

MATH1318 TIME SERIES ANALYSIS

SAMPLE FINAL TEST QUESTIONS

*This **sample** exam is composed of 30 multiple choice questions. Please choose the correct answer for each question by selecting one of (A), (B), (C), or (D) on THE ANSWER SHEET. Answers other than these will be counted incorrect. Each question is 2.5 marks ($2.5 \times 40 = 100$ marks).*

This exam question are only sample questions to give some insight into the format of final test. Please be noticed that the number and contents of questions may differ in the actual final test.

1. Which of the following statement(s) is(are) true?

1. Time series plot cannot be used to identify seasonality in a time series.
 2. Seasonality for quarterly values occurs when observations 12 months apart are related in some manner or another.
 3. Having seasonality in time series data does not imply a significant correlation.
- a) 1 and 2
b) Only 2
c) Only 3
d) 2 and 3

2. In which situation we use the model to forecast future values.

- a) When the model fits the data well.
b) When the assumptions of the model reasonably well satisfied and the model fits the data well.
c) When the R- squared value is greater than 90%.
d) When the residuals are normally distributed.

3. For the random walk series, which of the following is correct?

- a) Variance of the series is decreasing with time.
b) The neighbouring time points are less correlated than those distant from each other.
c) Mean of the series is equal to zero.
d) None of the above.

4. A model is considered a satisfactory fit for the data, if it has

- a) high value for the residual standard deviation.
b) normally distributed white noise series for the stochastic component.
c) high negative value for the coefficient of determination.
d) insignificant regression coefficients.

5. Which of the following are used to check the normality of residuals?

1. Normal QQ plot of the raw series.
2. Histogram of the transformed series.
3. Time series plot of residuals.

- a) 1 and 2
- b) 1,2 and 3
- c) Only 1
- d) None of the above.

6. For a constant mean model, the estimator of μ is

- a) sample mean.
- b) variance of the sample mean.
- c) standard deviation of the sample mean.
- d) population mean divided by the sample size.

7. Which of the following statement(s) is(are) true about an autoregressive process?

1. The series has a strong autocorrelation between the neighbouring values.
2. PACF of AR(1) process has a positive or negative spike at lag 1 depending on the sign of coefficient then cuts off.
3. ACF of AR(2) process cuts off after lag 2.

- a) 1 and 2
- b) 1, 2 and 3
- c) Only 1
- d) 2 and 3

8. Which of the following statements are true concerning the ACF and PACF?

1. The ACF and PACF are used to find candidate models in practice.
2. The ACF and PACF can be difficult to calculate for some data sets.
3. If applied correctly, the ACF and PACF will always deliver unique model selections.

- a) Only 3
- b) 1 and 3
- c) 2 and 3
- d) 1 and 2

9. In ARIMA models 'I' stands for

- a) Independence.
- b) Identically distributed.
- c) Integrated.
- d) Integration.

10. Following are some steps taken by an analyst to specify a model for a non-stationary time series.

1. Apply a logarithm transformation
2. Compute the first difference
3. Specify model parameters p and q

Please select the correct order for model specification.

- a) 1, 2, 3.
- b) 2, 1, 3.
- c) 3, 1, 2.
- d) 3, 2, 1.

11. Select the incorrect statement about Box-Cox transformation.

- a) It is also referred as power transformations.
- b) Lambda value of one implies no transformation.
- c) Lambda can only have positive values.
- d) A precise estimate of lambda is usually not warranted.

12. Which of the following statements are true for the class of ARIMA(p, d, q) models?

1. It is plausible for financial time series that the optimal value of d could not be more than 0.
2. An ARIMA($p, 1, q$) model estimated on a series of logs of prices is equivalent to an ARIMA($p, 0, q$) model estimated on a set of continuously compounded returns.
3. ARIMA stands for independent autoregressive moving average

- a) Only 3
- b) Only 2
- c) 2 and 3
- d) 1, 2 and 3

13. Select the incorrect statement about ACF plot.

- a) We use the ACF to observe the main characteristics of ARMA models.
- b) In the sample ACF of a white noise series, all autocorrelations should be insignificant at all lags.
- c) In the sample ACF of an AR(1) series, all autocorrelations are positive.
- d) In the sample ACF of an AR(2) series, there are exponential decays if the roots of the AR equation are real and a damped sine wave if the roots are complex.

14. EACF stands for

- a) Extension autocorrelation function.
- b) Extended autocorrelation function.

- a) {ARMA(0,4), ARMA(0,5), ARMA(1,4), ARMA(2,2)}
b) {ARMA(1,1), ARMA(1,2), ARMA(2,1), ARMA(2,2)}

- c) $\{\text{ARMA}(4,1), \text{ARMA}(5,1), \text{ARMA}(5,2)\}$
- d) $\{\text{ARMA}(3,2), \text{ARMA}(3,3), \text{ARMA}(4,3)\}$

17. Select the null hypothesis of the Augmented Dickey-Fuller (ADF) unit-root test

- a) The process is difference stationary.
- b) The process is normally distributed.
- c) The process is difference nonstationary.
- d) The process is stationary.

18. When selecting a model which of the following is preferred?

- a) Lower AIC and BIC values.
- b) Higher AIC and BIC values.
- c) Lower AIC and higher BIC values.
- d) Higher AIC and lower BIC values.

19. The ACF and PACF plots of a stationary series are given in Figure 2.1 and 2.2, respectively.

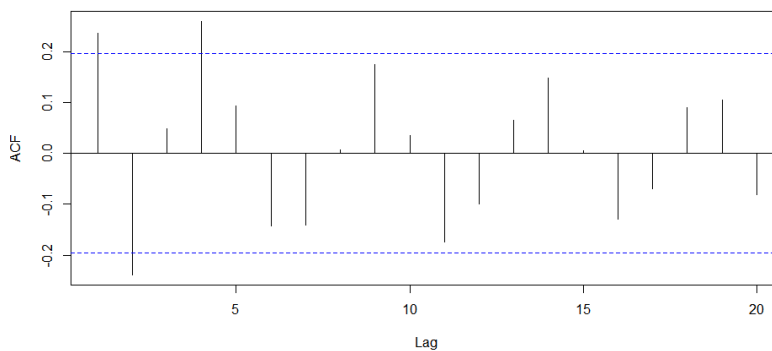


Figure 2.1: ACF plot.

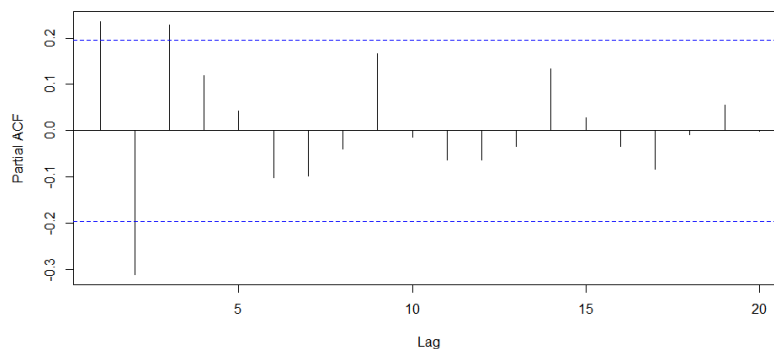


Figure 2.2: PACF plot.

Based on Figure 2.1 and 2.2, please select the most possible model.

- a) $\{\text{ARMA}(3,3), \text{ARMA}(2,3), \text{ARMA}(3,2)\}$
- b) $\{\text{ARMA}(3,0), \text{ARMA}(3,4), \text{ARMA}(3,2)\}$
- c) $\{\text{ARMA}(2,3), \text{ARMA}(4,3), \text{ARMA}(3,4)\}$
- d) $\{\text{ARMA}(1,6), \text{ARMA}(2,3), \text{ARMA}(3,2)\}$

20. The ACF and PACF plots of a raw series are given in Figure 3.1 and 3.2, respectively.

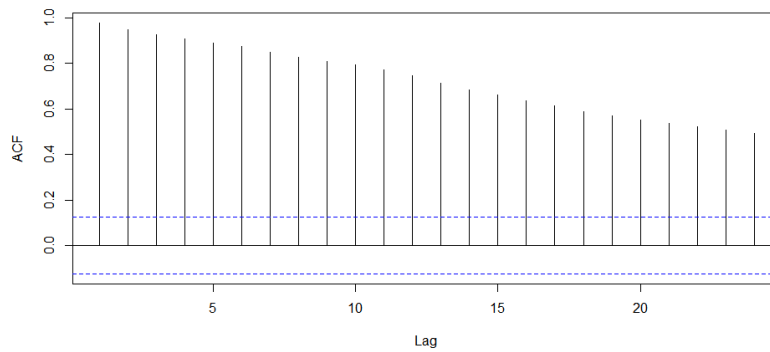


Figure 3.1: ACF plot.

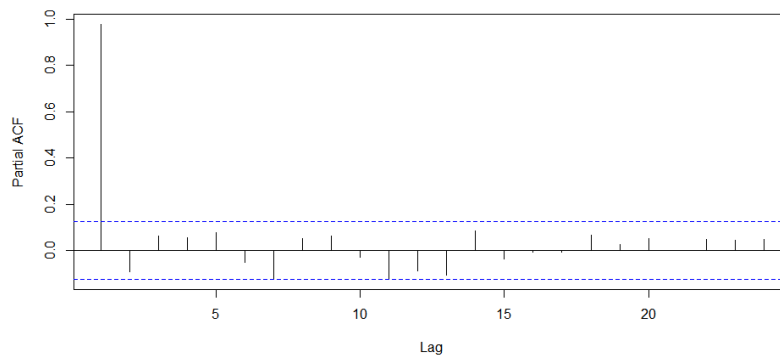
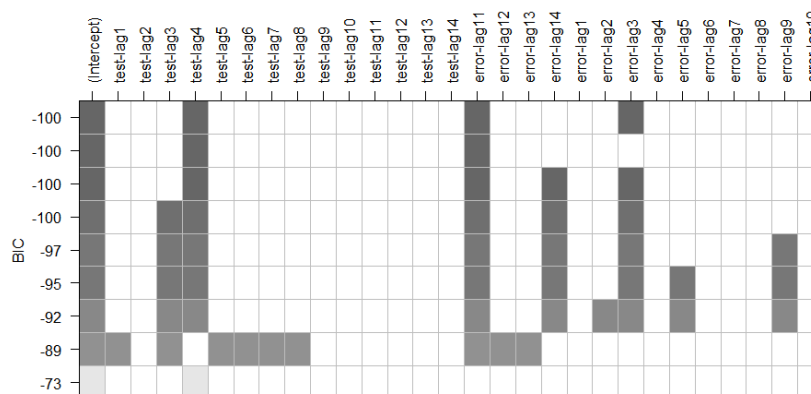


Figure 3.2: PACF plot.

Based on Figure 3.1 and 3.2, which of the following is correct?

- a) ARMA(1,0) model can be included in the set of possible models.
- b) ARMA(0,1) model can be included in the set of possible models.
- c) ARMA(25,1) model can be included in the set of possible models.
- d) ACF and PACF indicates non-stationary series.

21. Based on the BIC table given below, please select the set of most possible models.



- a) {ARMA(11,4), ARMA(3,4)}
- b) {ARMA(4,11), ARMA(4,3)}
- c) {ARMA(11,4), ARMA(4,3)}
- d) {ARMA(2,10), ARMA(2,1)}

22. If the model is correctly specified and the parameter estimates are reasonably close to the true values, then the residuals should have nearly

- a) the properties of an autoregressive process.
- b) the properties of a moving average process.
- c) the properties of a white noise process.
- d) the properties of a random walk process.

23. Shapiro-Wilk test for the residual of the fitted model produces a p-value of 0.30. What does this p-value indicate?

- a) It indicates that we do not have enough evidence to reject the null hypothesis that the residuals are normally distributed.
- b) It indicates that we do not have enough evidence to reject the null hypothesis that the residuals are non-normally distributed.
- c) It indicates that we do not have enough evidence to reject the null hypothesis that the residuals are stationary.
- d) It indicates that we do not have enough evidence to reject the null hypothesis that the residuals are non-stationary.

24. To check on the independence of the noise terms in the model, we consider the

- a) time series plot of residuals.
- b) time series plot of the original data.
- c) sample autocorrelation function of the residuals.
- d) normality plot of residuals.

25. If you were going to overparameterise the AR(1) model for diagnostic checking purposes, which two models would you fit?

- a) IMA(1,1) and ARMA(2,2)
- b) ARMA(1,1) and AR(2)
- c) ARMA(1,2) and ARI(1,1)
- d) IMA(1,1) and ARI(2,1)

26. In a SARIMA(p,d,q)(P,D,Q)_m model, which of the following shows all the seasonal elements?

- a) P,Q.
- b) P,D,Q.
- c) p,d,q.
- d) P,D,Q,m.

27. The ACF and PACF plots of a raw series are given in Figure 4.1 and 4.2, respectively.

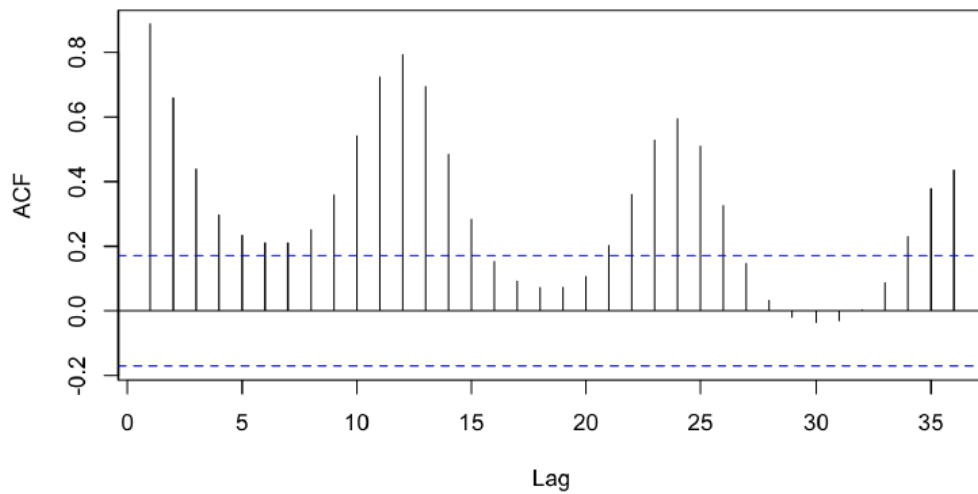


Figure 4.1: ACF plot.

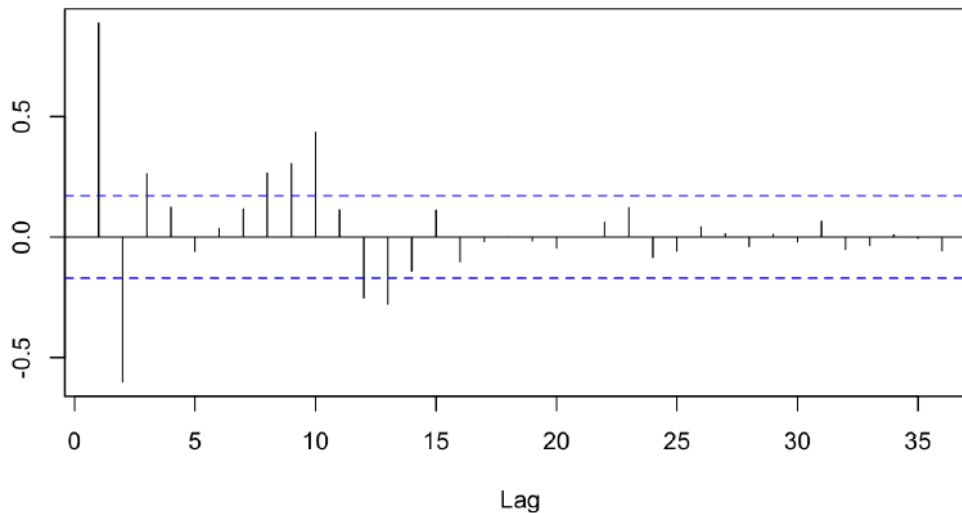


Figure 4.2: PACF plot.

Based on Figure 4.1 and Figure 4.2, please select the incorrect interpretation below.

- a) There are strong correlations at lags 12, 24, 36, and so on.
- b) There are significant seasonal autocorrelations in the series.
- c) ARMA(0,1) and ARMA(0,2) can be considered as candidate models for this series.
- d) ACF and PACF indicates non-stationary series.

27. Figure 5 displays the ACF and PACF plots after taking the first seasonal difference of a monthly time series.

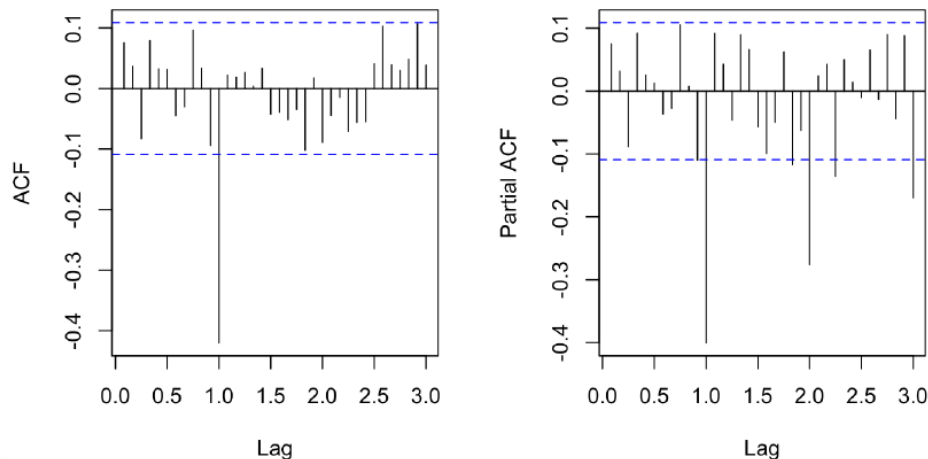


Figure 5: ACF and PACF plot.

Based on Figure 5, please select the next suitable candidate model for the series.

- a) Series is white noise after the first seasonal difference.
- b) SARIMA(0,0,0)(1,0,1)₁₂
- c) SARIMA(0,0,0)(1,1,0)₁₂
- d) SARIMA(0,0,0)(0,1,1)₁₂

29. Which of the following statements are true concerning a comparison between ARCH(q) and GARCH(1,1) models?

- 1. The ARCH(q) model is likely to be the more parsimonious.
- 2. The ARCH(q) model is more likely to violate non-negativity constraints.
- 3. The ARCH(q) model can allow for an infinite number of previous lags of squared returns to affect the current conditional variance.
- 4. The GARCH(1,1) model will usually be sufficient to capture all of the dependence in the conditional variance.

- a) 1 and 3.
- b) 2 and 4.
- c) 1, 2 and 3.
- d) 1, 2, 3 and 4.

30. Following is the EACF of an absolute return series.

AR/MA	0	1	2	3	4	5	6	7	8	9	10	11	12	13
0	x	x	x	x	x	x	o	o	o	o	o	o	o	o
1	x	o	o	o	o	o	o	o	o	o	o	o	o	o
2	x	x	o	o	x	x	o	o	o	o	o	o	o	o
3	x	x	o	o	o	x	o	x	o	o	o	o	o	x
4	x	x	o	o	o	x	x	x	o	o	o	o	o	o
5	x	x	o	o	o	x	x	x	o	o	o	o	o	o
6	x	x	o	o	o	x	o	o	o	o	o	o	o	o
7	x	x	x	x	x	x	o	x	o	o	o	o	o	o

Based on the EACF, please find a set of candidate GARCH(p,q) models.

- a) {GARCH(1,1), GARCH(2,1)}
- b) {GARCH(0,3), GARCH(1,3)}
- c) {GARCH(3,0), GARCH(3,1)}
- d) {GARCH(1,3), GARCH(3,1)}