TSAF CAT-I

1. Email *

   _____

2. Name and Surname *

   _____

3. Student Number *

   _____

Let's start (you have 50 questions with time limit of 1 hour 30 min.)

4. Q2-2 *

Which of the following is a time series?

	X Axis	Y Axis
A	Number of employees in company	Company share price
B	Number of leaves taken by CEO	Company profits
C	Date	Quarterly earnings

1. Only A and B

2. Only A and C

3. Only C

4. All of the above

Mark only one oval.

○ Option 1

○ Option 2

○ Option 3

○ Option 4

5. Q2-3 *

What is the maximum frequency in time series analysis?

| 1. 10 years |
| 2. 2 years |
| 3. 1 year |
| 4. No limit |

Mark only one oval.

○ Option 1
○ Option 2
○ Option 3
○ Option 4

6. Q2-4 *

Time series analysis can be conducted on which of the following data sets?

A: Number of cars sold yearly by Ford
B: Commodity prices of wheat from 2010 to 2015
C: Amount of shares repurchased by Apple in 2000, 2003, 2010 and 2018

| 1. Only A and B |
| 2. Only A and C |
| 3. All of the above |
| 4. None of the above |

Mark only one oval.

○ Option 1
○ Option 2
○ Option 3
○ Option 4

7.   Q2-7 *

Why is time series analysis required?

A. To conduct short term forecasting of prices
B. To recognise patterns in time series
C. To build high profit and risk-free trading strategy
D. To compare two time series

| 1. Only A and D |
| 2. Only B, C and D |
| 3. Only A, B and D |
| 4. All of the above |

Mark only one oval.

○ Option 1
○ Option 2
○ Option 3
○ Option 4

8. Q2-9 *

In which of the following scenarios, time series analysis is not required?

A: Company's share price have not changed since the past 5 years
B: Gold price has been set at $5000 by the government
C: Company's share price has been rising exponentially

1. Only A and C
2. Only A and B
3. Only B and C
4. A, B and C

Mark only one oval.

○ Option 1
○ Option 2
○ Option 3
○ Option 4

Returns

9. Q3-2 *

Why should we use returns and not price data for analysis?

1. Various companies report their annual returns and is thus easier to analyse

2. The returns of a stock tell us if a company performed better than yesterday or not

3. The returns of a stock can be compared across assets so that we understand which asset performed better

4. The returns capture all the price information as well as industry performance

Mark only one oval.

○ Option 1

○ Option 2

○ Option 3

○ Option 4

10.   Q3-3 *

The daily closing price of a company is given below. What is the simple daily return for the 4th day, ie July 27th?

Day	Price
24-Jul-2020	$90
25-Jul-2020	$110
26-Jul-2020	$100
27-Jul-2020	$130
28-Jul-2020	$130
31-Jul-2020	$135

1. 10%

2. 30%

3. 40%

4. 20%

Mark only one oval.

Option 1

Option 2

Option 3

Option 4

11.   Q3-4 *

The total returns from IBM and Google for the year 2019-20 is given below.
IBM: 10%
Google: 11%
Which is the better investment prospect between the two?

| 1. Google |
| 2. IBM |
| 3. Facebook |
| 4. Cannot be determined |

Mark only one oval.

◯ Option 1

◯ Option 2

◯ Option 3

◯ Option 4

12. Q3-6 *

What is the difference between simple and cumulative returns?

| |
|---|
| 1. Simple returns can be calculated using previous day's prices while cumulative returns need only the first and last day's price record |
| 2. Simple returns help us understand the journey of the price series while cumulative returns help us compare different assets' performance |
| 3. Simple returns take into factor only the previous day's price, whereas cumulative returns take into factor the price of all days in the period |
| 4. Simple returns are used for comparing daily performance while cumulative returns help us compare future performance |

Mark only one oval.

Option 1

Option 2

Option 3

Option 4

Log Returns

13.   Q4-2 *

Following are the daily prices for company ABC. Which graph correctly represents the log prices?

Date	Price
22-Jun-20	5
23-Jun-20	8
24-Jun-20	16
25-Jun-20	32
26-Jun-20	40

1.

2.
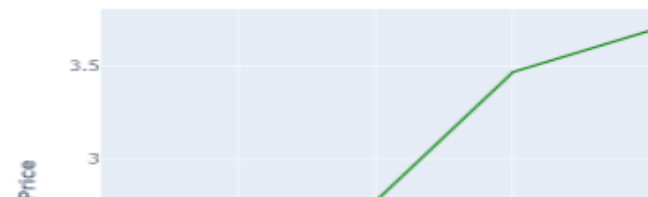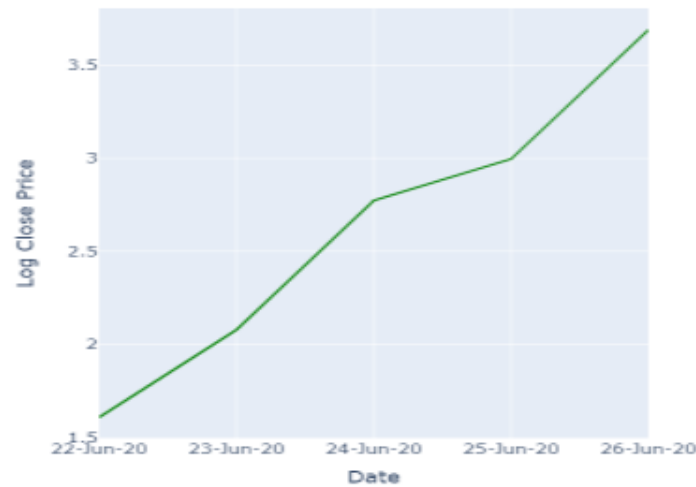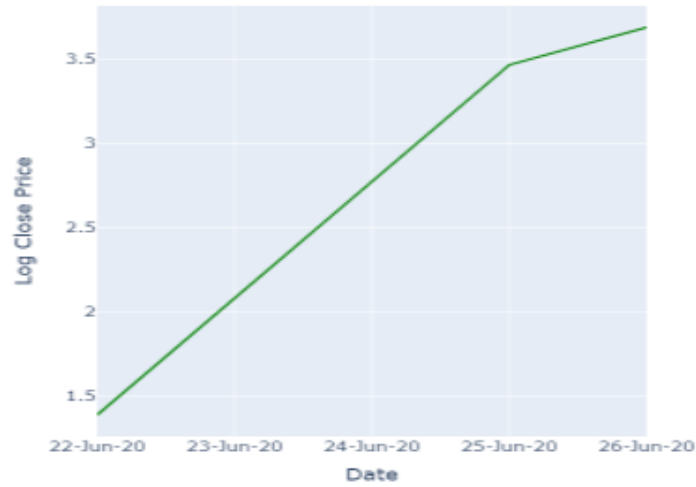
3.

_____

4. None of these

Mark only one oval.

○ Option 1

○ Option 2

○ Option 3

○ Option 4

14. Q4-3 *

What is the advantage of using log prices?

| 1. They help us see the rate at which the price increased or decreased |
| 2. They help us understand if the price increased or decreased in relation to yesterday |
| 3. They are easier to calculate than simple price changes |
| 4. None of the above |

Mark only one oval.

○ Option 1

○ Option 2

○ Option 3

○ Option 4

15. Q4-5 *

The daily log returns of Apple are given below.

Date	Log returns
03-Aug-2020	0.099
04-Aug-2020	0.006
05-Aug-2020	0.003
06-Aug-2020	0.034
07-Aug-2020	-0.024

Calculate the total log return for the 3rd day i.e. 5 August?

1. 0.108

2. 0.090

3. 0.043

4. 0.003

Mark only one oval.

○ Option 1

○ Option 2

○ Option 3

○ Option 4

16.   Q4-7 *

What is the difference between daily simple returns and daily log returns?

| 1. Daily log returns cannot be added to get total returns |
| 2. Daily simple returns cannot be added to get total returns |
| 3. Daily simple returns are harder to calculate than log returns |
| 4. All of the above |

Mark only one oval.

○ Option 1

○ Option 2

○ Option 3

○ Option 4

17. Q4-8 *

Calculate daily log returns on 12 August from the below table?
Formula: Change in log prices = Log returns

Date	Log prices
10-Aug-2020	7.26
11-Aug-2020	7.23
12-Aug-2020	7.35
13-Aug-2020	7.39
14-Aug-2020	7.41

1. 0.12

2. -0.03

3. 0.09

4. 14.48

Mark only one oval.

○ Option 1

○ Option 2

○ Option 3

○ Option 4

18. Q4-9 *

The log price is 5.6, how to find the original price?

| 1. 5.6/e |
| 2. 5.6*e |
| 3. 5.6^e |
| 4. $e^{5.6}$ |

Mark only one oval.

○ Option 1

○ Option 2

○ Option 3

○ Option 4

19. Q4-10 *

Why should you use log returns?

| 1. Log returns help us understand the rate at which the returns increase or decrease |
| 2. Log returns help us find days when the returns are really phenomenal |
| 3. Log returns do not take into account days when there was minimal change in the returns |
| 4. Log returns are not helpful in comparison to simple returns |

Mark only one oval.

○ Option 1

○ Option 2

○ Option 3

○ Option 4

20. **Q4-11** *

What is the difference between log prices and daily log returns?

1. When log prices are converted to percentage terms, they are called log returns
2. Log of price data is called log prices while log of cumulative returns are called log returns
3. Log prices are simply the natural log of the price data whereas daily log returns are the change in daily log prices
4. Log prices and log returns are one and the same

Mark only one oval.

○ Option 1

○ Option 2

○ Option 3

○ Option 4

Components of Time Series

21. **Q5-2** *

Can a time series be modelled without identifying the different components?

1. Yes. Time series modelling is essentially fitting a line on the existing data
2. No. A time series model which is not equipped to identify and model the different components would give a suboptimal performance
3. No. Along with the components, we have to compulsorily look at alternative data as well to build accurate models
4. Yes. But it only works in time series with less variance

Mark only one oval.

○ Option 1

○ Option 2

○ Option 3

○ Option 4

22.   Q5-5 *

Is the following price series mean reverting or trending?

YRCW Share Price
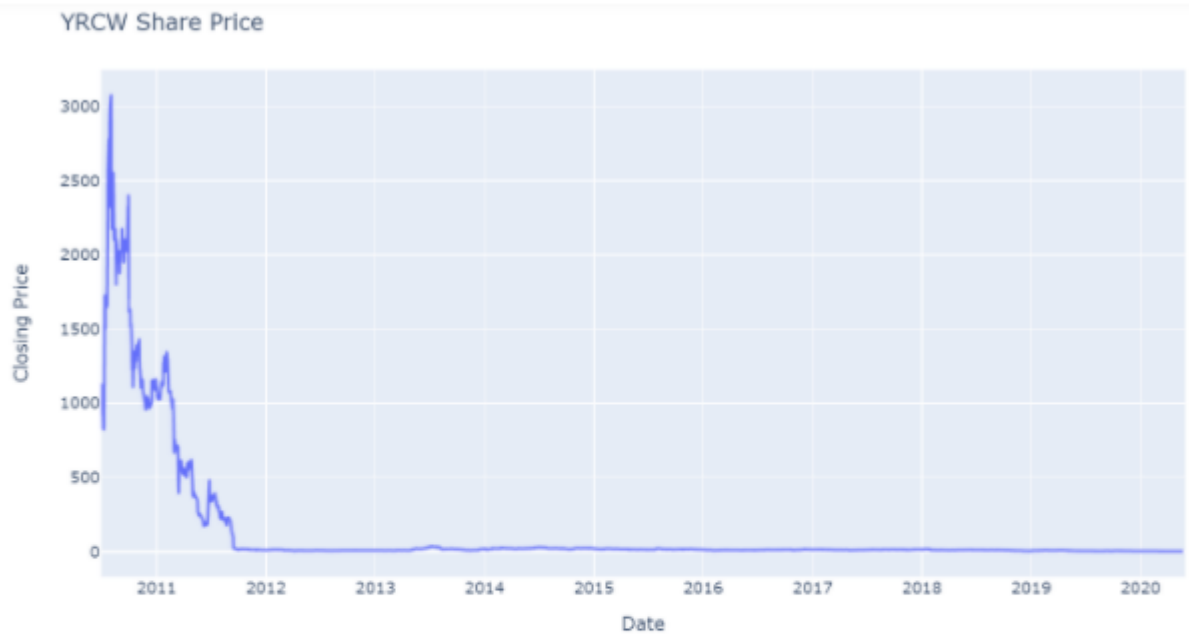
1. Mean reverting

2. Trending

3. Trending in 2010-2012 and mean reverting after 2012

4. None of these

Mark only one oval.

○ Option 1

○ Option 2

○ Option 3

○ Option 4

Correlation Analysis

23. Q10-3 *

What would be the covariance value for the given dataset?

Silver($)	Platinum($)
38.6	175.9
38.8	176.1
38.5	175.0
34.9	167.0
29.9	158.8

Covariance of a sample is given by the formula:

$$Cov(x,y) = \frac{\Sigma(x_i-\bar{x})(y_i-y)}{N-1}$$

Cov(x,y) = covariance between variable x and y
x_i = value of x variable
y_i = value of y variable
$\bar{x}$ = mean of variable x
$\bar{y}$ = mean of variable y
N = number of data values

1. 38.7

2. 170.3

3. 98.4

4. 28.96

Mark only one oval.

- Option 1
- Option 2
- Option 3
- Option 4

24.   Q10-4 *

The covariance between stock prices of Facebook and stock prices of Nvidia in Dollars is 79.33 and the covariance between stock prices of Infosys and stock prices of TCS in Rupees is 223.69. Which one is strongly correlated with each other?

| 1. Facebook and Nvidia |
| 2. Infosys and TCS |
| 3. Both stock pairs are equally correlated |
| 4. Can't say |

Mark only one oval.

○ Option 1

○ Option 2

○ Option 3

○ Option 4

Autocorrelation

25. Q11-2 *

Which of the following is true about autocorrelation?

A. It measures the value of correlation between two time series
B. It measures correlation of a time series with it's lagged values
C. It takes into account only the direct correlation effect
D. It is also called as serial correlation

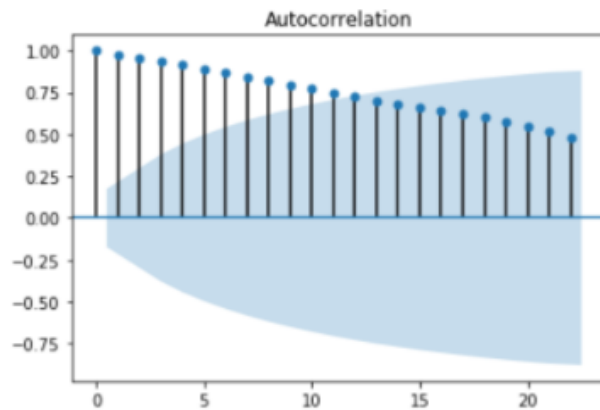| 1. Only A |
| 2. Only B |
| 3. Only B, C and D |
| 4. Only B and D |

Mark only one oval.

○ Option 1
○ Option 2
○ Option 3
○ Option 4

26.   Q11-3 *

This is the autocorrelation plot of Corn ETF prices, what is the approximate autocorrelation value at 6th lag?

Autocorrelation

1. 1

2. 0.95
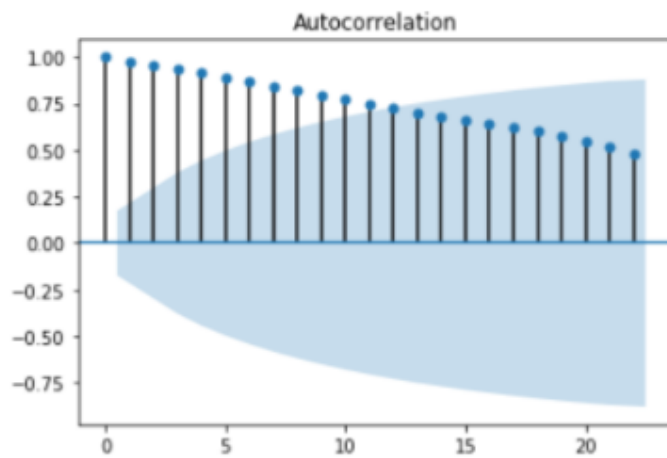
3. 0.85

4. 0.75

Mark only one oval.

○ Option 1

○ Option 2

○ Option 3

○ Option 4

27. Q11-4 *

This is the autocorrelation plot of Corn ETF prices, how much lagged value is statistically significant?

1. 11

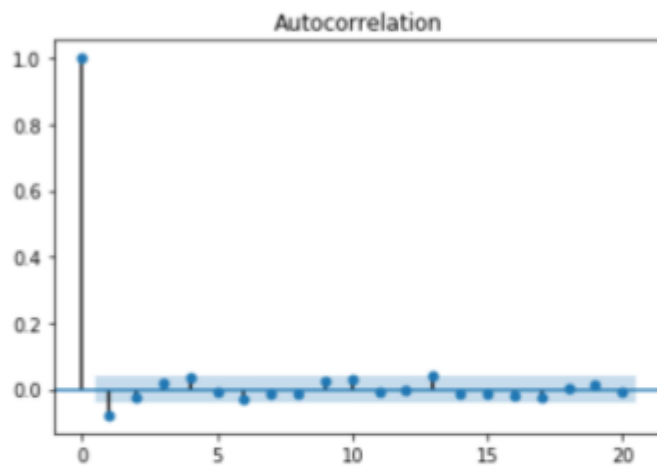2. 15

3. None

4. All

Mark only one oval.

  ◯ Option 1
  ◯ Option 2
  ◯ Option 3
  ◯ Option 4

28. Q11-5 *

How to interpret the value at 1st lag in this ACF plot?

Autocorrelation

1. If the past price has increased, the current price will increase

2. If the past price has decreased, the current price will decrease

2. If the past price has decreased, the current price will increase

4. They are independent of each other

Mark only one oval.

○ Option 1

○ Option 2

○ Option 3

○ Option 4

29.   Q11-8 *

Which of the following is/are correct about partial autocorrelation?

A. It is used to find both direct and indirect correlation between series lagged values
B. It is used to find only direct correlation between series lagged values
C. It is determined by calculating the correlation between lagged prices

1. Only A
2. Only B
3. Only B and C
4. Only A and C

Mark only one oval.

○ Option 1
○ Option 2
○ Option 3
○ Option 4

30. Q11-9 *

In the following equation, which term gives PACF value for 4th lag?

$$P_t = C + \Phi_1 * P_1 + \Phi_2 * P_2 + \Phi_3 * P_3 + \Phi_4 * P_4 + \Phi_5 * P_5 + \varepsilon_t$$

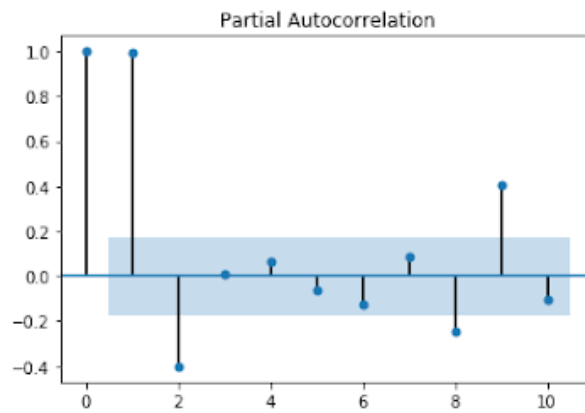| 1. C |
|---|
| 2. P_4 |
| 3. Φ_4 |
| 4. ε_t |

Mark only one oval.

○ Option 1
○ Option 2
○ Option 3
○ Option 4

31. Q11-10 *

This is the partial autocorrelation plot of Corn ETF prices. Which of the following is the correct equation for the significant lagged values?

Partial Autocorrelation

1. $P_t = C + \Phi_1 * P_1 + \Phi_2 * P_2 .... + \Phi_{10} * P_{10} + \varepsilon$

2. $P_t = C + \Phi_1 * P_1 + \Phi_2 * P_2 .... + \Phi_9 * P_9 + \varepsilon$

3. $P_t = C + \Phi_1 * P_1 + \Phi_2 * P_2 .... + \Phi_7 * P_7 + \varepsilon$

4. $P_t = C + \Phi_1 * P_1 + \Phi_2 * P_2 .... + \Phi_5 * P_5 + \varepsilon$

Mark only one oval.

○ Option 1

○ Option 2

○ Option 3

○ Option 4

32. Q11-12 *

Which of the following is right about the blue shaded region in ACF and PACF plot?

A. Plots inside the blue region are statistically significant
B. Plots outside the blue region are statistically significant
C. Blue region signifies the confidence interval

| 1. Only A |
| 2. Only A and C |
| 3. Only B |
| 4. Only B and C |

Mark only one oval.

○ Option 1
○ Option 2
○ Option 3
○ Option 4

Noise

33. Q12-2 *

Can the properties of returns, such as mean and standard deviation, be similar to white noise?

1. Yes
2. No
3. Cannot say
4. Returns cannot be compared to white noise at all

Mark only one oval.

○ Option 1
○ Option 2
○ Option 3
○ Option 4

34. Q12-3

Does white noise have properties of stationarity?

| 1. Yes |
| 2. No |
| 3. White noise in financial time series is not stationary |
| 4. White noise satisfies some properties of stationarity but not all |

Mark only one oval.

○ Option 1
○ Option 2
○ Option 3
○ Option 4

35.   Q12-4 *

What would you do if you find that the error plot of your model isn't white noise?
A. We check for white noise only to see the performance of the time series model and there are no further steps to improve the model
B. Since it is not white noise, there is some information which has not been accounted for in the time series model and you should try to incorporate it
C. The model does not work and you should discard it altogether

1. Only A
2. Only B
3. Only C
4. Neither of the above

Mark only one oval.

○ Option 1

○ Option 2

○ Option 3

○ Option 4

Autoregressive Model

36. Q13-3 *

Which of the following is/are correct about autoregression?

A. Autoregression is based on the linear regression model
B. Autoregression model uses past prices of a security to predict its future price
C. Autoregression model uses past prices of a security to predict the future price of another security
D. Autoregression model can be used to find the price of Gold using the price of Silver

| 1. Only A |
| 2. Only A and B |
| 3. Only C and D |
| 4. Only A, C and D |

Mark only one oval.

○ Option 1
○ Option 2
○ Option 3
○ Option 4

37. Q13-4 *

Which of the following represents the below autoregressive model?

$$Y = C + \Phi_1 * Y_{t-1} + \Phi_2 * Y_{t-2} + \Phi_3 * Y_{t-3}$$

1. AR(1)
2. AR(2)
3. AR(3)
4. AR(4)

Mark only one oval.

◯ Option 1

◯ Option 2

◯ Option 3

◯ Option 4

38. Q13-6 *

Which prerequisite condition should be satisfied before applying the AR model?

1. There are no prerequisites. AR models can be applied on any time series
2. The time series should be random
3. The time series should be from financial markets
4. There has to be an autocorrelation between past values and current values

Mark only one oval.

○ Option 1
○ Option 2
○ Option 3
○ Option 4

39. Q13-7 *

Why do we use PACF for finding optimal lag for AR models?

A. To find the direct relationship between the past values and the current value
B. To find both direct and indirect relationship between the past values and the current value
C. PACF helps find the past value that can explain the variance in the current value, which is not explained by earlier terms.

| 1. Only A |
| 2. Only A and C |
| 3. Only B and C |
| 4. None of the above |

Mark only one oval.

○ Option 1
○ Option 2
○ Option 3
○ Option 4

Moving Average

40. Q15-2 *

Which of the following is/are correct about moving average models?

A. MA models use the past price of a security to make future predictions
B. MA models use past error terms to make future prediction
C. ACF determines the optimal lag of the MA model
D. PACF determines the optimal lag of the MA model

| 1. Only A and C |
| 2. Only B and C |
| 3. Only A and D |
| 4. Only B and D |

Mark only one oval.

$\bigcirc$ Option 1
$\bigcirc$ Option 2
$\bigcirc$ Option 3
$\bigcirc$ Option 4

41. Q15-3 *

The coefficient for the error term at time t-1 (θ1) is 0.5. Use the MA(1) model to predict the third month's price of a security.

MA(1) model is given by the equation: $\hat{Y}t = \mu + \theta1 * \varepsilon_{t-1}$

Month	Actual price (yt)	Predicted price (ŷt)	Error (εt)
1	$96	$100	-$4
2	$100		
3		?	

Hint: Mean price of the security is $100.

1. $98

2. $100

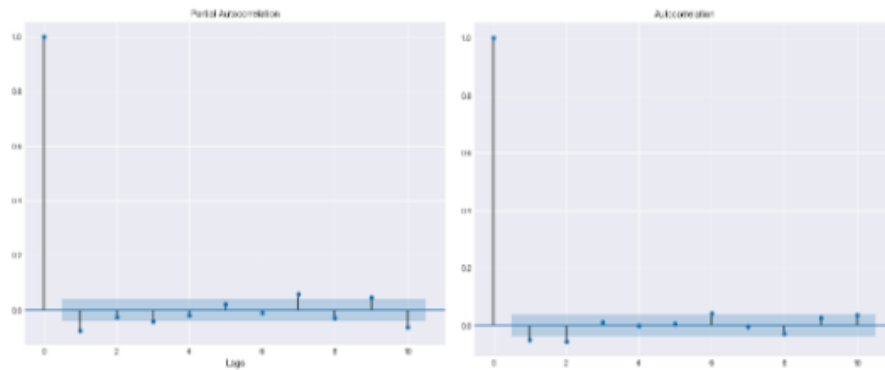3. $101

4. $104

Mark only one oval.

◯ Option 1

◯ Option 2

◯ Option 3

◯ Option 4

42.   Q15-4 *

ACF and PACF plots of two different securities are given to you. Which of the following MA models can be used for prediction using the plots below.

| 1. MA(7) |
| 2. MA(2) |
| 3. MA(10) |
| 4. MA(6) |

Mark only one oval.

◯ Option 1

◯ Option 2

◯ Option 3

◯ Option 4

43. Q15-5 *

Which of the following is the accurate definition of the MA(2) model?

A. Last 2 period error terms
B. Last 2 months error terms
C. Last 2 days error terms
D. Last 2 minutes price

1. Only A

2. Only D

3. Only A, B and C

3. All of the above

Mark only one oval.

○ Option 1
○ Option 2
○ Option 3
○ Option 4

ARMA

44. Q16-2 *

Which of the following best describes the ARMA model?

| 1. It uses both AR & MA models together for prediction |
| 2. It applies AR on moving average of price series |
| 3. ARMA model can be extended to incorporate an exponential moving average of the prices |
| 4. None of the above |

Mark only one oval.

- ⬭ Option 1
- ⬭ Option 2
- ⬭ Option 3
- ⬭ Option 4

45. Q16-3

Which of the following is the correct equation for ARMA(1,2)?

| 1. $\hat{Y}_t = C + \Phi_1 * Y_{t-1} + \Phi_2 * Y_{t-2} + \theta_1 * \varepsilon_{t-1}$ |
| 2. $\hat{Y}_t = C + \theta_1 * \varepsilon_{t-1} + \theta_2 * \varepsilon_{t-2}$ |
| 3. $\hat{Y}_t = C + \Phi_1 * Y_{t-1} + \Phi_2 * Y_{t-2}$ |
| 4. $\hat{Y}_t = C + \Phi_1 * Y_{t-1} + \theta_1 * \varepsilon_{t-1} + \theta_2 * \varepsilon_{t-1}$ |

Mark only one oval.

- ⬭ Option 1
- ⬭ Option 2
- ⬭ Option 3
- ⬭ Option 4

Stationarity

46. Q17-2 *

The price graph for Kodak is given below.

Kodak Price Graph

In 2019, Kodak had a constant mean of $2.5 and a variance of 1. Is the Kodak price series stationary since 2014?

1. Yes
2. No
3. The stationarity concept doesn't apply to a mix of trending and mean reverting price series
4. Can't say

Mark only one oval.

○ Option 1
○ Option 2
○ Option 3
○ Option 4

47. Q17-3 *

Does a stationary price series have a mean of 0?

| 1. Yes |
| 2. No |
| 3. Can't say |
| 4. A mean of 0 indicates the series is not stationary at all |

Mark only one oval.

- Option 1
- Option 2
- Option 3
- Option 4

48. Q17-4 *

If a price series has a mean of 50 and variance of 50 in the year 2019, and in 2020, the mean is still 50 but variance has risen to 150. Is this a stationary price series?

| 1. Yes |
| 2. No |
| 3. If it's on the positive side, then it is stationary |
| 4. None of these |

Mark only one oval.

- Option 1
- Option 2
- Option 3
- Option 4

49. Q17-5 *

Is single order differencing sufficient to get a stationary price series?

| 1. Yes |
| 2. No |
| 3. Can't say |
| 4. None of these |

Mark only one oval.

○ Option 1
○ Option 2
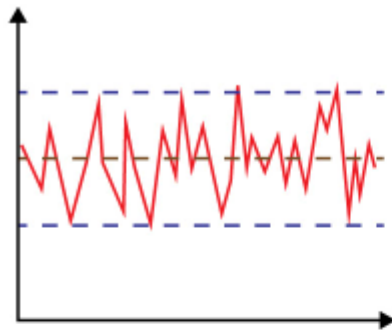○ Option 3
○ Option 4

50. Q17-6 *

What is stationarity?

| 1. A time series which has a constant mean and variance |
| 2. A time series which has a different mean and variance every year but it stays constant throughout the year. |
| 3. A time series whose mean is always 0 but variance is changing. |
| 4. A time series whose variance is constant but mean keeps changing |

Mark only one oval.
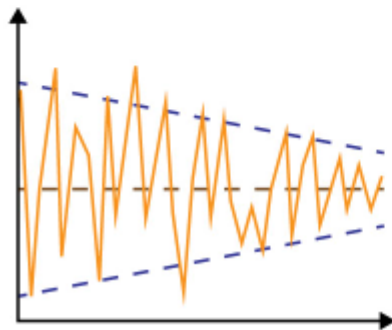
○ Option 1
○ Option 2
○ Option 3
○ Option 4

51. Q17-7 *

Which of the following time series are stationary?

A.
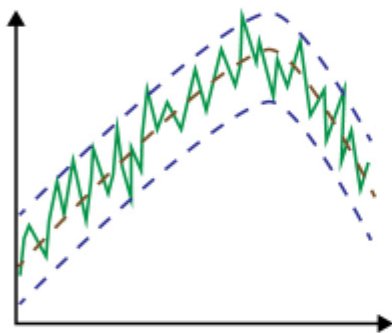
B.

C.

| 1. Only A |
| 2. Only A and C |
| 3. Only B and C |
| 4. A, B, and C |

Mark only one oval.

○ Option 1
○ Option 2
○ Option 3
○ Option 4

ARIMA

52. Q18-2 *

Why do we need an ARIMA model?

| 1. To convert non stationary time series to stationary |
| 2. To work with non stationary time series |
| 3. To find the order of AR and MA |
| 4. None of the above |

Mark only one oval.

- ◯ Option 1
- ◯ Option 2
- ◯ Option 3
- ◯ Option 4

53.   Q18-3 *

How will you find the order of I in ARIMA?

| 1. Using autocorrelation plot |
| 2. Using partial autocorrelation plot |
| 3. Number of differencing that makes time series stationary |
| 4. The order of integrated term is fixed |

Mark only one oval.

⭕ Option 1

⭕ Option 2

⭕ Option 3

⭕ Option 4