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B.Com Honours

Semester II

Calicut University

Fundamentals of Business Mathematics and Statistics

Course Code: COM2MN104 • Module 4 Notes

1. Descriptive Statistics: Central Tendency, Dispersion, and Skewness

Descriptive statistics provides the mathematical metrics to summarize datasets. A manager cannot look at 10,000 transaction records and understand performance; they need key metrics showing the center of the data, the spread of the data, and the shape of the distribution. This final module covers measures of central tendency, measures of dispersion, and coefficients of skewness and kurtosis.

Measures of Central Tendency (Averages)

A single value that represents the central point of a dataset:

- **Arithmetic Mean:** The sum of all values divided by count. Sensitive to extreme outliers.
- **Geometric Mean (GM):** The n -th root of the product of n values. Used for average growth rates and investment returns.
- **Harmonic Mean (HM):** Reciprocal of the arithmetic mean of reciprocals. Used for rates like speed or average costs.
- **Median & Mode:** **Median** is the middle value when sorted (splits data 50-50). **Mode** is the most frequently occurring value.

Measures of Dispersion (Spread)

Measures of central tendency only show the center; dispersion measures how spread out the values are from that center:

Measure of Dispersion	Mathematical Formula / Concept	Business Application
Range	Maximum Value minus Minimum Value.	Quick check on price volatility.
Quartile Deviation	$(QD = (Q_3 - Q_1) / 2)$. Focuses on middle 50% of data.	Analyzes salary spreads, ignoring outliers.
Standard Deviation ((sigma))	Square root of variance: $[\sigma = \sqrt{\frac{\sum(x - \mu)^2}{N}}]$	The standard measure of investment risk and quality control (Six Sigma).
Coefficient of Variation (CV)	$(CV = (\text{Standard Deviation} / \text{Mean}) \times 100)$.	Compares risk relative to return across different stocks. Lower is more stable.

Skewness and Kurtosis

These metrics describe the shape of the frequency distribution curve:

- **Skewness:** Measures asymmetry. If the tail extends to the right, it is **Positively Skewed** (Mean > Median > Mode). If the tail extends to the left, it is **Negatively Skewed** (Mean < Median < Mode). Calculated using Karl Pearson's coefficient: $(S_p = (\text{Mean} - \text{Mode}) / \sigma)$.
- **Kurtosis:** Measures the peakedness or flatness of the curve. A high, sharp peak is **Leptokurtic** (high concentration around center). A flat peak is **Platykurtic** (low concentration). A normal curve is **Mesokurtic**.

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