# Skewness and Kurtosis

What is Skewness?

Skewness defines the shape of the distribution. Usually, we get a lot of asymmetric distributions, and these distributions have unevenly spread data. There are two types of skewness – positive or right-skewed and negative or left-skewed.

Positive skewness is when the distribution takes place so that we get a long tail towards the right side of the graph. This is called a right-skewed graph, mean > median > mode. Skewness > 0

Negative skewness is when the distribution takes place so that we get a long tail towards the left side of the graph. This is called a left-skewed graph. mean <median < mode. Skewness < 0
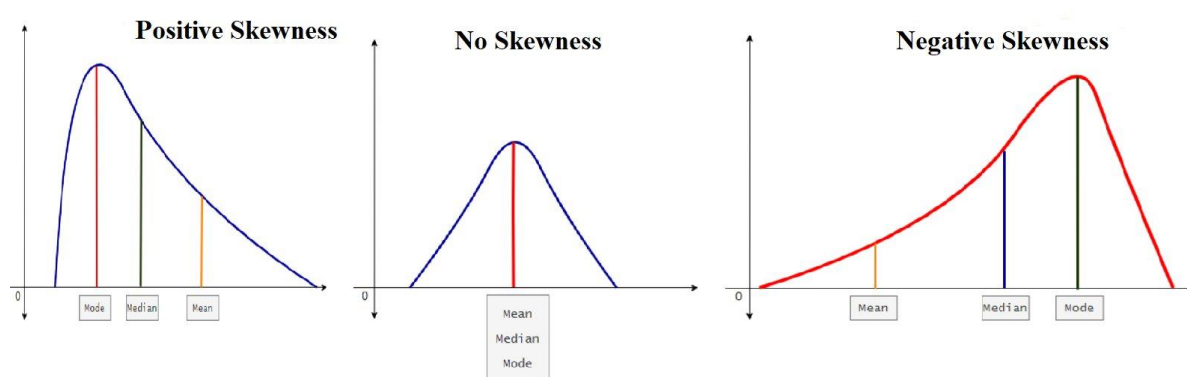

Uses:

- **Identify Distribution Shape**: Helps to determine whether the data distribution is skewed to the left (negatively skewed) or right (positively skewed).

- **Detect Outliers**: Skewness can indicate the presence of outliers or extreme values affecting the distribution.

- **Guide Data Transformation**: Provides insight into whether transformations (like log or square root) are needed to normalize the data.

- **Influence Statistical Analysis**: Skewness affects the assumptions of many statistical tests and models that assume normality, so understanding it helps in selecting appropriate methods.

- **Understand Data Behavior**: Assists in interpreting the underlying processes generating the data by highlighting deviations from normality.

Interpreting Skewness Magnitude:

- **< -1 or > 1**: Highly skewed

- **-1 to -0.5 or 0.5 to 1**: Moderately skewed

- **-0.5 to 0.5**: Approximately symmetrical (near normal distribution)

What is Kurtosis?

Kurtosis is a statistical measure that describes the degree of peakedness or flatness of a distribution. It measures the shape of the distribution, specifically the height and sharpness of the central peak, relative to that of normal distribution. It is the fourth moment of statistics.
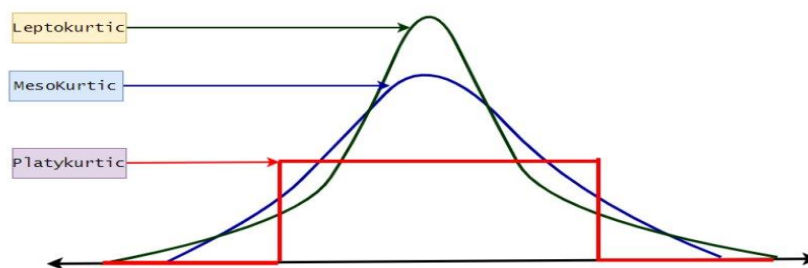
Used:

- **Understand Outlier Presence**: High kurtosis indicates more outliers or extreme values, while low kurtosis suggests fewer outliers.

- **Distribution Shape**:

    - **Leptokurtic (Kurtosis > 0)**: Distribution with heavy tails and a sharp peak. It indicates more outliers and a higher likelihood of extreme values.

    - **Platykurtic (Kurtosis < 0)**: Distribution with light tails and a flatter peak. It indicates fewer outliers and a lower likelihood of extreme values.

    - **Mesokurtic (Kurtosis = 0)**: Distribution similar to the normal distribution, with moderate tails and peak.

- **Model Assumptions**: Helps to assess if data deviates from the normal distribution assumption, which is important for many statistical models.

- **Risk Assessment**: In finance and risk management, kurtosis helps evaluate the risk of extreme returns or losses. High kurtosis in financial returns might indicate higher risk of extreme events.

Interpreting Magnitude:

- **Kurtosis > 3**: Excess kurtosis > 0; highly leptokurtic with heavy tails.

- **Kurtosis < 3**: Excess kurtosis < 0; highly platykurtic with light tails.

- **Kurtosis ≈ 3**: Excess kurtosis ≈ 0; approximately normal distribution (Mesokurtic).