1)What is a time series, and what are some common applications of time series analysis?

Ans- Time series analysis is used for non-stationary data—things that are constantly fluctuating over time or are affected by time. Industries like finance, retail, and economics frequently use time series analysis because currency and sales are always changing.

Time series are used in statistics, signal processing, pattern recognition, econometrics, mathematical finance, weather forecasting, earthquake prediction, electroencephalography, control engineering, astronomy, communications engineering, and largely in any domain of applied science

2) What are some common time series patterns, and how can they be identified and interpreted?

Ans- There are three types of time series patterns: trend, seasonal, and cyclic.

Trend(T)- reflects the long-term progression of the series. ...

Cyclic ( C)— reflects repeated but non-periodic fluctuations. ...

Seasonal(S)-reflects seasonality present in the Time Series data, like demand for flip flops, will be highest during the summer season.

3) How can time series data be preprocessed before applying analysis techniques?

Ans- Fourier Transform can help remove the noise by converting the time series data into the frequency domain, and from there, we can filter out the noisy frequencies. Then, we can apply the inverse Fourier transform to obtain the filtered time series.

Data Cleaning.

Dimensionality Reduction.

Feature Engineering.

Sampling Data.

Data Transformation.

Imbalanced Data.

4) How can time series forecasting be used in business decision-making, and what are some common challenges and limitations?

Ans- Time series forecasting makes predictions for future data and outcomes based on time-stamped past data collected over specified intervals of time. Unlike other data, time series data can show clear changes over time with an extensive data set.

Time series has the below-mentioned limitations; we have to take care of those during our data analysis. The data points must be linear in their relationship. Data transformations are mandatory, so they are a little expensive. Models mostly work on Uni-variate data.

Challenges

Researching for your forecast.

Finding the right methods and tools.

Using tools to simplify the process.

Measuring and analysing the data.

Updating your business forecast and planning for the unexpected.

Track your business finances with Countingup.

5) What is ARIMA modelling, and how can it be used to forecast time series data?

Ans- An autoregressive integrated moving average, or ARIMA, is a statistical analysis model that uses time series data to either better understand the data set or to predict future trends. A statistical model is autoregressive if it predicts future values based on past values.

ARIMA models use differencing to convert a non-stationary time series into a stationary one, and then predict future values from historical data. These models use “auto” correlations and moving averages over residual errors in the data to forecast future values.

6) How do Autocorrelation Function (ACF) and Partial Autocorrelation Function (PACF) plots help in identifying the order of ARIMA models?

Ans- These plots are called “lollipop plots”. Both the ACF and PACF start with a lag of 0, which is the correlation of the time series with itself and therefore results in a correlation of 1. The difference between ACF and PACF is the inclusion or exclusion of indirect correlations in the calculation.

7) What are the assumptions of ARIMA models, and how can they be tested for in practice?

Ans- The autoregressive-moving average (ARMA) class of models relies on the assumption that the underlying process is weakly stationary, which restricts the mean and variance to be constant and requires the autocovariances to depend only on the time lag.

8)Suppose you have monthly sales data for a retail store for the past three years. Which type of time series model would you recommend for forecasting future sales, and why?

Ans- The formula is: sales forecast = estimated amount of customers x average value of customer purchases. New business approach: This method is for new businesses and small startups that don't have any historical data. It uses sales forecasts of a similar business that sells similar products.

Sales forecasting is the use of current and previous sales data to predict your team's sales activity during an upcoming monthly, quarterly, semiannual or annual period. You can use sales forecasts to identify internal or external sales issues and resolve them with enough time remaining to reach sales goals.

9) What are some of the limitations of time series analysis? Provide an example of a scenario where the limitations of time series analysis may be particularly relevant.

Ans- It can suffer from generalization from a single study where more data points and models were warranted. Human error could misidentify the correct data model, which can have a snowballing effect on the output. It could also be difficult to obtain the appropriate data points.

Examples of time series analysis in action include: Weather data. Rainfall measurements. Temperature readings.

10) Explain the difference between a stationary and non-stationary time series. How does the stationarity of a time series affect the choice of forecasting model?

Ans- A stationary time series has a constant variance and it always returns to the long-run mean. A time series whose statistical properties change over time is called a non-stationary time series. Thus a time series with a trend or seasonality is non-stationary in nature.

Stationarity is an important concept in the field of time series analysis with tremendous influence on how the data is perceived and predicted. When forecasting or predicting the future, most time series models assume that each point is independent of one another.