MIS771 Descriptive Analytics and Visualisation

Topic 6 Tutorial – Time Series Analysis and Forecasting

Introduction

In this tutorial you will cover time series analysis and forecasting.

Specifically, the aims of this tutorial are to:

- To calculate moving averages.
- To understand exponential smoothing and forecasting.
- To calculate forecasting accuracy.
- To understand regression modelling based forecasting with seasonality.

Scenario

We are using **BLITZ sales data** in this tutorial.

Currently, BLITZ generate reports to analyse historical sales quantities and sales values. However, management have difficulties in stock management and budgeting as they do not have a proper way to forecast what would happen in the future. Therefore, BLITZ management is very interested in forecasting quarterly sales and quantities sold in advance and they believe there is a time based pattern in their sales values.

Some of their historical sales values and quantities sold are given in ***BLITZ_Tutorial07.xls***.

Open the data file

a) Download the file ***BLITZ_Tutorial07.xls*** from
"Content → Learning Resources → Topic 5 Folder" in Cloud Deakin. **Save it** to your hard drive.
b) Open the file in Excel.

Q1. '***Quantity_Sold-KIDS***' worksheet contains number of kids items sold in Melbourne store over the last 24 months.

a) Calculate **3-month** moving average, **5-month** moving average and **4-month centred** moving average for the quantities of kids items sold.
b) Plot the smoothed moving average series together with the actual sold quantities.
c) Comment on the smoothed data series.
d) Use exponential smoothing with ***α = 0.2***, ***α = 0.3*** and ***α = 0.9***.
e) Plot the exponentially smoothed series with the original data series. Comment on the observations.
f) Calculate **MAPE** for the 3 exponentially smoothed series.
g) Which α seems to perform better?

Q2. Regression – Linear Model

BLITZ total sales values from 20011 to 2016 are given in ***BLITZ_Quarterly_Sales*** worksheet. BLITZ would like to forecast their sales for the **next 4 quarters**.

a) Generate a scatter plot diagram for the BLITZ sales data and calculate the regression equation.
b) Generate the sales forecasts based on the linear trend model.
c) If the sales values for the next 4 quarters are **73.20, 76.83, 81.56** and **83.68** ($ millions) in order, calculate the **MAPE** of the forecast.

Q3. Multiplicative Model – Seasonal forecast

a) Smooth the sales data using **MA**. What moving average is better for this scenario?
b) Calculate **normalised seasonal indices** for all 4 quarters.
c) Generate **deseasonalised** sales data.
d) **Plot** the deseasonalised sales data and **draw the best-fitted line**.
e) Generate the deseasonalised forecast for the **next 4 quarters**.
f) Generate the seasonalised forecast using the **seasonal indices**.
g) **Plot** the original sales data together with the forecasted sales data.
h) Calculate **MAPE** of the forecast. (Sales values for the next 4 quarters are **73.20, 76.83, 81.56** and **83.68** ($ millions))
i) Comment on the forecasted values from the linear model and multiplicative seasonal model.