

DOE Course Content

Section 1. Statistical Methods - "A Review"

1.1. Statistical Thinking

1.2 Descriptive Statistics

1.2.1. Statistics that Measure Center or 'Location' of the Data Set

1.2.2. Statistics that Measure the 'Dispersion' or Variability of the Data Set

Section 2. Probability Density Functions

2.1. Discrete Density Functions

2.1.1. Binomial Distribution

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2.1.3. Some Discrete Density Functions

2.2. Continuous Density Functions

2.2.1. Normal Distribution

2.2.2. Standard Normal Distribution

2.2.3. Lognormal Distribution

2.2.4. Weibull Distribution

2.2.5. t Distribution or "Student's T Distribution"

2.2.6. Chi-Square Distribution

2.2.7. F Distribution* 'Important for Design of Experiments'

2.2.8. Some Continuous Density Functions

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3.2. Quantile and Q-Q Plots

3.2.1 Percentiles

3.3. Box Plots

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3.5. Enumerative and Analytical Statistical Studies

3.6. Select References

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4.1.1 For JMP Users

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Section 5. Hypothesis Testing, Type I Error, and p-values

5.1. Hypothesis Testing

5.2. Level of Significance

5.3. Confidence Intervals

5.3.1. Confidence Interval for μ when σ^2 is known

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5.4. Significance Tests on the Mean when σ^2 is unknown

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5.4.2. Hypothesis Test Exercise

5.5. Post-hoc Analysis Comparison Tests

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5.5.3. Paired Sample t-test.

5.5.4 One and Two-Tailed t-tests

5.6. F test - "Important for ANOVA"

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6.2. Introduction to Modern Design

6.3. Key Design Principles

6.4. Example: Experiments with a Single Factor

6.5. Analysis of Variance (ANOVA)

6.6. General Linear Model (GLM)

6.7. Example: General Linear Model (GLM) - ANOVA

6.8. Assumptions of ANOVA

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6.9. Sums of Squares

6.10. One-Way ANOVA Computational Approach

6.10.1. Cochran's Theorem

6.10.2. Example: Single Factor One-Way ANOVA (Random Run Order)

6.10.3. Example: Single Factor One-Way ANOVA

6.10.4. Minitab Example: Single Factor Experiment

6.10.5. Additional Exercises

6.11. Example: Helicopter Experiment

6.12. Full Factorial Designs Two-Way ANOVA

6.12.1. Two-Factor "Full Factorial Design"

6.12.2. Example: "Two-Factor, Fixed Effects Model"

6.12.3. JMP Example: Two-Factor, Fixed Effects Model

6.12.4. Minitab Two Factor Fixed Effects Example – Battery Life

6.12.5. Exercise: Helicopter Experiment Two Factors

6.13. 'Three Factor Fixed-Effects' Model

6.14. ANCOVA - Designing Experiments with 'Covariates'

6.14.1. JMP Example: Designing Experiments with Covariates

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6.15.1. 'Yates Notation' for 2^3 Design

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8.1. The Use of Operating Characteristic (OC) Curves

8.2. Sample Size Determination using Minitab

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9.3. Example: RCBD for Two-Factor using JMP and Minitab

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10.2 ‘2-Level’ Split Plot in JMP

10.3 ‘3-Level’ Split-Plot Design (Box et al. 2005)

10.4. Box et al. (2005) example in JMP

10.5 Split-Plot Design “Industrial Engineered Panel Application”

Exercise 10.5.1. Analyze ‘3-level’ split plot in JMP

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12.2. Orthogonal Arrays (OA)

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12.4. Limitations of the Taguchi Method

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12.6. JMP Example: Taguchi Philosophy

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12.8. Exercise: Helicopter Experiment with “Induce Noise”

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13.2. One-Half Fraction of the 2^k Design “Design Resolution”

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15.2. The Central Composite Design or CCD

15.2.1 Axial Points in Central Composite Designs

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16.2. Simplex and Centroid Designs - 3 Component Mixture Designs

16.3. Extreme Vertices Designs – Constrained Mixture Designs

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16.5.1. Minitab – ‘Fondue’ Example

Section 17. DOE Flow Chart Guide (Fixed Effects)

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