Econ 219B
Psychology and Economics: Applications
(Lecture 4)

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Outline

Section 1

Methodology: Commitment Field Experiments II

Representative studies: Leisure Goods

- *Consumption/Savings* (Ashraf-Karlan-Yin)
  - Result 1. Commitment device take-up 24%
  - Result 2. Significant effect on overall savings

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- *Consumption/Savings* (Beshears, Choi, Laibson, Madrian, Mekong, 2011)
  - RAND panel respondents, 495 subjects, given $50, $100, or $500
  - Choice between
    - Liquid account (r=22% yearly)
    - Commitment account (set a goal) with r of 21%, 22%, or 23%
    - Penalty for early withdrawal
    - (Notice: only group with r=21% is a commitment device design)
    - Can choose share into each account

Beshears et al., 2011

- Result 1. Commitment device take-up quite high – up to 56%

	21%	22%	23%
10% penalty	0.28	0.39	0.58
20% penalty		0.45	0.61
No withdrawal		0.56	0.60

Representative studies: Leisure Goods

- *Retirement Savings* (SMRT plan, Thaler and Benartzi, 2007 – last lecture)
  - Result 1. Take-up rate 80% when offered in person
  - Result 2. Huge effects on 401(k) contribution rates

Representative studies: Leisure Goods

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  - Result 1. Take-up rate 80% when offered in person
  - Result 2. Huge effects on 401(k) contribution rates
- *Online gaming* (Chow, 2010 and Acland and Chow, 2010)
  - Offer online interface that one can use to limit play of online games
  - Result 1. Take-up rate relatively high initially, but declines to 5-10%
  - Result 2. Suggestive effects on time spent playing

Representative studies: Leisure Goods

- *Smoking* (Gine, Karlan, and Zinman, 2010)
  - Offer urine test for smoking in 6 months
  - Can deposit money into account – forfeited if fail test at month 6
  - Result 1. Low take-up: 11% of 781 offered product
  - Result 1. Conditional on take-up, average deposit of 57 pesos (4 weeks worth of cigarettes)
  - Result 2: At 6 months, increase of 4-5 percentage point in chance of making urine test

Representative studies: Leisure Goods

- Smoking (Gine, Karlan, and Zinman, 2010), continued
  - Result 2: At 12 months, similar increase at surprise test

TABLE 5—IMPACT OF CARES ON PASSING URINE TEST ONE YEAR LATER
(*OLS, intent-to-treat estimates*)

Assumption:	Everyone that did not take the test continues smoking		Drop if did not take the test		Everyone that was found but refused to take the test still smokes	
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. With baseline covariates						
CARES treatment	0.035**	0.035*	0.057**	0.055*	0.054**	0.054**
	(0.018)	(0.018)	(0.028)	(0.028)	(0.027)	(0.027)

Representative studies: Leisure Goods

- Why often low-take up? At least 3 possibilities:
    - Self-control not prevalent
    - Self-control prevalent, but naivete' is strong
    - Demand for commitment outweighed by costs of commitment in terms of loss of flexibility
- Important to have designs to separate explanations

Representative studies: Leisure Goods

- Alternative design of the commitment device field experiments: *2*2 Design* (Chow, 2010)
  - Offer *everyone* the commitment device
  - Then randomly assign whether commitment device is actually offered
  - Therefore groups are 2 (wanted comm./did not) * (got comm./did not)

Representative studies: Leisure Goods

- Alternative design of the commitment device field experiments: *2*2 Design* (Chow, 2010)
  - Offer *everyone* the commitment device
  - Then randomly assign whether commitment device is actually offered
  - Therefore groups are 2 (wanted comm./did not) * (got comm./did not)
- Advantage of this design
  - More power on demand for commitment since everybody (not just 1/2 of subjects) is asked
  - Can estimate effect of commitment both on the subjects that demand it, and the ones who do not (but who may end up using it)
  - See also Chassang, Padro-i-Miguel, Snowberg, (AER 2012)

Section 2

Laboratory Experiments on Present Bias

Time Preferences

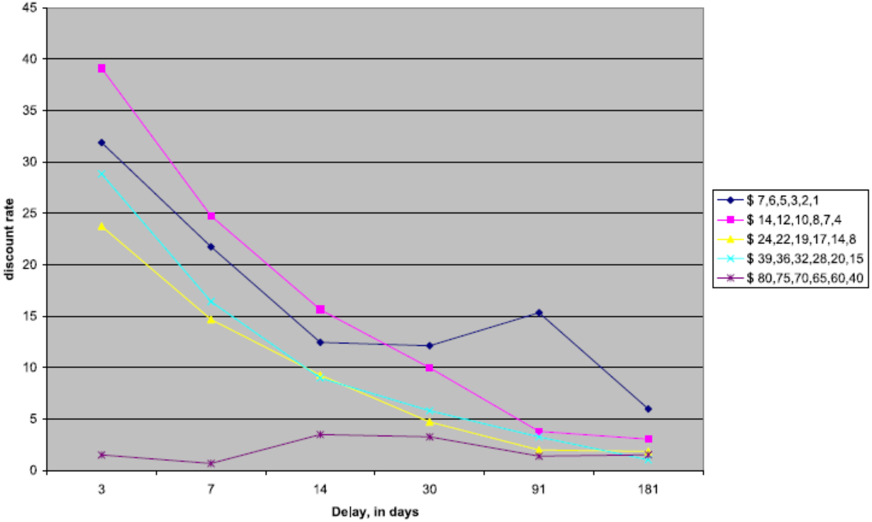
- Experiments on time preferences (Ainslie, 1956; Thaler, 1981; Benhabib, Bisin, and Schotter, 2009; Andreoni and Sprenger, 2012)

- Typical design (Thaler *EL* 1981):
  - What is X today that makes indifferent to \$10 in one week?
  - What is Y in one week that makes indifferent to \$10 in two weeks?

- Assuming (locally) linear utility:
  - $X = \beta\delta 10$ and $Y = \delta 10$
  - Hence, $Y/10$ is estimate of weekly δ
  - X/Y is estimate of (weekly) β

Alternative Design

- Alternative design: Benhabib, Bisin, and Schotter (BBS, *GEB* 2009):
  - What is X today that makes indifferent to \$10 in one week? $\rightarrow$ Implied weekly discount factor $\beta\delta$
  - What is Y today that makes indifferent to \$10 in T weeks? $\rightarrow$ Implied weekly discount factor $\left(\beta\delta^{T}\right)^{1/T} = \beta^{1/T}\delta$
- For $\beta < 1$, implied weekly discount factor should be increasing in T
- BBS (2009):
  - 27 undergraduate students making multiple choices
  - Support for a hyperbolic discount function
  - Next figure: data from a representative subject: weekly discount rate implied by choice, as function of delay


45
40
35
30
25
20
15
10
5
0
discount rate
3
7
14
30
91
181
Delay, in days
$ 7,6,5,3,2,1
$ 14,12,10,8,7,4
$ 24,22,19,17,14,8
$ 39,36,32,28,20,15
$ 80,75,70,65,60,40

Problem 1: Credibility

- BSS: '*If money today were to be paid subjects were handed a check. If future money were to be paid subjects were asked to supply their mailing address and were told that on the day promised a check would arrive at their campus mailboxes with the promised amount.*'
- Suppose subjects believe *future* payments occur only with probability q, while immediate payments are sure
- Implied discount factor is $q\delta^T$
- $\rightarrow \beta$ captures subjective probability q that future payments will be paid (compared to present payments)

Problem 2: Money vs. Consumption

- Discounting applies to consumption, not income (Mulligan, 1999):

$$U_0 = u(c_0) + \beta\delta Eu(c_1) + \beta\delta^2 Eu(c_2)$$

- Assume that individual plans to consume the \$$X$ paid today or the \$10 paid in one week one week later$\rightarrow$ Then the choice is between
    - $\beta\delta u(X)$
    - $\beta\delta u(10)$
- Hence, present bias β does not play a role
- It does play a role *with credit constraints* $\rightarrow$ Consume immediately

Problems 3 & 4

Problem 3: Concave Utility

- Choice equates

$$u(10) = \beta\delta u(X)$$

- $\beta\delta = u(10)/u(X) \rightarrow$ Need to estimate the concavity of the utility function to extract discount function
- Problem likely less serious for small payments

Problem 4: Uncertain future marginal utility of money

- Marginal utility of money certain for present, uncertain in future:

$$u(10) = \beta\delta Eu(X)$$

- $\rightarrow$ Marginal utility of money can differ in the future, depending on future shocks

Recent Improvements: Andreoni & Sprenger

- Improved experimental design: Andreoni and Sprenger (AS, *AER* 2012)
- To deal with *Problem 1 (Credibility)*, emphasize credibility
  - All sooner and later payments, including those for $t = 0$, were placed in subjects' campus mailboxes.
  - Subjects were asked to address the envelopes to themselves at their campus mailbox, thus minimizing clerical errors
  - Subjects were given the business card of Professor James Andreoni and told to call or e-mail him if a payment did not arrive
- Potential drawback: Payment today take places at end of day
  - Other experiments: post-dated checks

Estimate Concavity

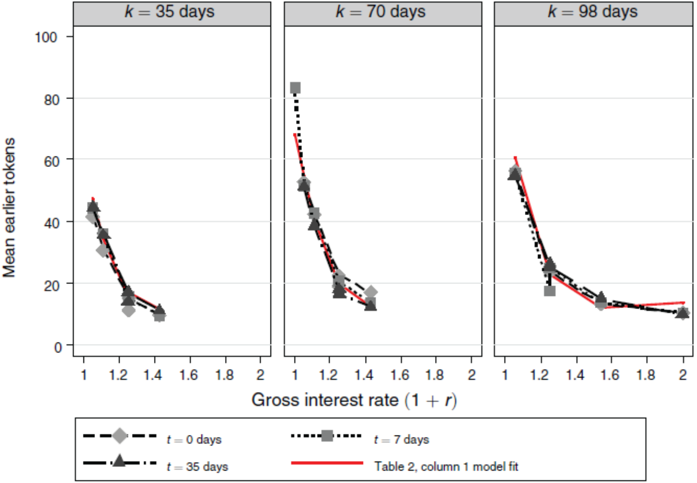
- To deal with *Problem 3 (Concave Utility)*, design to estimate concavity:
  - Subject allocate share of money to earlier versus later choice
  - $\rightarrow$ That is, interior solutions, not just corner solutions
  - Vary interest rate between earlier and later choice to back out concavity
- Example of choice screenshot

January 21, February 25 | January 21, April 1 | January 21, April 29 | January 28, March 4 | January 28, April 8

	Divide Tokens between January 28 (1 week(s) from today), and April 8 (10 week(s) later)				January 28	April 8
1	Allocate 100 tokens:	83	tokens at \$0.20 on January 28, and	17	tokens at \$0.20 on April 8	\$16.60	\$3.40
2	Allocate 100 tokens:	51	tokens at \$0.19 on January 28, and	49	tokens at \$0.20 on April 8	\$9.69	\$9.80
3	Allocate 100 tokens:	43	tokens at \$0.18 on January 28, and	57	tokens at \$0.20 on April 8	\$7.74	\$11.40
4	Allocate 100 tokens:	21	tokens at \$0.16 on January 28, and	79	tokens at \$0.20 on April 8	\$3.36	\$15.80
5	Allocate 100 tokens:	14	tokens at \$0.14 on January 28, and	86	tokens at \$0.20 on April 8	\$1.96	\$17.20

Results

- Main result: No evidence of present bias

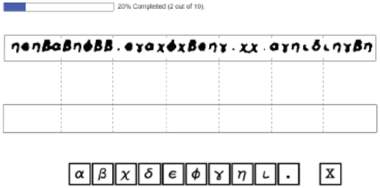


Recent Improvements: Augenblick, Niederle, and Sprenger (2015)

- What about *Problem 2 (Money vs. Consumption)*?
  - One solution: Do experiments with goods to be consumed right away:
    - Low- and High-brow movies (Read and Loewenstein, 1995)
    - Squirts of juice for thirsty subjects (McClure et al., 2005)
  - Problem: Harder to invoke linearity of utility when using goods as opposed to money
- Augenblick, Niederle, and Sprenger (*QJE* 2015): Address problem by having subjects intertemporally allocate effort
  - 102 subjects have to complete boring task

Design

Panel A: Job 1- Greek Transcription



- Experiment over multiple weeks, complete online
  - Pay largely at the end to reduce attrition
  - Week 1: Choice allocation of job between weeks 2 and 3
  - Week 2: Choose again allocation of job between weeks 2 and 3
  - $\rightarrow$ Do subjects revise the choice?
  - As in AS, choice of interior solution, and varied 'interest rate' between periods

Design

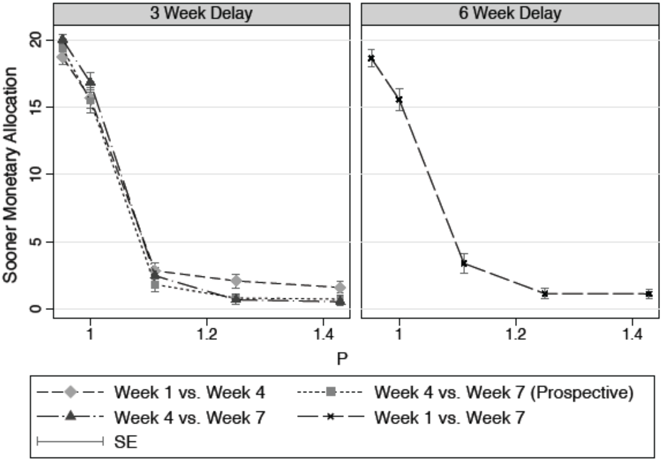
- Also do monetary discounting, with immediate *cash* payment (unlike AS)

Table 1: Summary of Longitudinal Experiment

	10 Effort Allocations	Minimum Work	Allocation-That-Counts Chosen	Complete Work	Commitment Choice	Receive Payment
Week 1 (In Lab):	x	x				
Week 2 (Online):	x	x	x	x		
Week 3 (Online):		x		x		
Week 4 (In Lab):	x	x			x	
Week 5 (Online):	x	x	x	x		
Week 6 (Online):		x		x		
Week 7 (In Lab):						x

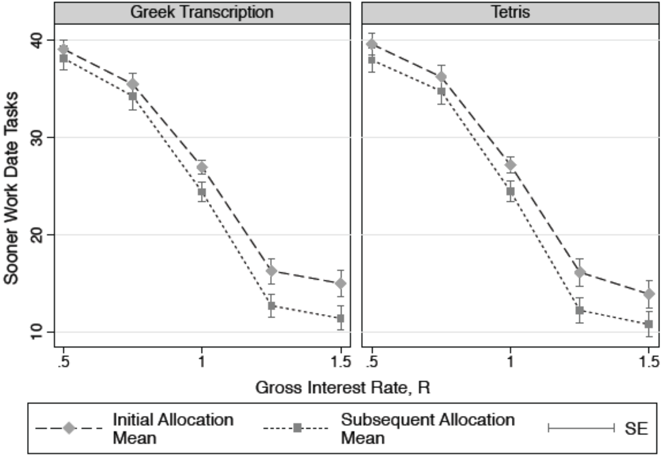
Results

- Result 1: On monetary discounting no evidence of present-bias



Results

- Result 2: Clear evidence on effort allocation



Results

- Result 3: Estimate of present-bias given that can back out shape of cost of effort function $c(e)$

	Monetary Discounting		Effort Discounting		
	(1) All Delay Lengths	(2) Three Week Delay Lengths	(3) Job 1 Greek	(4) Job 2 Tetris	(5) Combined
Present Bias Parameter: β	0.974	0.988	0.900	0.877	0.888
	(0.009)	(0.009)	(0.037)	(0.036)	(0.033)
Daily Discount Factor: δ	0.998	0.997	0.999	1.001	1.000
	(0.000)	(0.000)	(0.004)	(0.004)	(0.004)
Monetary Curvature Parameter: α	0.975	0.976			
	(0.006)	(0.005)			
Cost of Effort Parameter: γ			1.624	1.557	1.589
			(0.114)	(0.099)	(0.104)
# Observations	1500	1125	800	800	1600
# Clusters	75	75	80	80	80
Job Effects					Yes

Recent Improvements: Dean and Sautmann (2016)

- **Dean and Sautmann (2016):** Provide direct evidence on *Problem 2 (Money vs. Consumption)*
  - Elicit time preferences with standard money now versus money in the future questions

Table 1: A Price List Experiment

Set A		Set B	
today	in 1 week	in 1 week	in 2 weeks
a_0	a_1	b_1	b_2
CFA 50	CFA 300	CFA 50	CFA 300
CFA 100	CFA 300	CFA 100	CFA 300
CFA 150	CFA 300	CFA 150	CFA 300
CFA 200	CFA 300	CFA 200	CFA 300
CFA 250	CFA 300	CFA 250	CFA 300
CFA 300	CFA 300	CFA 300	CFA 300
CFA 350	CFA 300	CFA 350	CFA 300
CFA 400	CFA 300	CFA 400	CFA 300

Design

- Observe shocks to ability to borrow and marginal utility of income
  - Do those affect the choices in price list?
  - If so, clearly we are not capturing δ, but rather r or u'
  - Estimate MRS from questions above, relate to adverse income shock

Table 5: Consumption shocks and MRS_t.

	MRS (A) OLS	MRS (A) OLS	MRS (A) OLS	MRS (A) OLS	MRS (A) IV	MRS (A) IV
Adv. event (0/1)	0.284 *	0.263 *				
	(0.124)	(0.124)				
Adv. event expense			0.256 +	0.237 +	1.707 *	1.579 *
			(0.147)	(0.141)	(0.695)	(0.797)
Constant	4.588 **	4.678 **	4.665 **	4.755 **	4.579 **	4.663 **
	(0.041)	(0.074)	(0.009)	(0.059)	(0.101)	(0.130)
Ind FE	yes	yes	yes	yes	yes	yes
Time FE		yes		yes		yes
Observations	2547	2547	2543	2543	2543	2543

Standard errors clustered at the individual level (OLS) or bootstrapped (IV, ML) (in pa
*Significance levels + p<0.10, * p<0.05, ** p<0.01*

Related to savings shock

Table 7: Income, spending, and MRS_t.

	MRS (A) OLS	MRS (A) OLS	MRS (A) OLS	MRS (A) OLS	MRS (A) IV	MRS (A) IV	MRS (A) ML
Labor income			-0.185	-0.189	-0.153	-0.159	-0.324 *
			(0.142)	(0.143)	(0.163)	(0.142)	(0.135)
Nonlabor income "endogenous"			-0.330	-0.321	-0.268	-0.265	-0.281
			(0.251)	(0.258)	(0.261)	(0.270)	(0.351)
Nonlabor income "exogenous"	**-0.409** **	**-0.409** **	**-0.382** **	**-0.384** **	**-0.378** *	**-0.380** *	**-0.407** **
	(0.142)	**(0.149)**	**(0.125)**	**(0.133)**	**(0.171)**	**(0.149)**	**(0.199)**
Other spending			0.268 *	0.245 +	0.192	0.177	0.236
			(0.128)	(0.131)	(0.141)	(0.132)	(0.135)
Adv. event expense	**0.252** +	**0.233** +	**0.251**	**0.222**	**1.683** +	**1.562** *	**0.357** +
	(0.145)	**(0.139)**	**(0.182)**	**(0.183)**	**(0.761)**	**(0.769)**	**(0.250)**
Constant	4.69 **	4.782 **	4.56 **	4.67 **	4.527 **	4.622 **	2.737 **
	(0.011)	(0.059)	(0.093)	(0.125)	(0.144)	(0.145)	(0.145)
Ind FE	yes	yes	yes	yes	yes	yes	yes
Time FE		yes		yes		yes	
Observations	2540	2540	2390	2390	2390	2390	1437

*Standard errors clustered at the individual level (OLS) or bootstrapped (IV, ML) (in parentheses). Significance levels + p<0.10, * p<0.05, ** p<0.01*

Recent Improvements: Carvalho, Meier, Wang (2016)

- **Carvalho, Meier, Wang (AER 2016):** Replicates both of the previous findings
  - Measures time preferences with money and real effort
  - 1,191 participants rendomized into
    - Surveyed before payday (financially constrained)
    - Surveyed after payday (not constrained)
  - Real effort task (clever):
    - Complete shorter survey within 5 days
    - Complete longer survey within 35 days
    - Multiple choices with varying length of sooner survey

Results: Financial Choices

- Replicates Dean and Sautmann result on financial choices

Table 3: Intertemporal Choices about Monetary Rewards

	\$ Amount of Sooner Reward	
	Coefficient	Standard Error
{Before Payday} * {Immediate Rewards}	10.6	3.83***
{Before Payday} * Interest Rate	2.7	3.24
{Before Payday} * Delay Time	-1.4	1.06
{Before Payday}	-6.3	9.80
{Immediate Rewards}	-5.3	2.75*
Experimental Interest Rate	-47.3	2.33***
Delay Time	-0.7	0.72
Constant	304.3	6.83***

Notes: This table reports results from an OLS regression where the dependent variable is the dollar amount of the sooner payment. "Immediate Rewards" is an indicator variable that is 1 if the mailing date of the sooner payment is today. "Delat Time" is the time interval between the sooner and later payments. The sample is restricted to the 1,060 subjects who made all 12 choices in the task with monetary rewards. $N = 12{,}720$.

Results: Real Effort

- Replicates Augenblick et al. on real effort

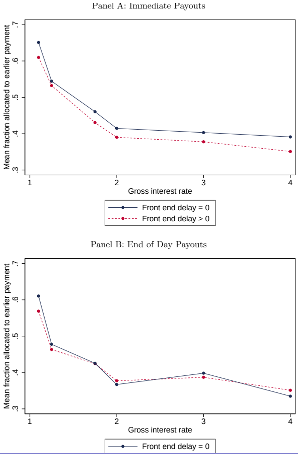
Table 4: Intertemporal Choices about Real Effort

	Monthly Discount Rate
{Before Payday} * {Immediate Task}	-0.03
	[0.025]
{Before Payday}	0.02
	[0.027]
{Immediate Task}	0.09
(5-day deadline for short-sooner survey)	[0.018]***
Constant	0.31
	[0.019]***

Notes: This table reports estimates from an interval regression where the dependent variable is the interval measure of the individual discount rate (IDR). Two IDRs are estimated for each subject; one for each time frame. "Immediate Task" is an indicator variable for the "5 days (sooner) x 35 days (later)" time frame. Standard errors clustered at the individual level. The sample is restricted to the 1,025 subjects who made all 10 choices in the non-monetary intertemporal task. $N = 2{,}050$.

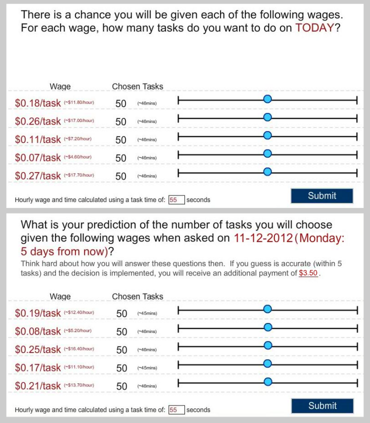
Balakrishnan, Haushofer, Jakiela (2016)

- Return to puzzle of no present bias over money in AS
    - Estimate in Kenya with immediate transfers of cash over money
    - Individuals likely to be more hand to mouth



Recent additional work using real effort

- **Augenblick and Rabin (forthcoming)**:
  - Use real effort to elicit not only β, but also $\hat{\beta}$
  - Elicit forecasts for future choice, in addition to choice



There is a chance you will be given each of the following wages.
For each wage, how many tasks do you want to do on TODAY?

Wage	Chosen Tasks
$0.18/task (~$11.80/hour)	50 (~46mins)
$0.26/task (~$17.00/hour)	50 (~46mins)
$0.11/task (~$7.20/hour)	50 (~46mins)
$0.07/task (~$4.60/hour)	50 (~46mins)
$0.27/task (~$17.70/hour)	50 (~46mins)

Hourly wage and time calculated using a task time of: 55 seconds

Submit

What is your prediction of the number of tasks you will choose given the following wages when asked on 11-12-2012 (Monday: 5 days from now)?

Think hard about how you will answer these questions then. If you guess is accurate (within 5 tasks) and the decision is implemented, you will receive an additional payment of $3.50.

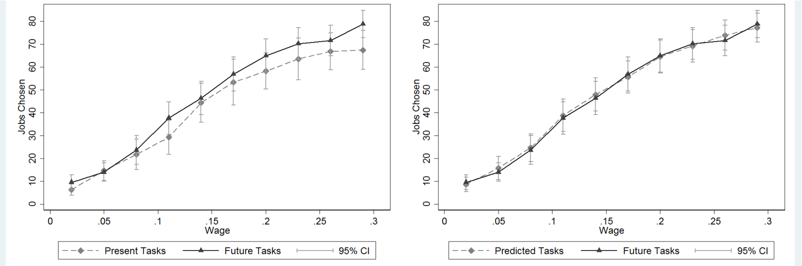
Wage	Chosen Tasks
$0.19/task (~$12.40/hour)	50 (~45mins)
$0.08/task (~$5.20/hour)	50 (~46mins)
$0.25/task (~$16.40/hour)	50 (~46mins)
$0.17/task (~$11.10/hour)	50 (~45mins)
$0.21/task (~$13.70/hour)	50 (~46mins)

Hourly wage and time calculated using a task time of: 55 seconds

Submit

Recent additional work using real effort

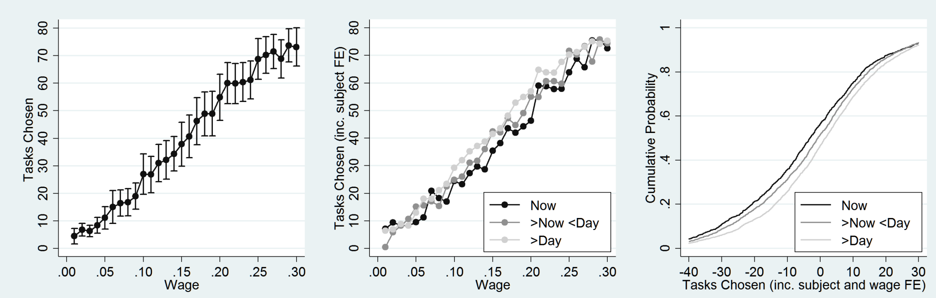
- Replicate evidence of present bias β, but $\hat{\beta} = 1$



	Initial Estimation	Participant FE	Decision Day FE	Later Decisions	Pred. Soph.
Present Bias β	0.835	0.812	0.833	0.833	0.825
	(0.038)	(0.042)	(0.040)	(0.041)	(0.041)
Naive Pres. Bias β_h	0.999	1.014	1.006	1.003	1.004
	(0.011)	(0.011)	(0.010)	(0.009)	(0.003)

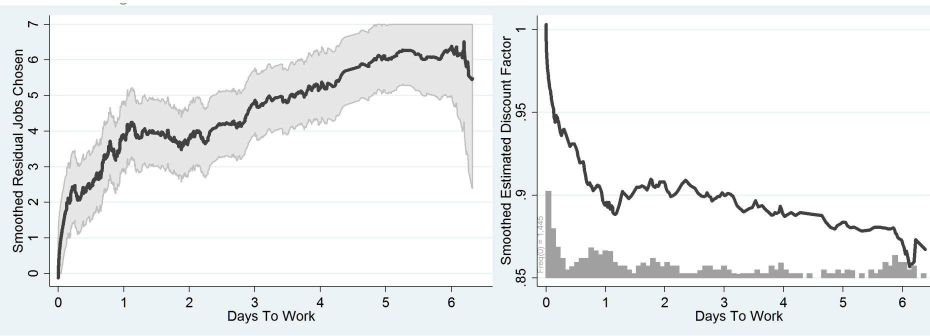
Recent additional work using real effort

- **Augenblick (2017):** Estimate timing of β
  - Elicit preference for task going from immediate to a few hours, to >1 day



Recent additional work using real effort

- **Augenblick (2017):** Estimate timing of β
  - Can estimate intra-day decay in β



Recent additional work using real effort

- **Fedyk (2017)**: What beliefs do people have about others' self control?

OTHER SUBJECTS' DECISIONS: for 01/26/16

On 01/26/16, **after the warm-up**, each subject will do some number of extra rounds of the Task. Every subject will have to complete his or her extra work **immediately** after the "Decision that Counts" is selected, with no more than 15 minutes of breaks.

Decisions made <u>now</u> for work to be done on 01/26/16

How many extra one-minute rounds do you think, on average, other subjects are **choosing today** to complete on 01/26/16 at the following wages?

Wage	Rounds

Decisions made <u>on 01/26/16</u> when the time to do the work comes

When the time comes to actually do the work on 01/26/16, how many extra one-minute rounds do you think, on average, other subjects will want to do at the following wages?

Wage	Rounds

Recent additional work using real effort

- **Fedyk (2017)**:
  - Naive about one self
  - Sophisticated about others

Parameter	Without attrited participants	With attrited participants
Present bias β	**0.8589**	**0.8151**
	(0.0330)	*(0.0335)*
Self-prediction $\beta_{(s)}$	**1.0502**	**1.0306**
	(0.0629)	*(0.0523)*
Other-prediction $\beta_{(o)}$	**0.8711**	**0.8715**
	(0.0349)	*(0.0314)*

Section 3

Methodology: Errors in Applying Present-Biased Preferences

Introduction

- Present-Bias model very successful
- Quick adoption at cost of incorrect applications
- **Four common errors**

Error 1. Procrastination with Sophistication

- 'Self-Control leads to Procrastination'
- This is not accurate in two ways
- *Issue 1.*
  - (β, δ) Sophisticates do not delay for long (see our calibration)
  - Need Self-control + Naiveté (overconfidence) to get long delay
- *Issue 2.* (Definitional issue) We distinguished between:
  - Delay. Task is not undertaken immediately
  - Procrastination. Delay systematically beyond initial expectations
  - Sophisticates and exponentials do not procrastinate, they *delay*

Error 2. Naives with Yearly Decisions

- 'We obtain similar results for naives and sophisticates in our calibrations'
- Example 1. Fang, Silverman (*IER*, 2009)
- Single mothers applying for welfare. Three states:
  1. Work
  2. Welfare
  3. Home (without welfare)
- Welfare dominates Home – So why so many mothers stay Home?

Error 2. Naives with Yearly Decisions

Choice at $t-1$	Choice at t Welfare	Work	Home
Welfare			
Row %	84.3	3.5	12.3
Column %	76.7	6.3	17.9
Work			
Row %	5.3	79.3	15.3
Column %	2.6	76.4	12.1
Home			
Row %	28.3	12.0	59.7
Column %	20.7	17.3	70.0

- Model:
  - Immediate cost ϕ (stigma, transaction cost) to go into welfare
  - For ϕ high enough, can explain transition
  - Simulate Exponentials, Sophisticates, Naives

Error 2. Naives with Yearly Decisions

However: Simulate decision at **yearly** horizon.

- BUT: At yearly horizon naives do not procrastinate:
  - Compare:
    - Switch now
    - Forego *one year* of benefits and switch next year
  - Result:
    - Very low estimates of β
    - Very high estimates of switching cost ϕ
    - Naives are same as sophisticates

Error 2. Naives with Yearly Decisions

Parameters		(1) Time Consistent		(2) Present-Biased (sophisticated)		(3) Present-Biased (Naive)	
		Estimate	S.E.	Estimate	S.E.	Estimate	S.E.
Preference Parameters							
Discount Factors	β	1	n.a.	0.33802	0.06943	0.355	0.0983
	δ	0.41488	0.07693	0.87507	0.01603	0.868	0.02471
Net Stigma	$\phi^{(1)}$	7537.04	774.81	8126.19	834.011	8277.46	950.77
(by type)	$\phi^{(2)}$	10100.9	1064.83	10242.01	955.878	10350.20	1185.27
	$\phi^{(3)}$	13333.2	1640.18	12697.25	1426.40	12533.69	1685.92

- Conjecture: If allowed daily or weekly decision, would get:
  - Naives fit much better than sophisticates
  - β much closer to 1
  - ϕ much smaller

Error 2. Naives with Yearly Decisions

- Example 2. Shui and Ausubel (2005) $\rightarrow$ Estimate Ausubel (1999)
  - Cost k of switching from credit card to credit card
  - Again: Assumption that can switch only every quarter
  - Results of estimates (again):
    - Quite low β
    - Naives do not do better than sophisticates
    - Very high switching costs

Table 4: Estimated Parameters [a]

	Sophisticated Hyperbolic	Naive Hyperbolic	Exponential
β	0.7863 (0.00192)	0.8172 (0.003)	
δ	0.9999 (0.00201)	0.9999 (0.0017)	0.9999 (0.00272)
k	0.02927 \$293 (0.00127)	0.0326 \$326 (0.00139)	0.1722 \$1,722 (0.0155)

Error 3. Present-Bias over Money

- We discussed problem applied to experiments
- Same problem applies to models
  - Notice: Transaction costs of switching k in above models are real effort, apply immediately
  - Effort cost c of attending gym also 'real' (not monetary)
  - Consumption-Savings models: Utility function of consumption c, not income I

Error 4. Getting the Intertemporal Payoff Wrong

- 'Costs are in the present, benefits are in the future'
- (β, δ) models very sensitive to timing of payoffs
- Sometimes, can easily turn investment good into leisure good
- Need to have strong intuition on timing
- Example: Paper on nuclear plants as leisure goods
  - Immediate benefits of energy
  - Delayed cost to environment
- BUT: 'Immediate' benefits come after 10 years of construction costs!

Section 4

Reference Dependence: Introduction

Introduction to Reference Dependence

- Kahneman and Tversky (*EMA* 1979) — Anomalous behavior in experiments:
  1. *Concavity over gains.* Given \$1000, A=(500,1) $\succ$ B=(1000,0.5;0,0.5)
  2. *Convexity over losses.* Given \$2000, C=(-1000,0.5;0,0.5) $\succ$ D=(-500,1)
  3. *Framing Over Gains and Losses.* Notice that A=D and B=C
  4. *Loss Aversion.* (0,1) $\succ$ (-8,.5;10,.5)
  5. *Probability Weighting.* (5000,.001) $\succ$ (5,1) and (-5,1) $\succ$ (-5000,.001)

- Can one descriptive model theory fit these observations?

Prospect Theory Features

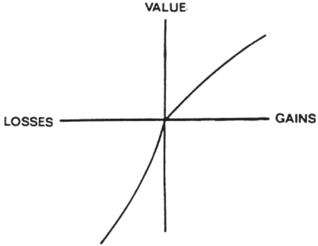
- Subjects evaluate a lottery $(y, p; z, 1-p)$ as follows: $\pi(p)\,v(y-r) + \pi(1-p)\,v(z-r)$

Five key components:

1. Reference Dependence
    - Basic psychological intuition that changes, not levels, matter (applies also elsewhere)
        - Utility is defined over differences from reference point $r \rightarrow$ Explains Experiment 3 Result

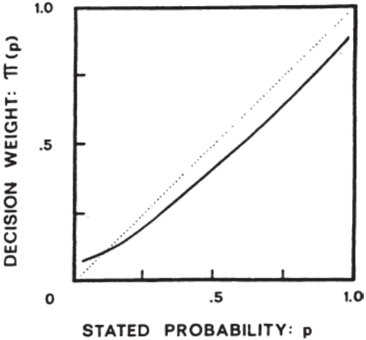
Prospect Theory Features

2. Diminishing sensitivity.
   - Concavity over gains of v $\rightarrow$ Explains (500,1)$\succ$(1000,0.5;0,0.5)
   - Convexity over losses of v $\rightarrow$ Explains (-1000,0.5;0,0.5)$\succ$(-500,1)
3. Loss Aversion $\rightarrow$ Explains (0,1) $\succ$ (-8,.5;10,.5)



Prospect Theory Features

4. Probability weighting function π non-linear $\rightarrow$ Explains (5000,.001) $\succ$ (5,1) and (-5,1) $\succ$ (-5000,.001)



- Overweight small probabilities + Premium for certainty

Prospect Theory Features

5. Narrow framing (Barberis, Huang, and Thaler, 2006; Rabin and Weizsäcker, 2011)
   - Consider only risk in isolation (labor supply, stock picking, house sale)
   - Neglect other relevant decisions

- Tversky and Kahneman (1992) propose calibrated version

$$v(x) = \begin{cases} (x-r)^{.88} & \text{if } x \geq r; \\ -2.25\left(-(x-r)\right)^{.88} & \text{if } x < r, \end{cases}$$

and

$$w(p) = \frac{p^{.65}}{\left(p^{.65} + (1-p)^{.65}\right)^{1/.65}}$$

Reference point r?

- Open question – depends on context
- Koszegi-Rabin (2006 on): personal equilibrium with rational expectation outcome as reference point
- Most field applications use only (1)+(3), or (1)+(2)+(3)

$$v(x) = \begin{cases} x - r & \text{if } x \geq r; \\ \lambda(x - r) & \text{if } x < r, \end{cases}$$

- Assume backward looking reference point depending on context

Section 5

Reference Dependence: Housing I

Housing

- Start from old-school reference-dependence papers
- Two typical ingredients:
  1. Backward-looking reference points (status quo, focal point, or past outcome)
  2. 'Informal' test – No model
- **Genesove-Mayer (QJE, 2001)**
  1. For house sales, natural reference point is previous purchase price
     - Validation: 75% of home owners remember exactly the purchase price of their home (survey evidence from our door-to-door surveys)
  2. Loss Aversion $\rightarrow$ Unwilling to sell house at a loss
     - Will ask for higher price if at a loss relative to purchase price

Data

- Evidence: Data on Boston Condominiums, 1990-1997
- Substantial market fluctuations of price

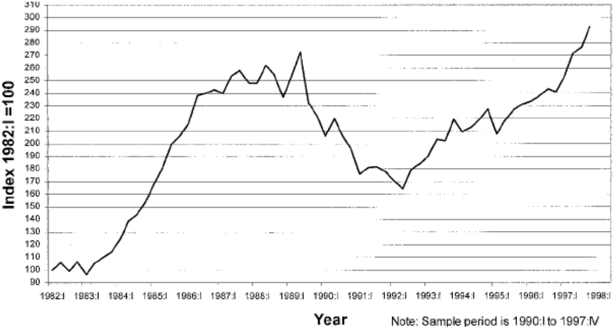


FIGURE I
Boston Condominium Price Index

Setup

- Observe
  - Listing price $L_{i,t}$ and last purchase price P_0
  - Observed Characteristics of property X_i
  - Time Trend of prices δ_t
- Define:
  - $\hat{P}_{i,t}$ is market value of property i at time t
- Ideal Specification:

$$\begin{aligned} L_{i,t} &= \hat{P}_{i,t} + m1_{\hat{P}_{i,t}<P_0}\left(P_0 - \hat{P}_{i,t}\right) + \varepsilon_{i,t} \\ &= \beta X_i + \delta_t + v_i + mLoss^* + \varepsilon_{i,t} \end{aligned}$$

Model

- However:
  - Do not observe $\hat{P}_{i,t}$, given v_i (unobserved quality)
  - Hence do not observe $Loss^*$
- Two estimation strategies to bound estimates. *Model 1:*

$$L_{i,t} = \beta X_i + \delta_t + m 1_{\hat{P}_{i,t} < P_0} \left(P_0 - \beta X_i - \delta_t \right) + \varepsilon_{i,t}$$

  - This model overstate the loss for high unobservable homes (high v_i)
  - Bias upwards in $\hat{m}$, since high unobservable homes should have high $L_{i,i}$
- *Model 2:*

$$L_{i,t} = \beta X_i + \delta_t + \alpha \left(P_0 - \beta X_i - \delta_t \right) + m 1_{\hat{P}_{i,t} < P_0} \left(P_0 - \beta X_i - \delta_t \right) + \varepsilon_{i,t}$$

- Estimates of impact on sale price

TABLE II
LOSS AVERSION AND LIST PRICES
DEPENDENT VARIABLE: LOG (ORIGINAL ASKING PRICE),
OLS equations, standard errors are in parentheses.

Variable	(1) All listings	(2) All listings	(3) All listings	(4) All listings	(5) All listings	(6) All listings
LOSS	0.35	0.25	0.63	0.53	0.35	0.24
	(0.06)	(0.06)	(0.04)	(0.04)	(0.06)	(0.06)
LOSS-squared			−0.26	−0.26		
			(0.04)	(0.04)		
LTV	0.06	0.05	0.03	0.03	0.06	0.05
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Estimated value in 1990	1.09	1.09	1.09	1.09	1.09	1.09
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Estimated price index at quarter of entry	0.86	0.80	0.91	0.85		
	(0.04)	(0.04)	(0.03)	(0.03)		
Residual from last sale price		0.11		0.11		0.11
		(0.02)		(0.02)		(0.02)
Months since last sale	−0.0002	−0.0003	−0.0002	−0.0003	−0.0002	−0.0003
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Dummy variables for quarter of entry	No	No	No	No	Yes	Yes
Constant	−0.77	−0.70	−0.84	−0.77	−0.88	−0.86
	(0.14)	(0.14)	(0.13)	(0.14)	(0.10)	(0.10)
R^2	0.85	0.86	0.86	0.86	0.86	0.86
Number of observations	5792	5792	5792	5792	5792	5792

Effect of Experience

- Effect of experience: Larger effect for owner-occupied

TABLE IV
LOSS AVERSION AND LIST PRICES: OWNER-OCCUPANTS VERSUS INVESTORS
DEPENDENT VARIABLE: LOG (ORIGINAL ASKING PRICE)
OLS equations, standard errors are in parentheses.

Variable	(1) All listings	(2) All listings	(3) All listings	(4) All listings
LOSS × owner-occupant	0.50	0.42	0.66	0.58
	(0.09)	(0.09)	(0.08)	(0.09)
LOSS × investor	0.24	0.16	0.58	0.49
	(0.12)	(0.12)	(0.06)	(0.06)
LOSS-squared × owner-occupant			−0.16	−0.17
			(0.14)	(0.15)
LOSS-squared × investor			−0.30	−0.29
			(0.02)	(0.02)
LTV × owner-occupant	0.03	0.03	0.01	0.01
	(0.02)	(0.02)	(0.01)	(0.01)
LTV × investor	0.053	0.053	0.02	0.02
	(0.027)	(0.027)	(0.02)	(0.02)
Dummy for investor	−0.02	−0.02	−0.03	−0.03
	(0.014)	(0.01)	(0.01)	(0.01)
Estimated value in 1990	1.09	1.09	1.09	1.09
	(0.01)	(0.01)	(0.01)	(0.01)
Estimated price index at quarter of entry	0.84	0.80	0.86	0.82
	(0.05)	(0.04)	(0.04)	(0.04)
Residual from last sale price		0.08		0.08
		(0.02)		(0.02)

Effect of Last Price

- Some effect also on final transaction price

TABLE VI
LOSS AVERSION AND TRANSACTION PRICES
DEPENDENT VARIABLE: LOG (TRANSACTION PRICE)
NLLS equations, standard errors are in parentheses.

Variable	(1) All listings	(2) All listings
LOSS	0.18	0.03
	(0.03)	(0.08)
LTV	0.07	0.06
	(0.02)	(0.01)
Residual from last sale price		0.16
		(0.02)
Months since last sale	−0.0001	−0.0004
	(0.0001)	(0.0001)
Dummy variables for quarter of entry	Yes	Yes
Number of observations	3413	3413

Implications

- Lowers the exit rate (lengthens time on the market)

TABLE VII
HAZARD RATE OF SALE
Duration variable is the number of weeks the property is listed on the market.
Cox proportional hazard equations, standard errors are in parentheses.

Variable	(1) All listings	(2) All listings	(3) All listings	(4) All listings
LOSS	−0.33	−0.63	−0.59	−0.90
	(0.13)	(0.15)	(0.16)	(0.18)
LOSS-squared			0.27	0.28
			(0.07)	(0.07)
LTV	−0.08	−0.09	−0.06	−0.06
	(0.04)	(0.04)	(0.04)	(0.04)
Estimated value	0.27	0.27	0.27	0.27
in 1990	(0.04)	(0.04)	(0.04)	(0.04)
Residual from		0.29		0.29
last sale		(0.07)		(0.07)

- Overall, plausible set of results that show impact of reference point

Section 6

Methodology: Bunching-Based Evidence of Reference Dependence

Identifying Reference-Dependence

- Some Cases: Key role for *diminishing sensitivity* and *probability weighting*
  - Disposition effect: Diminishing sensitivity $\rightarrow$ more prone to sell winners (part of effect)
  - Insurance: Prob. weighting $\rightarrow$ propensity to get low deductible
- Most Cases: Key role for *loss aversion*
- Common element for several papers:
  - Well-defined, backward-looking reference point r
  - Optimal effort choice e^*
  - Cost of effort $c(e)$
  - Return of effort e, reference point r

- Individual maximizes

$$\max_e e + \eta [e - r] - c(e) \quad \text{for } e \geq r$$
$$\max_e e + \eta\lambda [e - r] - c(e) \quad \text{for } e < r$$

- Derivative of utility function:

$$1 + \eta - c'(e^*) \quad \text{for } e \geq r$$
$$1 + \lambda\eta - c'(e^*) \quad \text{for } e < r$$

  - Discontinuity in marginal utility of effort
  - Implication 1 $\rightarrow$ Bunching at $e^* = r$
  - Implication 2 $\rightarrow$ Missing mass of distribution for $e < r$ compared to $e > r$

Bunching

- Older literature does not pursue this, new literature does
  - Bunching is much harder to explain with alternative models
  - Shift in mass can generally be well identified too under assumptions of contiuity of distribution

Examine four related applications:

1. Housing (where test is not formalized)
   - Effort: How hard to 'push' the house
   - Reference point: Purchase price
2. Tax filing
   - Effort: Tax elusion
   - Reference point: Withholding amount

Bunching

3. Marathon running
   - Effort: Running
   - Reference point: Round goal
4. Merger
   - Effort: Pushing for higher price
   - Reference point: 52-week high

Two more related cases next lecture:

5. Labor supply
   - Effort: Work more hours
   - Reference point: Expected daily earnings?
6. Job search
   - Effort: Search for a job
   - Reference point: Recent average earnings

Section 7

Reference Dependence: Housing II

Formalize Intuition

- Return to Housing case, formalize intuition.
  - Seller chooses price P at sale
  - Higher Price P
    - lowers probability of sale $p(P)$ (hence $p'(P) < 0$)
    - increases utility of sale $U(P)$
  - If no sale, utility is $\bar{U} < U(P)$ (for all relevant P)

Model

- Maximization problem:

$$\max_P p(P)U(P) + (1 - p(P))\bar{U}$$

- F.o.c. implies

$$MG = p(P^*)U'(P^*) = -p'(P^*)(U(P^*) - \bar{U}) = MC$$

- Interpretation: Marginal Gain of increasing price equals Marginal Cost
- S.o.c are

$$2p'(P^*)U'(P^*) + p(P^*)U''(P^*) + p''(P^*)(U(P^*) - \bar{U}) < 0$$

- Need $p''(P^*)(U(P^*) - \bar{U}) < 0$ or not too positive

Model

- Reference-dependent preferences with reference price P_0 (with pure gain-loss utility):

$$v(P|P_0) = \begin{cases} P - P_0 & \text{if } P \geq P_0; \\ \lambda(P - P_0) & \text{if } P < P_0, \end{cases}$$

  - (in this case, think of $\bar{U} < 0$)
  - Can write as

$$\begin{aligned} p(P) &= -p'(P)(P - P_0 - \bar{U}) \text{ if } P \geq P_0 \\ p(P)\lambda &= -p'(P)(\lambda(P - P_0) - \bar{U}) \text{ if } P < P_0 \end{aligned}$$

  - Plot Effect on MG and MC of loss aversion
- Compare $P^*_{\lambda=1}$ (equilibrium with no loss aversion) and $P^*_{\lambda>1}$ (equilibrium with loss aversion)

Cases

- Case 1. Loss Aversion λ increase price $(P^*_{\lambda=1} < P_0)$

- Case 2. Loss Aversion λ induces bunching at $P = P_0$ $(P^*_{\lambda=1} < P_0)$

Cases

- Case 3. Loss Aversion has no effect ($P^*_{\lambda=1} > P_0$)

- General predictions. When aggregate prices are low:
  - High prices P relative to fundamentals
  - Bunching at purchase price P_0
  - Lower probability of sale $p(P)$
  - Longer waiting on market
- Important to tie housing evidence to model
- Would be great to redo with data from recent recession

Section 8

Reference Dependence: Tax Elusion

Alex Rees-Jones (2014)

- Preparation of tax returns
  - Can lower taxes due expending effort (finding receipts/elusion)
  - Important setting with clear reference point: 0 taxes due
  - Pre-manipulation balance due b^{PM}
  - Denote by s the tax dollars sheltered
- Slides courtesy of Alex
- Other relevant paper: **Engstrom, P., Nordblom, K., Ohlsson, H., & Persson, A. (AEJ: Policy, 2016)**
  - Similar evidence, but focus on claiming deductions

Simple example with smooth utility

Consider a model abstracting from income effects:

$$\max_{s \in \mathbb{R}^+} \underbrace{(w - b^{PM} + s)}_{\text{linear utility over money}} - \underbrace{c(s)}_{\text{cost of sheltering}}$$

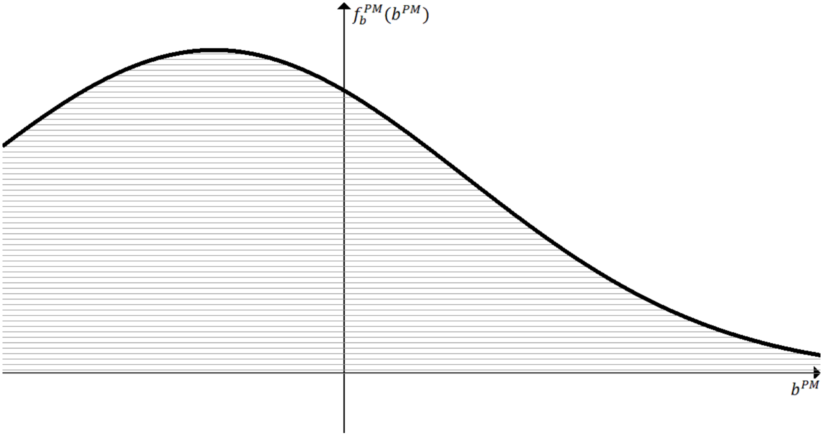
Optimal sheltering is determined by the first-order condition:

$$1 - c'(s^*) = 0$$

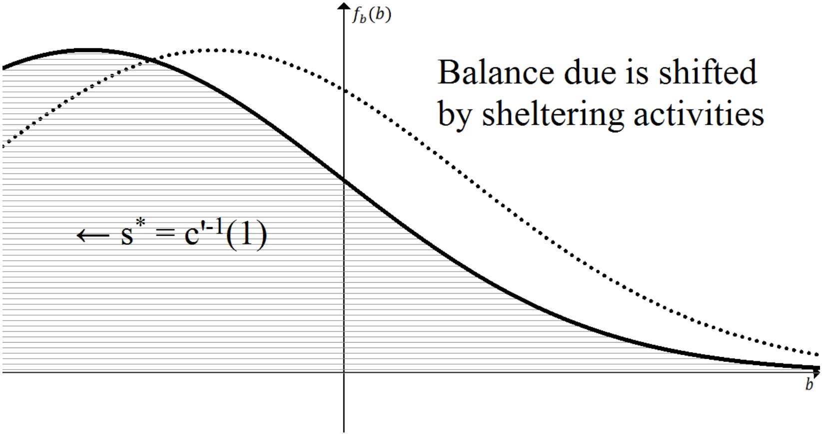
Optimal sheltering solution: $s^* = c'^{-1}(1)$.

→ Distribution of balance due, $b \equiv b^{PM} - s^*$, is a horizontal shift of the distribution of b^{PM}.

PDF of pre-manipulation balance due



PDF of final balance due after sheltering



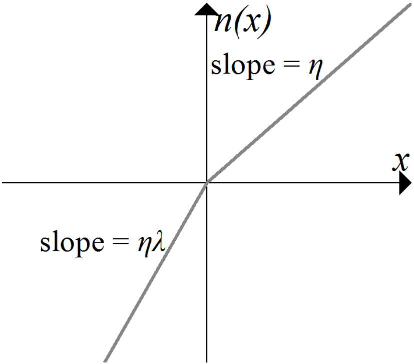
Loss-averse case

$$\max_{s \in \mathbb{R}^+} \quad \underbrace{m(-b^{PM} + s)}_{\text{utility over money}} \quad - \quad \underbrace{c(s)}_{\text{cost of sheltering}}$$

Loss-averse utility specification:

$$\underbrace{(w - b^{PM} + s)}_{\text{consumption utility}} + \underbrace{n(-b^{PM} + s - r)}_{\text{gain-loss utility}}$$

$$n(x) = \begin{cases} \eta x & \text{if } x \geq 0 \\ \eta \lambda x & \text{if } x < 0 \end{cases}$$



Optimal loss-averse sheltering

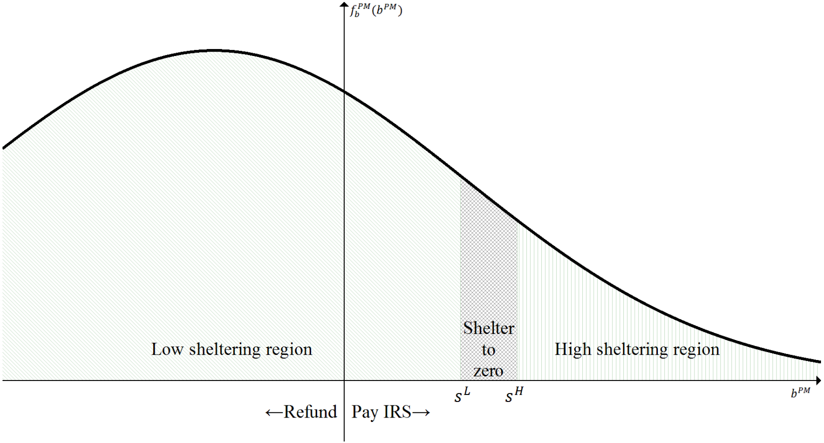
This model generates an optimal sheltering solution with different behavior across three regions:

$$s^*(b^{PM}) = \begin{cases} s^H & \text{if } b^{PM} > s^H - r \\ b^{PM} + r & \text{if } b^{PM} \in \left[s^L - r, s^H - r\right] \\ s^L & \text{if } b^{PM} < s^L - r \end{cases}$$

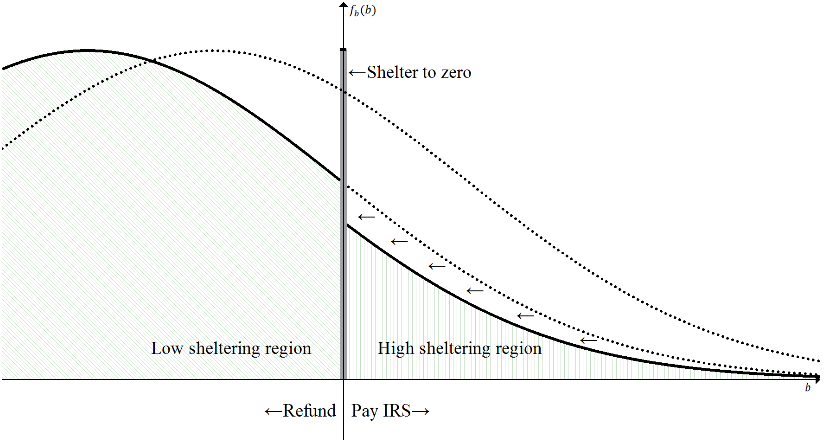
where $s^H \equiv c'^{-1}(1 + \eta\lambda)$ and $s^L \equiv c'^{-1}(1 + \eta)$.

- Sufficiently large b^{PM} $\rightarrow$ high amount of sheltering.
- Sufficiently small b^{PM} $\rightarrow$ low amount of sheltering.
- For an intermediate range, sheltering chosen to offset b^{PM}.

PDF of pre-manipulation balance due



PDF of final balance due after loss-averse sheltering



Revenue effect of loss framing: $s^H - s^L$.

Data description

Dataset: 1979-1990 SOI Panel of Individual Returns.

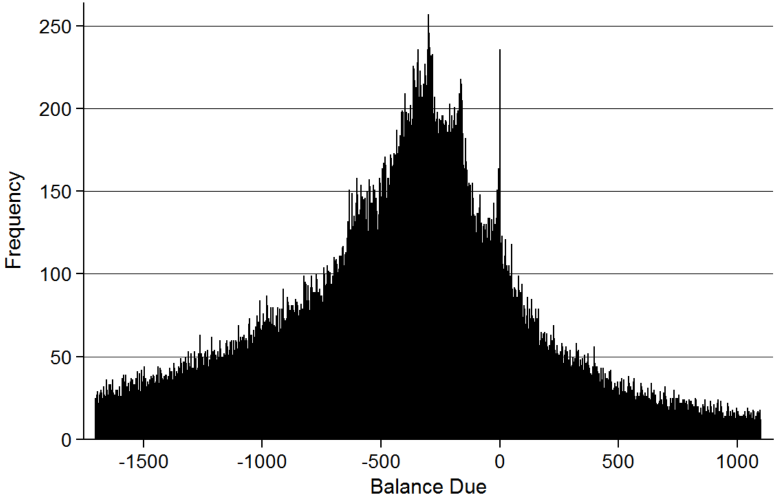
- Contains most information from Form 1040 and some related schedules.
- Randomized by SSNs.

Exclude observations filed from outside of the 50 states + DC, drawn from outside the sampling frame, observations before 1979.

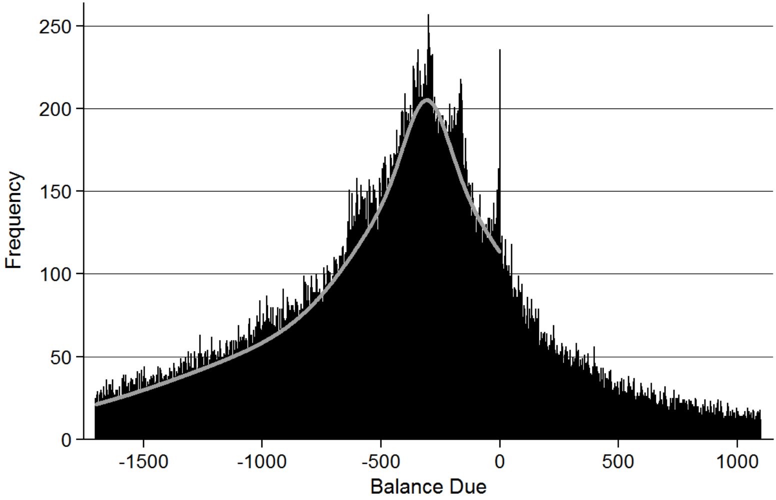
Exclude individuals with zero pre-credit tax due, individuals with zero tax prepayments.

Primary sample: $\approx 229k$ tax returns, $\approx 53k$ tax filers.

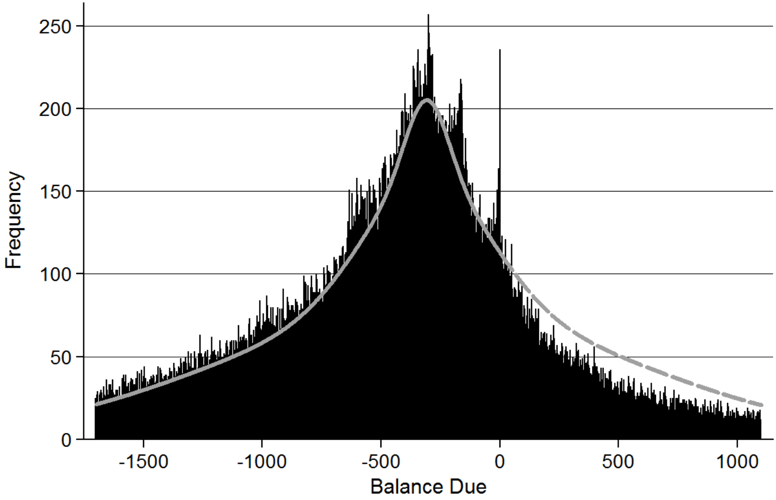
First look: distribution of nominal balance due



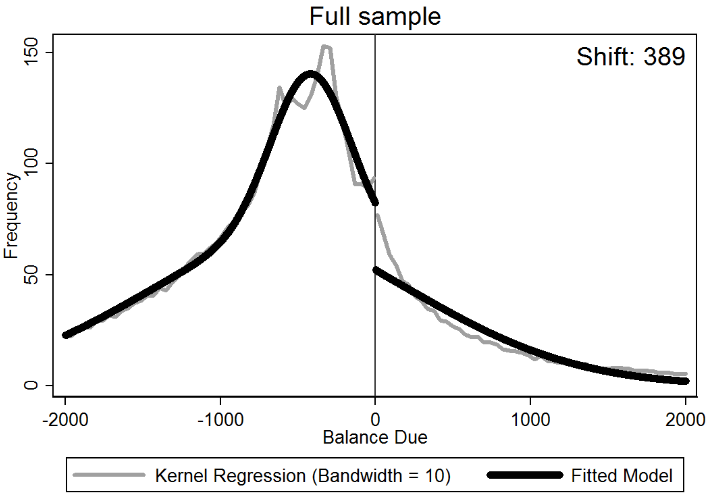
First look: distribution of nominal balance due



First look: distribution of nominal balance due

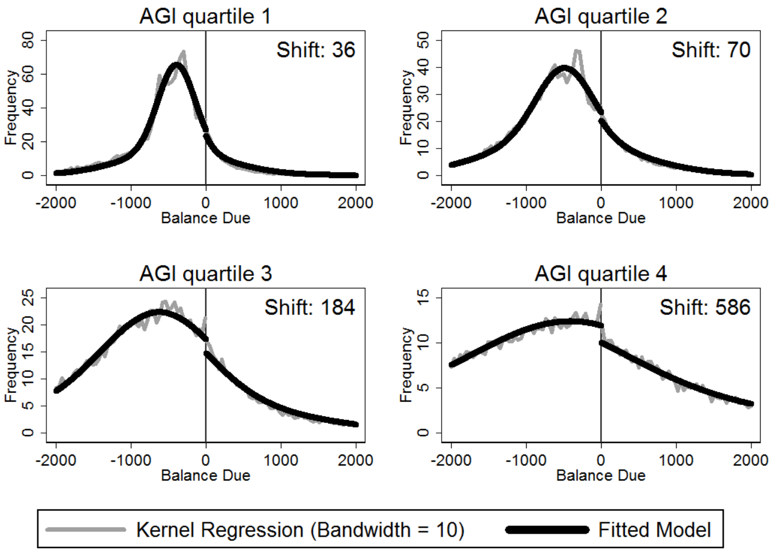


Fit of predicted distributions



Estimate table

Fit of predicted distributions



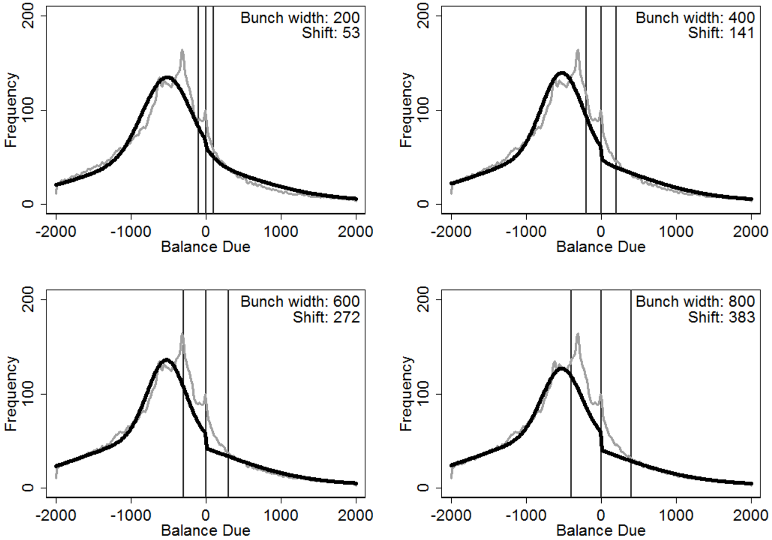
Rationalizing differences in magnitudes

What drives the differences in the bunching and shifting estimates?

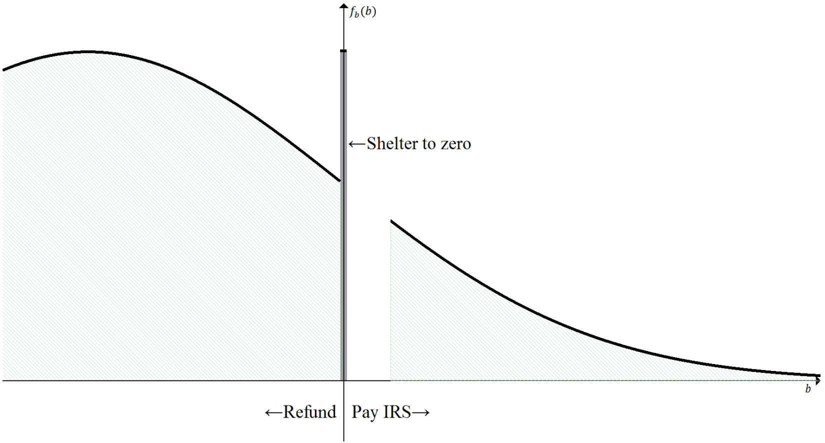
Primary explanation: assumption that sheltering can be manipulated to-the-dollar.

- Possible for some types of sheltering: e.g. direct evasion, choosing amount to give to charity, targeted capital losses.
- Not possible for many types of sheltering.
- Excess mass at zero will “leave out” individuals without finely manipulable sheltering technologies.
- Potential solution: permit diffuse bunching “near” zero.

Fit of predicted distributions



Distribution with fixed cost in loss domain



Back

Section 9

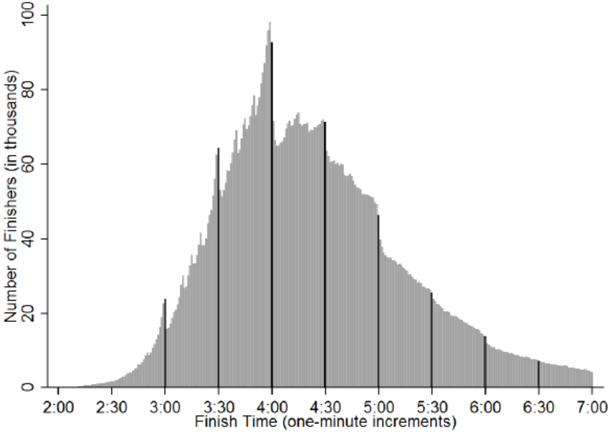
Reference Dependence: Goal Setting

Allen, Dechow, Pope, Wu (*MS* 2016)

- Reference point can be a goal
- Marathon running: Round numbers as goals
- Similar identification considering discontinuities in finishing times around round numbers

Distribution of Finishing Times

Figure 2: Distribution of marathon finishing times ($n = 9,378,546$)



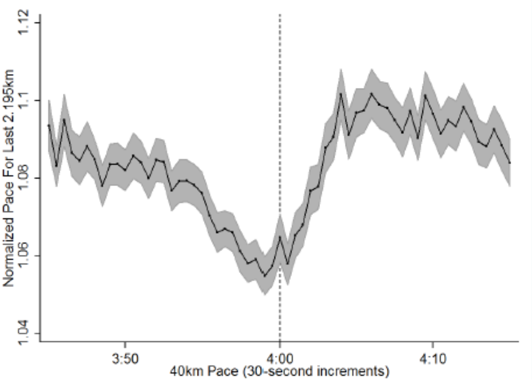
NOTE: The dark bars highlight the density in the minute bin just prior to each 30 minute threshold.

Intuition

- Channel of effects: Speeding up if behind and can still make goal

Figure 8: Normalized pace for last 2.195 kilometers as a function of 40 kilometer pace

(a) Runners on 3:45 to 4:15 pace through 40 kilometers



Summary

- Evidence strongly consistent with model
    - Missing distribution to the right
    - Some bunching
- Hard to back out loss aversion given unobservable cost of effort

Section 10

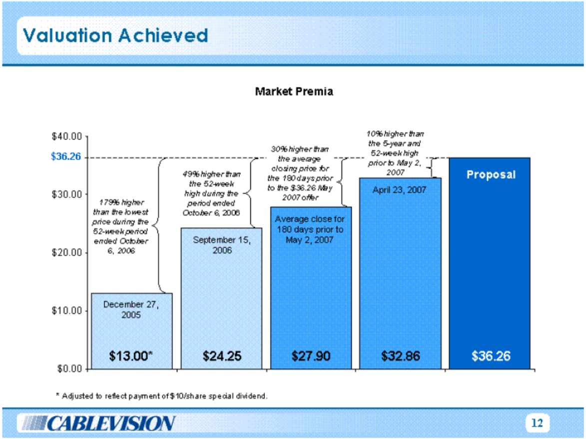
Reference Dependence: Mergers

Baker, Pan, Wurgler (*JF* 2012)

- On the appearance, very different set-up:
  - Firm A (Acquirer)
  - Firm T (Target)
- After negotiation, Firm A announces a price P for merger with Firm T
  - Price P typically at a 20-50 percent premium over current price
  - About 70 percent of mergers go through at price proposed
  - Comparison price for P often used is highest price in previous 52 weeks, P_{52}

Example: How Cablevision (Target) trumpets deal

Figure 1. Slide from Cablevision Presentation to Shareholders, October 24, 2007. The management of Cablevision recommended acceptance of a $36.26 per share cash bid from the Dolan family. The slide compares this bid price to various recent prices including 52-week highs.



Model

- Assume that Firm T chooses price P, and A decides accept reject
- As a function of price P, probability $p(P)$ that deal is accepted (depends on perception of values of synergy of A)
- If deal rejected, go back to outside value $\bar{U}$
- Then maximization problem is same as for housing sale:

$$\max_P p(P) U(P) + (1 - p(P)) \bar{U}$$

- Can assume T reference-dependent with respect to

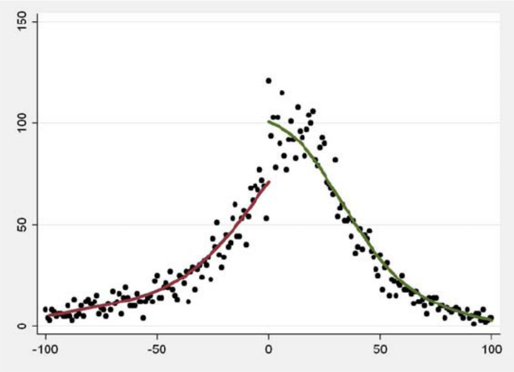
$$v(P|P_0) = \begin{cases} P - P_{52} & \text{if } P \geq P_{52}; \\ \lambda (P - P_{52}) & \text{if } P < P_{52}, \end{cases}$$

Predictions and Tests

- Obtain same predictions as in housing market
- (This neglects possible reference dependence of A)
- Baker, Pan, and Wurgler (2009): Test reference dependence in mergers
  - Test 1: Is there bunching around P_{52}? (GM did not do this)
  - Test 2: Is there effect of P_{52} on price offered?
  - Test 3: Is there effect on probability of acceptance?
  - Test 4: What do investors think? Use returns at announcement

Test 1: Offer price P around P_{52}

- Some bunching, missing left tail of distribution



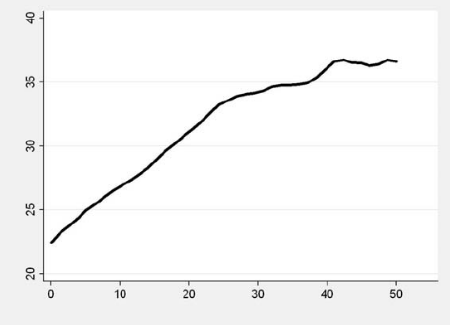
Test 1: Offer price P around P_{52}

- Notice that this does not tell us how the missing left tail occurs:
  - Firms in left tail raise price to P_{52}?
  - Firms in left tail wait for merger until 12 months after past peak, so P_{52} is higher?
  - Preliminary negotiations break down for firms in left tail
- Would be useful to compare characteristics of firms to right and left of P_{52}

Test 2: Kernel regression of P

- Kernel regression of price offered P (Renormalized by price 30 days before, P_{-30}, to avoid heterosked.) on P_{52} :

$$100 * \frac{P - P_{-30}}{P_{-30}} = \alpha + \beta \left[100 * \frac{P_{52} - P_{-30}}{P_{-30}} \right] + \varepsilon$$



Test 4: What do investors think?

- Test 3: Probability of final acquisition is higher when offer price is above P_{52} (Skip)

- Test 4: What do investors think of the effect of P_{52}?
  - Holding constant current price, investors should think that the higher P_{52}, the more expensive the Target is to acquire
  - Standard methodology to examine this:
    - 3-day stock returns around merger announcement: $CAR_{t-1,t+1}$
    - This assumes investor rationality
    - Notice that merger announcements are typically kept top secret until last minute $\rightarrow$ On announcement day, often big impact

Test 4: What do investors think?

- Regression (Columns 3 and 5):

$$CAR_{t-1,t+1} = \alpha + \beta \frac{P}{P_{-30}} + \varepsilon$$

where P/P_{-30} is instrumented with P_{52}/P_{-30}

Table 8. Mergers and Acquisitions: Market Reaction. Ordinary and two-stage least squares regressions of the 3-day CAR of the bidder on the offer premium.

$$r_{t-1\to t+1} = a + b\,\frac{Offer_{it}}{P_{i,t-30}} + e_{it}$$

$$\left(\frac{Offer_{it}}{P_{i,t-30}} - 1\right)\cdot 100 = a + b_1 \min\left(\left(\frac{52WeekHigh_{i,t-30}}{P_{i,t-30}} - 1\right)\cdot 100, 25\right) + b_2 \max\left(0, \min\left(\left(\frac{52WeekHigh_{i,t-30}}{P_{i,t-30}} - 1.25\right)\cdot 100, 50\right)\right) + b_3 \max\left(\left(\frac{52WeekHigh_{i,t-30}}{P_{i,t-30}} - 1.75\right)\cdot 100, 0\right) + e_{it}$$

where r is the market-adjusted return of the bidder for the three-day period centered on the announcement date, *Offer* is the offer price from Thomson, P is the target stock price from CRSP, and *52WeekHigh* is the high stock price over the 365 calendar days ending 30 days prior to the announcement date. The first, second, and fourth columns use ordinary least squares. The third and the fifth columns instrument for the offer premium using *52WeekHigh*. Robust t-statistics with standard errors clustered by month are in parentheses.

	OLS	*OLS*	*IV*	*OLS*	*IV*
	1	2	3	4	5
Offer Premium:					
b	-0.0186***	-0.0204***	-0.215***	-0.0443***	-0.253***
	(-2.64)	(-2.74)	(-3.48)	(-4.21)	(-4.39)

- Results very supportive of reference dependence hypothesis – Also alternative anchoring story

Section 11

Next Lecture

Next Lecture

- Reference-Dependent Preferences
  - Labor Supply
  - Job Search
  - Finance
- Problem Set 2 due next week