Summary

- The concept of moments was borrowed from physics. The characteristics of a frequency distribution are described by its moments.
- The rth moment of a set of values about any constant is the mean of the rth powers of the deviations of the values from the constant.
- Moments about any constant can be found. The moments about the arithmetic mean are called central moments. The moments about any other constant are called raw moments.
- E(|X|) always exists in the extended real numbers $R \equiv R \cup \{\infty\} \cup \{-\infty\}$ and $E(|X|) \in$

 $[0,\infty]$; i.e., either E(|X|) is a non-negative real number or E(|X|) = ∞ .

- If the moments of a specified order exist, then all the lower order moments automatically exist. However, the converse is not true. That is we may have a distributions for which all moments of a specified order exist but no higher order moment exist.
- The relation between raw and central moments is given by the expression,

 $Mr = \mu_{r}`-{}^{r}C_{1} \ \mu_{r-1}` \ \mu_{1}`+{}^{r}C_{2} \ \mu_{r-2}` \ \mu_{1}`^{2}-\ldots \ + \ (-1)^{r\mu_{1}'r}$

- \circ $\;$ The first moment about zero is the arithmetic mean
- \circ $\;$ The second central moment is the variance of the distribution
- o The third central moment is a measure of skewness
- o The fourth central moment is a measure of kurtosis
- Based on the measures of skewness and kurtosis we can write the nature of the distribution.
- Quantiles are points taken at regular intervals from the cumulative distribution function of a random variable. Dividing ordered data into q essentially equal-sized data subsets is the motivation for q-quantiles; the quantiles are the data values marking the boundaries between consecutive subsets. Mainly we discuss the four quantiles viz., median, quartiles, deciles and percentiles.