BUSI4496 Supply Chain Planning and Management

Forecasting Problems

Problem 1:
The sales data of the first 6 months for a shop is given in 100 dollars as following:

January	February	March	April	May	June
180	220	290	310	370	380

1.a) Using a three-months simple moving average, estimate the sales for April, May, and June.

1.b) Considering the forecast of April calculated in question 1.a as F_{April}, using exponential smoothing method, forecast the sales for May, June and July using $\alpha_1 = 0.1$ and $\alpha_2 = 0.8$.

1.c) Assuming that the slope and the intercept of the regression of the given data is 42 and 145 respectively, estimate the sales in May, June and July by regression method.

1.d) Given the information that the income in July in 100 dollars is 376. Using MAD through May, June and July, determine whether regression gave you a better forecast or the exponential smoothing using $\alpha_2 = 0.8$. (only over these 3 months)

Problem 2:
Product XYZ was introduced at the beginning of 2019. The sales data for this product is given until October as in the following table.

Month	Sale amount
January	138
February	231
March	351
April	421
May	601
June	625
July	711
August	856
September	975
October	1014

2.a) Considering that the slope and intercept for this data set is equal to 100 and 42 respectively, calculate the estimated sales for the next 2 months: November and December of 2019.

2.b) Now assume that the actual demand for November and December of 2019 is 1140 and 1230 respectively. Assuming that $S_{sept} = 900$ and $G_{sept} = 100$, using a one step ahead double exponential smoothing (Holt's method), with $\alpha = 0.2$ and $\beta = 0.1$ estimate the sales of November and December.

2.c) Using the Slope and Intercept that you found in part 2.b for December, using a two step ahead double exponential smoothing, forecast the sales of February 2020. ($\alpha = 0.2, \beta = 0.1$)

2.d) Given the real sales for November and December in part 2.b compare the estimations of the regression (part 2.a) and double exponential smoothing (part 2.b) using MAD, MSE methods.

Problem 3:
Assume that the demand of a product has the following data:

Year	Season	Demand
1	1	15
	2	24
	3	36
	4	30
2	1	21
	2	27
	3	51
	4	36

3.a) Assuming that the data is seasonal but stationary, calculate the seasonal factors for each period of the season.

3.b) With the same assumptions from part 3.a, find the corresponding deseasonalized series of the given data.

3.c) Assuming that the data has both seasonality and trends, Calculate the Adjusted Regression forecast for the first 3 years. (Assume Slope ≅ 3 and Intercept ≅ 17)