

Basic logistics

- Class
 - Mondays from 6p to 8p in Nitze Building N417
- Office hours
 - Wednesdays from 8a to 9a in BOB 718
- My Contact Info
 - nhiggins@jhu.edu
- Course website
 - <http://www.nathanielhiggins.com>
 - (Not a fan of Blackboard, but we'll use it if we have to)
- TA: TBD
 - TA session time TBD
 - Fill out schedule to assist us in finding a time

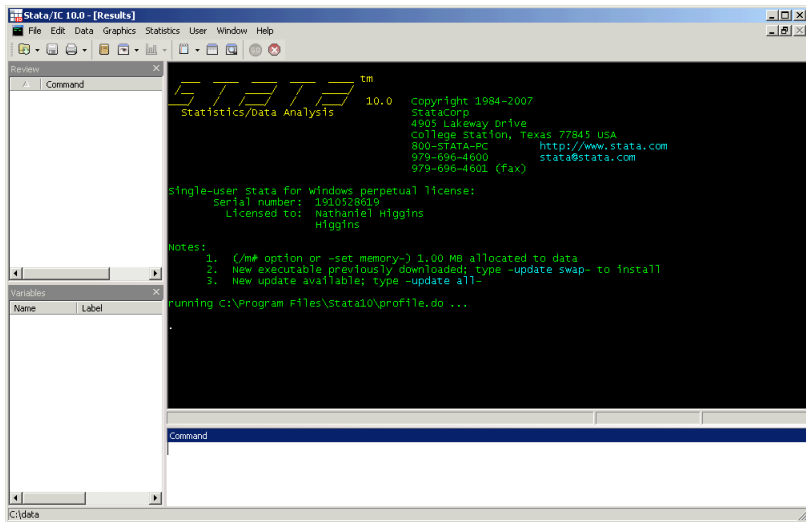
- Required

- Wooldridge, Jeffrey M. (2009). *Introductory Econometrics: A Modern Approach, 4e*. Mason, OH: South-Western CENGAGE Learning.
- Stata student gradplan (order online using this link)
 - A six-month license for Stata/IC 12 is \$65
 - A six-month license for Small Stata is \$32

- Recommended

- KENNEDY, PETER (2008). *A Guide to Econometrics (6th Edition)*. Malden, MA: Blackwell Publishing.
- CAMERON, A. COLIN, and PRAVIN K. TRIVEDI (2010). *Microeconometrics Using Stata, Revised Edition*. College Station, TX: Stata Press.
- R – Free. <http://www.r-project.org/>

Stata will be the in-class software



The screenshot shows the Stata/IC 10.0 software interface. The window title is "Stata/IC 10.0 - [Results]". The menu bar includes File, Edit, Data, Graphics, Statistics, User, Window, and Help. The main display area shows the Stata logo and the following text:

```
STATA™ 10.0 Copyright 1984-2007
Statistics/Data Analysis StataCorp
4905 Lakeway Drive
College Station, Texas 77845 USA
800-STATA-PC http://www.stata.com
979-696-4600 stata@stata.com
979-696-4601 (Fax)

Single-user Stata for windows perpetual license:
Serial number: 1910528619
Licensed to: Nathaniel Higgins
Higgins

Notes:
1. (/m# option or -set memory-) 1.00 MB allocated to data
2. New executable previously downloaded; type -update swap- to install
3. New update available; type -update all-

running C:\Program Files\Stata10\profile.do ...
```

The interface also includes a "Review" panel on the left with a "Command" field, and a "Variables" panel below it with columns for "Name" and "Label". The status bar at the bottom left shows "C:\data".

How you will be evaluated

- Problem sets (6-8), dropping lowest grade
 - Throughout semester
- Mid-term exam
 - 24 October (class 8)
- Replication project
 - Due at the beginning of the final class period (class 13), i.e. 5:59p on 5 December
- Final exam

What you will learn

- Will learn to be a good *consumer* of empirical research
 - Will learn to understand the assumptions on which empirical analyses are based (and so understand which ones you are willing to believe, and which ones make you queasy)
 - Will learn what to be skeptical of
 - Will learn to interpret empirical models and estimation strategies
- Will learn to be a *producer* of basic empirical analysis
 - Learn to use Stata as a programming language
 - Learn to use Stata to manipulate data and produce basic econometric results

Weight	Assignment
25%	Problem Sets
25%	Mid-term exam
25%	Replication Project
25%	Final Exam

Grade	Interpretation	Numerical
A	Excellent	4.00 (passing)
A-	Very good	3.67 (passing)
B+	Good	3.23 (passing)
B	Passing	3.00 (passing)
B-	Minimal Pass	2.67 (passing)
C	Failure	0 (failure)

Assignment details: Replication project

- One grade is subtracted for every day late (A goes to an A-, etc.). Due on last day of class, before class.
- Replicate the results of an econometrics exercise that has already been completed (as part of a journal article, blog post, or other “scholarly” work)
- Choose from a pool that is posted on my website, nathanielhiggins.com
- Completed project will consist of (at least) three separate deliverables

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 - 3 The **source data** that the text file references in order to create the results in your paper

Assignment details: Replication project

- Main document
 - Essentially, I want you to explain to me what you are doing, using language consistent with the level of this class
 - The main project document will contain **tables** that look professional
 - That is, each table/calculation in the work you are replicating will appear in your paper and, while the tables need not be *identical* in format, your tables should display the results in a manner that is clean and easy-to-compare with the original
 - Have a look at an issue of the *American Economic Review* to see what professional tables should look like
 - Not necessary to reproduce graphics, but doing so might help you to ensure that you understand the data

Assignment details: Replication project

- Code (text file)
 - Either a .do (Stata) or a .r (R) file that produces results as they appear in your main document (verbatim!)
 - This text file is nothing but a series of commands; the commands work with data that you will provide as part of the project
 - Code must work on an anonymous machine (must not contain references to directories on your machine — only local directories)
- Data
 - You must assemble the data needed so that your programs call the data that you provide to me

Assignment details: Problem sets

- Six to eight (more depending on how quickly we move through topics)
- Use STATA or R to complete
- Will drop the lowest score
- **Therefore no late problem sets will be accepted**
- All problem sets are due before class in my email inbox

Assignment details: Mid-term

- This is a regular old exam — boring, I know
- Just to keep you on track
- We will have a review class to get you prepared (class 7, on 17 October)
- Exam during class 8, on 24 October

Assignment details: Final

- Cumulative exam
- Given during the scheduled exam period
- You will have the whole exam period to complete the work, but the final will not be longer than the mid-term

- Hold your horses. Let's talk about what econometrics is first
- Econometrics is the combination of statistics (based on probability theory) and model-building (based on economic theory)
- That probably doesn't mean much to you yet (it wouldn't mean much to me if I was in your shoes)
- First thing we'll do is go over some recent research of mine

What can we do with Econometrics/Stata?

My recent research

- My most recent research project
- Discounting (time preferences)
 - Do people prefer money now or money later?
 - By how much do they prefer it?

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 - Would you rather have \$100 now, or \$100 next year?
or ...

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 - Do people prefer money now or money later?
 - By how much do they prefer it?
 - Simple question will help you to think about the usual direction of this preference:
 - Would you rather have \$100 now, or \$100 next year?
or ...
 - How much interest would I have to pay you for you to give me \$100 now

- Annual percentage rate (APR)
- *The APR necessary to get a person to forgo money today* is one way to express how much a person prefers money now to money later, in a way that is consistent over different lengths of time

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- How to calculate APR for one year with *annual* compounding
 - 1 If somebody offers you 5% APR on \$100 principal for one year you get:
 - 2 $\$100 + \$100 \times 0.05 = \$105.00$
- How to calculate same APR for one year with *daily* compounding . . .

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- See Excel example

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- A consistent way to express the equivalence between an amount of money *now* and an amount of money *later* (at some specified point in the future)

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- A consistent way to express the equivalence between an amount of money *now* and an amount of money *later* (at some specified point in the future)
- \$100 now is worth \$105.13 in one year at an APR of 5%

$\$100 \text{ now} = \$105.13 \text{ in one year at } 5\%$

- \$100 now is worth \$103.77 in nine months at an APR of 5%

$\$100 \text{ now} = \$103.77 \text{ in nine months at } 5\%$

My recent research

Discount rate

- Somebody with a *discount rate* of 5% sees these amounts as equivalent

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- The higher the discount rate, the more/less people prefer money now vs. money later?

My recent research

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\$100 now = \$105.13 in one year

\$100 now = \$103.77 in nine months

- The higher the discount rate, the more/less people prefer money now vs. money later?
- more

My recent research

Why we (OK, I) care about discount rates

- Some of the largest conservation programs in the U.S. are managed by the USDA
- Why? Because a very large amount of privately owned land is farmland and ranchland
- The USDA manages a host of programs meant to set-aside land for a period of time (to take it out of active cultivation or active use)
- Doing so has a host of environmental benefits
 - Reducing erosion
 - Providing habitat for migratory birds
 - etc.
- The government contracts with private landowners — govt. pays an annual rental rate (often for a period of 10-15 years) and in exchange the landowners agree to, e.g. plant native grasses on their land

My recent research

Why we care

- Suppose that instead of offering landowners annual payments, the government offered landowners a single up-front payment
- If the landowners are (on average) more impatient than the government, then the government can save money by offering landowners money up front instead of annually
- Everybody can be better off — the government saves money, and the landowners get a payment schedule that they prefer
- All this will make more sense after you see the numbers

My recent research

An experiment

- Based on this premise, an experiment was conducted
- We want to know: what are farmers' discount rates?

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- Start with a sample of 291 farmers
- Split the farmers into one of three treatments

	Now payment	Later payment	Implied APR
Treatment 1			
Treatment 2			
Treatment 3			

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- Start with a sample of 291 farmers
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	Now payment	Later payment	Implied APR
Treatment 1	\$405	\$430	8%
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- Start with a sample of 291 farmers
- Split the farmers into one of three treatments

	Now payment	Later payment	Implied APR
Treatment 1	\$405	\$430	8%
Treatment 2	\$405	\$463	18%
Treatment 3	\$405	\$498	28%

An experiment

Results

- Think of what the responses mean
- If you offer somebody the choice between \$405 now and \$430 in nine months and they choose \$430, what does that imply?

An experiment

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- If you offer somebody the choice between \$405 now and \$430 in nine months and they choose \$430, what does that imply?
- It implies that their discount rate is *at least* 8% (but it could be much higher)

An experiment

Results

- Think of what the responses mean
- If you offer somebody the choice between \$405 now and \$430 in nine months and they choose \$430, what does that imply?
- It implies that their discount rate is *at least* 8% (but it could be much higher)
- If they choose \$405, it implies that their discount rate is *at most* 8% (but it could be lower)

An experiment

Results

- So what do you think happened?

Now choices	Total choices	% choosing now

An experiment

Results

- So what do you think happened?

	Now choices	Total choices	% choosing now
\$430			

An experiment

Results

- So what do you think happened?

	Now choices	Total choices	% choosing now
\$430		68	

An experiment

Results

- So what do you think happened?

	Now choices	Total choices	% choosing now
\$430	59	68	86.8%

An experiment

Results

- So what do you think happened?

	Now choices	Total choices	% choosing now
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An experiment

Results

- So what do you think happened?

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\$463		67	

An experiment

Results

- So what do you think happened?

	Now choices	Total choices	% choosing now
\$430	59	68	86.8%
\$463	44	67	65.7%

An experiment

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\$430	59	68	86.8%
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An experiment

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\$430	59	68	86.8%
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An experiment

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- So what do you think happened?

	Now choices	Total choices	% choosing now
\$430	59	68	86.8%
\$463	44	67	65.7%
\$498	44	73	60.3%

An experiment

Results

- So what do you think happened?

	Now choices	Total choices	% choosing now
\$430	59	68	86.8%
\$463	44	67	65.7%
\$498	44	73	60.3%
Total	147	208	70.7%

An experiment

What can we learn from these results?

- A substantial majority of farmers in the sample have discount rates over nine months (approximately the time between when the experiment was conducted — this past June — and the next growing season) that *exceed* 28%

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- Any idea what the government's borrowing costs over nine months are?

An experiment

What can we learn from these results?

- A substantial majority of farmers in the sample have discount rates over nine months (approximately the time between when the experiment was conducted — this past June — and the next growing season) that *exceed* 28%
- Any idea what the government's borrowing costs over nine months are?
- Essentially zero

An experiment

What can we learn from these results?



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Recent Bill Auction Results

Security Term	Issue Date	Maturity Date	Discount Rate %	Investment Rate %	Price Per \$100	CUSIP
4-WEEK	08-25-2011	09-22-2011	0.000	0.000	100.000000	9127952F7
13-WEEK	08-25-2011	11-25-2011	0.015	0.015	99.996167	9127953U3
26-WEEK	08-25-2011	02-23-2012	0.045	0.046	99.977250	912795Z38
52-WEEK	08-25-2011	08-23-2012	0.100	0.102	99.898889	912795Y96
12-DAY	08-19-2011	08-31-2011	0.015	0.015	99.999500	912796AD1
4-WEEK	08-18-2011	09-15-2011	0.010	0.010	99.999222	9127953K5
13-WEEK	08-18-2011	11-17-2011	0.035	0.036	99.991153	9127952P5
26-WEEK	08-18-2011	02-16-2012	0.080	0.081	99.959556	912795Z20
4-WEEK	08-11-2011	09-08-2011	0.035	0.036	99.997278	9127953J8
13-WEEK	08-11-2011	11-10-2011	0.045	0.046	99.988625	9127953T6
26-WEEK	08-11-2011	02-09-2012	0.065	0.066	99.967139	9127953C3
10-DAY	08-05-2011	08-15-2011	0.000	0.000	100.000000	912796AC3
4-WEEK	08-04-2011	09-01-2011	0.070	0.071	99.994556	9127953F6
13-WEEK	08-04-2011	11-03-2011	0.115	0.117	99.970931	9127953R0
26-WEEK	08-04-2011	02-02-2012	0.150	0.153	99.924167	912795Y88
5-DAY	07-28-2011	08-02-2011	0.000	0.000	100.000000	912795Z79
4-WEEK	07-28-2011	08-25-2011	0.055	0.056	99.995722	9127952A8

An experiment

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An experiment

What can we learn from these results?

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 - 1 the government can borrow at essentially zero interest and ...

An experiment

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- The government can save money by paying folks now instead of later

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What can we learn from these results?

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- The government can save money by paying folks now instead of later
- Suppose that farmers on average had a discount rate of exactly 8% over nine months

An experiment

What can we learn from these results?

- If ...
 - ① the government can borrow at essentially zero interest and ...
 - ② folks prefer money now to money later, then ...
- The government can save money by paying folks now instead of later
- Suppose that farmers on average had a discount rate of exactly 8% over nine months
- The government could either pay a farmer \$405 now or \$430 in nine months
- It costs the government less to pay the farmer \$405 now, since the government can borrow money at very low interest rates. I.e. the government saves almost exactly \$25
- If the average farmer has a higher discount rate, the government saves more

Econometrics

What we have done so far

- So, how much money do you think the government could save?
- We would like to know the average discount rate (adr) to help give us a better idea
- We can infer something about the adr by looking at the raw results of the experiment

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Econometrics

Past summary statistics

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$$U_L = \frac{1}{\left(1 + \frac{\delta}{365}\right)^{270}} * \text{Payment}_L$$

$$U_N = \frac{1}{\left(1 + \frac{\delta}{365}\right)^{14}} * \text{Payment}_N$$

- Model the probability of choosing *now*

$$Pr_N = \frac{U_N}{U_N + U_L}$$

- Model the probability of choosing *now*

$$Pr_N = \frac{U_N^\mu}{U_N^\mu + U_L^\mu}$$

- Model the probability of choosing *now*

$$Pr_N = \frac{U_N^\mu}{U_N^\mu + U_L^\mu}$$

$$Pr_N = \frac{\left[\frac{1}{\left(1 + \frac{\delta}{365}\right)^{14}} * 405 \right]^\mu}{\left[\frac{1}{\left(1 + \frac{\delta}{365}\right)^{14}} * 405 \right]^\mu + \left[\frac{1}{\left(1 + \frac{\delta}{365}\right)^{270}} * \textit{laterpayment} \right]^\mu}$$

Avg. discount estimation

	ALL
Discount rate (δ)	0.34*** (7.60)
Noise parameter (μ)	0.11*** (3.51)
Observations	208
Log likelihood	-119.8

Robust z-statistics in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

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Robust z-statistics in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

- The following two amounts are equally appealing:
\$405.00 now
\$520.75 later

Schedule

29	August	Class 1
5	September	No Class — Labor Day
12	September	Class 2
19	September	Class 3
26	September	Class 4
3	October	Class 5
10	October	Class 6
17	October	Class 7
24	October	Class 8
31	October	Class 9
7	November	Class 10
14	November	Class 11
21	November	No Class — Fall Break
28	November	Class 12
5	December	Class 13
12–16	December	Exam Week

- Probability basics
- Linear regression modeling with a single variable (OLS basics)
- Statistical inference and hypothesis testing
- Multivariate modeling
- Functional form, goodness of fit
- Dummy variables and treatment effects
- Binary dependent variables
- Heteroskedasticity
- Endogeneity, omitted variables, etc. (problems with observational data)
- Two stage least squares and Instrumental variables
- Panel data
 - Fixed effects
 - Random effects (need to know GLS to know how this works)
- Matching

Homework

- Homework is due before class on 12 September
-

- 1 Read all of appendices A and B. Read *at least* C.1 and C.2 of appendix C. Read more if you can push through. See me if you have difficulty.
- 2 Doing the problems at the end of appendix A might help you to prepare for appendices B and C. Do those problems if it helps you. But don't hand them in.

Homework

- Homework is due before class on 12 September

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- 1 Read all of appendices A and B. Read *at least* C.1 and C.2 of appendix C. Read more if you can push through. See me if you have difficulty.
 - 2 Doing the problems at the end of appendix A might help you to prepare for appendices B and C. Do those problems if it helps you. But don't hand them in.
 - 3 Hand in your answers to the following problems: B.1 - B.5 (except part (iii) of B.3), B.7 - B.8, B.10 (all starting on page 745), and C.1 (page 783)

Homework

- Homework is due before class on 12 September

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- 1 Read all of appendices A and B. Read *at least* C.1 and C.2 of appendix C. Read more if you can push through. See me if you have difficulty.
 - 2 Doing the problems at the end of appendix A might help you to prepare for appendices B and C. Do those problems if it helps you. But don't hand them in.
 - 3 Hand in your answers to the following problems: B.1 - B.5 (except part (iii) of B.3), B.7 - B.8, B.10 (all starting on page 745), and C.1 (page 783)
 - 4 Please send me a short bio. Nothing fancy. Just want to get an idea of your backgrounds. Department, area of study, interests. Any relevant training (or lack thereof). Experience with software (esp. Stata).

Next time

- We will go over the homework
- We will begin material contained in chapters 1 and 2 (and some concepts from appendix C)
- A basic Stata tutorial