

Seminar 23 (Suggested Solution)

1. Seasonal variation
2. Cyclical variation
3. Irregular variation
4. Secular trend
5. c

seasonal variations occur over a cycle shorter than that of any cyclical variations. For example, variations may occur over a year, and cyclical variations over five years. However, seasonal variations could occur over (for example) a week or a month, rather a year. They need not repeat exactly, but could vary in size from one year, month etc to the next. The data may be a combination not only of trend and seasonal variations, but also of residuals.

6. a) $\sum x = 670, \sum y = 1560, \sum xy = 105109, \sum x^2 = 45074, \sum y^2 = 245708, n = 10$

$$b_1 = \frac{[\sum xy - (\sum x \sum y)/n]}{[\sum x^2 - (\sum x)^2/n]}$$

$$= \frac{[105109 - (670 \times 1560 / 10)]}{[45074 - 670^2/10]}$$

$$= 589 / 184 = 3.2010$$

$$b_0 = \sum y/n - b_1 \sum x/n$$

$$= 1560/10 - (3.2010) 670/10$$

$$= -58.467$$

$$\hat{y} = -58.467 + 3.2010 x$$

the estimated sales in 1971= $\hat{y} = -58.467 + 3.2010(71) = 168.804$

b) Yes. Since $\sum x = 670$, and $\bar{x} = 67$, it is an integer.

c)

Year (19xx)	70	63	72	60	66	70	74	66	62	67
Coding time (X-67)	3	-4	5	-7	-1	3	7	-1	-5	0

7.

X	$X - \bar{X}$	$(X - \bar{X})^2$	Coded Time (x)	Y	xY	x^2
1979	-6.5	-13	-13	12	-156	169
1980	-5.5	-11	-11	24	-264	121
1981	-4.5	-9	-9	20	-180	81
1982	-3.5	-7	-7	24	-168	49
1983	-2.5	-5	-5	26	-130	25
1984	-1.5	-3	-3	21	-63	9
1985	-0.5	-1	-1	30	-30	1
1986	0.5	1	1	36	36	1
1987	1.5	3	3	40	120	9
1988	2.5	5	5	39	195	25
1989	3.5	7	7	30	210	49
1990	4.5	9	9	50	450	81
1991	5.5	11	11	55	605	121
1992	6.5	13	13	100	1300	169
$\Sigma = 27797$				507	1925	910
$\bar{X} = \Sigma X/n$ = 27797/14 = 1985.5				$\bar{Y} =$ 507/14		

$$b = \frac{\sum xY}{\sum x^2} = 1925 / 910 = 2.1154$$

$$a = \bar{Y} = 507 / 14 = 36.2143$$

therefore, the equation is $\hat{Y} = 36.2143 + 2.1154 x$

we want to forecast the sales in 1995, we must *first translate 1995 into a coded variable x by subtracting the mean year, 1986 :*

$$x = X - \bar{X} = (1995 - 1985.5) \times 2 = 19$$

this value, x = 19, is then substituted into the equation

$$\hat{Y} = 36.2143 + 2.1154 (19) = 76.4069 (\text{'000})$$

the forecast sales in 1995 is \$76,406.9 .