Applied Time Series and Forecasting (CIE 1)

Total points 7/10

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✓ Time series analysis usually is a distribution of two variables, the first being _____ and the second being ___. *1/1

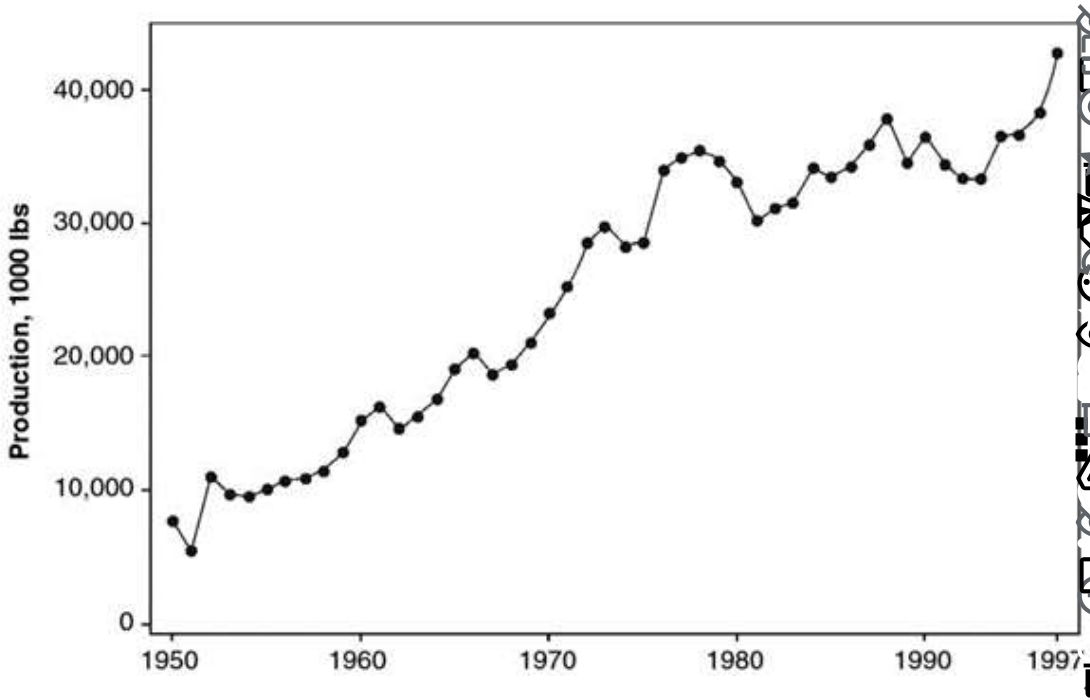
- ○ Time, time in years
- ○ Time, time in months
- ◉ Time, value of the variable ✓
- ○ Time in years, time

✓ Which of the following is not a component of time series? * 1/1

- ○ Trend Variations
- ○ Cyclic Variations
- ○ Seasonal Variations
- ◉ Time Variations ✓

✓ What property of time series is displayed in the following graph? *

1/1



- ○ Cyclicity
- ○ Seasonality
- ◉ Trend
- ○ Noise

✓ What is trend in a time series data? *

1/1

- ○ Overall consistent downward direction of data points
- ◉ Overall direction for data not regarding direction of data points.
- ○ Overall flat direction of data
- ○ Overall consistent upward direction of data points

✓ Assume that the sale of cricket merchandise increases yearly just before the start of the IPL season. If we were to plot the graph of 5 years of cricket merchandise sales(monthly) with the previous assumption, the resulting time series would show which of the following properties? 1/1

- ○ Noise
- ○ Trend
- ◉ Seasonality
- ○ Cyclicity

✓ What is data imputation? * 1/1

- ○ A good forecast of data.
- ○ Unavailable data
- ◉ An estimate of missing data
- ○ A bad forecast of data.

✗ Consider the following 6-month data points of the closing stock price of a certain stock on the last day of the month. In the series, a missing data point is denoted by X. Which of the following would be the most likely value to replace X if you were to impute the given data.

(10, 11, X, 15, 16, 18)

- ○ 14
- ◉ 13
- ○ 12
- ○ 15

Correct answer

- ◉ 14

0/1

✓ The occurrence of an uncontrolled circumstance which may cause the presence of outliers (natural disasters, adverse weather) leads to which of the following effects in representation of time series data?

- ○ Cyclicity Effects
- ◉ Irregular Effects
- ○ Trend Effects
- ○ Seasonality Effects

1/1

✗ Developing an understanding of how the forecasting will be used in the future is undertaken in which of the following steps of Forecasting analysis? 0/1

- ○ Problem Definition
- ◉ Model Validation
- ○ Data Analysis
- ○ Data Modeling

Correct answer

- ◉ Problem Definition

✗ Which of the following is not a characteristic of a Time Series Data representation 0/1

- ○ Chronological
- ○ Continuous
- ○ Discontinuous
- ◉ Plotting a single variable of interest

Correct answer

- ◉ Discontinuous

Applied Time Series and Forecasting : CIE 2

Total points 9/10

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✓ While evaluating time series, which method is used to create subsets of data for training and validation? *1/1

- Cross-Sectional Partitioning
- Temporal Partitioning ✓
- Evaluation Partitioning
- All of the above

✗ What function determines how the current values of the time series relate to its past values? *…/1

- (●) Autocorrelation Function ✗
- ( ) Evaluation Function
- ( ) Covariance Function
- ( ) Lag Function

No correct answers

✓ In Time series analysis, Autocorrelation is used to detect components of Time Series. Which of the following component of Time series exist when a strong correlation is present at lag greater than 1? *1/1

- ( ) Seasonality
- (●) Cyclicity ✓
- ( ) Noise
- ( ) Trend

✓ In Time series analysis, Autocorrelation is used to detect components of Time Series. Which of the following component of Time series exist when a strong correlation is present at regular intervals of lags? *1/1

- (●) Seasonality ✓
- ( ) Cyclicity
- ( ) Noise
- ( ) Trend

✓ Given a linear time series trend, Y' = 4 + 2t, what is the forecast for 2020 if the time series started in 2015? *1/1

- (●) 14 ✓
- ( ) 12
- ( ) 15
- ( ) 13

✓ Which of the following is not a characteristic of a White Noise Time series? *1/1

- Mean value is close to 0
- Autocorrelation is not significant
- Autocorrelation is significant ✓
- Standard Deviation is constant

✓ Which of the following commands is used to check if a data object in R is a time series object? *1/1

- None of the above
- ts(objectname)
- as.ts(objectname)
- is.ts(objectname) ✓

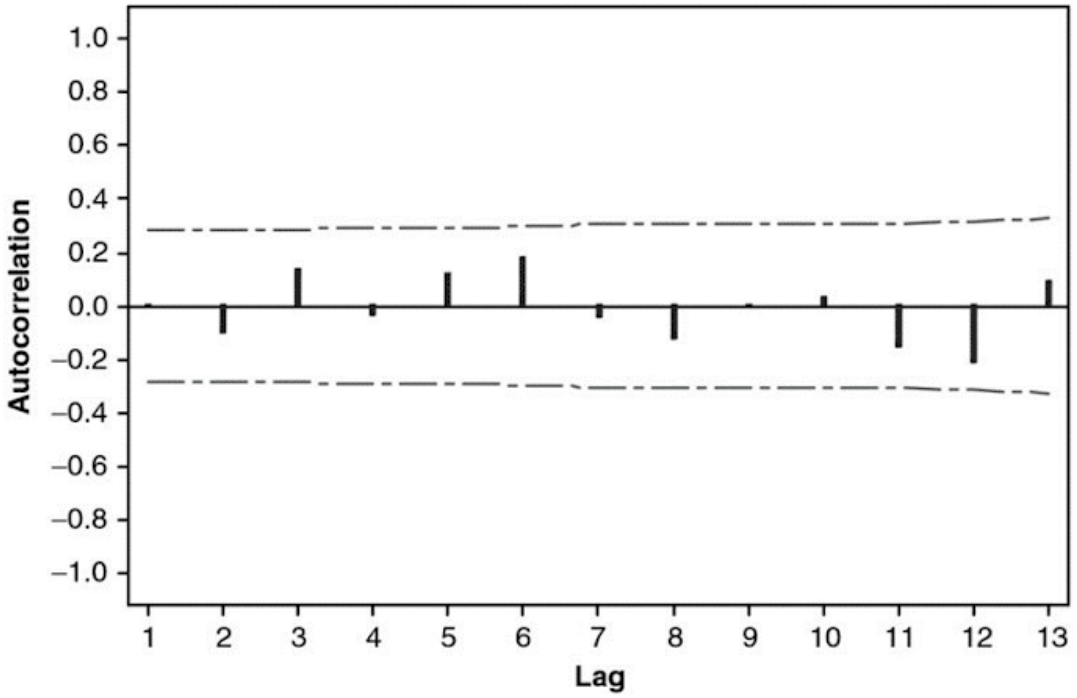
✓ A time series model where the current observation is based on the previous observation with a step up and step down is known as what model? *1/1

- ○ Stochastic Model
- ◉ Random Walk ✓
- ○ Linear Drift
- ○ White Noise

✓ A time series model that uses previous observations to forecast future observations is known as what model? *1/1

- ○ Partial Autocorrelation Function
- ○ Autocorrelation Function
- ◉ Autoregressive Model ✓
- ○ Autocovariace Model

✓ The following time series representation is an example of which of the following characteristics? *1/1



- ○ Random Walk
- ○ High Autocorrelation
- ○ Linear Drift
- ◉ White Noise ✓

Applied Time Series and Forecasting : CIE 3

Total points 10/10

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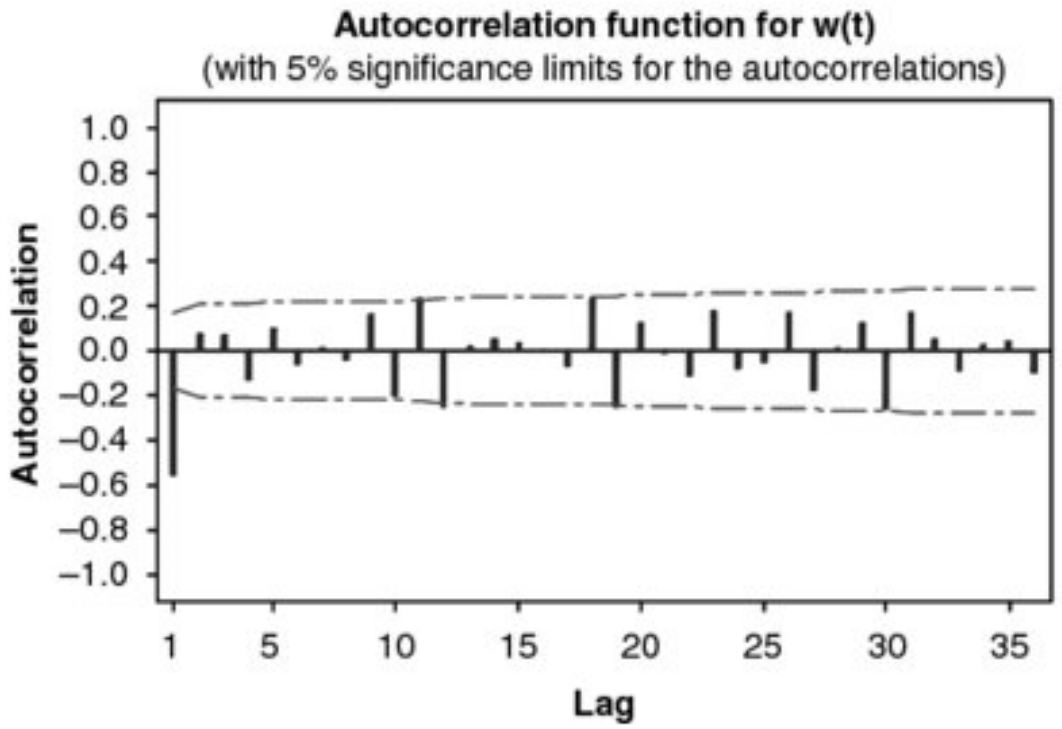
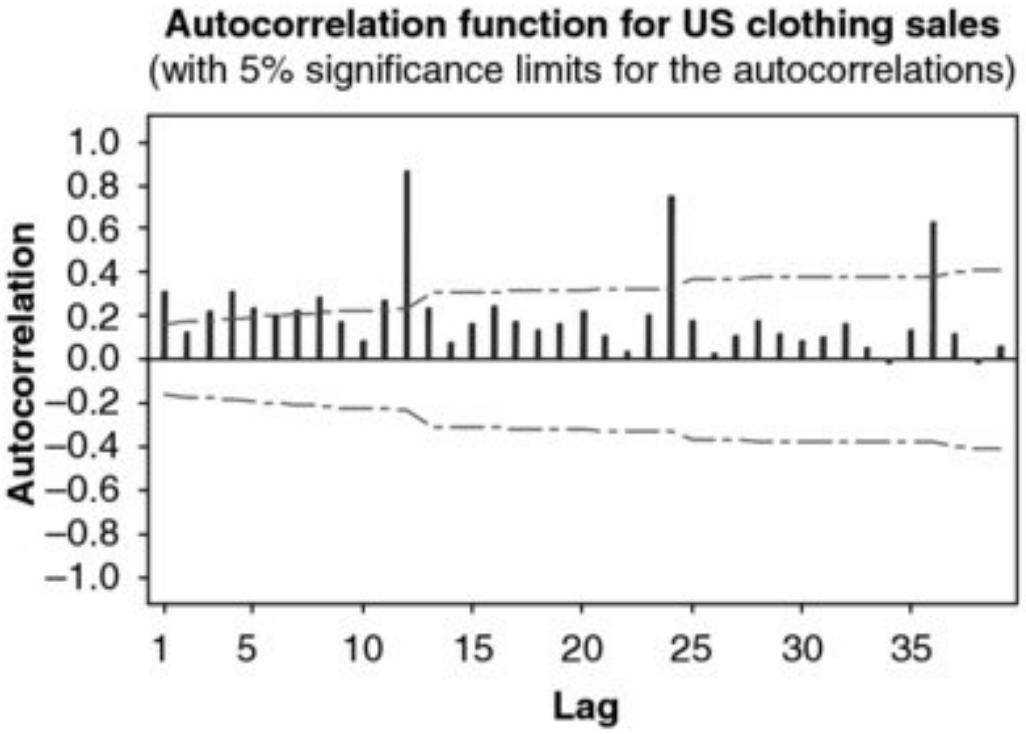
✓ The following image shows and ACF plot for monthly sales of clothing in the United States from Jan 1992 to March 2003 .At what lag does the strongest correlation exists and what type of correlation is it? *1/1



- ○ 1, Positive
- ○ 20, Negative
- ○ 30, Negative
- ◉ 1, Negative ✓

✓ The following image shows and ACF plot for monthly sales of clothing in the United States from Jan 1992 to March 2003 . Does this ACF show evidence of seasonality? *1/1

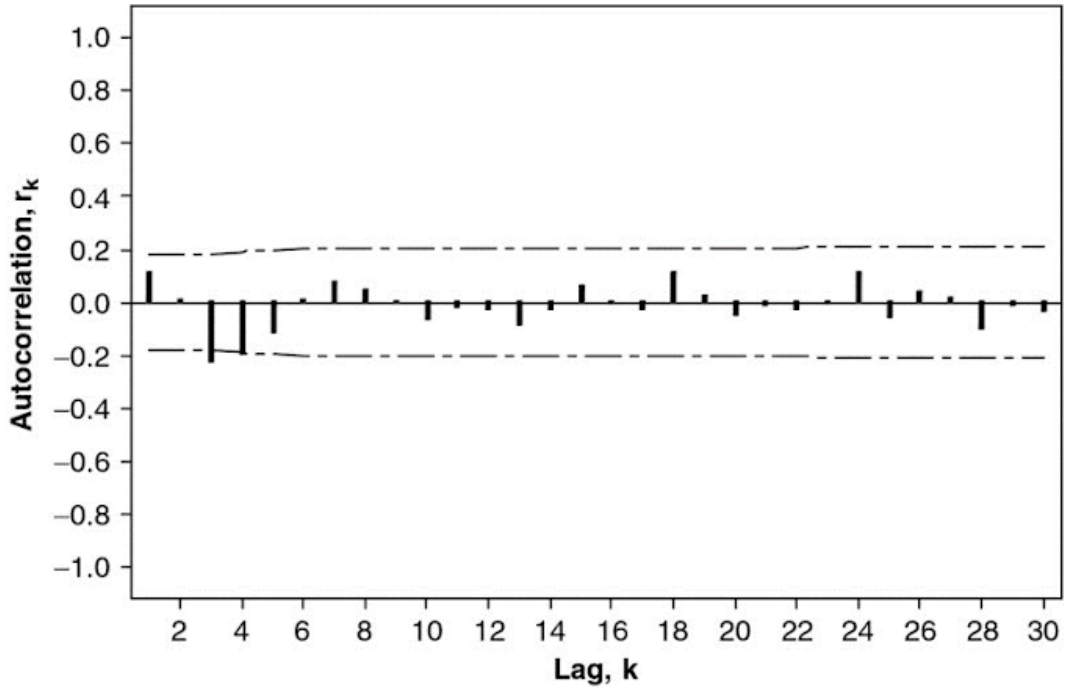


- (●) True ✓
- ( ) False

✓ If in a time series representation, mean, variance and autocorrelation are consistent over subsets of time, then the time series is known as _____? *1/1

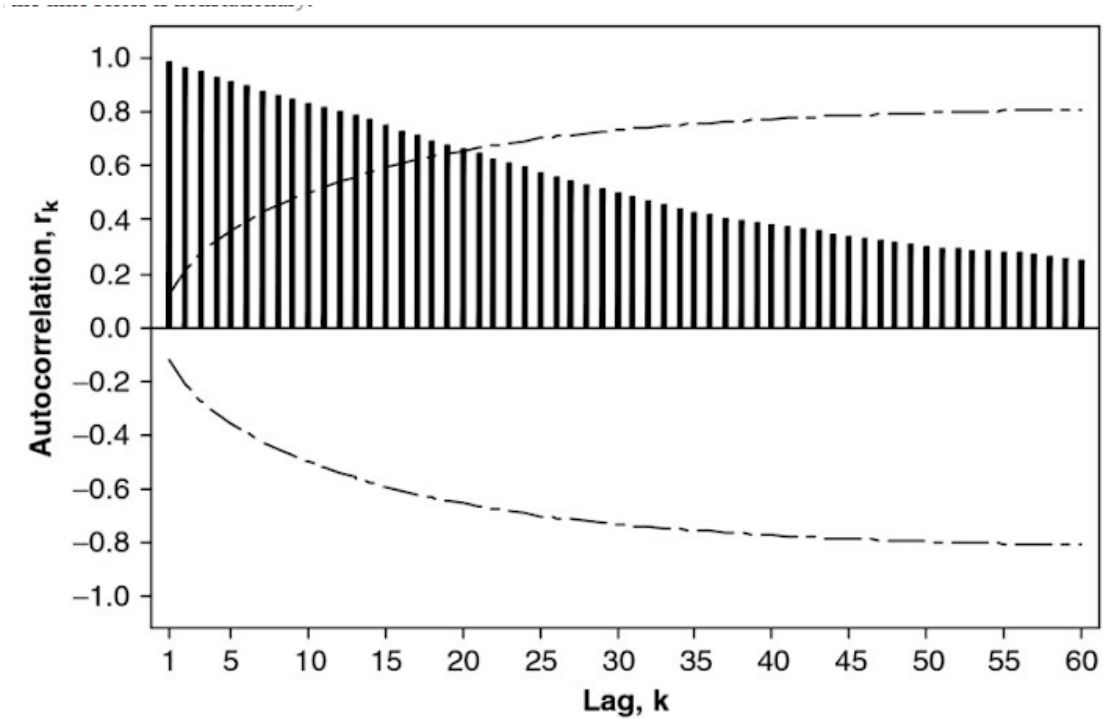
- ○ Random Walk
- ○ Stationary Time Series
- ◉ Non Stationary Time Series ✓
- ○ White Noise

✓ Based on the ACF Plot provided below, identify if the time series is Stationary or Non stationary. *1/1



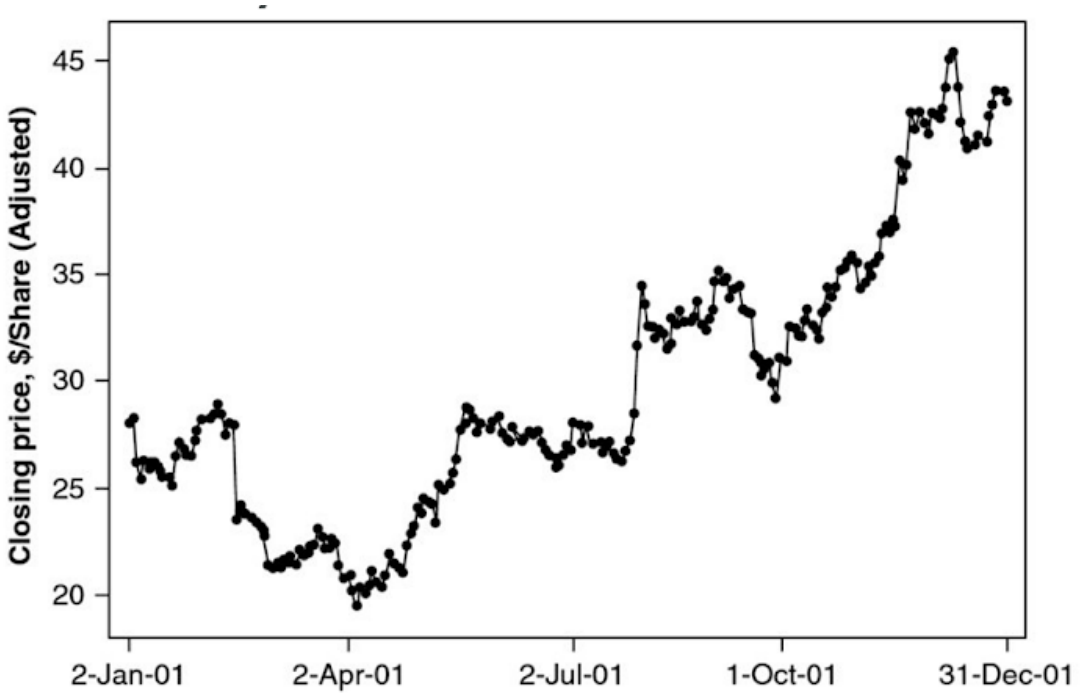
- (●) Stationary Time Series ✓
- ( ) Non Stationary Time Series

✓ Based on the ACF plot provided below, identify if the time series is Stationary or Non Stationary. *1/1



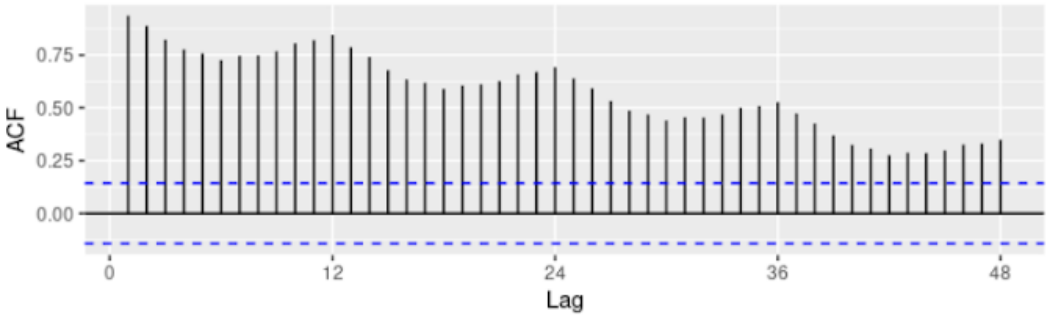
- ○ Stationary Time Series
- ◉ Non Stationary Time Series ✓

✓ Consider the following Time series of a stock price. Select the appropriate option which describes the properties of this time series. *1/1



- ○ Stationary Time Series with Seasonality
- ○ Non Stationary Time Series with Seasonality
- ○ Stationary Time Series with Trend
- ◉ Non Stationary Time Series with Trend ✓

✓ Based on the ACF plot provided below, what component of time series can be certainly predicted to exist in the time series? *1/1



- (●) Trend ✓
- ( ) Seasonality
- ( ) Cyclicity
- ( ) Noise

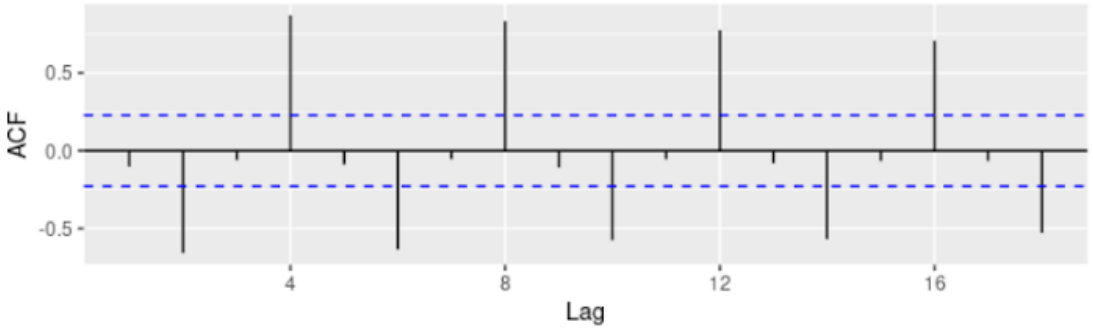
✓ Complete the following statement. The statistical relationship in which change in one variable affects the change in the second variable is called _____ while the degree to which the first variable and second variable move with respect to each other is called _____. *1/1

- ○ Correlation, Variance
- ○ Variance , Correlation
- ◉ Covariance, Correlation ✓
- ○ Correlation, Covariance

✓ Which of the following is a required characteristic for a time series to be classified as STRONG stationary time series? *1/1

- ○ Constant Variance
- ◉ Constant Probability Distribution ✓
- ○ Constant Mean
- ○ Constant Autocorrelation

✓ Consider the following ACF Plot demonstrating seasonality. If the lags displayed are for monthly data, what is the duration of the seasonality of the data in months? *1/1



- 8
- 2
- 4 ✓
- 6

CIE 4 : Applied Time Series and Forecasting

Total points 10/10

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✓ Which of the following is NOT a characteristic of an MA model? * 1/1

- ○ It models the mean of the time series
- ○ It models the variance of the time series
- ◉ It models the relationship between the current value of the time series and its past values ✓
- ○ It models the distribution of the time series

✓ What does the term "q" represent in an MA(q) model? * 1/1

- ◉ The number of lagged errors included in the model ✓
- ○ The order of the differencing used in the model
- ○ The number of seasonal terms included in the model
- ○ The number of lagged values included in the model

✓ What does the "d" in the notation ARIMA(p, d, q) represent? * 1/1

- ( ) The number of autoregressive terms in the model
- ( ) The number of moving average terms in the model
- (•) The number of differences required to make the time series stationary
- ( ) The number of lagged predictor variables in the model

✓ What does the term "p" represent in an AR(p) model? * 1/1

- ( ) The order of the differencing used in the model
- (•) The number of lagged values included in the model
- ( ) The number of lagged errors included in the model
- ( ) The number of seasonal terms included in the model

✓ What is an autoregressive (AR) model? * 1/1

- ( ) A model that predicts the value of a time series based on the values of other time series
- (•) A model that predicts the value of a time series based on its past values
- ( ) A model that predicts the value of a time series based on a combination of its past values and the values of other time series
- ( ) A model that predicts the value of a time series based on the trend and seasonal patterns in the data

✓ How do you determine the order of an AR model? * 1/1

- (●) By examining the PACF of the time series and identifying the number of significant lags
- ( ) By examining the ACF of the time series and identifying the number of significant lags
- ( ) By fitting a model with a large order and then simplifying it by removing insignificant terms
- ( ) By fitting multiple models with different orders and selecting the one with the lowest mean squared error

✓ What is the purpose of taking the first difference of a time series as we observed in the demonstration for the ARIMA model? * 1/1

- ( ) To remove the trend from the time series
- ( ) To remove the seasonal component from the time series
- ( ) To stabilize the variance of the time series
- (●) To make the time series stationary

✓ What does an MA model assume about the relationship between the current value of the time series and its past values? * 1/1

- ( ) It assumes a nonlinear relationship
- ( ) It assumes a linear relationship
- ( ) It assumes a random relationship
- (●) It assumes no relationship

✓ What does an AR model assume about the relationship between the current value of the time series and its past values? 1

- ○ It assumes a nonlinear relationship
- ◉ It assumes a linear relationship
- ○ It assumes a random relationship
- ○ It assumes no relationship

✓ In an ARIMA model, the "p" parameter refers to the order of the _____ model. 1

- ○ MA
- ◉ AR
- ○ both AR and MA
- ○ none of the above

CIE 5: Applied Time Series and Forecasting

Total points 10/10

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✓ For an ML model on predictive maintenance to work effectively, it should contain data both on normal operational history and _____ ? *1/1

- (●) Failure Patterns ✓
- ( ) Usage Data
- ( ) Sensor Data
- ( ) Environmental Data

✓ Which of the following is NOT a benefit of predictive maintenance? * 1/1

- ( ) Enhanced safety for maintenance personnel
- ( ) Reduced equipment downtime
- (●) Increased maintenance costs ✓
- ( ) Improved equipment reliability

✓ When maintenance activities are performed by scheduling timely maintenance, the strategy of maintenance is called? 1/1

- Predictive Maintenance
- ◉ Planned Maintenance
- Reactive Maintenance
- Proactive Maintenance

✓ In the given ARIMA equation, the term represented by Theta 1 is what component of the ARIMA model? * 1/1

$$z_t = \phi_1 z_{t-1} + \theta_1 \epsilon_{t-1} + \epsilon_t$$

- Integrated term
- ◉ Moving average term
- Autoregressive term
- Random Noise

✓ Which of the following is NOT an example of Predictive Maintenance? * 1/1

- ◉ Social Media Analysis
- Oil Analysis
- Accoustic Analysis
- Vibration Analysis

✓ What type of data is typically used in predictive maintenance? * 1/1

- ○ Only historical data about equipment failures
- ◉ Both historical and real-time data about equipment performance
- ○ Only real-time data about equipment performance
- ○ Only data about the maintenance history of the equipment

✓ Which of the following is NOT a component of an ARIMA model? * 1/1

- ○ Autoregressive term
- ○ Moving Average Term
- ◉ Random noise term
- ○ Integrated term

✓ How does predictive maintenance differ from preventive maintenance? * 1/1

- ○ Predictive maintenance is based on time and preventive maintenance is based on data
- ◉ Predictive maintenance is based on data and preventive maintenance is based on time
- ○ Predictive maintenance is less disruptive to equipment operation than preventive maintenance
- ○ Predictive maintenance is more expensive than preventive maintenance

✓ The technical information gathered on a machine such as the date of creation, the system's location is called? *1/1

- Machine Operation Conditions
- Maintenance History
- Error History
- (●) Equipment Metadata

✓ In the given ARIMA equation, the term represented by Phi 1 is what component of the ARIMA model *1/1

$$z_t = \phi_1 z_{t-1} + \theta_1 \epsilon_{t-1} + \epsilon_t$$

- Moving average term
- (●) Autoregressive term
- Integrated term
- Random Noise

CIE 6 : Applied Time Series and Forecasting

Total points 9/10

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✓ What is Amazon Monitron? * 1/1

- (●) A physical device for collecting data from industrial equipment ✓
- ( ) A software tool for analyzing and visualizing data from industrial equipment
- ( ) A cloud-based platform for managing and monitoring industrial equipment
- ( ) A machine learning algorithm for predicting equipment failures

✓ What is the primary goal of predictive maintenance? * 1/1

- ( ) To schedule maintenance at regular intervals
- ( ) To improve the efficiency of maintenance tasks
- (●) To identify and fix problems before they occur ✓
- ( ) To reduce the number of breakdowns

✗ What command is used to extract the time series components (trend, seasonal, and remainder) in R? * 0/1

- (●) decompose()
- ( ) trendseasonalremainder()
- ( ) tscomponents()
- ( ) tsdecompose()

No correct answers

✓ What is the primary benefit of predictive maintenance? * 1/1

- (●) Uptime Improvement
- ( ) Energy Savings
- ( ) Risk Reduction
- ( ) New Revenue Streams

✓ Which of the following is a good target variable to predict from a predictive maintenance algorithm? 1/1

- (●) Likelihood of failure
- ( ) Temperature Data
- ( ) Pressure Data
- ( ) Vibration Readings

✓ model <- arima(x, order = c(1,0,0)) * 1/1

The above R code will create which of the following first order models?

- (●) Autoregressive Model
- ( ) Integrated Model
- ( ) ARIMA model
- ( ) Moving Average Model

✓ Why do ARIMA models require stationary data? * 1/1

- (●) Because stationary data has no trend or seasonality, which are important assumptions in ARIMA models
- ( ) Because stationary data has a constant mean but not necessarily a constant variance
- ( ) Because stationary data has a constant mean and variance, which makes it easier to model
- ( ) Because stationary data has a constant variance but not necessarily a constant mean

✓ How can companies create new revenue streams with predictive maintenance? *1/1

- By selling the data collected from their equipment to third parties
- By offering predictive maintenance services to other companies
- By using the data collected from their equipment to improve their own operations and reduce costs
- (●) All of the above

✓ Which of the following is NOT a potential drawback of predictive maintenance? *1/1

- It can lead to over-maintenance and unnecessary repairs
- It can be costly to implement and maintain
- (●) It reduces the need for maintenance staff
- It requires specialized training for personnel

✓ How do ARIMA models account for trends in a time series? * 1/1

- By using the "MA" term, which is a linear combination of past errors in the time series
- By using polynomial regression
- By using the "AR" term, which is a linear combination of past values in the time series
- (●) By using the "I" term, which is the difference between the current and previous values in the time series

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