Skewness & Kurtosis

Skewness means lack of symmetry. In mathematics, a figure is called symmetric if there exists a point in it through which if a perpendicular is drawn on the X-axis, it divides the figure into two congruent parts i.e. identical in all respect or one part can be superimposed on the other i.e mirror images of each other. In Statistics, a distribution is called symmetric if mean, median and mode coincide. Otherwise, the distribution becomes asymmetric.

- If the right tail is longer, we get a positively skewed distribution for which

  mean > median > mode
- while if the left tail is longer, we get a negatively skewed distribution for which

  mean < median < mode
- The example of the Symmetrical curve, Positive skewed curve and Negative skewed curve are given as follows.

Symmetric curve

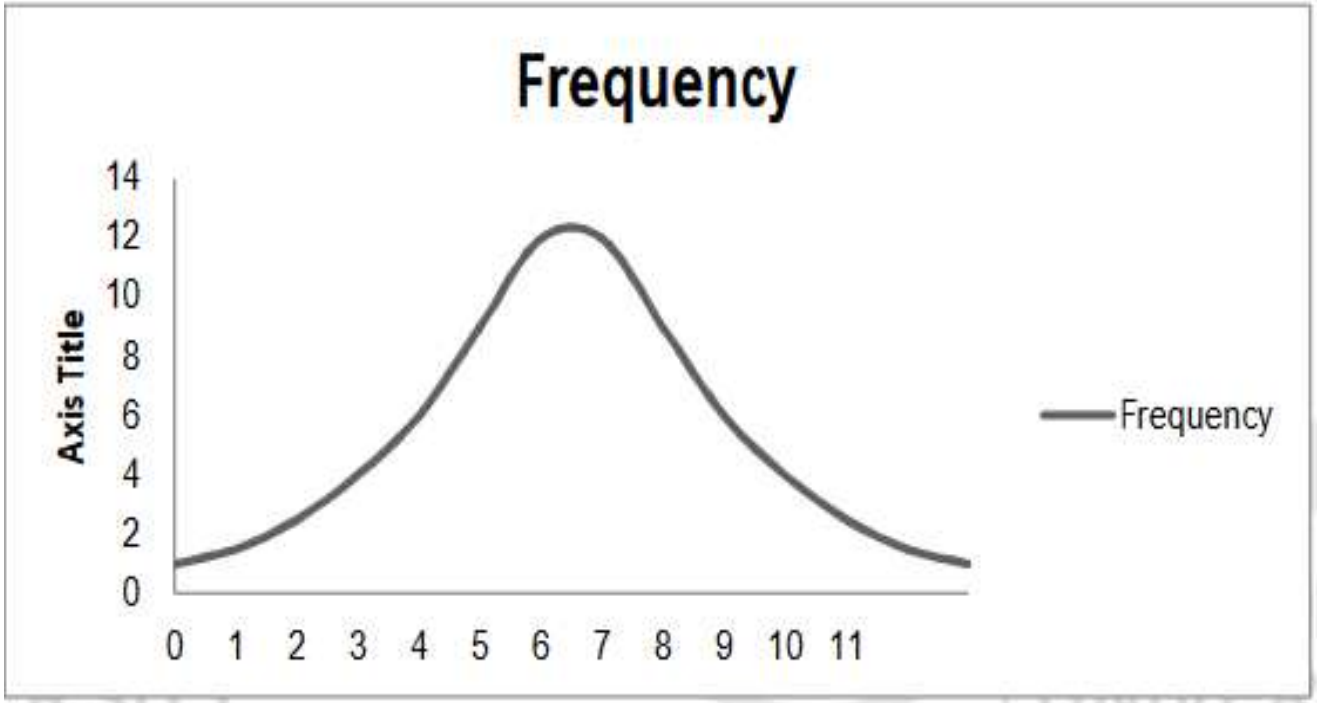

Fig. 4.1: Symmetrical Curve

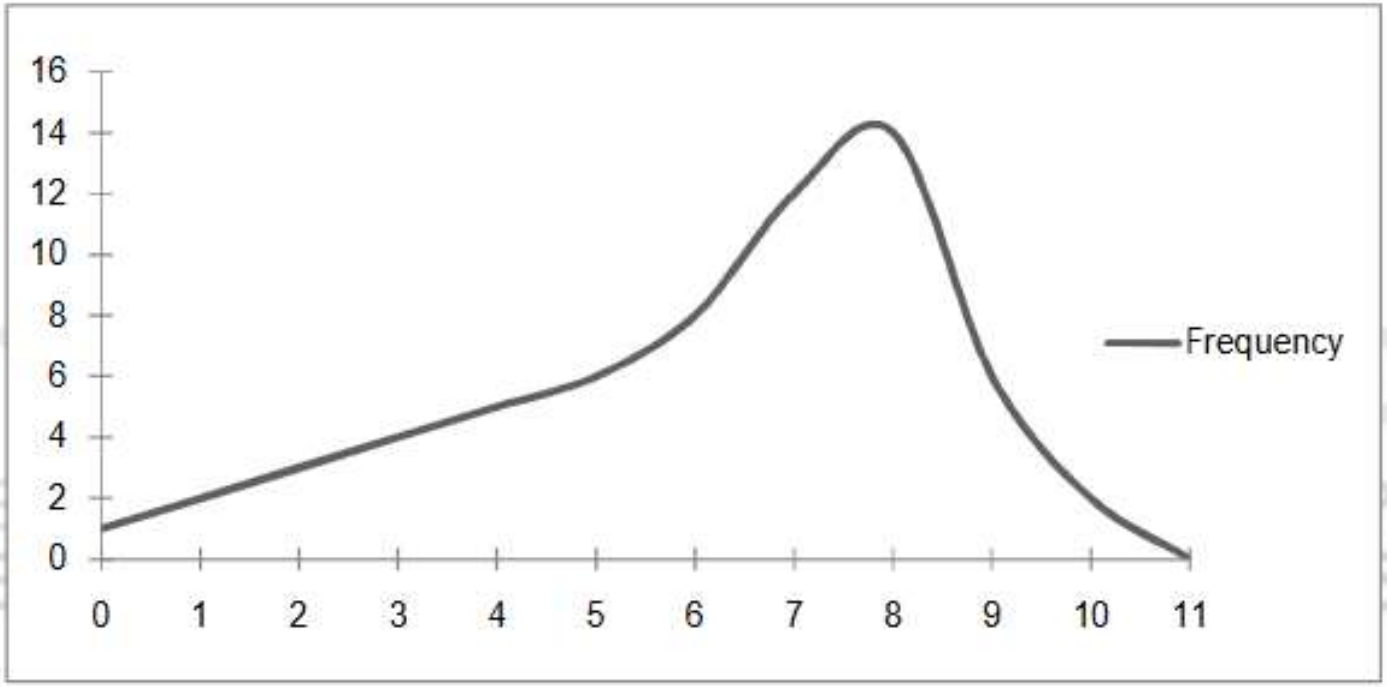

Fig. 4.2: Negative Skewed Curve

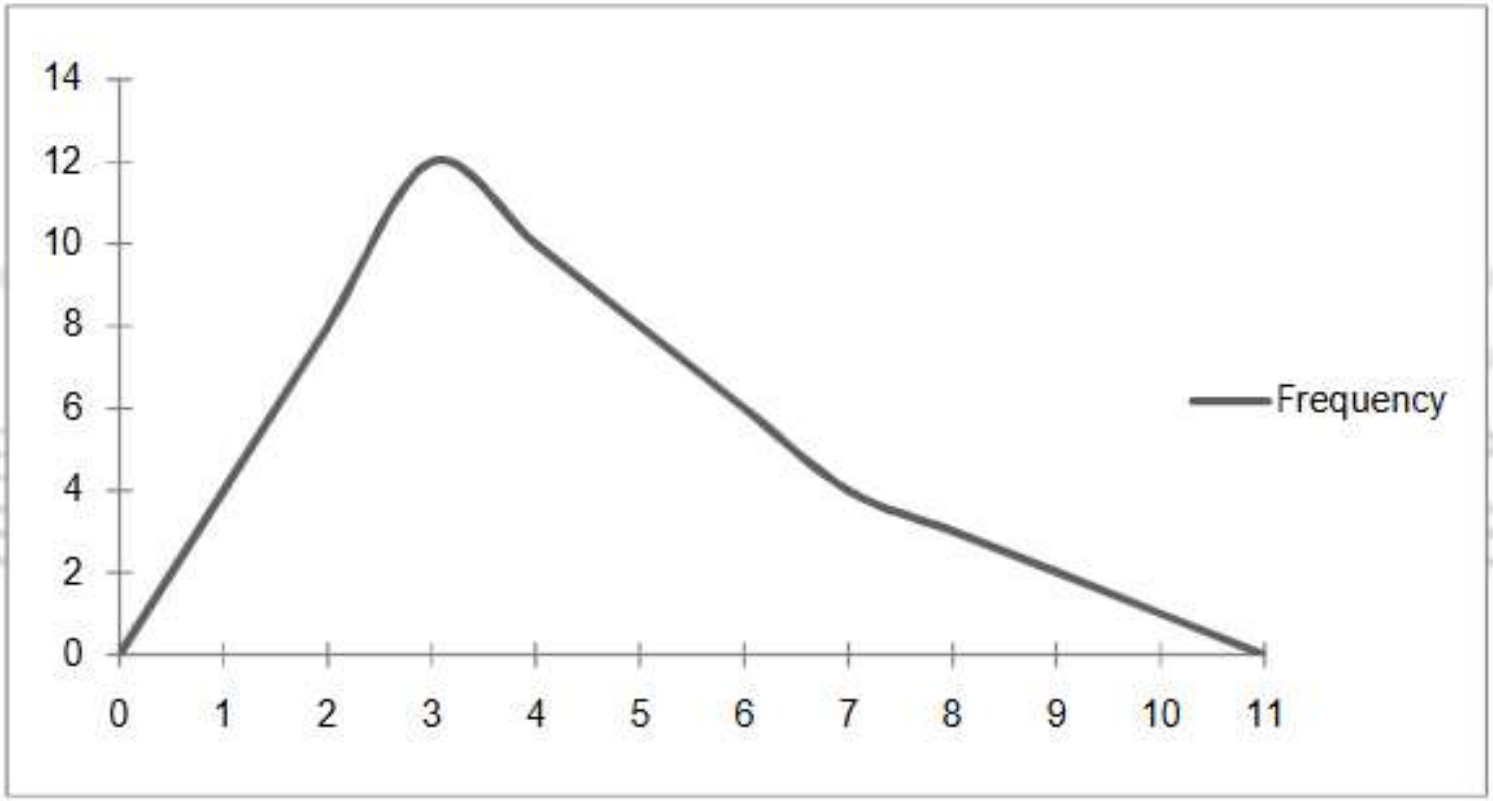

Fig. 4.3: Positive Skewed Curve

Absolute Measures of Skewness

1. Skewness (S_k) = Mean – Median
2. Skewness (S_k) = Mean – Mode
3. Skewness (S_k) = $(Q_3 - Q_2) - (Q_2 - Q_1)$

For comparing to series, we do not calculate these absolute mearues we calculate the relative measures which are called coefficient of skewness. Coefficient of skewness are pure numbers independent of units of measurements.

Relative measure of Skewness

This method is most frequently used for measuring skewness. The formula for measuring coefficient of skewness is given by

$$S_k = \frac{\text{Mean} - \text{Mode}}{\sigma}$$

The value of this coefficient would be zero in a symmetrical distribution. If mean is greater than mode, coefficient of skewness would be positive otherwise negative. The value of the Karl Pearson's coefficient of skewness usually lies between ± 1 for moderately skewed distubution. If mode is not well defined, we use the formula

$$S_k = \frac{3(\text{Mean} - \text{Median})}{\sigma}$$

Kurtosis

If we have the knowledge of the measures of central tendency, dispersion and skewness, even then we cannot get a complete idea of a distribution. In addition to these measures, we need to know another measure to get the complete idea about the shape of the distribution which can be studied with the help of Kurtosis. Prof. Karl Pearson has called it the "Convexity of a Curve". Kurtosis gives a measure of flatness of distribution.

The degree of kurtosis of a distribution is measured relative to that of a normal curve. The curves with greater peakedness than the normal curve are called **"Leptokurtic".** The curves which are more flat than the normal curve are called **"Platykurtic"**. The normal curve is called "**Mesokurtic**." The Fig.4 describes the three different curves mentioned above:

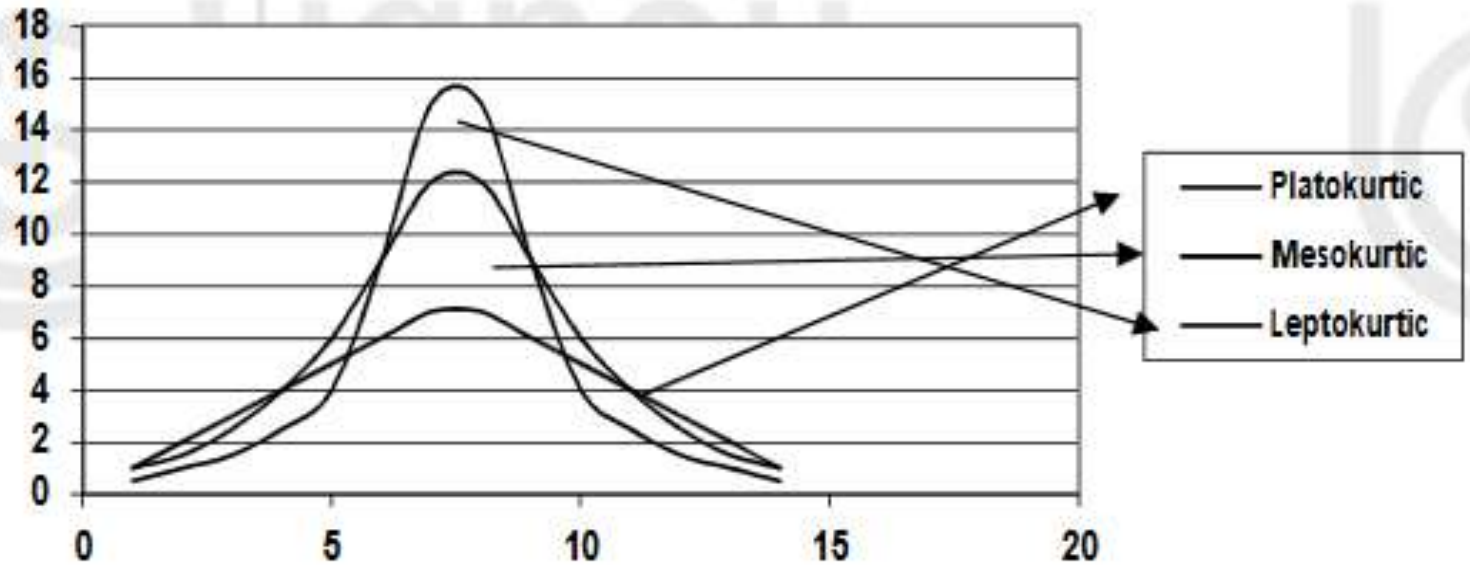

Fig.4.4: Platykurtic Curve, Mesokurtic Curve and Leptokurtic Curve