**Problem 3**

Do the problem and answer all the questions.

Hint for question: Compare the errors on the basis of the Mean Absolute Deviation (MAD)?http://edugen.wiley.com/edugen/courses/crs1396/art/common/pixel.gif

Copy and paste the following data set in Excel to save the typing effort and possible mistakes in data entry.

|  |  |
| --- | --- |
| Year | Shipments |
| 1985 | 14,705 |
| 1986 | 15,064 |
| 1987 | 16,676 |
| 1988 | 18,061 |
| 1989 | 21,327 |
| 1990 | 23,738 |
| 1991 | 26,966 |
| 1992 | 32,411 |
| 1993 | 38,851 |
| 1994 | 47,894 |
| 1995 | 60,171 |
| 1996 | 71,065 |
| 1997 | 82,400 |
| 1998 | 97,321 |

**Solution**

1. Construct a scatter diagram between year (year 1985 is equivalent to x =1) and shipments. Add a linear trend line and a fitted equation to the chart.
2. Use the linear equation obtained from the chart to forecast the shipments from 1985 – 1998.

1985 Y = (6115.6\*1) -5391.90 = 723.70

1986 Y = (6115.6\*2) -5391.90 = 6839.30

1987 Y = (6115.6\*3) -5391.90 = 12954.90

1988 Y = (6115.6\*4) -5391.90 = 19070.50

1989 Y = (6115.6\*5) -5391.90 = 25186.10

1990 Y = (6115.6\*6) -5391.90 = 31301.70

1991 Y = (6115.6\*6) -5391.90 = 37417.30

1992 Y = (6115.6\*6) -5391.90 = 43532.90

1993 Y = (6115.6\*6) -5391.90 = 49648.50

1994 Y = (6115.6\*6) -5391.90 = 55764.10

1995 Y = (6115.6\*6) -5391.90 = 61879.70

1996 Y = (6115.6\*6) -5391.90 = 67995.30

1997 Y = (6115.6\*6) -5391.90 = 7410.90

1998 Y = (6115.6\*6) -5391.90 = 80226.50

1. Construct a scatter diagram between year (year 1985 is equivalent to x =1) and shipments. Add a quadratic trend line and a fitted equation to the chart.

d.) Use the quadratic equation obtained from the chart to forecast the shipments from 1985 – 1998.

1985 =(0.61701\*(1^2))-(3139.5\*13)+19288

1986 =(0.61701\*(2^2))-(3139.5\*2)+19288

1987 =(0.61701\*(3^2))-(3139.5\*3)+19288

e.) Compute the errors for each forecast and compare the errors produced by using the two different fitted equations.

Comparison of the methods based on MAD. 

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Year | Shipments | Forecast Linear | Forecast Quadratic | Abs Deviation Linear | Abs Deviation Quadratic |
| 1 | 14,705 | 723.70 | 13011.47 | 13981 | 1694 |
| 2 | 15,064 | 6839.30 | 9875.05 | 8225 | 5189 |
| 3 | 16,676 | 12954.90 | 6739.87 | 3721 | 9936 |
| 4 | 18,061 | 19070.50 | 3605.93 | -1010 | 14455 |
| 5 | 21,327 | 25186.10 | 473.21 | -3859 | 20854 |
| 6 | 23,738 | 31301.70 | -2658.27 | -7564 | 26396 |
| 7 | 26,966 | 37417.30 | -5788.51 | -10451 | 32755 |
| 8 | 32,411 | 43532.90 | -8917.52 | -11122 | 41329 |
| 9 | 38,851 | 49648.50 | -12045.30 | -10798 | 50896 |
| 10 | 47,894 | 55764.10 | -15171.84 | -7870 | 63066 |
| 11 | 60,171 | 61879.70 | -18297.15 | -1709 | 78468 |
| 12 | 71,065 | 67995.30 | -21421.43 | 3070 | 92486 |
| 13 | 82,400 | 74110.90 | -24544.07 | 8239 | 106944 |
| 14 | 97,321 | 80226.50 | 19288.00 | 17095 | 78033 |
|  |  |  | MAD | -0.10 | 44464.33 |