**Time Series Analysis and Forecasting – Assignment 4**

**Resampling and Interpolation**

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**Q1. How is resampling used in time series data?**

Resampling in time series data refers to the process of changing the frequency of the time series data. There are two types of it – downsampling and upsampling.

Downsampling reduces the frequency of observations in the dataset, whereas upsampling increases the frequency of observations in the dataset. In downsampling common aggregation methods such as mean, sum, median, etc. are used whereas in upsampling interpolation techniques are used.

* Reduces noise by aggregating to higher level
* Helps in matching the frequency of different time series datasets for some combined analysis
* Reduces the size of the data while retaining the key trends

**Q2. How the resampling in time series data differs from other cross-sectional, paneled or numerical data?**

In time series data, the resampling technique is about changing the frequency of the observations either increasing or decreasing the frequency. In cross-sectional data, resampling refers to increasing or decreasing the number of observations using techniques like bootstrapping for example. In paneled data, resampling refers to sampling data by either the cross-sectional entities, time period (temporal dependency) or both.

**Q3. How sampling helps in descriptive statistics to provide aggregate representation of data?**

Sampling helps in bringing out statistical values for a population with a smaller sample. Bootstrapping method can be used to resample in such a way that the smaller portion of the data and its statistical measure aggregate to the statistical measure of the bigger population. Sampling helps in reducing the data complexity by systematically choosing the sample to represent the entire population. It further helps in a cost-effective and efficient way of determining the descriptive statistics of the entire population.

**Q4. What are the different ways of interpolation applied on a time series data?**

1. Linear interpolation
2. Polynomial interpolation
3. Spline interpolation
4. Nearest-neighbor interpolation

**Q5. How are extrapolation and time series forecasting related?**

Extrapolation and forecasting essentially tries to predict what the future (or the next timestamp) value holds. But they are very different with the way they process things. Extrapolation tries to extend the same trends and relationships for the future values. But forecasting uses various factors such as trends, seasonality and cyclic values.