Measures of dispersion.

Q: Define measures of dispersion.

Ans: By dispersion we mean the extent (limit) to which the values are spread out from their average, such kinds of measures are called measures of dispersion.

Q: Define Absolute and Relative measures of dispersion.

Absolute measure of Dispersion:- An absolute measure of dispersion is one that measures the variability in terms of same units or in square units, as the units of the given data.

eg: If the unit of the data is rupee, meter or kg etc. then the unit of the dispersion will also be rupee, meter or kg etc.

Relative measure of Dispersion:-

A Relative Measure of Dispersion, measures the variability of the data relative to its average and is independent of unit of measurement.

Q: What are the most Common measures of dispersion.

Ans:

The most common measures of dispersion are.

I The Range

II The Semi Interquartile Range or Quartile deviation.

III The mean deviation.

IV The variance.

V The Standard deviation.

Q. Define Range: (The difference b/w largest and smallest observations for a given set of data is called Range.

i,e $R = x_m - x_0$) x_m = max. value of x, x_0 = min. value of x.

Co-efficient of Range is

(called Co-efficient of dispersion $= \frac{x_m - x_0}{x_m + x_0}$)

Q. Define Semi Interquartile Range or Quartile deviation.

Ans: The half of the difference b/w upper and lower quartiles is called Semi Interquartile Range or Quartile deviation.

i,e $Q.D = \frac{Q_3 - Q_1}{2}$

Co-efficient of Q.D is called Quartile Co-efficient of dispersion : $\frac{Q_3 - Q_1}{Q_3 + Q_1}$

Q: Define mean deviation.

Let $x_1, x_2, x_3, \ldots x_n$ are values. Then the arithmetic mean of the absolute deviations of x_i from their average ($\bar{x}$, $\tilde{x}$ or $\hat{x}$) is called mean deviation.

$$\text{m.d(for mean)} = \frac{\Sigma|x-\bar{x}|}{n}, \quad \frac{\Sigma f|x-\bar{x}|}{\Sigma f}$$

$$\text{m.d(from median)} = \frac{\Sigma|x-\tilde{x}|}{n}, \quad \frac{\Sigma f|x-\tilde{x}|}{\Sigma f}$$

$$\text{m.d(from mode)} = \frac{\Sigma|x-\hat{x}|}{n}, \quad \frac{\Sigma f|x-\hat{x}|}{\Sigma f}$$

Q: Define variance: (SD → positive square root)

Let $x_1, x_2, x_3, \ldots x_n$ are values. Then the ~~average~~ sum of squared deviations of x_i from their mean $\bar{x}$ is called variance.

✓ Var(x): $S_x^2 = \frac{\Sigma(x-\bar{x})^2}{n}$ for ungrouped data.

✓ Var(x): $S_x^2 = \frac{\Sigma f(x-\bar{x})^2}{\Sigma f}$ for grouped data.

Q: Define standard deviation: Let $x_1, x_2, x_3, \ldots x_n$ are values. Then (the positive square root) of the ~~average~~ sum of squared deviations of x_i from then mean $\bar{x}$ is called Standard deviation.

S.D: $S_x = \sqrt{\frac{\Sigma(x-\bar{x})^2}{n}}$ for ungrouped data.

S.D: $S_x = \sqrt{\frac{\Sigma f(x-\bar{x})^2}{\Sigma f}}$ for grouped data.

Q] What is Co-efficient of variation? and for what purpose we use it.

Ans: Co-efficient of variation is the relative term of variance. It is used to measure the variability for two or more sets of data. Then any data having least co-efficient of variation is called more Consistent.

e.g.

$$C.V_x = \frac{S_x}{\bar{x}} \times 100\%$$

$$C.V_y = \frac{S_y}{\bar{y}} \times 100\%$$

If $C.V_x < C.V_y$ then x data is said to be more Consistent than the y data.

Q] What are the properties of variance & S.D?

Ans: If x, y are two independent variables, where "a" is Constt. Then variance has following properties.

(i) $Var(a) = 0$ i,e variance of Constt is zero.

(ii) $Var(x \pm a) = Var(x)$ i,e variance is independent of change of origin.

(iii) $Var(ax) = a^2 Var(x)$ i,e variance is multiplied by square of Constt. when a Constt. is multiplied to each x.

(iv) $Var\left(\frac{1}{a}x\right) = \frac{1}{a^2} Var(x)$

(v) $Var(x \pm y) = Var(x) + Var(y)$

☐ Standard deviation has following properties.

i) $S.D(a) = 0$

ii) $S.D(x \pm a) = S.D(x)$

iii) $S.D(ax) = |a| S.D(x)$

iv) $S.D\left(\frac{1}{a}x\right) = \left|\frac{1}{a}\right| S.D(x)$

v) $S.D(x \pm y) = \sqrt{Var(x) + Var(y)}$ when x & y are independent.

Q: What are moments?

Moments are the arithmetic mean of the deviation. inwhich the power of deviations raise with respect to the order of moments.

Q: Why we calculate moments?

Ans: Moments are calculated inorder to Study the shape of the dist. i.e whether the dist. is symmetrical or skewed, And whether the dist. is meso kurtic, platy kurtic or lepto kurtic.

Q What are moment Ratios? There are some ratios inwhich both the numerator and denominator are moments.

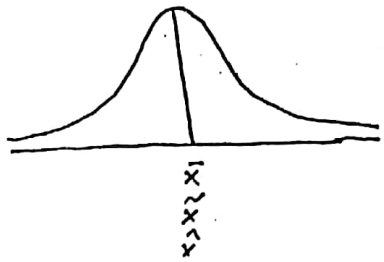
$$b_1 = \frac{(m_3)^2}{(m_2)^3}$$

$$b_2 = \frac{m_4}{(m_2)^2}$$

Q: What is Symmetry?

Ans: Any dist. is said to be symmetrical if its mean, median and mode are Coincide.

i.e mean = median = mode



Q: What is skewness.

As we know that any dist. is said to be symmetrical, if its mean, median and mode are Coincide, then any departure from symmetry is Called Skewness.

$$b_1 = \frac{(m_3)^2}{(m_2)^3}.$$

Q: What is Positive Skewness?

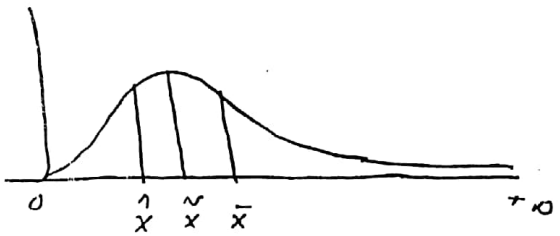
Any dist. is said to have +ve Skewness

iff.

mean > median > mode

or $Sk > 0$ (+ve)

or $m_3 > 0$ (+ve)



Q: What is Negative Skewness?

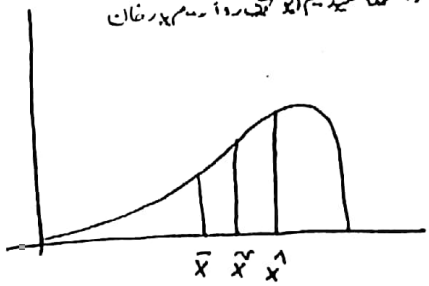
Any dist. is said to have -ve Skewness

iff.

mean < median < mode

or $Sk < 0$ (-ve)

or $m_3 < 0$ (-ve)



Q: What is Kurtosis? The degree of peakedness or flatness of a unimodal frequency dist. curve is called Kurtosis.

Co-efficient of kurtosis is given as:

$$b_2 = \frac{m_4}{(m_2)^2}$$

If $b_2 = 3$ then dist. is called meso kurtic or normal.

If $b_2 > 3$ then dist. is called lepto kurtic.

If $b_2 < 3$ then dist. is called platy kurtic.