_{t-1}, X_{t-2}, \dots

- (i) Is the process $\{X_t\}$ invertible?
- (ii) Show that one- step-ahead forecast is given by $\hat{X}_t(1) = 0.8 X_t + 0.7 Z_t + 0.6 Z_{t-1}$.
- (iii) If $X_N = 10, Z_N = 2$ and $Z_{N-1} = 1$, forecast the value of X_{N+1} .

- (a) Assuming that the trend from the additive model is increasing by 0.3 per quarter, what would be your forecasts for the four quarters of 2001? Compare with those produced in part (b).

Question 2

- (a) An MA(2) process is defined in terms of white noise $\{z_t\}$ by

$$X_t = Z_t + 0.8Z_{t-1} - 0.1Z_{t-2}$$

Find the ACF of $\{X_t\}$ assuming that $\text{Var}(Z_t)=1 \quad \forall t$.

Obtain the correlogram for the process. What do you notice.

Can you use this correlogram to identify an MA process.

- (b) Show that the MA(2) process given by $X_t = Z_t - Z_{t-1} + 0.16Z_{t-2}$ is invertible. Explain why the correlogram of this process has only two spikes. Find their sizes.