1. Overview

Types of Studies

- Controlled Experiments ($F = ma, PV = nRT$)
- Controlled Experiments with Supplemental variables
- Confirmatory observational studies
- Exploratory observational studies
- Data Collection and preparation
  - How the data are collected? (Design, Nature of the study)
  - Data consistency. (Plots and numerical summaries, logical relations)
  - Is this data analysis-ready? (Format checking, file conversion, etc.)

– GIGO (Garbage In; Garbage Out.)

- Reduction of explanatory or predictor variables
  Find parsimonious model with good explanatory/prediction power. Trade-off.
- Model refinement and selection
  Choosing from many "good" models, checking the adequacy of the models, sensitivity of the models, fixing the weak spots.
- Model Validation
  OK to explain what's going on? OK to predict what the future will be?

Overview

Selection of Predictors

4. Remedial Measure

For UEQ error variances, high MTCL, INFLU obs

- Contrast to ...
- Weighted LSE, General Error
- MTCL: Ridge Regression:

$$(X'X + cI)^{-1}$$

- Robust Regression
- Nonparametric regression, Boostraping.

5. Model Validation

- Consistency e8 m B T F40 T f 14.5 910oee 14.5N 5.5454 5141