EDUCATION 257      Winter-Spring 2005

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note: NWK chapter cites to fourth ed.; corresponding ver5 added alongside

I. Design and Analysis of Comparative Studies (Experiments)

A. Introduction and review. Factorial Designs
1. Comparing group outcomes on a single classification: One-way analysis of variance
2. Multiple comparisons in one-way anova
3. Two-way fixed effects anova and interactions

NWK readings for intro factorial designs
one-way anova NWK 16.1-16.9 ver 4; 16.1-16.6 ver5
post hoc pairwise comparisons NWK 17.4-17.5 ver4 and ver5;

B. More Factorial Designs
1. Random and mixed anova models (multiple comparisons, variance component estimation)
2. Unbalanced designs
3. k-way classifications
4. Design--Sample size and power
5. Randomized block designs (including Latin Squares)

NWK readings for more factorial designs
mixed and random 2-way NWK 24.2-24.4 ver4; 25.2-25.4 ver5
one observation per cell NWK 21.1-21.2 ver4 and ver5
Unbalanced two-way designs NWK 22.1, 22.2, 22.6 24.6 ver 4; 23.1, 23.2, 23.6 23.6 ver5;
three-way factorial designs NWK 23.1-23.6, 24.5 ver4; 24.1-24.5, 25.6 ver5
planned (orthogonal) comparisons NWK 17.3 ver4 and ver5
design and sample size NWK 26.1-26.5 ver4; 16.10,16.11, 19.11, 24.7 ver5
randomized block designs NWK 27.1-27.7, 30.1-30.2 ver4; 21.1-21.9, ver5

C. Nested and Repeated Measures Experimental Designs
1. Nested designs
2. Repeated measures designs

NWK readings for nested and repeated measures designs
repeated measures designs NWK 29.1-29.4 ver4; 27.1-27.4 ver5

II. Analysis of Association: Correlation and Regression

Review
Correlation and Straight-line regression

A. Basic Regression Models
1. Multiple regression
2. Polynomial regression
3. Model violations and transformations
Note: readings for introductory regression lectures Part A
Review: Straight-line regression NWK Ch 1-4 ver4,5

Multiple Linear Regression
Basic fit: Inference for params & fit Ch.6 ver4,5
R-sq, adj R-sq pp230-1 ver 4; 226-7 ver 5
Adjusted Variable Interpretation (partial regr) sec 9.1 ver 4; sec 10.1 ver5 (added-variable plots)
Testing composite Hypoth sec 7.1-7.3 ver4,5
partial part correl sec 7.4 ver4,5
standardized coeff sec 7.5 ver4,5
polynomial regr sec 7.7 ver4; sec 8.1 ver5
Inference for correlations sec 15.4 640-643 ver 4; sec 2.11 ver5
Problems
heteroskedascity sec 10.1 ver 4; 11,1 ver 5; autocorrelation ch12.1-12.4 ver4,5;
multicollinearity sec 7.6 ver4,5, VIF sec 9.5, 10.2 ver 4; sec 10.5 ver5
outliers, residuals sec 9.2 ver4; sec10.2 ver5

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B. Regression Models with Categorical Variables
1. Reformulation of anova models
2. Analysis of covariance & alternatives

Note: readings for regression lectures Part B: categorical predictor vars,
Qualitative predictors: NWK Ch 11 ver 4, Chap 8 ver5 ;
Ancova (via anova models)NWK Ch 25 ver4, Ch 22 ver 5
Qualitative predictors:
0,1 dummy vars, reg params sec 11.1 p456- ver4; 8.3 p.313- ver5
non-parallel regrs sec 11.2 ver4, sec8.4,8.5 ver5
regr approach to ancova, more than 2 groups sec 11.3 ver 4, sec8.6 ver5
anova one-way sec 16.11, 2-way sec 19.7 p.832 ver 4
sec 16.8 ver5
Ancova
reduction of error var sec 25.1 ver4, 22.1 ver5
single factor sec 25.2, crackers ex sec25.3 ver 4, 22.2,3 ver5

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C. Building Regression Models
1. Variable Selection and Model Construction:
   Statistical algorithms, stepwise regression, best subsets
   Composites and variable reduction (including principal components)
2. Model building by "theory", Intro Path Analysis and LISREL (see ed260 page, Rogosa "casual models")
3. Regression models with hierarchical data

Note: readings for regression lectures Part C: Model Building,
stepwise, best subsets, "automatic" NWK 8.1-8.5 ver 4, 9.1-9.5 ver 5
cross-validation NWK 10.5-10.7 ver 4, 9.6 ver 5
advanced topics: path analysis, hierarchical data see ed260 page

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III. Analysis of Categorical Data

A. Proportion and Count Outcomes:
   Intro and Review: Bernoulli, Binomial, Multinomial, and Poisson distributions; inferences for
   proportion and count data;
   Univariate Categorical Data; Logit and odds transformations;
   Generalized Linear Models: Logistic and Poisson Regression
   Readings for IIIA
   NWK Ch.14, ver4, ver5 Logistic regression, Poisson Regression
   Agresti Ch.1 (proportions and counts); 4, 5, 8 (logistic, poisson regression); 10 (history)

B. Statistical Modelling, Estimation, and Inference for Multivariate Categorical Data
   Review: Basic contingency Tables
Odds-ratios, conditional and marginal independence, Simpson's Paradox,
Cochran-Mantel-Haenszel for meta-analysis,
Log-linear models for Multi-way Contingency Tables,
Associations among ordinal variables
Agresti Ch. 2, 3, 6, 7, 9.

Additional Readings

**Bringing Evidence-Driven Progress To Education:**


Journal of Educational Statistics, 12, 185-195.

**Guest books**