**TIME SERIES ANALYSIS**

**PRACTICAL – 7**

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**AIM:** To Estimate trend using Grompertz curve by method of three selected points and comment on fitting of Grompertz curve in comparison with given data.

**EXPERIMENT:**

The following data gives the amount of savings and loan association in

the US from 1945 to 1971:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| YEAR 1945 1946 1947 1948 1949 1950 1951 1952 1953 | AMOUNT 7.40  8.50  9.80  11.00 12.50 14.00 16.10 19.20 22.30 | YEAR 1954 1955 1956 1957 1958 1959 1960 1961 1962 | AMOUNT 27.3  32.1  37.1  41.9  48  54.6  62.1  70.9  80.2 | YEAR 1963 1964 1965 1966 1967 1968 1969 1970 1971 | AMOUNT 91.3  101.9 110.4  114  124.5 131.6 135.5 146.4 174.5 |

Estimate trend using Gompertz curve by method of three selected points.

Comment on fitting of Gompertz curve in comparison with given data.

Forecast amount for next five years.

**THEORY:**

METHOD OF THREE SELECTED POINTS:

Equation for modified exponential curve: yt = a + bct (1) Consider 3 ordinates, say y1, y2, y3, corresponding to 3 equivalent values of t, say t1, t2, t3, so that

t2 – t1 = t3 – t2

Now, substituting the values of t = t1, t2, t3 in equation (1), we get:

* y1 = a + bct1
* y2 = a + bct2
* y3 = a + bct3

Solving the above 3 equations, we get the values of a, b and c.

* c = ((y3 – y2)/( y2 – y1))1/(t2-t1)
* b = ((( y2 - y1)2)/( y3 - 2y2 + y1)) \* ((y2 – y1)/( y3 – y2))t1/(t2-t1)
* a = (y1 y3 – y22)/(y3 – 2y2 + y1)

GROMPERTZ CURVE:

The Grompertz curve describes a trend in which the growth increments of the logarithms are declining by a constant percentage. Thus the natural values of the trend would show a declining ratio of increase, but the ratio does not decrease by either a constant amount or a constant percentage.

Equation: yt = a + bc^t

Taking log both sides,

log yt = log a + ct \* log b

Let, log yt = Yt, log a = A, log b = B

Therefore, we get

Yt = A + Bct

The above equation is comparable to the equation of modified exponential curve.

**CALCULATIONS:** (An excel sheet has also been attached)

Table 7.1



Table 7.2



Graph 7.1

**RESULT:**

* Trend values using Grompertz Curve (method of 3 selected points) have been calculated and shown in Table 7.1.
* The trend values have been plotted along with the given values in Graph 7.1.
* The amount for the next 5 years has been forecasted and shown in Table 7.1.

**CONCLUSION:**

* Estimated values are increasing exponentially.
* The R2 value calculated in Table 7.2 is almost equal to 1 (0.992731). This indicates that the values estimated are almost equal to the given values.