

“Innovative” Instruction for Business Analytics

Bob Stine
Department of Statistics
The Wharton School
University of Pennsylvania

www-stat.wharton.upenn.edu/~stine

Outline

Impact of analytic emphasis on courses

- More content

- More students

- More diverse students

Leverage technology

- Inside the classroom

- Outside the classroom

Business Analytics

What is Business Analytics?

Depends on who you ask...

Marketing

Accounting

Management

...

Business Analytics differs from Stat

Greater emphasis on business context

Communication

Business Context

Analysis must have realistic context

Problem has to be well motivated

For example, regression analysis should begin with a question rather than with several anonymous columns in a spreadsheet

Solution needs to communicate an answer

“The confidence interval for the slope is $[-2.8 \text{ to } -2.0]$ ” isn’t enough.

Technical skills remain necessary but not sufficient

Identify the appropriate statistical technique

Choose between paired or two-sample comparison, for example.

Do the calculations correctly

Increasingly the domain of software

Consequence

More to teach

Business application + Statistical analysis

Often in less time

Two-semester courses are less common

And to bigger classes

Analytics now a very popular major (STEM)

Three sections @ 120 each, one TA

How to manage this?

Approach

Business context

Lecture starts with business question

Defer details of context to the textbook

Example

Hard problem: Regression with logs, elasticity

Varying background of students is a problem.

Some have little Econ, see linear demand curves.

Few appreciate logs.

Connect to obvious problem: optimal price

Elasticity used to set optimal price

Along the way: relate logs to percentages

“Variation on log scale is relative variation” “Diff of logs \approx Pct diff”

Role of Technology

After problem introduction...

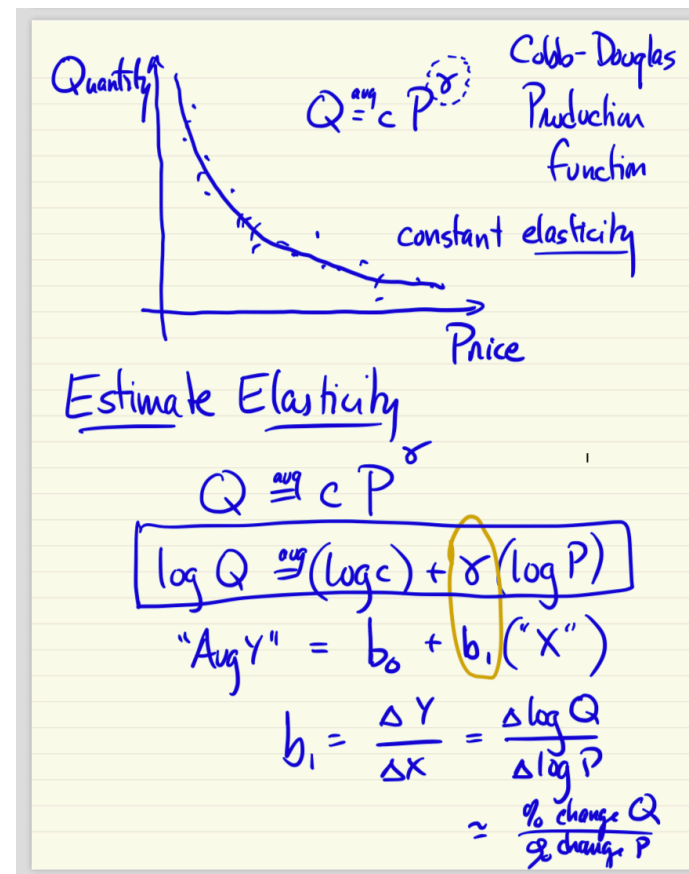
Reinforce, expand discussion at “blackboard”

Slide deck is too passive, for both me and my students

Research shows writing important for retention

Works with large room much better than whiteboard

Save and post after class



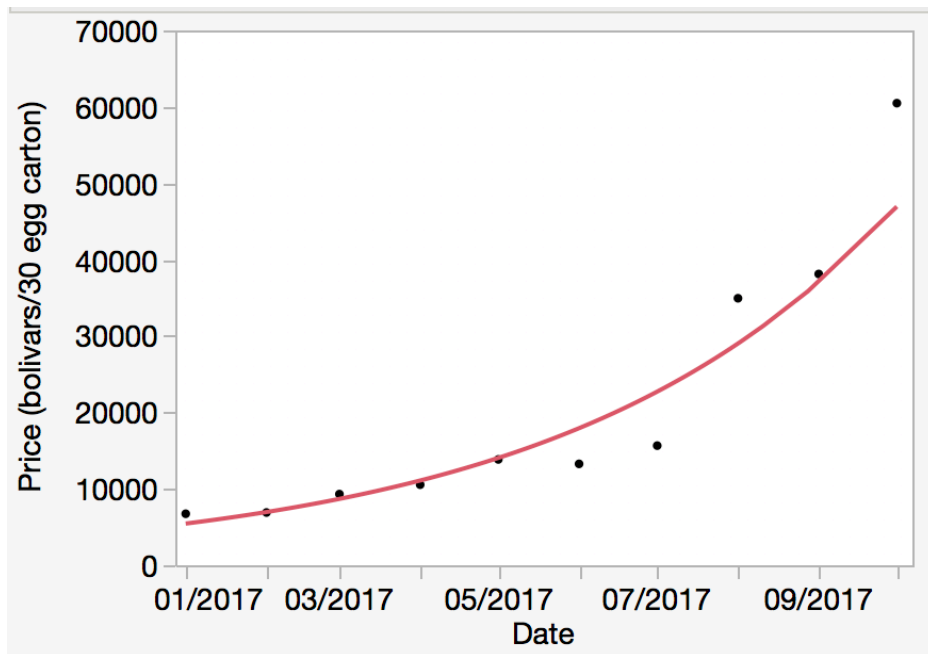
Role of Technology

After the blackboard discussion...

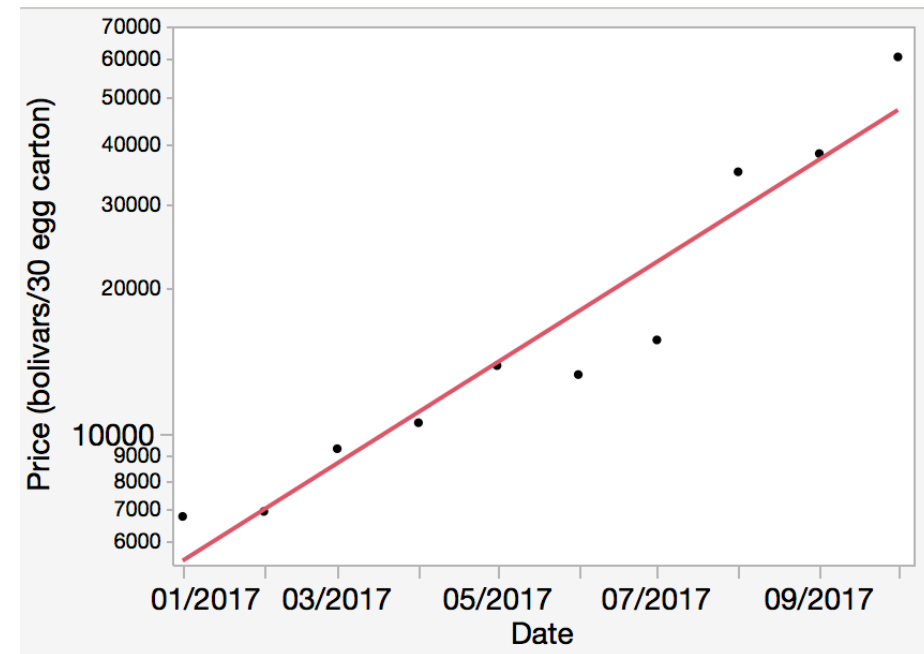
“Real time” data analysis

Open data file, perform analysis, make choices interactively

Exploit interactive modern software



click



Role of Technology

After the computing and review of slides...

Collaborative quizzes

Grade attendance so they help each other

Short, less than 10 minutes total

Immediate feedback to them — and to me (Canvas summary statistics)

Quiz Instructions

Answer the following four questions. Collaboration is encouraged, so talk with your classmates. All of the questions concern the following regression analysis, so read this part first.

Rather than regress prices of used cars on the ages of the cars as done in class on Monday, a data analyst instead regressed prices of these cars on the mileages of the cars, obtaining the following results.

The fitted least squares line is

$$\text{Estimated price} = 39,000 - 0.24 \text{ Mileage}$$

with $r^2 = 0.37$ with $s_e = 4,500$

Question 1 1 pts

The correlation between miles driven and price is approximately

-0.37

0.37

0.6

-0.6

Results in real time

Attempts: 300 out of 300

The correlation between miles driven and price is approximately

-0.37	9 respondents	3 %	
-0.6	238 respondents	79 %	✓
0.6	38 respondents	13 %	
0.37	15 respondents	5 %	

Role of Technology

Inside the classroom

Team quizzes, collaborative

Grade attendance so they help each other

Short, 10 minutes total

Immediate feedback to them and to me (Canvas summary statistics)

“Interactive” iPad discussion

Slide deck is too passive, for both me and my students

Research shows writing important for retention

Works with large room much better than whiteboard

“Real time” data analysis

Open data file, perform analysis, make choices interactively

Exploit interactive modern software

Slide deck as a review

End class by reviewing slides

Defer details, tangential comments







Role of Technology

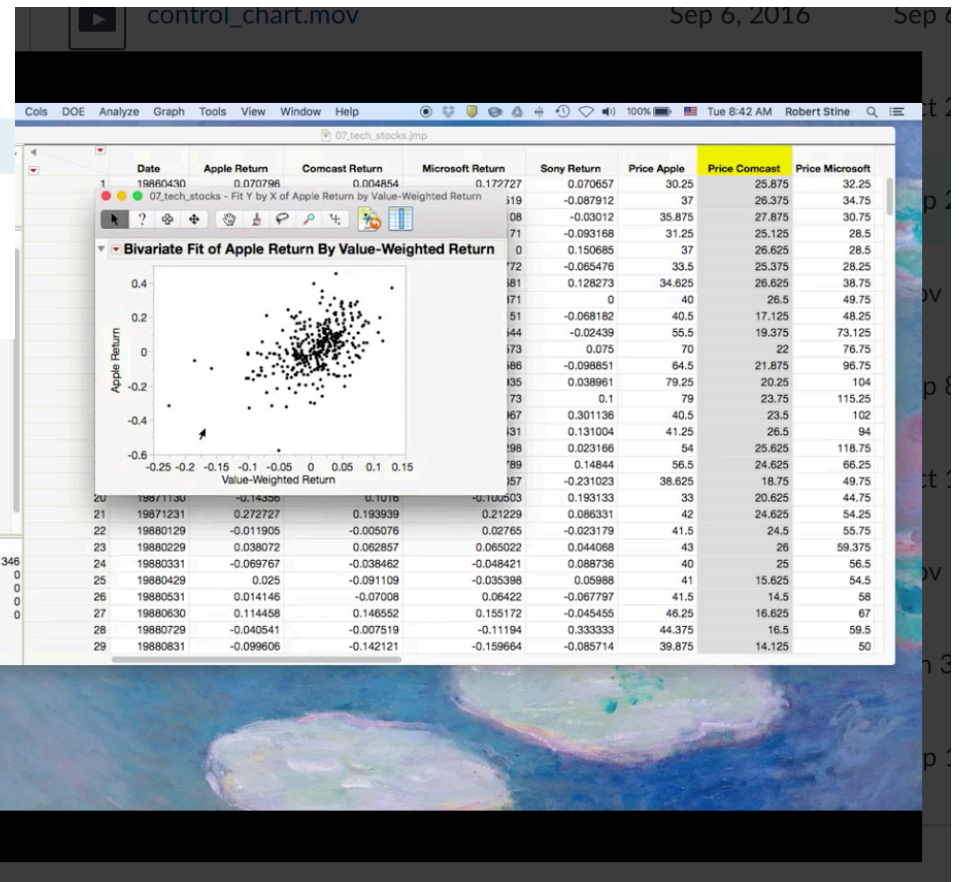
Supplements outside the classroom

Software movies

Desktop recordings show “how to do it”

Allows classroom session to move without need to show every detail

 control_chart.mov	Sep 6, 2016	Sep 6, 2016	106.8 MB	✓
 durbin_watson.mov	Oct 20, 2016	Oct 20, 2016	114.8 MB	✓
 linear.mov	Sep 20, 2016	Sep 20, 2016	97.2 MB	✓
 multiple_regr.mov	Nov 1, 2016	Nov 1, 2016	119.5 MB	✓
 one_sample_inference.mov	Sep 8, 2016	Sep 8, 2016	177.7 MB	✓
 pred_interval.mov	Oct 17, 2016	Oct 17, 2016	79.6 MB	✓



Role of Technology

Supplements outside the classroom

Piazza collaborative e-mail

Students can answer questions

Answer the question once, not many many times

The screenshot displays the Piazza Q&A interface for STAT 102. The top navigation bar includes 'Q & A', 'Resources', 'Statistics', and 'Manage Class'. The main content area is divided into a left sidebar and a right main panel. The sidebar lists various questions, including 'Chi Square Test' which is highlighted. The main panel shows the details of the 'Chi Square Test' question, including the text of the question, a 'Thanks!' message, and an instructor's answer. The instructor's answer states: 'Look in the class notes or Chapter 18 for the sample size condition for chi-squared. The midterms are posted mentioned today in class.' The interface also shows a 'followup discussions' section for lingering questions and comments.

hosted
within
Canvas

Role of Technology

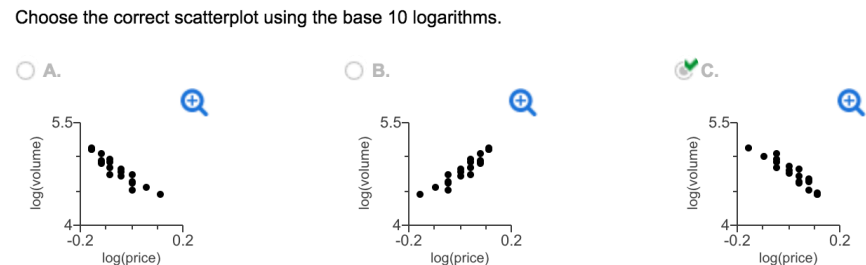
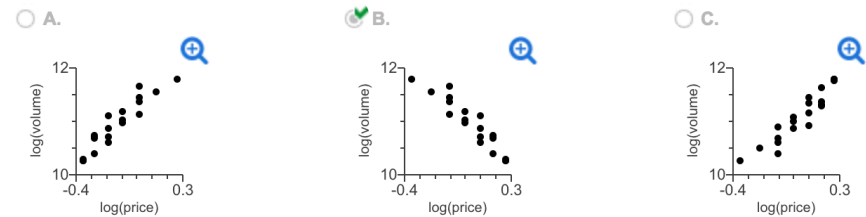
Supplements outside the classroom

Online, randomized assignments (MyLab)

Give them multiple attempts

Requires students to use software

Order ↑	Ch.	Assignment Name	Category	Assigned	Start	Due
1	2-4, 7-9, 12, 13	Background review	●	✓	01/03/18	20.1.41-T
2	14-17	Confidence intervals and tests	●	✓	01/10/18	Suppose the accompanying data represent the number of cans of pet food sold and the selling price. Complete the assignment.
3	18, 19	Association and linear patterns	●	✓	01/17/18	Click the icon to view the data table.
4	19, 20	Fitting lines and logs, residuals	●	✓	01/21/18	(a) Transform the price and volume data using natural logs and then using base 10 logs. Then plot the natural log of volume on the base 10 log of price. What's the difference in your plots?
5	20, 21	Simple regression model	●	✓	02/15/18	Choose the correct scatterplot using the natural logarithms.
6	21, 22	Inference in the SRM	●	✓	02/15/18	
7	23	Multiple regression	●	✓	02/15/18	



Role of Technology

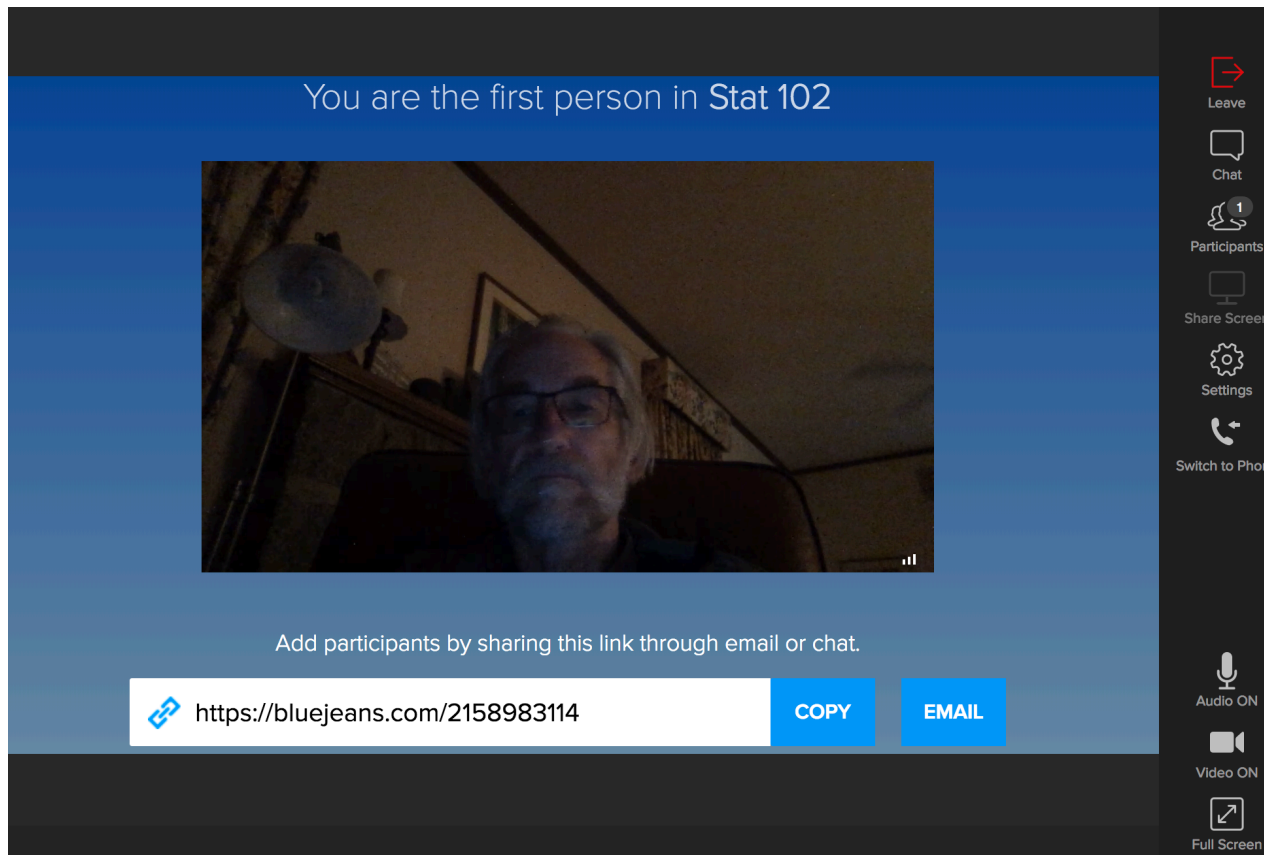
Supplements outside the classroom

BlueJeans online office hours

Schedule help sessions in evening, fewer scheduling conflicts

Many can participate without crowding

Like Skype, but easy for students to use



You are the first person in Stat 102

Add participants by sharing this link through email or chat.

<https://bluejeans.com/2158983114> COPY EMAIL

Leave
Chat
Participants
Share Screen
Settings
Switch to Phone
Audio ON
Video ON
Full Screen

Role of Technology

Outside the classroom

Software movies

Desktop recordings show “how to do it”

Allows classroom session to move without need to show every detail

Piazza collaborative e-mail

Students can answer questions

Answer the question once, not many many times

Online, randomized assignments (MyLab)

Give them multiple attempts

Requires students to use software

BlueJeans online office hours

Schedule help sessions in evening, fewer scheduling conflicts

Many can participate without crowding

Like Skype, but easy for students

Summary

BA brings challenges handling expanded content and increased enrollment

Adjusting the “usual” course

Motivate stat methods with business problems

Exploit technology where possible

In the classroom...

Interactive data analysis, iPad blackboard, collaborative quizzes

Outside the classroom...

Piazza email, Bluejeans shared office hours, software movies

Randomized assignments

How'd it go?

I'll tell you when its done!