

### Tutorial 5

1. The sales records of a wholesales company have shown the following annual sales (in RM'000) for the past ten years:

Year	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Sales	325.5	380.0	399.2	391.8	413.1	453.0	491.1	389.1	426.1	454.2

- a) Plot the time series.
  - b) Using 3-year moving averages method, find the trend and plot the trend line.
2. The quarterly sales data (number of copies sold) for a college textbook over the past three years follow.

Quarter	Year 1	Year 2	Year 3
1	1690	1800	1850
2	940	900	1100
3	2625	2900	2930
4	2500	2360	2615

- a) Using the least squares regression method, find the trend values.
  - b) Calculate the seasonal factors based on multiplicative model.
  - c) Hence, make a forecast for the 4 quarters in Year 4.
3. Quarterly productions of a manufacturing company over the past 4 years are shown as follows:

Year	Quarter	Production ('000)	Year	Quarter	Production ('000)
1	1	126	3	1	137
	2	99		2	107
	3	102		3	113
	4	141		4	160
2	1	130	4	1	145
	2	102		2	112
	3	105		3	120
	4	148		4	171

- a) Using the moving averages method, find the trend values.
- b) Plot the time series histogram together with the trend line.
- c) Calculate the seasonal factors using multiplicative model.
- d) Interpret the results.
- e) Make a forecast for quarters 1 and 2 of year 5 using multiplicative model.
- f) Find also the seasonally adjusted time series

4. The daily yield of latex from a small holding is recorded as follows:

Week	Yield (kg)				
	Mon	Tue	Wed	Thu	Fri
1	50	56	66	72	85
2	52	64	68	75	98
3	55	68	70	80	92

- a) Using the moving averages method, calculate the trend values.
- b) Plot the time series histogram together with the trend line.
- c) Interpret the seasonal factors using multiplicative model.
- d) Hence, make a forecast for Tuesday and Wednesday for week 4.

5. The sales of ABC for January through June are shown as follow:

Month	Jan	Feb	Mar	Apr	May	June
Sales (RM'000)	185.72	167.84	205.11	210.36	255.57	261.19

- a) Show a graph of this time series. Does a linear trend appear to be present?
- b) Using the least squares regression method, find the equation of the trend.
- c) Plot the trend line.

6. The following table gives the number of cellular telephone subscribers ('000) by year from 1986 to 1993.

Year	1986	1987	1988	1989	1990	1991	1992	1993
Number	682	1231	2069	3509	5283	7557	11033	16009

- a) Using the 3-year moving averages method, find the trend values.
- b) Plot the time series histogram together with the trend line
- c) Find the seasonal factors using the multiplicative model.
- d) Hence, forecast the number of cellular telephone subscribers in 1995.