STAT 830
Statistics vs Probability

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STAT 830 — Fall 2013

Purposes of These Notes

- Differentiate Probability from Statistics
- Discuss role of former in latter

Scientific Inference

- Standard view of scientific inference has a set of theories which make predictions about the outcomes of an experiment:

Theory	Prediction
A	1
B	2
C	3

- Conduct experiment, see outcome 2: **infer** B is correct (or at least A and C are wrong).

Scientific Inference with Randomness

Theory	Prediction
A	Usually 1 sometimes 2 never 3
B	Usually 2 sometimes 1 never 3
C	Usually 3 sometimes 1 never 2

- See outcome 2: infer Theory B probably correct, Theory A probably not correct, Theory C is wrong.

Probability Theory versus Statistical Inference

- **Probability Theory**: construct table: compute likely outcomes of experiments.
- **Statistics**: inverse process. Use table to draw inferences from outcome of experiment.
- How should we do it and how wrong are our inferences likely to be?
- Notice: hopeless task unless different theories make different predictions.
- Start with Probability; switch after about 5 weeks to statistics.