Engaging Students in the Time of Business Analytics

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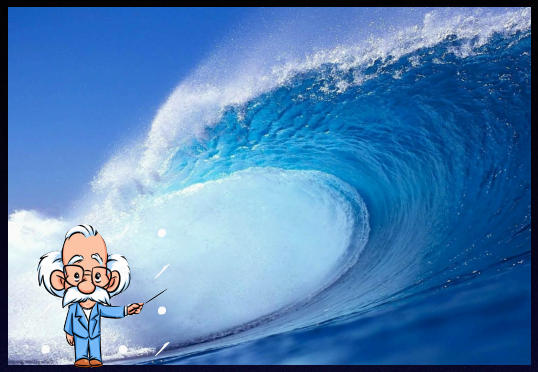
Perspective

- Currently…
  Teaching required undergrad regression
  - "Analytical" regression
  - Focus on answering business questions
  - Emphasize motivation/interpretation/action rather than "theory"
  - Software such as JMP, Excel, StatCrunch
- 3 sections, each with 120 students
  - 1 TA
- Gateway or barrier to later courses…

Business Analytics



- Everywhere
  - Particularly in business schools
  - Elsewhere "Data Science"
- At Wharton
  - New joint Business Analytics concentrations

    Undergraduate
    MBA
  - Attractive STEM field

    Facilitates VISA
  - Soaring enrollment for many courses

    Modern data analytics
    R programming
    Probability… one section @ 30 has grown to 3 @ 65

Challenges to Engagement

- Scale
  - Attention span
  - Phones
  - Behavioral changes

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- Freshmen, sophomores
  - Don't know business: e.g. CAPM, elasticity, …
  - Business Analytics has expanded variation
  - Growing subset of AP students adds yet more

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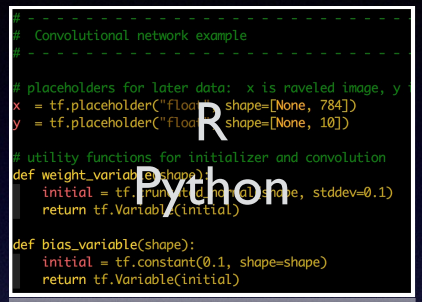
  - Business Analytics has expanded variation
  - Growing subset of AP students adds yet more
- Placement: Statisticians' view of Business Analytics is not the same as recruiters' view

Work backwards through this list…

Bus Analytics ≠ Applied Stat

- Talk to those hiring Business Analytics grads
  - Data manipulation
  - Programming, scripting
  - Problem solving, willing to dive in
  - And, yes, statistical sense for data analysis



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- Wharton concentration
  - Joint concentration with "Decision Science"
  - Deliberate distinction from Stat concentration

    Probability course is not in the concentration!
  - Mixture: Data collection, Data analysis, Optimization

OID

- Lesson: Collaboration enhances marketable skills

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- Undergraduate business program
  - Revised undergrad curriculum
  - First year exploration
  - Second and third year skills
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- Capstone course
  - Limited size, group project
  - Blend knowledge from various courses
  - Application field project

    Hard to find, harder to sustain over time…

- Lesson: More collaboration!

Engagement at Scale

- Compelling examples are key
  - Distract from those phones as well…
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Engagement at Scale

- Compelling examples are key
  - Distract from those phones as well…
  - Compelling for MBA ≠ Compelling for Undergrad
- Topical examples
  - Themselves
  - Contemporary issues
- Software
  - Not teaching programming

    At least not at the introductory level!
  - Jazzy animation

Examples that click

- Student generated data
  - Number text messages, male vs female
  - Hard to manage (much less grade) at scale

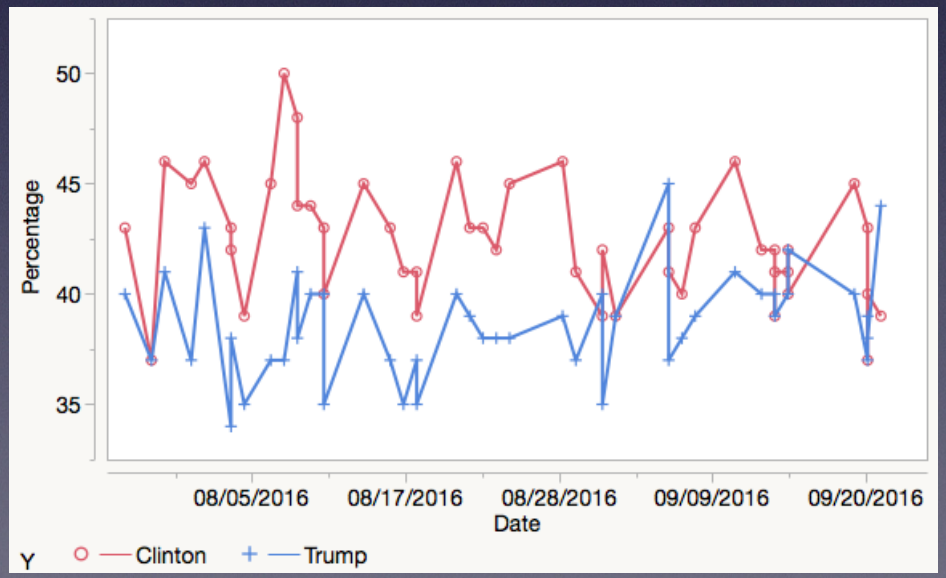
projects

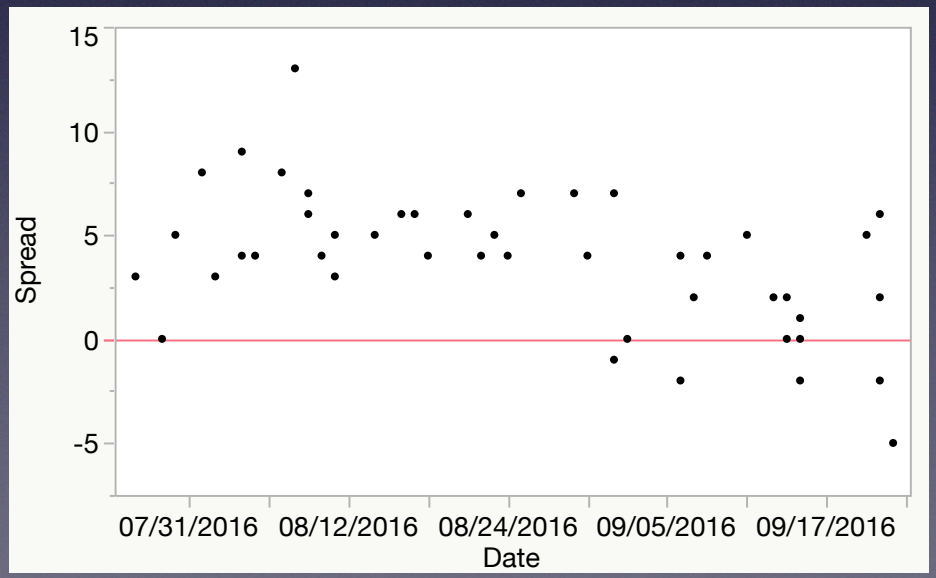
Examples that click

- Student generated data
  - Number text messages, male vs female
  - Hard to manage (much less grade) at scale projects
- Substantive examples
  - Contemporary: Election surveys, sports
  - Climate change
  - Crime rates
  - Wage discrimination
- "Eye candy" examples
  - Macroeconomic data

Election Surveys

- Topic
  - Data collection, survey design/execution
  - Sampling variation
- Example
  - Surveys prior to recent election

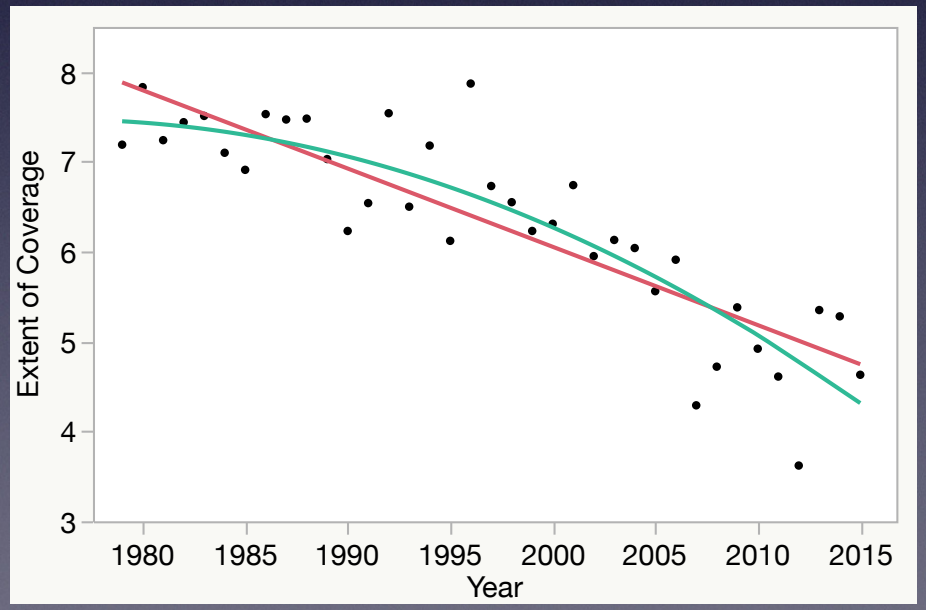




Not just the data, but what you say about data.

Climate Change

- Topic
  - Polynomial trends, time series
- Example
  - Arctic ice extent (million km^2)



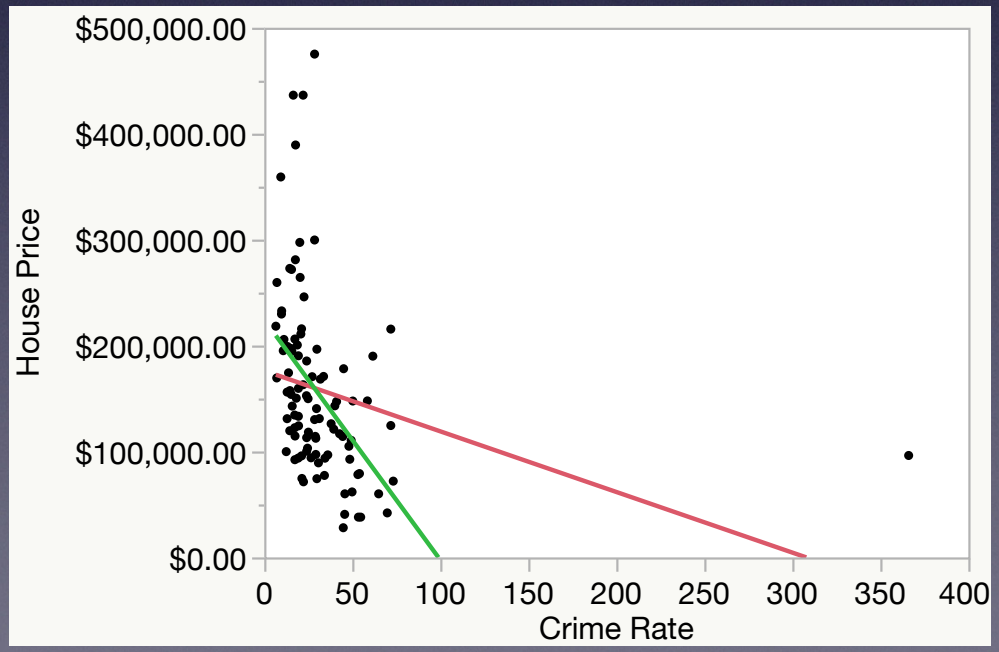
Linear or Quadratic?

Assumptions?

Again how you frame data matters.

Crime Rates

- Topic
  - Leveraged outliers
- Example
  - Association between crime rates and housing values in communities in Philadelphia area



Where is that?
Why is it so different?

Crime Rates

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  - Leveraged outliers, nonlinear trends
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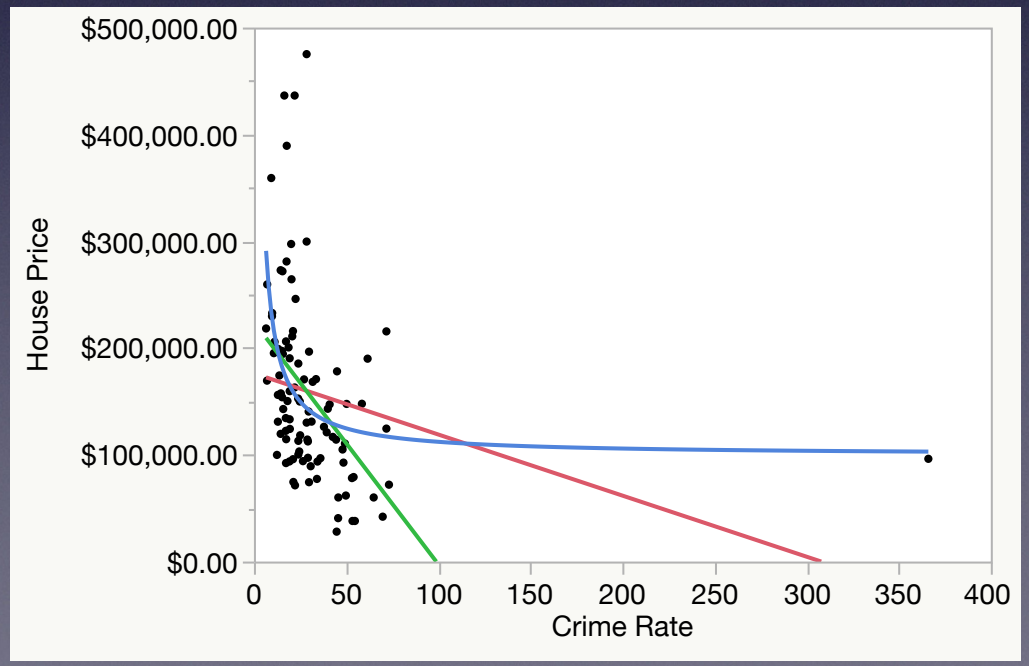

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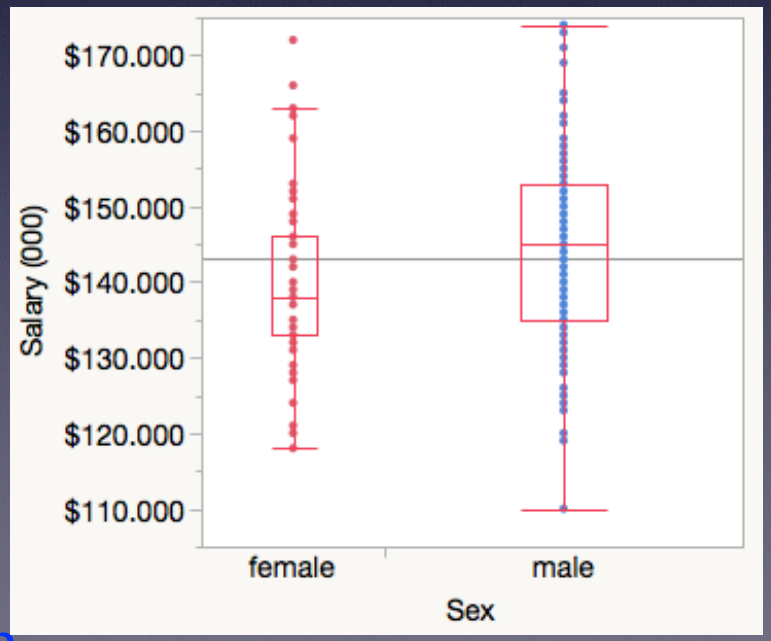
Linear?

Wage Discrimination

- Topic
  - Dummy variables in regression
- Example
  - Adjusting for confounding effects in two-sample comparisons



male-female
Assuming unequal variances

Difference	4.67045	t Ratio	2.390108
Std Err Dif	1.95407	DF	122.4104
Upper CL Dif	8.53861	Prob > |t|	0.0184*
Lower CL Dif	0.80229	Prob > t	0.0092*
Confidence	0.95	Prob < t	0.9908

Wage Discrimination

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- Example
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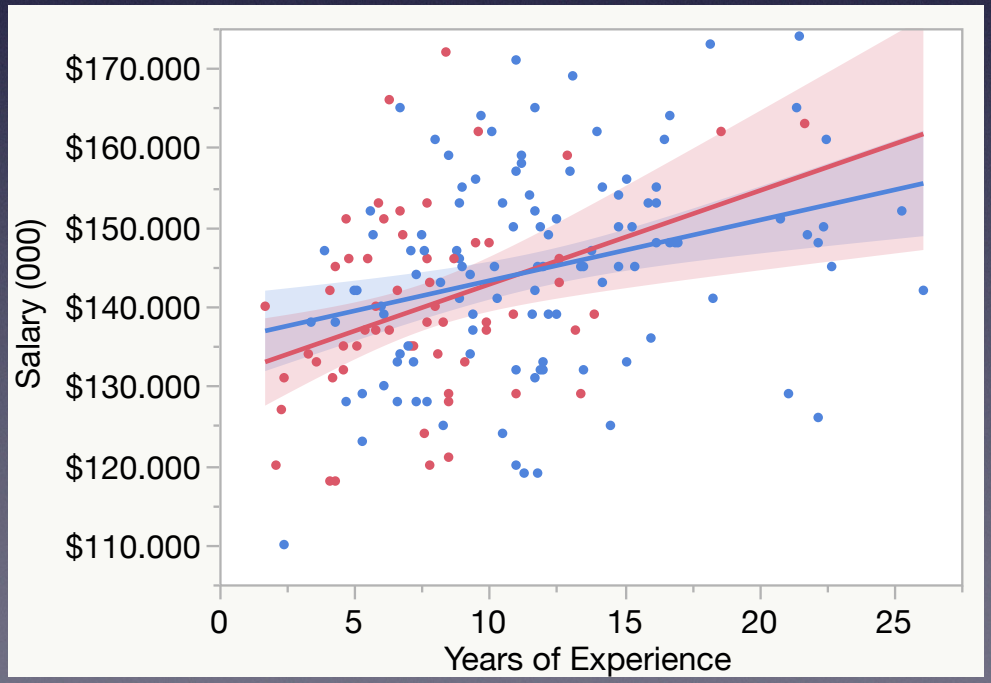
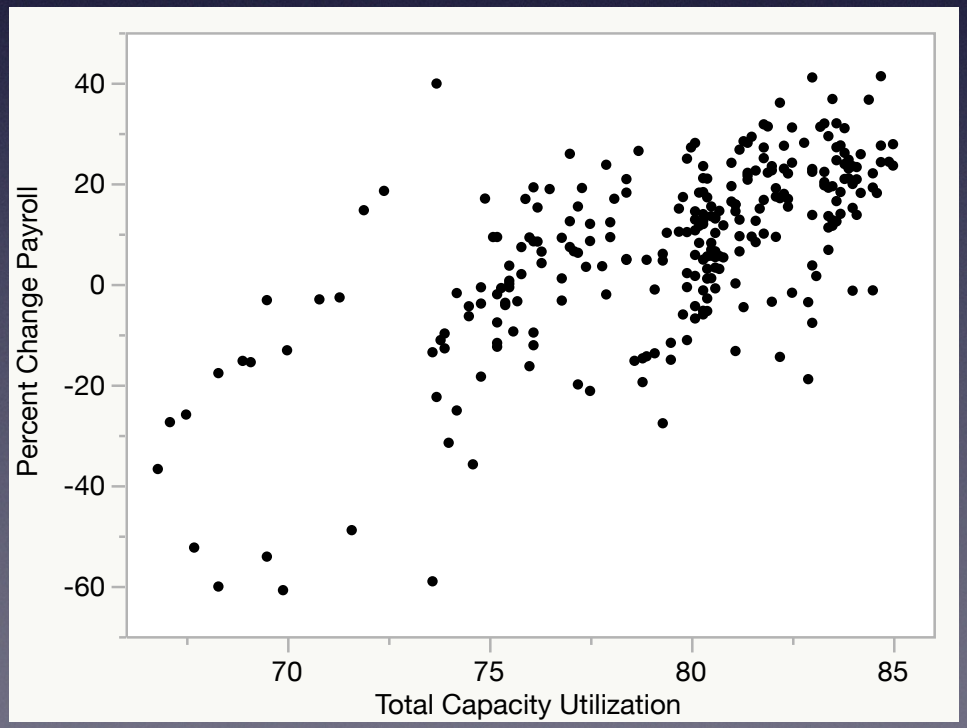
Knowing how to use dummy variable is irrelevant if don't know when!



Macroeconomic Data

- Macro data common in other courses
- Why are there circular patterns in this plot?
  - Monthly macroeconomic data
  - Payrolls and capacity utilization



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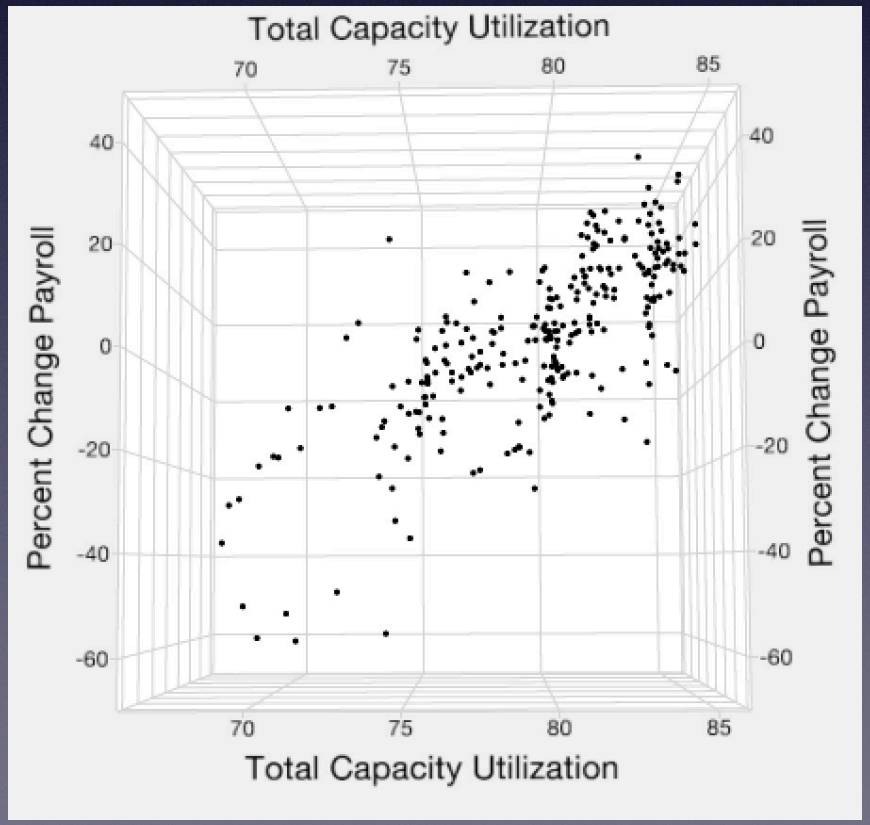

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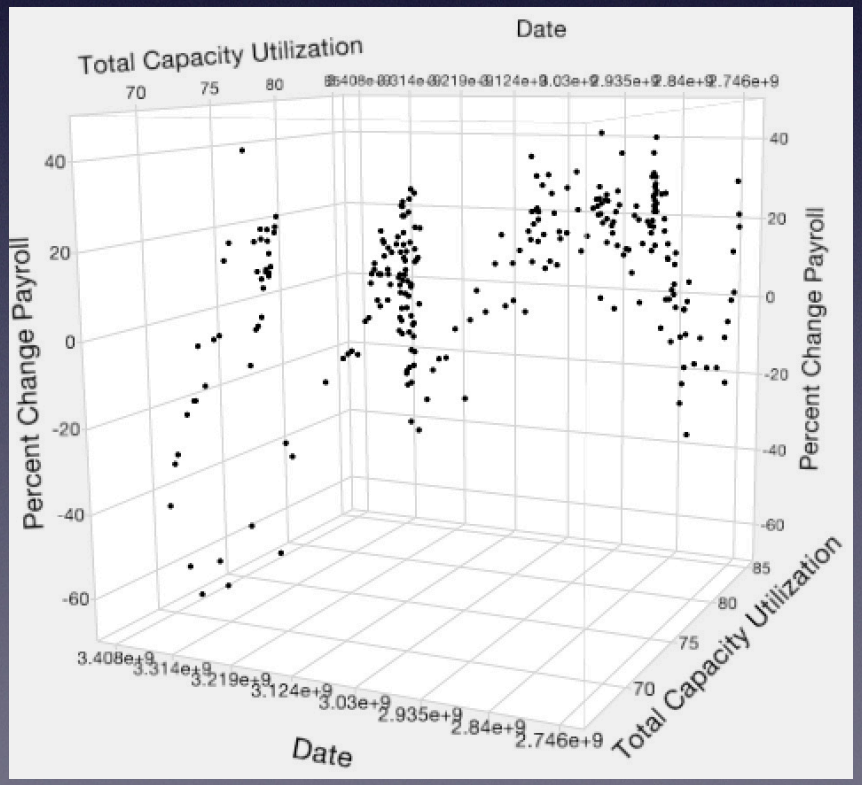
At some point to show that Stat actually leverages technology!



Discussion

- Examples draw attention, curiosity
  - Need to be topical to students
  - Have to be fresh
- Collaboration with other fields
  - More important in age of "data science"
  - Reach outside B School: computer science
- Other thoughts
  - Passion
  - Respect