**TIME SERIES ANALYSIS**

**PRACTICAL – 8**

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**AIM:** To Estimate trend using Grompertz curve by method of partial sums 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 | AMOUNT | YEAR | AMOUNT | YEAR | AMOUNT |
| 1945 1946 1947 1948 1949 1950 1951 1952 1953 | 7.40  8.50  9.80  11.00 12.50 14.00 16.10 19.20 22.30 | 1954 1955 1956 1957 1958 1959 1960 1961 1962 | 27.3  32.1  37.1  41.9  48  54.6  62.1  70.9  80.2 | 1963 1964 1965 1966 1967 1968 1969 1970 1971 | 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 Partial Sums.

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

Forecast amount for next five years.

**THEORY:**

METHOD OF PARTIAL SUMS:

Equation for modified exponential curve: yt = a + bct (1)

The given time series data is split up into 3 equal parts, each containing n consecutive values of yt corresponding to t=1,2,…,n ; t=n+1,n+2,…,2n ; t=2n+1,2n+2,…,3n. Let S1, S2 and S3 represent the partial sums of the 3 parts respectively, such that,

* S1 =
* S2 =
* S3 =

Substituting for yt from equation (1), we get the values of a, b and c.

* c =( )1/n
* b =
* a = []

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 8.1











Graph 8.1

**RESULT:**

* Trend values using Grompertz Curve (method of partial sums) have been calculated and shown in Table 8.1.
* The trend values have been plotted along with the given values in Graph 8.1.
* The amount for the next 5 years has been forecasted and shown in Table 8.1.
* Correlation coefficient between the given amount and the estimated amount is:

R2 = 0.996155895.

**CONCLUSION:**

* Estimated values are increasing exponentially.
* The R2 value calculated is almost equal to 1 (0.996155895). This indicates that the values estimated are almost equal to the given values.