

Statistics for Management

Third Edition

Dr. K. Subramani

Former Professor
Department of Mathematics
Kumaraguru College of Technology
Coimbatore - 641 006
Tamilnadu.

Dr. A. Santha

Associate Professor
Department of Mathematics
Kumaraguru College of Technology
Coimbatore - 641 006
Tamilnadu.



Publishing for future

SCITECH PUBLICATIONS (INDIA) PVT. LTD.

www.scitechpublications.com

Contents

1	Introduction to Statistics and Probability	1.1 - 1.201
1.1	Introduction	1.1
1.1.1	First type	1.1
1.1.2	Second type	1.2
1.2	Main divisions of Statistics	1.3
1.3	Functions of Statistics	1.4
1.4	Importance of Statistics	1.6
1.5	Limitations of Statistics	1.11
1.6	Collection of Data	1.12
1.6.1	Primary and secondary data	1.12
1.6.2	Methods of collecting primary data	1.13
1.6.3	Drafting a questionnaire	1.16
1.7	Collection of Secondary Data	1.18
1.8	Classification of Data	1.20
1.9	Frequency Distribution	1.21
1.9.1	Formation of discrete frequency distribution	1.22
1.9.2	Formation of a continuous frequency distribution	1.23
1.10	Diagrammatic and Graphic Presentation of Data	1.28
1.10.1	Diagrams	1.29
1.10.2	Bar diagrams	1.29
1.10.3	Pie diagram	1.32
1.10.4	Graphs of frequency distributions	1.33
1.10.5	Theoretical frequency curves	1.38
1.10.6	Cumulative frequency curves or Ogives	1.40
1.11	Descriptive Statistics	1.43
1.11.1	Measures of central tendency	1.44
1.11.2	Arithmetic mean	1.44
1.11.3	Median	1.54
1.11.4	Mode	1.57
1.12	Measures of Dispersion	1.63
1.13	Coefficient of Variation	1.66
1.14	Quartile Deviation	1.68
1.15	Skewness, Moments and Kurtosis	1.69

1.15.1	Definition	1.70
1.15.2	Measures of skewness	1.73
1.15.3	Relative measures of skewness	1.74
1.16	Moments	1.85
1.16.1	Moments about the mean	1.86
1.16.2	Moments about an arbitrary origin	1.87
1.16.3	Moments about zero	1.88
1.16.4	Coefficients of skewness based on moments	1.92
1.17	Kurtosis	1.93
1.18	Probability and Statistics for Managers	1.103
1.19	Introduction to Probability	1.103
1.20	Basic Concepts of Probability Theory	1.103
1.21	Axioms of Probability	1.106
1.22	Conditional Probability and Independence	1.120
1.23	Total Probability Theorem and Baye's Theorem	1.135
1.23.1	Total probability theorem	1.135
1.23.2	Baye's theorem	1.135
1.24	Random Variables	1.148
1.24.1	Discrete random variable	1.148
1.24.2	Probability mass function	1.148
1.24.3	Continuous random variable	1.148
1.24.4	Probability density function	1.149
1.24.5	Cumulative distribution function (c.d.f)	1.149
1.25	Mathematical Expectation	1.160
1.26	Standard Distributions	1.164
1.26.1	Binomial distribution	1.164
1.26.2	Poisson distribution	1.175
1.26.3	Normal distribution	1.182
1.26.4	The standard normal distribution	1.182
1.26.5	Uniform distribution	1.193

2 Sampling Distribution and Estimation

2.1-2.60

2.1	Introduction	2.1
2.1.1	Parameter and statistic	2.1
2.1.2	Sampling distribution and sampling error	2.2
2.1.3	Uses of standard error	2.2
2.1.4	Testing of hypothesis	2.3
2.1.5	Tests of significance	2.3
2.1.6	Type I and Type II errors	2.4

2.1.7	Critical region and level of significance	2.5
2.1.8	One tailed and two tailed tests	2.5
2.1.9	Critical values or significant values	2.6
2.1.10	Procedure for testing the hypothesis	2.7
2.2	Types of Sampling Methods	2.8
2.2.1	Simple random sampling	2.8
2.2.2	Systematic sampling	2.9
2.2.3	Stratified sampling	2.9
2.2.4	Cluster sampling	2.10
2.2.5	Judgement sampling and Quota sampling	2.10
2.3	Sampling and Non-Sampling Errors	2.10
2.4	Sampling Distribution of the Mean	2.11
2.5	Sampling distribution of the Difference between two means	2.16
2.6	Sampling Distribution of Proportions	2.19
2.7	Sampling Distribution of the Difference of Two Proportions	2.19
2.8	Central Limit Theorem	2.23
2.9	Estimation	2.26
2.9.1	Point estimation	2.26
2.9.2	Interval estimation	2.27
2.9.3	Characteristics of a good estimator	2.27
2.10	Confidence Interval for the Population Mean for Large Samples (when σ is known)	2.31
2.11	Confidence Interval for the Population Mean for Small Samples (when σ is unknown)	2.34
2.11.1	The t-distribution	2.34
2.12	Confidence Interval for the Difference between Two Population Means for Large Samples (when σ is know)	2.37
2.13	Confidence Interval for the Difference between Two Population Means for Small Samples (when σ is unknown)	2.39
2.14	Confidence Interval for the Population Proportion for Large Samples	2.40
2.15	Confidence Interval for the Difference between Two Population Proportions for Large Samples	2.44
2.16	Determining the Sample Size [Using Confidence Interval]	2.46

3 Tests of Hypothesis

3.1 - 3.153

3.1	Test of Significance for Large Sampling Theory	3.1
3.2	Testing of Hypothesis about a Population Proportion	3.2
3.3	Testing Hypothesis about the Difference between Two Proportions	3.13

3.4	Testing Hypothesis about Population Mean	3.23
3.5	Testing Hypothesis about the Difference between Two Means	3.28
3.6	Testing Hypothesis about the Difference Between two Standard Deviations	3.39
3.7	Tests of Significance for Small Sampling Theory	3.45
3.8	Test of Hypothesis about the Population Mean	3.48
3.9	Test of Hypothesis about the Difference between Two Means (Using t -test)	3.53
3.10	Paired t -Test for Difference of Means	3.60
3.11	Testing the Hypothesis for Equality of Two Variances	3.65
3.12	Chi-Square Distribution	3.72
3.13	χ^2 - Test of Goodness of Fit	3.74
3.14	χ^2 - Test of Independence of Attributes	3.82
3.15	Chi-Square Test for a Population Variance	3.91
3.16	Design of Experiments	3.102
3.17	Completely Randomized Design (CRD) (or) One - Way Classification	3.106
3.18	Randomised Block Design (RBD) (or) Two-Way Classification	3.118
3.19	Latin Square Design (LSD)	3.135

4 Non-Parametric Methods

4.1 - 4.75

4.1	Introduction	4.1
4.2	Uses of Non-Parametric Methods	4.2
4.3	Sign Test	4.3
4.3.1	The sign test for paired data	4.3
4.3.2	One Sample Sign Test	4.9
4.4	Rank-Sum Tests	4.13
4.4.1	Mann-Whitney U-Test	4.14
4.4.2	Working Rule	4.14
4.4.3	Kolmogorov - Smirnov Test	4.28
4.4.4	Kruskal-Wallis test or H-test	4.32
4.5	One Sample Run Test	4.44
4.5.1	Working rule	4.44
4.6	Rank Correlation	4.54
4.6.1	Repeated ranks	4.55
4.7	Test for Rank Correlation Coefficient	4.60

5 Correlation, Regression, Time Series Analysis and Index Numbers

5.1 - 5.124

5.1	Correlation and Regression	5.1
5.1.1	Scatter Diagram	5.1
5.1.2	Karl Pearson's co-efficient of correlation (Product moment correlation co-efficient)	5.2
5.1.3	Properties of correlation coefficient	5.3
5.1.4	Calculation of co-efficient of correlation for a bi-variate distribution	5.4
5.1.5	Regression	5.5
5.1.6	Lines of regression	5.5
5.1.7	Regression Equations	5.6
5.1.8	Angle between regression lines	5.7
5.2	Time Series Analysis	5.35
5.2.1	Components of time series	5.36
5.2.2	Preliminary adjustments before analysing time series	5.38
5.2.3	Mathematical models for analysis of time series	5.39
5.3	Secular Trend	5.40
5.3.1	Freehand or graphic method	5.40
5.3.2	Method of semi averages	5.42
5.3.3	Method of moving averages	5.46
5.3.4	Method of least squares	5.50
5.3.5	Fitting a straight line using the method of least squares	5.50
5.3.6	Fitting a Second degree parabola	5.50
5.3.7	Fitting an exponential curve	5.51
5.4	Measurement of Seasonal Variations	5.62
5.4.1	Method of simple averages	5.63
5.4.2	Ratio to trend method	5.66
5.4.3	Ratio to moving average method	5.70
5.4.4	Link relative method	5.79
5.5	Cyclical Variations	5.86
5.5.1	Residual method	5.86
5.5.2	Direct method	5.86
5.5.3	Reference cycle analysis	5.86
5.5.4	Harmonic analysis	5.87
5.6	Irregular Variations	5.87
5.7	Index Numbers	5.87
5.7.1	Characteristics of index numbers	5.88
5.7.2	Uses of index numbers	5.89

5.7.3	Problems in the construction of index numbers	5.90
5.8	Methods of Constructing Index Numbers	5.92
5.9	Tests of Consistency and Adequacy	5.98
5.10	Cost of Living Index	5.105

Appendix

A.1 - A.8

University Questions Solved Papers

UQ.1 - UQ.156

Bibliography

SCITECH