

# Time Series

## Interview Questions

(Practice Project)



## Easy

### 1.What is a time series?

**Ans:** A times series is a dataset that might comprise the successive observations listed in order of time of occurrence. It depicts any change of a variable against time and is generally used to inspect trends, pattern, and seasonality.

### 2.What are the major components of a time series?

**Answer:** The main components of a time series are:

**Trend:** A very long-term rise or fall in the data.

**Seasonality:** Regular variation that recurs within known fixed periods.

**Cyclic patterns:** Changes that recur at irregular intervals.

**Noise:** Random variations in data.

### 3.What is the difference between a trend and seasonality of a timeseries?

**Answer:** A trend is a broad upward or downward movement in the data; seasonality, on the other hand, describes regular patterns or cycles that recur at fixed periods (e.g., monthly, yearly).

### 4.What is stationarity in time series?

**Answer:** A time series is said to be stationary if its statistical properties such as mean, variance, and autocorrelation are time-invariant.

### 5.What is differencing in time series analysis?

**Answer:** Differencing is a technique used to make a time series stationary by simply subtracting the previous observation from the current observation.

### 6.What is a lag in time series?

**Answer:** A lag refers to the shifting of a time series by one or more time periods. It is used to compare current values with past values.

### 7.What is the difference between a time series and cross-sectional data?

**Answer:** A time series consists of observations over time, whereas cross-sectional data consists of observations at a single point in time.

## Medium Level

### 1. Describe the ARIMA model.

**Ans:** ARIMA stands for AutoRegressive Integrated Moving Average. It is also a class of models to explain a time series based on its own past values, differencing to make it stationary, and lagged forecast errors. The model is denoted as  $ARIMA(p, d, q)$ , where

**p:** Number of lagged observations.

**d:** Degree of differencing.

**q:** Order of moving average.

### 2. What is the difference between ACF and PACF?

**Ans:** The ACF–Autocorrelation Function measures the correlation between a time series and its lagged values over variable time intervals. PACF–Partial Autocorrelation Function calculates the correlation between a time series and its past values while eliminating the effect of the intervening observations.

### 3. How can we check for stationarity in a time series?

**Ans:** The following can be used to check for stationarity:

**Visual inspection:** The plotting of time series and the check for constant mean and variance.

**Statistical tests:** Augmented Dickey–Fuller test or KPSS test.

**Autocorrelation plots:** Stationarity in a series will be indicated by rapidly declining autocorrelations.  $p$ ,  $d$ , and  $q$  are the parameters of an ARIMA model.

### 4. What is the role of the $p$ , $d$ , and $q$ parameters in an ARIMA model?

**Answer:**

**p:** Number of lagged observations in the model – AutoRegressive part.

**d:** Specifies the number of times the data needs to be differenced to achieve stationarity.

**q:** Number of lagged forecast errors in model (Moving Average part).

### 5. What is the basic difference between an AR model and an MA model?

**Answer:** The AR–AutoRegressive model provides the forecast of a series based on its past values. The MA, or Moving Average, model is one that generates predictions of the next value as a weighted average of past errors in forecasting.

### 6. Describe the operation of exponential smoothing in forecasting time series.

**Answer:** The forecasting method known as exponential smoothing gives more weight to recent observations while decreasing the weights assigned to earlier ones. To create short-term forecasts, it smoothes the time series data.

## 7. What distinguishes Random Walk from White Noise?

**Answer:** A time series with a constant mean, variance, and lack of autocorrelation is referred to as white noise. A random walk is a type of time series that frequently produces non-stationary data, with the current value equal to the previous value plus a random step.

## Hard

### 1. In what way would you manage a seasonal non-stationary time series?

**Ans:** The following is how to deal with a seasonal non-stationary time series: Applying differencing will help you get rid of the trend.

**Seasonal Differencing:** Deduct the observation from the preceding cycle's corresponding time period. Break down the series into its trend, seasonality, and residuals. Then, model each component independently.

**Applying SARIMA:** Using Seasonal ARIMA (SARIMA), a version of the ARIMA model that incorporates seasonal elements.

### 2. Explain the difference between additive and multiplicative decomposition in time series analysis.

**Answer:** In additive decomposition, the time series is assumed to be a sum of its components:  $Y(t) = T(t) + S(t) + R(t)$  where  $T$  is trend,  $S$  is seasonality, and  $R$  is residuals. In multiplicative decomposition, the time series is assumed to be the product of its components:  $Y(t) = T(t) \times S(t) \times R(t)$ . Additive is used when the seasonal variations are constant, and multiplicative is used when the seasonal variations increase with the level of the time series.

### 3. For model identification, how should ACF and PACF charts be interpreted?

**Ans:** The ACF plot for an  $MA(q)$  model will exhibit notable spikes up to lag  $q$  before stopping. The ACF for an  $AR(p)$  model will progressively deteriorate.

**PACF Plot:** The PACF for an  $AR(p)$  model will exhibit notable spikes up until lag  $p$ , at which point it will stop. The PACF for an  $MA(q)$  model will progressively deteriorate.

### 4. Give an example of the model diagnostics you would carry out following the fitting of an ARIMA.

**Residual Analysis:** Analyze the residuals to see if they are white noise, meaning that they should have zero mean, constant variance, and no autocorrelation.

**Residuals' ACF and PACF:** Plot the residuals' ACF and PACF to make sure there isn't any discernible autocorrelation.

**Ljung-Box Test:** To look for autocorrelation in residuals, do the Ljung-Box test.

**Prediction Accuracy:** Use measures such as Mean Absolute Error (MAE), Root Mean Squared Error (RMSE), or AIC/BIC for model comparison when evaluating the model.

**5. How are missing values in time series data handled?**

**Ans:** In time series, methods for handling missing values include forward filling, backward filling, interpolation, and more complex time series-specific imputation algorithms.

**6. What function does the Dickey-Fuller test serve in the analysis of time series?**

In order to determine whether a time series is stationary, one might apply the Dickey-Fuller test. It specifically tests the null hypothesis that the series is non-stationarity due to the presence of a unit root.

