POLITICAL SCIENCE 205
INTRODUCTION TO RESEARCH METHODOLOGY

Statistical Inference
Tuesday, January 16

Agenda

I. Probability
II. The Normal Curve
III. Z-Scores
IV. Uncovering Significance

Week 3, Day 1

Probability | The Normal Curve | Z-Scores | Significance

Practicum #1 – Tuesday 1/23

PART A (Paper-and-pencil – 48 points)
3 short answer questions (6 points each)
10 multiple choice questions (3 points each)

PART B (Computer – 18 points)
3 short answer questions (6 points each)

Office Hours
Tu 11:30a-1:00p
Th 11:30a-1:30p

Probability | The Normal Curve | Z-Scores | Significance

Slow down!!!

The quarter *has* jumped into high gear. I'm here to help!

Probability | The Normal Curve | Z-Scores | Significance

Review

Independent Variable: The cause; doing the changing
Dependent Variable: The effect/outcome; being changed
Nominal variable: Non-rankable categories
Ordinal variable: Rankable categories
Interval-ratio variable: "Countable" variables

Level of Measurement	Central Tendency	Variability
Nominal	Mode	Range & standard deviation
Ordinal	Mode	Range & standard deviation
Interval-Ratio	Mean & median (median if outliers exist)	Range & standard deviation

---

Probability | The Normal Curve | Z-Scores | Significance

Lecture Question

How do we know our data represents something significant?

Probability | The Normal Curve | Z-Scores | Significance

Inferential Statistics

What's the best way to draw a sample?

Randomly

Probability | The Normal Curve | Z-Scores | Significance

Random Events

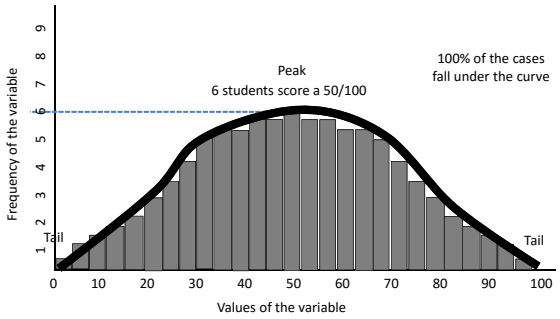
Probability | The Normal Curve | Z-Scores | Significance

Understanding the coin toss

http://justflipacoin.com

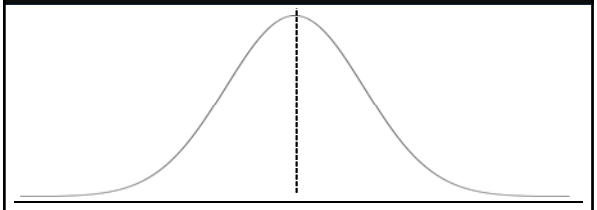
Probability | The Normal Curve | Z-Scores | Significance

Frequency Curves



Probability | The Normal Curve | Z-Scores | Significance

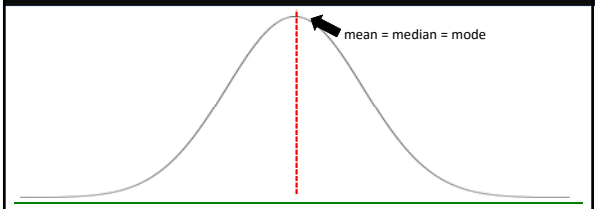
Normal Curve



The normal curve is the type of distribution we would expect in a truly random draw, if everything is held constant, with nothing affecting the data.

Probability | The Normal Curve | Z-Scores | Significance

Normal Curve

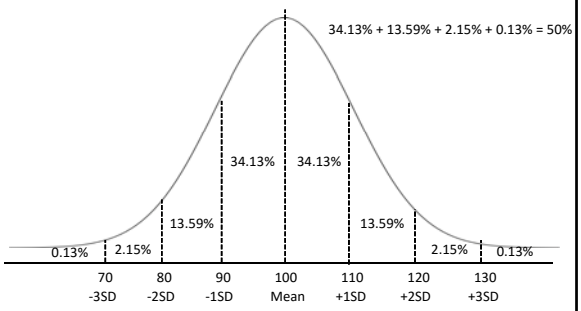


The normal curve has three characteristics:

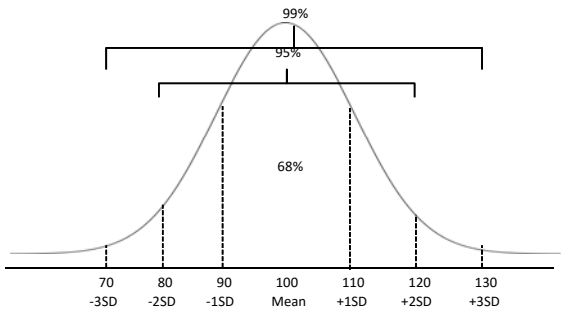
1) Identical central tendency
2) Symmetry
3) Asymptotic

Probability | The Normal Curve | Z-Scores | Significance

Properties of the Normal Curve

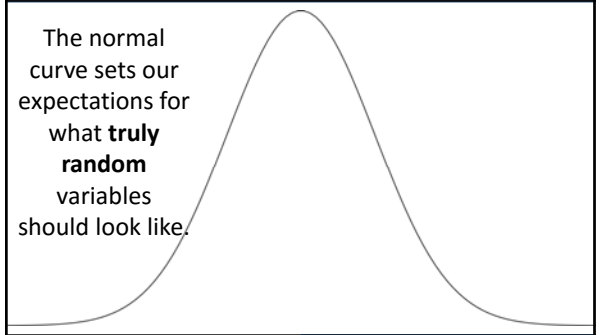


68-95-99 Rule



The Normal Curve

The normal curve sets our expectations for what **truly random** variables should look like.



Comparing Distributions

Bob Terwiliger has 16 years of **education** and a yearly **income** of $75,000.

If the average **education** in America is 13 years and the average **income** is $60,000, which of the two variables is this guy "more average"?

Z-Scores

Z-scores: A standardized measure that uses the normal curve to allow us to compare values of different variables.

$$z = \frac{(X - \overline{X})}{s}$$

The Z-Score Equation

$$z = \frac{(X - \overline{X})}{s}$$

z = z-score

X = individual score

$\overline{X}$ = mean of variable

s = standard deviation

The Z-Score Equation

quiz	$\overline{X}$	$X - \overline{X}$	$\frac{(X-\overline{X})}{s}$
9	7	2	0.64
10	7	3	0.96
8	7	1	0.32
9	7	2	0.64
7	7	0	0
5	7	-2	-0.64
1	7	-6	-1.93

$$z = \frac{(X - \overline{X})}{s}$$

s = 3.10913

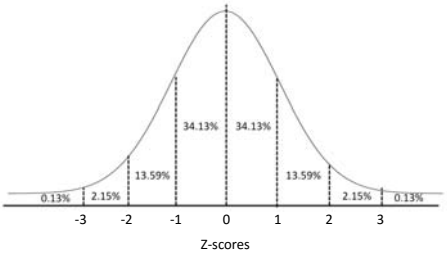
We develop a z-score for each value.

Probability | The Normal Curve | Z-Scores | Significance

Interpreting Z-Scores

$\frac{(X-\bar{X})}{s}$
0.64
0.96
0.32
0.64
0
-0.64
-1.93

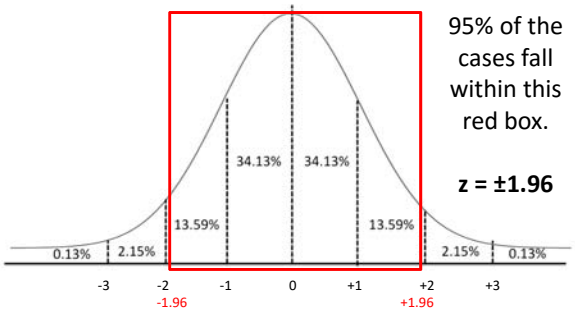
What do these z-scores actually mean?



Appendix B (Page 400)

Probability | The Normal Curve | Z-Scores | Significance

Rule of Thumb



95% of the cases fall within this red box.

z = ±1.96

Probability | The Normal Curve | Z-Scores | Significance

Calculating Z-Scores in SPSS

How do we use SPSS to calculate z-scores?

Probability | The Normal Curve | Z-Scores | Significance

Activity 2: Part B

Probability | The Normal Curve | Z-Scores | Significance

Uncovering Significance

p < .05

The risk associated with not being 100% confident that what you observe is random.

We can do this with individual values on a variable, but what about evaluating a hypothesis?