

Sri Lanka Institute of Information Technology

Faculty of Computing

IT2120 - Probability and Statistics

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Lecture 13

TIME SERIES ANALYSIS

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- Introduction
- Components of Time Series
- Time Series Analysis
 - Additive Model
 - Multiplicative Model

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 regularity within a year or 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 / decreasing 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 / decreasing with time

THANK YOU!

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Good Luck for the Exam!

