

STATS BOOK CONTENTS

CHAPTER 1 - INTRODUCTION

Uncertainty in data, confidence and decision-making, predicting the future, summary of the book.

CHAPTER 2 - THE PRESENTATION OF DATA

Scatter plots, histograms, dot-plots, column and bar charts, pie charts, box plots, error bars, 3D plots, size distributions, mineral composition, liberation data, geometallurgical data, tables, filtering, pivot tables, PowerPoint.

CHAPTER 3 - UNCERTAINTY IN DATA: THE NATURE AND CONSEQUENCE OF EXPERIMENTAL ERROR

Precision and accuracy, error and the normal distribution, sources of experimental error, populations and samples, confidence intervals, error propagation, outliers and their rejection, strategies for reducing uncertainty

CHAPTER 4 - COMPARING QUANTITIES

Principles of hypothesis tests, t-tests for means, size of sample for t-tests, power, F-test for variances, 1-way ANOVA, χ^2 -test for count data, non-parametric tests.

CHAPTER 5 - BUILDING AND EVALUATING REGRESSION MODELS

Correlation, simple linear regression (trendline), judging the simple linear regression, multiple linear regression, judging the multiple linear regression.

CHAPTER 6 - MORE ABOUT REGRESSION MODELS

Improving the model, transformation of variables, comparing two trendlines, non-linear regression, weighted regression, regression traps for the unwary, aids to model-building, choosing the best model, three modelling case studies.

CHAPTER 7 - DESIGNING EFFICIENT EXPERIMENTS

Features of good experimental design, randomised block designs, analysis of covariance, factorial experiments, response surface designs.

CHAPTER 8 - DESIGNING, RUNNING AND ANALYSING PLANT TRIALS

Trials using formal experimental designs, analysing informal trials by modelling, cusum charts, the reference distribution, comparing process variability, practical considerations in running plant trials.

CHAPTER 9 - THE ANALYSIS OF TIME SERIES DATA

Features of time series, stationarity, autocorrelation and the correlogram, the variogram, time series models.

CHAPTER 10 - MULTIVARIATE ANALYSIS

Principal components analysis (PCA), cluster analysis, binary logistic regression, multivariate ANOVA (MANOVA).

CHAPTER 11 - PERFORMANCE MONITORING AND OPTIMISATION

Statistical process control (SPC), evolutionary operation (EVOP and SSDEVOP), response surface optimisation, particulate tracer testing.

CHAPTER 12 - STATISTICS FOR CHEMISTS AND MINERALOGISTS

Statistical behaviour of assays, laboratory quality control, statistics of mineral point counting and liberation analysis.

CHAPTER 13 - OTHER TOPICS OF INTEREST

Mass balancing, Monte Carlo simulation, bootstrapping and resampling, sampling of particulate analysis (Gy formula), size distributions, mean sizes and surface area, Six Sigma, Box-Cox transformations.

CHAPTER 14 - A ROADMAP FOR COLLECTING AND ANALYSING DATA

General principles, preliminary data analysis by plotting, choosing an experimental design and/or analysis method, method selection charts.

APPENDIX 1: TABLES (normal distribution, t-distribution, Grubbs' test for outliers)

APPENDIX 2: PROTOCOL FOR CONDUCTING MINERAL PROCESSING EXPERIMENTS (Proforma)

APPENDIX 3: SOME USEFUL STATISTICAL DISTRIBUTIONS (normal, log-normal, Weibull, binomial, Poisson)

APPENDIX 4: WEB RESOURCES

APPENDIX 5: THE MATHEMATICS OF LINEAR REGRESSION

APPENDIX 6: FORMULAS FOR THE COMPARISON OF TWO TRENDLINES

APPENDIX 7: GLOSSARY OF TERMS

REFERENCES

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