

Simple Linear Regression
Week 3 – Thursday
Applied Regression Analysis (STAT 757)

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Tuesday, 4 Feb, 2016



Announcements

David Quammen

Discover Science Lecture Series
7 p.m., TODAY (Feb. 4)
Redfield Auditorium (DMSC 110)



Random Variables & Probability Distributions

What does it mean for X to be a random variable?

- ① X is the outcome of an experiment; a place-holder for a random number.

Random Variables & Probability Distributions

What does it mean for X to be a random variable?

- ① X is the outcome of an experiment; a place-holder for a random number.
- ② X has a *distribution* associated with it.

Random Variables & Probability Distributions

What does it mean for X to have a distribution?

- 1 Distributions describe the propensity for some outcomes to occur more often, or with greater likelihood, than others.

Random Variables & Probability Distributions

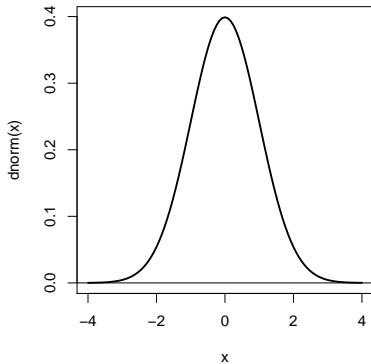
What does it mean for X to have a distribution?

- ① Distributions describe the propensity for some outcomes to occur more often, or with greater likelihood, than others.
- ② When we refer to the distribution, we are referring to a few different, but equivalent, functions!

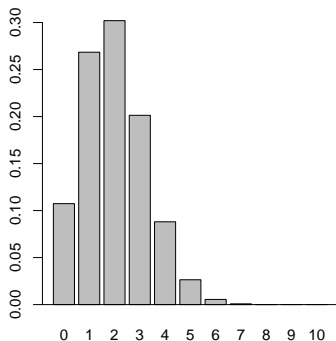
Random Variables & Probability Distributions

Probabilities of events are calculated from either the PDF (continuous) or PMF (discrete):

Normal PDF



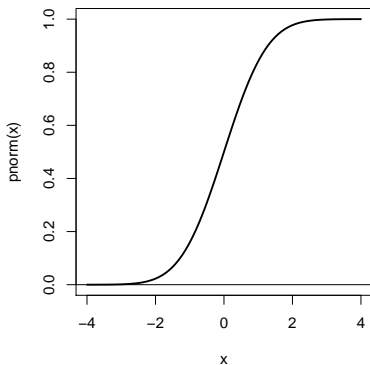
Binomial PMF



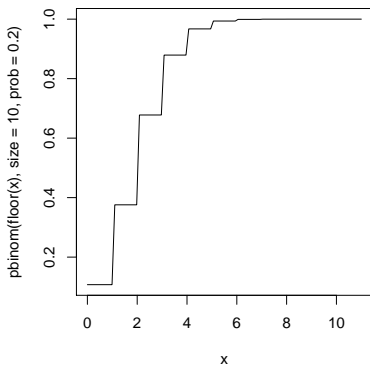
Random Variables & Probability Distributions

If you know the CDF, you know the PDF/PMF, and *vice versa*.

Normal CDF

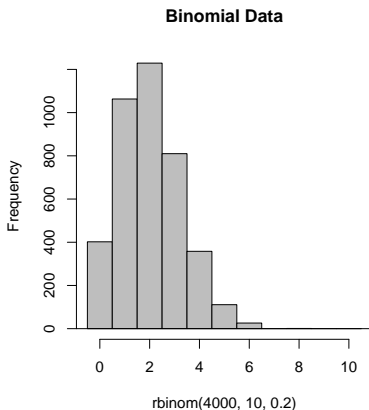
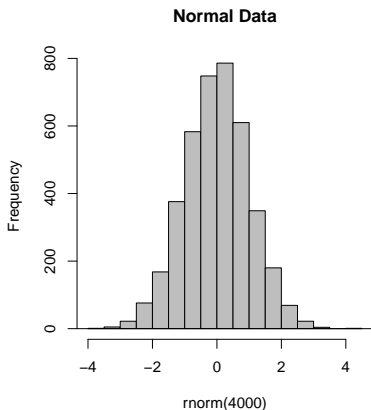


Binomial CDF



Random Variables & Probability Distributions

Histograms of large random samples look like the PDF/PMF!



Estimates vs Estimators?

- ① **Estimators** are *functions of random variables*, and thus are themselves random variables. Rules for calculating...

Estimates vs Estimators?

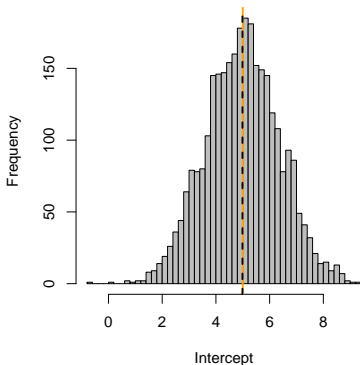
- ① **Estimators** are *functions of random variables*, and thus are themselves random variables. Rules for calculating...
- ② **Estimates**, which are *single numbers*.

Unfortunately, you must rely on context for which $\hat{\beta}$ refers to!

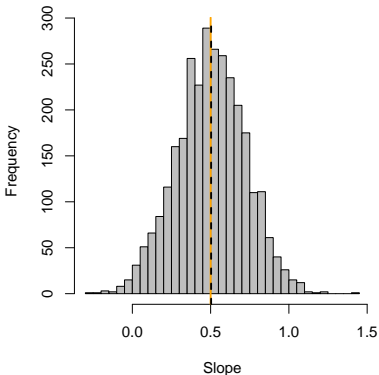
Estimators as random variables

3000 Replicated SLR Estimates (N=10)

Histogram of Intercept

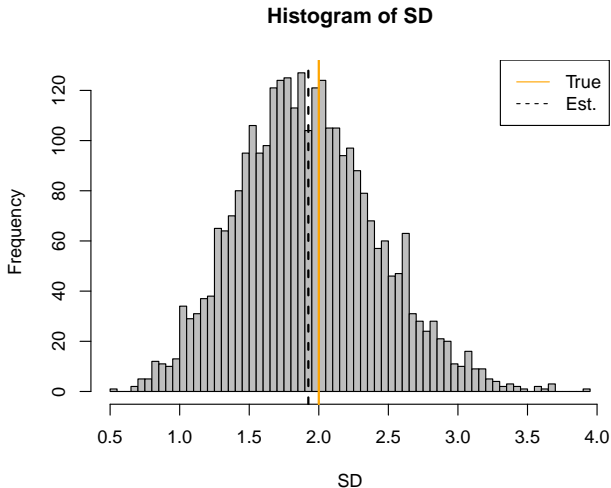


Histogram of Slope



Estimators as random variables

3000 Replicated SLR Estimates (N=10)



Announcements



Distributions



Estimates vs Estimators



Intervals

