

Code: STAT-102

Title: Probability and Probability Distributions

Credit Hours: 03

Prerequisite: Elementary Statistics

Objectives:

This course is designed to equip students with higher statistical tools and their application in economic analysis.

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Course Contents

Probability

A survey of probability concepts: Classical probability, Empirical concept, Subjective probability; Some rules of probability: Rules of addition, Rules of multiplication; Tree diagrams; Conditional Probability, Bayes Theorem; Counting rules: The multiplication formula, The permutation formula, The combination formula.

Random Variables and Probability Distribution

Random variables, Discrete random variable, Continuous random variable, Discrete probability distribution; The mean, variance and standard deviation of a probability distribution; Binomial probability distribution, and its computation. Cumulative probability distributions, Properties of Binomial probability distribution. Poisson Probability Distribution, Hypergeometric

Probability Distribution

The normal probability distribution: Properties of normal distribution, Applications of the standard normal distribution, Areas under the normal curve, Finding areas under the normal curve; The normal approximation of the binomial; Continuity correction factor.

Survey Sampling and Sampling Distributions

Sampling the population, Advantages of sampling, Representative samples, Sample design and sample survey, Sampling frame, Probability and non-probability sampling, Sampling with and without replacement, Sampling and non-sampling error, sampling bias; Probability sampling and non-probability sampling methods; Sampling distribution of the mean; The central limit theorem; Sampling distribution of differences between means; Sampling distribution of sample proportion; Sampling distribution of differences between proportions.

Estimation and Confidence Intervals

Point estimates and confidence intervals; Estimation by confidence interval: Confidence interval estimate of a population mean (Known Variance), Confidence interval estimate of a population mean (Unknown Variance) Confidence interval for differences of means, Confidence interval for differences of means; Confidence interval for population proportion, Confidence interval for differences between proportions; One sided confidence interval; Sample size for estimating population mean.

Hypothesis Testing

One sample test of hypothesis; One Sample; One tail and two tails tests of significance; Testing for a population mean with a known population standard deviation: Two-tailed test, one-tailed test; P-Value in hypothesis testing; Testing for a population mean: Large sample, Population standard deviation unknown; Testing hypotheses about population proportion when sample size is large; Type II error.

Testing of two Sample Hypothesis: Population means, Population proportions; comparing populations with small samples.

Chi Square Applications

Introduction; Goodness-of-fit test: Equal expected frequencies; Goodness-of-fit test: Unequal

expected frequencies; Limitations of Chi square; Using the goodness-of-fit test to test for normality; Contingency Table Analysis.

Analysis of Variance

Introduction, The F distribution; Comparing two population variances; ANOVA assumptions; ANOVA test; Inferences about pairs of treatment means; Two-way analysis of variance.

Recommended Books:

- Anderson, D. R., Sweeney, D. J., Williams, T. A., Camm, J. D., & Cochran, J. J. (2014). Essentials of statistics for business and economics. Cengage Learning.
- Anderson, D. R., Williams, T. A., & Sweeney, D. J. (2011). Statistics for Business and Economics. 12th. Cengage Learning.
- Lind, Douglas A., Marshal, William G. and Mason, Robert D., (2015) Statistical Techniques in Business and Economics (16th edition). Boston: McGraw Hill, 2003.