قسم الاحصاء وبحوث العمليات

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# Tutorial set #1

## Question 1:

1- Define a time series? mention some examples of time series data.
2- Mention four goals of time series analysis.
3- Explain briefly the components of a time series.
4- Explain the difference between time series models and causal models.
5- When measuring forecast accuracy (or error size), explain why don't we use the sum of errors.
6- Is the best forecasting technique always the most accurate one? explain.
7- Give two examples from the real life of a time series that have:
   a- seasonal component of length a year.
   b- seasonal component of length a month.
   c- seasonal component of length a week.
   d- seasonal component of length a day.

## Question 2:

The following table monthly sales (in thousands of riyals) of some item, and estimated values of the sales calculated from some fitted model:

| Year | 1995 | 1996 | 1997 | 1998 | 1999 |
|---|---|---|---|---|---|
| Sales | 240 | 251 | 265 | 250 | 260 |
| Estimated sales | 235 | 258 | 260 | 260 | 255 |

a- calculate the estimated errors.
b- calculate mean squared errors MSE, the mean absolute deviances MAD, and mean absolute percentage errors MAPE.

**Question 3:**

The following table shows the loans financed by a bank (in millions of dollars) in the period 1995 to 2001:

| Year | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|
| Sales | 12 | 13 | 11 | 13 | 12 | 14 | 11 |

a- Use the method of simple moving averages method to find all the possible forecasts using k=3, and k=4. Also find the mean absolute deviances in each case.

b- Forecast the amount of loans that the bank will finance in the year 2002 using the simple moving average method.

c- Estimate the initial value $\hat{y}_0(1)$ using the mean of the series, then use the single exponential smoothing method to find all the forecasts, use $\alpha = 0.75$, and then $\alpha = 0.95$. Which one gives a better forecasts? explain.