

TUTORIAL - 1

CALCULATION OF STATISTICAL PARAMETERS

Example :

Peak annual flow series in cumecs for 32 years from 1948 to 1979 of river Narmada at Garudeshwar discharge measuring site is given below. Calculate mean, standard deviation, coefficient of variation and coefficient of skewness of the original and log transformed (base e) series.

Year	Flow (Cumecs)	Year	Flow (Cumecs)
1948	23890	1964	19560
1949	26810	1965	15250
1950	45630	1966	13000
1951	10380	1967	22670
1952	13290	1968	58100
1953	17100	1969	31170
1954	28650	1970	69400
1955	29150	1971	19980
1956	12810	1972	47980
1957	26700	1973	61350
1958	19700	1974	27300
1959	38800	1975	33750
1960	21250	1976	19500
1961	43360	1977	22700
1962	38880	1978	34260
1963	15250	1979	38200

Solution :

The mean, standard deviation, coeff. of variation and coeff. of skewness are calculated from the following equations

$$\bar{X} = \frac{1}{N} \sum_{i=1}^N X_i \quad (T 1-1)$$

$$S = \sqrt{\frac{1}{(N-1)} \sum_{i=1}^N (X_i - \bar{X})^2} \quad (T 1-2)$$

(T-1/1)

$$C_v = \frac{S}{\bar{X}} \quad (T 1-3)$$

$$C_s = \frac{N \sum_{i=1}^N (X_i - \bar{X})^3}{(N-1)(N-2) S^3} \quad (T 1-4)$$

Using eq. T1-1 to T1-4, the mean, standard deviation, coeff. of variation and coeff. of skewness of the original series are 29556.9 cumecs, 14864.4 cumecs, 0.5029 and 1.052 respectively.

If $\log_e X$ is used instead of X then above equations give parameters of log transformed series. The statistical parameters of $\log_e$ transformed series are

Mean = 10.179

Standard deviation = 0.488

Coeff. of variation = 0.04794

Coeff. of skewness = 0.1

Problem : Peak annual flow series for 32 years from 1951—82 of river Narmada at Mortakka discharge measuring site is given below. Calculate mean, standard deviation, coeff. of variation and coeff. skewness of the original and log transformed (base e) series.

Year	Flow (Cumecs)	Year	Flow (Cumecs)
1951	11127	1967	19690
1952	13631	1968	31604
1953	19521	1969	27935
1954	33915	1970	41691
1955	20746	1971	18101
1956	11982	1972	47851
1957	25023	1973	54063
1958	13005	1974	36562
1959	30372	1975	33278
1960	20540	1976	17713
1961	55323	1977	24354
1962	31604	1978	29564
1963	16135	1979	26232
1964	23438	1980	22751
1965	18591	1981	25662
1966	11338	1982	16602

Solution :

[illegible]

$$\sum X_i$$

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$$\Sigma (X_i - \bar{X})$$

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(T-1/3)

[illegible]

Original series

$$\text{Mean} = \bar{X} = \frac{\sum_{i=1}^N X_i}{N} =$$

$$\text{Standard deviation } S = \sqrt{\frac{\sum_{i=1}^N (X_i - \bar{X})^2}{N - 1}}$$

$$\text{Coefficient of variation } C_v = \frac{S}{\bar{X}}$$

Skewness :

$$a = \frac{N}{(N-1)(N-2)} \sum_{i=1}^N (X_i - \bar{X})^3$$

Coefficient of skewness

$$C_s = \frac{a}{S^3} =$$

Log Transformed series

$$\text{Mean} = \bar{Y} = \frac{\sum_{i=1}^N Y_i}{N} =$$

$$\text{Standard deviation} = S_y = \sqrt{\frac{\sum_{i=1}^N (Y_i - \bar{Y})^2}{N - 1}} =$$

$$\text{Coeff. of variation} = C_{v_y} = \frac{S_y}{\bar{Y}}$$

$$a_y = \frac{N}{(N-1)(N-2)} \sum_{i=1}^N (Y_i - \bar{Y})^3$$

$$\text{Coeff. of skewness} = C_{s_y} = \frac{a_y}{S_y^3}$$