11. TIME SERIES ANALYSIS [IT2110]

By Department of Mathematics and Statistics
Faculty of Humanities and Sciences, SLIIT

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INTRODUCTION

- A time series is a collection of observations made sequentially in time.

- Examples,
    - Monthly inflation rates
    - Daily temperature
    - Annual sales of breads
    - Annual birth rates

Discrete & Continuous Time Series

- A time series is said to be discrete when observations are taken only at specific time points. (Eg: Daily Temperature)

- A time series is said to be continuous when observations are made continuously in time. (Heart beat of a patient in every second)

- In both cases, the measured variable can be either discrete or continuous.

Objectives of T.S. Analysis

- Description
  - Simple descriptive measures of time series. Eg: trend, seasonality
- Explanation
  - Use variation in one time series to explain another
- Forecasting (Most important)
- Control
  - Applicable in quality control

COMPONENTS OF TIME SERIES

- A time series is made up of one or more components mentioned below.
  - Trend
    - Measures the average change in the variable per unit time
  - Seasonality
    - Periodic variations that recur with some degree of regulatory within a year of shorter
  - Cyclical variations
    - Recurring up and down movements which are extended over long period (Usually 2 yrs or more).
  - Irregular variations
    - Random fluctuations

Time Series Analysis

- There are two main classical methods of analyzing time series data.
  - ***Additive Model***
  - ***Multiplicative Model***

- Other classical Methods :
  - ***Curve Fitting***
    - ✓Polynomial Models
    - ✓Exponential Models

Model Selection

- ***Additive Model*** : Magnitude of the seasonal component is constant over the time

- ***Multiplicative Model*** : Magnitude of the seasonal component is increasing / deceasing with time

- If the model can not be clearly identify, fit the both models and use forecasts to choose the better model.

Fitting an Additive Model

- ***Additive Model :***

$$Y_t = T + S + C + I$$

- Can be fitted only when magnitude of the seasonal component is constant over the time

Fitting a Multiplicative Model

- ***Multiplicative Model :***

$$Y_t = T \times S \times C \times I$$

- Can be fitted only when magnitude of the seasonal component is increasing / deceasing with time

THANK YOU!

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Good Luck for the Exam!