



B.Com Honours

Semester IV

Calicut University

BUSINESS STATISTICS

Course Code: COM4CJ205 • Module 4 Notes

Module IV: Theoretical Probability Distributions

Covers discrete probability distributions (Binomial, Poisson) and continuous normal distribution modeling for quality control and risk analysis.

Unit 9: Theoretical Distributions – Basic Assumptions

Mathematical models depicting how probabilities are distributed over values of a random variable.

Unit 10: Probability Distributions & Fitting Procedures

Fitting involves comparing observed sample frequencies against expected theoretical frequencies using Chi-Square goodness-of-fit.

Unit 11: Binomial Distribution & Fitting

Discrete distribution for (n) independent Bernoulli trials with constant success probability (p):

$$(P(X = k) = {}^n C_k \cdot p^k \cdot q^{n-k}) \mid \text{Mean} = (n p), \text{Variance} = (n p q)$$

Unit 12: Poisson Distribution & Fitting

Limiting form of Binomial distribution when $(n \rightarrow \infty)$ and $(p \rightarrow 0)$ with constant mean $(\lambda = n p)$:

$$(P(X = k) = \frac{e^{-\lambda} \cdot \lambda^k}{k!}) \mid \text{Mean} = \text{Variance} = (\lambda)$$

Unit 13: Normal Distribution & Standard Normal Curve (Z-Score)

Symmetrical bell-shaped continuous distribution. Standard Normal Variable $(Z = \frac{X - \mu}{\sigma})$. Mean = Median = Mode. Empirical Rule: 68.26% within $(\pm 1\sigma)$, 95.44% within $(\pm 2\sigma)$, 99.74% within $(\pm 3\sigma)$.

Practical Problem 2 (Standard Normal Curve Z-Score Solved Computation): Monthly salaries of employees in a corporation are normally distributed with Mean $(\mu = \text{Rs. } 50,000)$ and Standard Deviation $(\sigma = \text{Rs. } 10,000)$.

Calculate (a) The Z-score for an employee earning Rs. 70,000, (b) The proportion of employees earning more than Rs. 70,000, given Area under Standard Normal Curve from $(Z = 0)$ to $(Z = 2.0)$ is (0.4772) , and (c) Out of 1,000 total employees, how many earn more than Rs. 70,000?

Step-by-Step Solved Normal Distribution Calculations:

- 1. Standard Normal Variate (Z-Score):

$$(Z = \frac{X - \mu}{\sigma} = \frac{70,000 - 50,000}{10,000} = \frac{20,000}{10,000} = \mathbf{+2.00})$$

- **2. Probability of Earning More than Rs. 70,000 ($P(Z > 2.0)$):**

Area under right half of curve = 0.5000.

Area between ($Z = 0$) and ($Z = 2.0$) = 0.4772.

$(P(Z > 2.0) = 0.5000 - 0.4772 = \mathbf{0.0228} \text{ ext{ (or 2.28\%)}})$

- **3. Expected Number of Employees Earning > Rs. 70,000 (out of 1,000):**

$\text{Expected Count} = (1,000 \text{ imes } 0.0228 = \mathbf{22.8 \text{ approx } 23 \text{ ext{ Employees}}})$

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