Data

Professor Jarad Niemi

STAT 226 - Iowa State University

August 22, 2018

Outline

Important terminology/concepts:

- Data
  - Individuals and variables
  - Categorical vs numerical variables
  - Nominal vs ordinal variables
  - Random variables vs observations
- Descriptive vs inferential statistics
  - Population vs sample
  - Parameters vs statistics
- Time series - out of place

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2. Dataset basics - Data types

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The top and bottom portions of the data set that the students collected are reproduced in the following table; dots indicate that the intervening rows in the data set are not displayed. [*Source:* S. Singfat Chu, "Pricing the C's of diamond stones," *Journal of Statistics Education* 9(2) (2001).]

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Note that color purity is a desirable characteristic of a diamond. A grade of D indicates top color purity, a diamond graded E has less color purity than a diamond graded D, a diamond graded F has less color purity than a diamond graded E, and so on. Clarity is also a desirable characteristic. The top clarity rating is IF (internally flawless); other clarity ratings, in descending order, are VVS1, VVS2, VS1, and VS2. (VVS is the notation for "very, very slightly imperfect," and VS is shorthand for "very slightly imperfect.") Certification Body has three different values, which are coded as 1 = Gemological Institute of America, 2 = International Gemological Institute, and 3 = HRD Antwerp.

Category	Region	Subcategory	Revenue	Profit	Cost
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		Business	$400,871	$89,274	
		Literature	$296,229	$57,986	
		Books - Miscellaneous	$315,929	$53,007	
		Science & Technology	$811,787	$184,275	
		Sports & Health	$335,106	$74,724	
Electronics		Audio Equipment	$3,782,832	$633,169	
		Cameras	$5,061,148	$900,830	
		Computers	$1,928,998	$338,585	
		Electronics - Miscellaneous	$4,671,957	$810,424	
		TV's	$3,837,906	$679,393	
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Movies		Action	$617,565	$37,746	
		Comedy	$669,642	$33,243	
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Keyword Set:

buy shoes in Boulder Colorado

Rank:	Site Name	Google Business Photos?	POI Photos	Other Images	Google Reviews	Star Rating	DA	PA	Linked Domains	URL Match?	Domain Age (Years)
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3	Rocky Mountain Kids	NO	0	0	23	4.5	22	34	31	NO	14.7
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Examples:

- height/weight of a person
- temperature
- time it takes to run a mile
- currency exchange rates
- number of webpage hits in an hour

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TL;DR Know the difference between a random variable and an observation (data point) and how to distinguish between them in terms of notation!

- upper case letter $\implies$ not yet observed
- lower case letter $\implies$ observed

Population

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The population is entirely defined by the target group of interest and the purpose of the study!

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Examples (of extremely non-representative) samples:

- students in STAT 226, Section A, Fall 2018 (who came to class)
- Starbucks customers visiting 2302 Lincoln Way, Ames from 11-11:30am today
- Wells Fargo customers visiting 3910 Lincoln Way, Ames, IA 50014 today

https://www.abc15.com/lifestyle/what-too-much-alcohol-can-do-to-your-health:

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Another 2018 study found that consistently drinking a moderate amount of alcohol, within recommended guidelines, had a protective effect on the heart over time. Unstable drinking habits were associated with a higher risk of heart disease, which the authors reflected might indicate broader lifestyle changes, such as poor health or stress. Former drinkers were also at greater risk.

Descriptive versus Inferential Statistics

Definition

Descriptive statistics is the collection, presentation and description of data in form of **graphs**, **tables**, and **numerical summaries** that provide meaningful information about the sample.

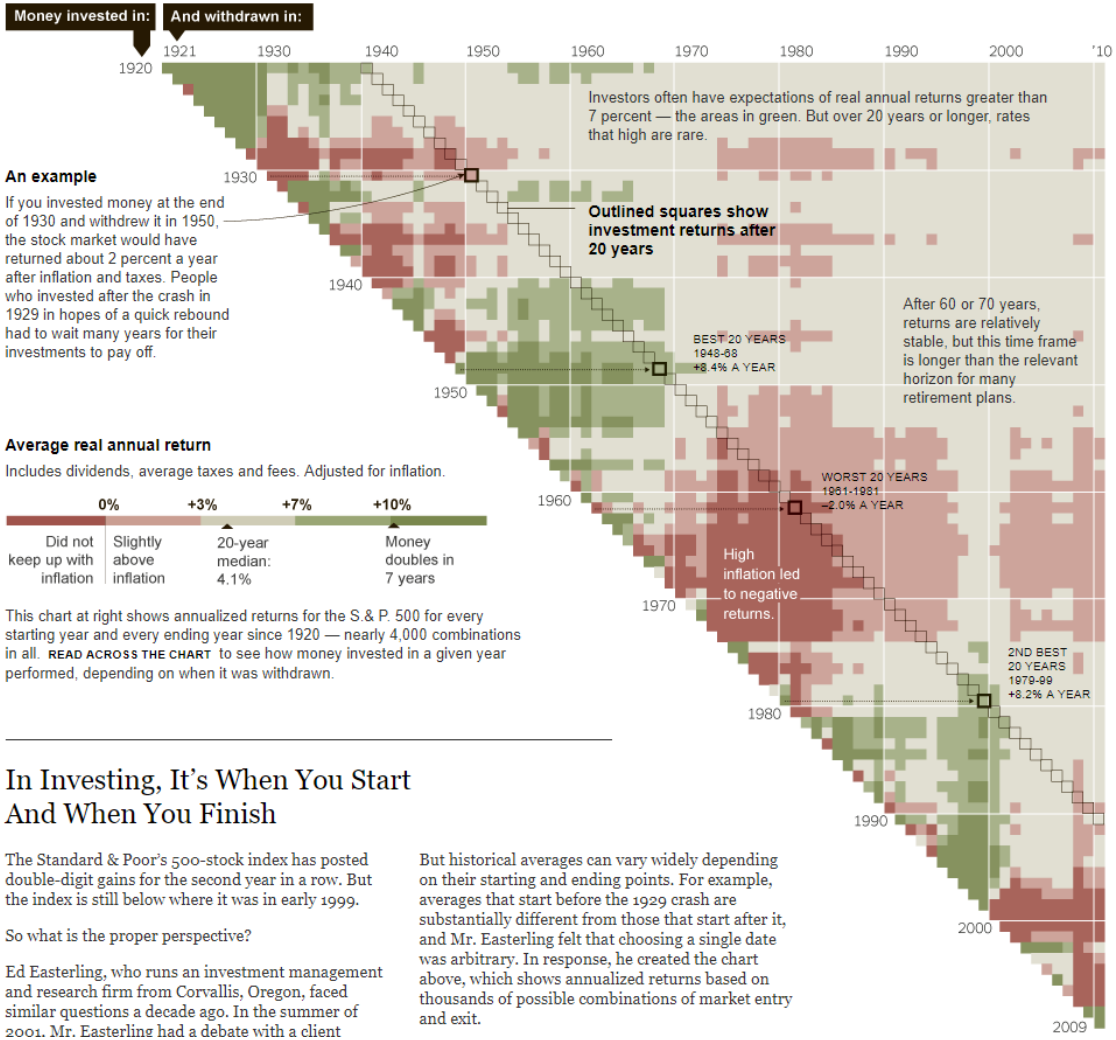
Goals:

- look for patterns
- summarize and present data

Descriptive statistics focuses on obtaining a better understanding about the **distribution**, **variability**, and **central tendency** that a variable of interest exhibits.

Geomorphological Structure Type	Area (km^2)	Area (acres)	% of Total Reef Area
Total Coral Reef and Hardbottom	**74.8**	**18473.1**	**68.8**
Pavement	48.5	11981.7	44.6
Aggregate Reef	17.1	4221.7	15.7
Spur and Groove	5.5	1353.4	5.0
Rubble	1.6	384.9	1.4
Aggregated Patch Reef	0.9	217.0	0.8
Rock/Boulder	0.5	115.2	0.4
Individual Patch Reef	0.5	113.2	0.4
Scattered Coral/Rock	0.3	86.0	0.3
Total Unconsolidated Sediment	**33.9**	**8376.5**	**31.2**
Sand	33.4	8251.9	30.7
Mud	0.5	124.6	0.5
Total Reef Area	**108.7**	**26872.1**	**100.0**

Table B. Thematic content summary of geomorphological structure



In Investing, It's When You Start And When You Finish

The Standard & Poor's 500-stock index has posted double-digit gains for the second year in a row. But the index is still below where it was in early 1999.

So what is the proper perspective?

Ed Easterling, who runs an investment management and research firm from Corvallis, Oregon, faced similar questions a decade ago. In the summer of 2001, Mr. Easterling had a debate with a client

But historical averages can vary widely depending on their starting and ending points. For example, averages that start before the 1929 crash are substantially different from those that start after it, and Mr. Easterling felt that choosing a single date was arbitrary. In response, he created the chart above, which shows annualized returns based on thousands of possible combinations of market entry and exit.

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- making statements about the population
- making data-based decisions

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A Low-Carb Diet Could Cut 4 Years Off Your Life, So Just Eat the Damn Pasta

Keto dieters, be warned.

Statistic

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Examples:

- Mean, median, mode
- Tables
- Charts, figures

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Numerical statistics are often used to estimate population parameters.

Iowa Governor - Reynolds vs. Hubbell

RCP Senate Map | Senate Polls | RCP House Map | Generic Vote | RCP Governor Map | Governor Polls | All 2018 Polls

Candidates

Kim Reynolds (R)*
Bio | Campaign Site

Fred Hubbell (D)
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Iowa Snapshot

RCP Ranking: Leans GOP

----------PAST KEY RACES----------

2016: President | Senate | IA-1, IA-3
2014: Governor | IA-1 | IA-2 | IA-3 | IA-4
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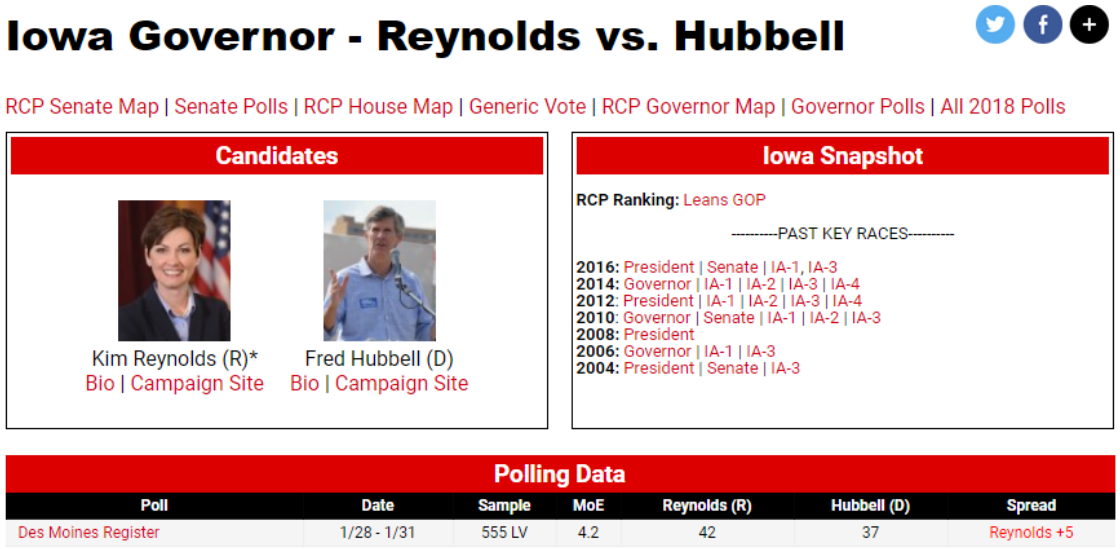
2008: President
2006: Governor | IA-1 | IA-3
2004: President | Senate | IA-3

Polling Data

Poll	Date	Sample	MoE	Reynolds (R)	Hubbell (D)	Spread
Des Moines Register	1/28 - 1/31	555 LV	4.2	42	37	Reynolds +5



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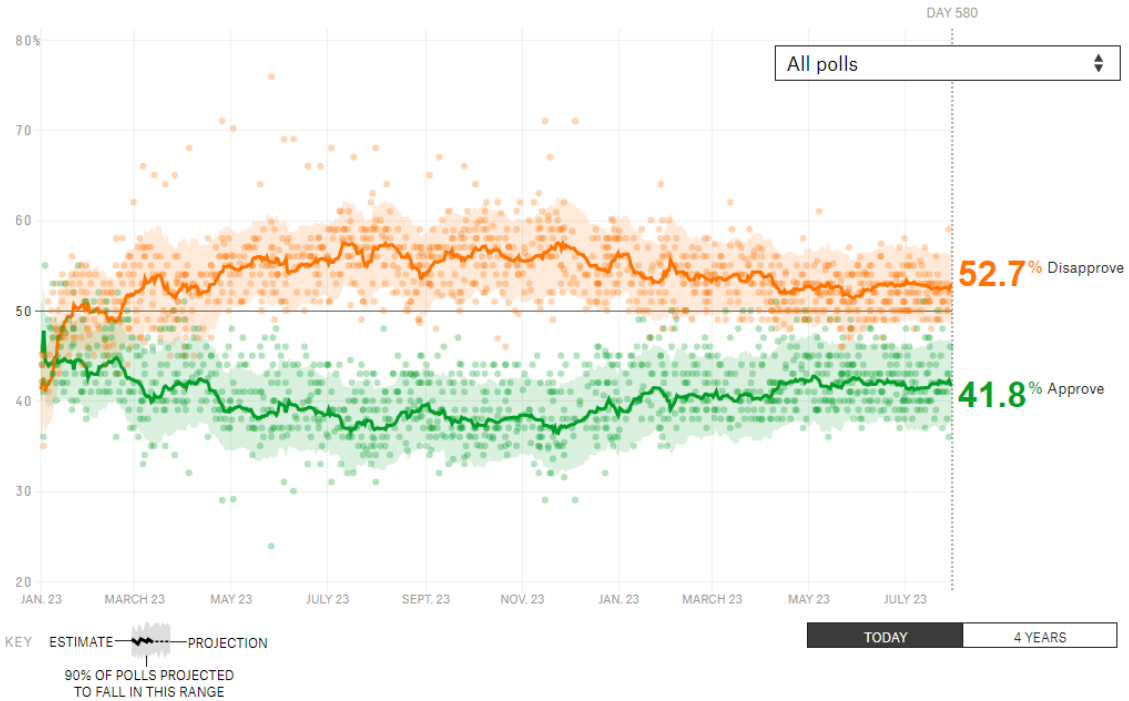

DATES	POLLSTER	GRADE	SAMPLE	WEIGHT	APPROVE	DISAPPROVE	ADJUSTED	
AUG. 19-21	Rasmussen Reports/Pulse Opinion Research	C+	1,500 LV	0.95	46%	52%	41%	52%
AUG. 19-20	YouGov	B	1,000 A	0.30	43%	51%	44%	53%
AUG. 17-20	American Research Group	C+	1,100 A	1.15	36%	59%	38%	56%

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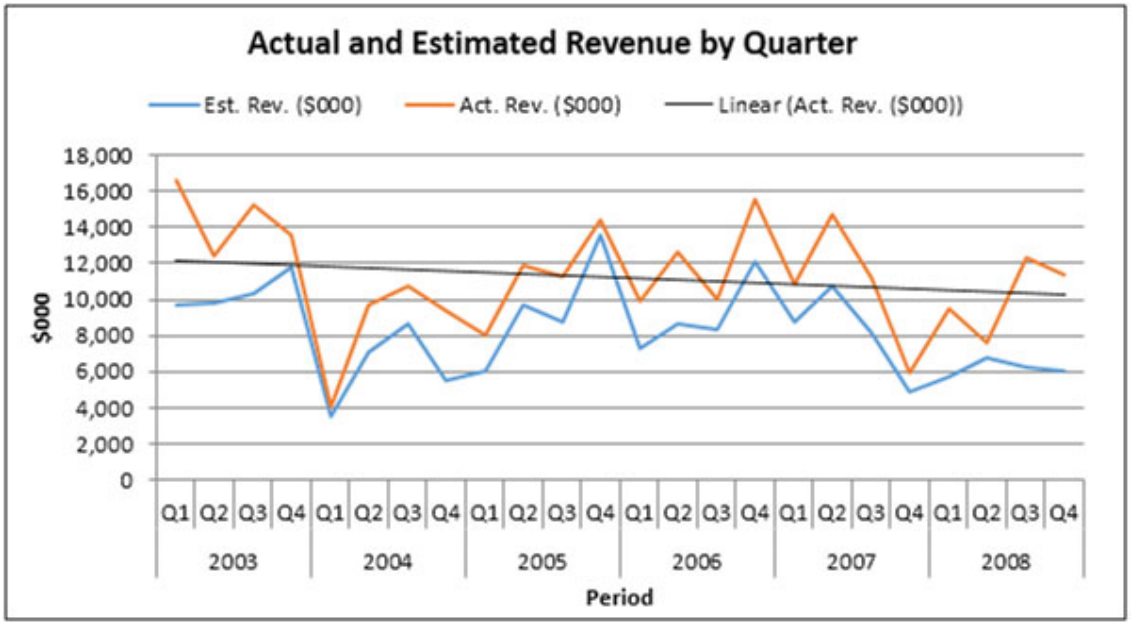
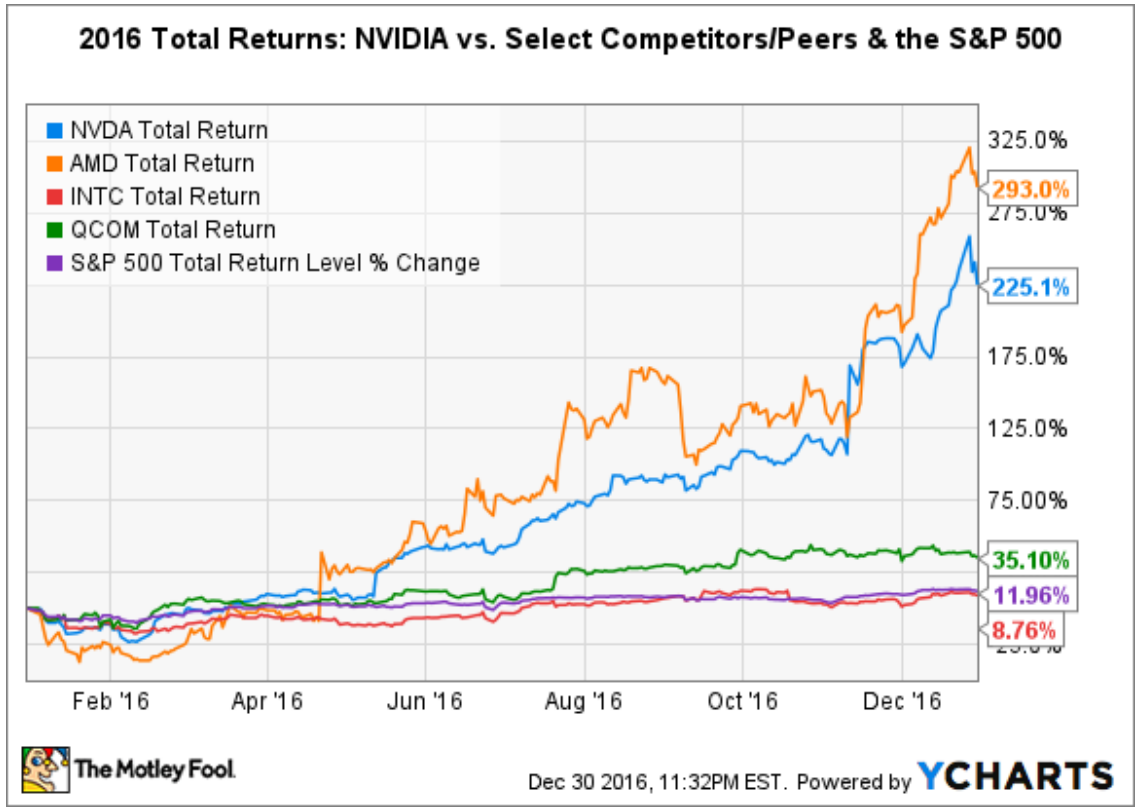
Sometimes, variables are **collected over time.** Typically plot these data as a time series where time is on the x-axis.




2016 Total Returns: NVIDIA vs. Select Competitors/Peers & the S&P 500
NVDA Total Return
AMD Total Return
INTC Total Return
QCOM Total Return
S&P 500 Total Return Level % Change
325.0%
293.0%
225.1%
175.0%
125.0%
75.00%
35.10%
11.96%
8.76%
Feb '16
Apr '16
Jun '16
Aug '16
Oct '16
Dec '16
The Motley Fool
Dec 30 2016, 11:32PM EST. Powered by YCHARTS