Psychology and Economics

14.13 Lecture 9: Reference-dependent preferences[1]

Frank Schilbach

MIT

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[1]Some slides are based on notes by Botond Kőszegi, Devin Pope, and Josh Dean. I would like to thank them, without implicating them in any way, for sharing their materials with me.

Recap: most important points in Kahneman and Tversky (1979)

(1) **Changes rather than levels.** Utility seems better described by *changes* in consumption rather than by *levels* of consumption.

The carriers of value are changes in wealth or welfare, rather than final states. This assumption is compatible with basic principles of perception and judgment.

(2) **Loss aversion.** Losses loom larger than gains.

The aggravation that one experiences in losing a sum of money appears to be greater than the pleasure associated with gaining the same amount.

(3) **Diminishing sensitivity.** People are risk-averse in the gain region, but risk-loving in the loss region.

Many sensory and perceptual dimensions share the property that the psychological response is a concave function of the magnitude of physical change. For example, it is easier to discriminate between a change of 3 degrees and a change of 6 degrees in room temperate, than it is to discriminate between a change of 13 degrees and a change of 16 degrees.

Diminishing sensitivity

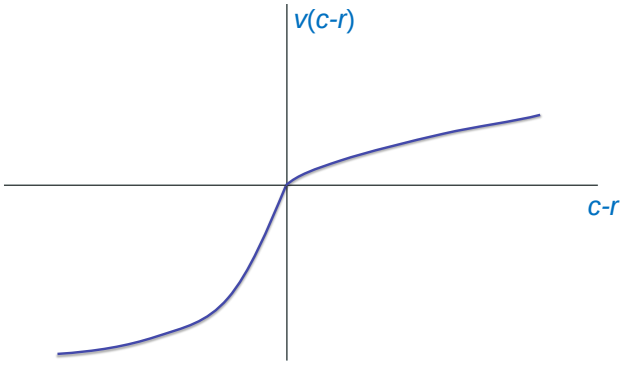
- People's sensitivity to *further* changes in consumption is smaller for consumption levels that are further away from the reference point.
  - A change from getting \$0 to getting \$10 feels greater than a change from getting \$1,000 to getting \$1,010.
  - Risk taking in loss domain and risk aversion in gain domain are consistent with diminishing sensitivity.

- Much like reference dependence, diminishing sensitivity is a general feature of human perception:

Distance	1 ft. vs. 0 ft.	101 ft. vs. 100 ft.
Time	1 day vs. 0 days	101 days from now vs. 100 days
Chance	1% vs. 0%	19% vs. 18%

"Prospect Theory": proposed alternative utility (value) function

Loss aversion – diminishing sensitivity



(1) Carrier of utility: changes relative to reference point (rather than levels)

(2) Loss aversion: kink at zero

(3) Diminishing sensitivity: diminishing returns on both sides of the reference point

- Concavity in gains
- Convexity in losses

- Key question: how is the reference point determined?

Value function: example

- Matthew has reference-dependent utility over shirts (c_S) and money (c_M):

$$v(c_S - r_S) + v(c_M - r_M), \tag{1}$$

  where r_M is the reference point for money and r_S is the reference point for shirts.

- The 'value function' $v(x)$:
  - (Usually) concave in gain domain ($x > 0$) and convex in loss domain ($x < 0$).
  - Kink at zero: $v(x)$ is steeper to the left of $x = 0$ than to the right of $x = 0$.

- Example:

$$v(x) = \begin{cases} \sqrt{x} & \text{for } x > 0, \\ -2\sqrt{|x|} & \text{for } x < 0. \end{cases} \tag{2}$$

Many applications of reference-dependent utility

- Endowment effect: Kahneman et al. (1990), Plott and Zeiler (2005)
- Insurance: Sydnor (2010)
- Labor supply, employment, and effort: Mas (2006); Camerer et al. (1997) and many other taxi driver papers
- Finance (Odean, 1998) and housing (Genesove and Mayer, 2001)
- Marathon running (Allen et al., 2014) and golf (Pope and Schweitzer 2011)
- Domestic violence: Card and Dahl (2011)

Labor supply

- Suppose a worker is in the following situation:
  - She can freely choose how many hours she works every day.
  - There are frequent temporary changes in her hourly wage.
- Possible relationships between wages and hours per day
  (1) Always work the same number of hours
  (2) Work more hours on days when wages are high
  (3) Work less hours on days when wages are high
- What does standard theory predict?

Which strategy works best?

- Suppose the wage is \$5/hr on day 1 and \$10/hr on day 2.
- Three strategies:
  (1) 8 hours on both days
  (2) 6 hours on day 1, 9 hours on day 2
  (3) 9 hours on day 1, 6 hours on day 2
- Resulting earnings from the three strategies:
  (1) 8 hours on both days makes \$120.
  (2) 6 and 9 is fewer hours of work, and still makes \$120.
  (3) 9 and 6 is also fewer hours of work, but only makes \$105
- What would you do? Why?

Complications

- Why do the wage changes have to be temporary?
  - Permanent changes might cause non-trivial income effects.
- Why might strategy (1) be optimal?
  - Effort costs might be convex.
  - The extra hour might be particularly painful.
- Can we really say that strategy (3) is a mistake?
  - Effort costs might be correlated with wages.
  - Example: Cab driving in rain/snow more strenuous/dangerous

Empirical evidence: Camerer et al. (1997)

- Labor supply of New York City cab drivers (pre Uber).
  - Typical cab driver rents cab for 12-hour period for a fixed fee.
  - Within this 12-hour window, a driver can choose hours freely.
  - Cab drivers' wage varies quite a bit: Weather, subway breakdowns, conferences, ...
- Trip sheets measure how long each cab driver works, and overall earnings, allowing them to calculate each driver's hour wage for each day.
- Basic finding: hours are negatively related to wages.

Explanation: reference-dependent preferences

(1) What is being evaluated in a reference-dependent way?

- Daily income

(2) What is the reference point?

- Some daily target that the driver expects or wants to make

(3) What feature of the value function explains the phenomenon?

- Loss aversion: falling short of the target is more painful than going above it is pleasant.

- Main take-away: drivers often stop at their daily income target.
  - Drivers with higher wage reaches target faster, works fewer hours.
  - Lots of subsequent work and debate regarding this finding. Debate still ongoing!

Alternative hypotheses?

(1) Liquidity constraints

- Fixed daily expenses to meet from drivers' income that day?
- But drivers who own medallion exhibit same behavior patterns.

(2) Fatigue

- If it's more tiring to drive on high-wage days, then it's natural for drivers for drivers to stop early on those days
- But drivers say it's *easier* to drive with more passengers.

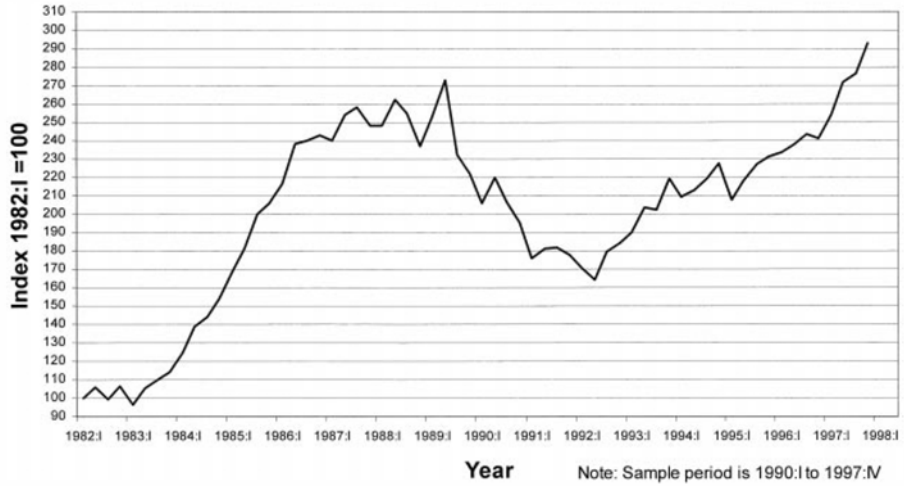
(3) Unobserved shocks

- Some shocks affect all drivers' labor supply at same time.
- Example: there are some days when all drivers get the flu.
- Fewer drivers will work, and those who do will work fewer hours.
- And those who work get higher wages.

Genesove and Mayer (2001): Housing market

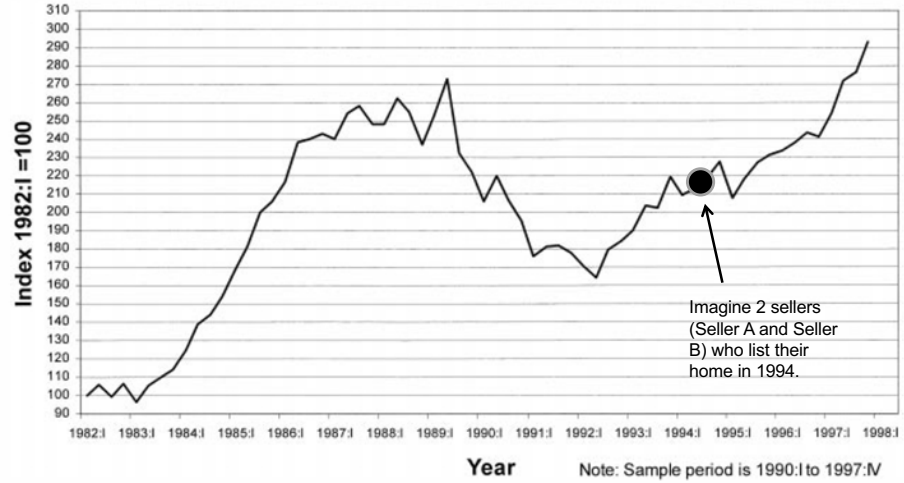
- What is the natural reference point for housing prices?
  - Previous purchase price
  - 75% of home owners know exact purchase price of their home
- Loss Aversion makes people unwilling to sell house at a loss.
  - Ask for higher price if at a loss relative to purchase price
- Data on Boston Condominiums, 1990-1997

Substantial market fluctuations of prices

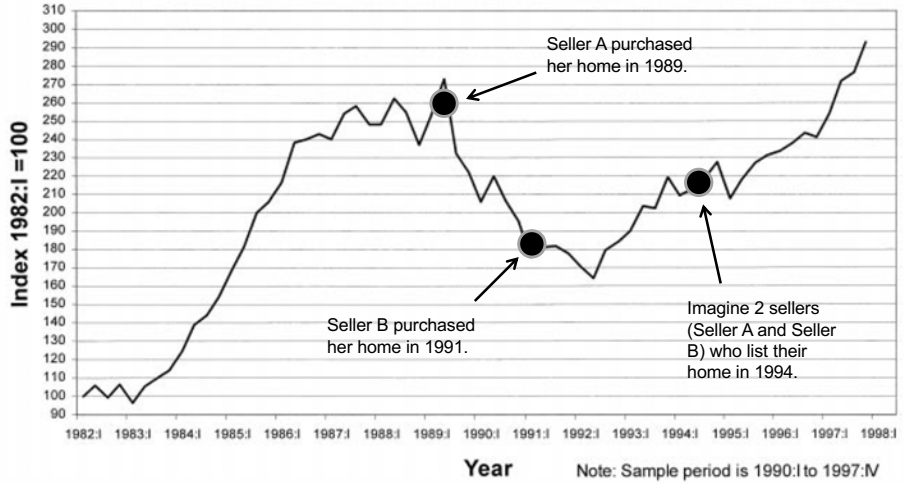


Courtesy of David Genesove and Christopher Mayer. Used with permission.

Substantial market fluctuations of prices



Substantial market fluctuations of prices



Courtesy of David Genesove and Christopher Mayer. Used with permission.

How can we test for reference-dependent preferences?

- What predictions do we want to test?
  - House owners are reluctant to sell their house when the current market price is below the purchase price.
- Ideal econometric specification:

$$\text{List Price} = \alpha + \beta \cdot \text{Actual Market Value} + \delta \cdot \text{Loss} + \epsilon$$

  - **Actual Market Value:** unobserved but can be estimated using housing characteristics and time and geographic dummies.
  - **Loss:** the difference between the previous selling price and the expected selling price (truncated from below at 0).

Higher list prices for places with nominal losses

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)

- 10 percent increase in a prospective loss leads to a 2.5 to 3.5 percent higher list price.
- These effects translate into higher sales prices and a lower hazard rate of sales.

Genesove and Mayer (2001): Summary of results

- Sellers subject to losses:
  - (i) set higher asking prices of 25 to 35 percent of the difference between the expected selling price of a property and their original purchase price,
  - (ii) attain higher selling prices of 3 to 18 percent of that difference, and
  - (iii) have a lower hazard rate of sale.
- Effects roughly twice as large for owner-occupants compared to investors

Behavioral finance

- Economists originally thought that neoclassical assumptions are most likely to hold in the financial market. Why?
- The argument goes something like:
  - The financial market is extremely competitive.
  - So it favors result-oriented, rational, and selfish behavior.
  - People who are not rational, selfish, and money-oriented will be eliminated from the market
- Surprisingly, finance became one of the most influential and most fruitful applications of psychology and economics.

Selling winners and holding on to losers: Odean (1997)

- 10,000 customer accounts at nationwide brokerage house
  - All trade dates and prices for the period 1987 to 1993.
- Winners and losers
  - During each trading day, evaluate for each stock in portfolio whether it has made a gain or a loss relative to the purchase price.
  - Count each stock with a loss as a "loser," and each stock with a gain as a "winner."
  - No data recorded on days without activity in the account
- Realized gains and realized losses
  - If a losing stock is sold, count it as a "realized loss,"
  - If a winning stock is sold, count it as a "realized gain."
  - Compare number of realized losses to number of realized gains?

Key findings

- Odean defines the proportion of losers realized (PLR) as

$$\frac{\#\text{ of realized losses}}{\#\text{ of total losers}},$$

and similarly for the proportion of gains realized (PGR).

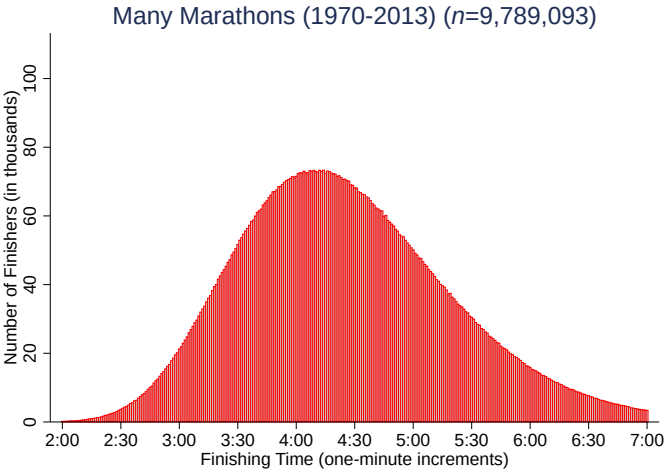
	Entire Year	**December**	**Jan-Nov**
PLR	0.098	0.128	0.094
PGR	0.148	0.108	0.152
Difference	-0.050	0.020	-0.058
t-stat	-35	4.3	-38

- The tendency to sell winners and hold on to losers is called the *disposition effect*.

Explanation: reference-dependent preferences

- Evaluation of stock's sales price is reference-dependent.
  - The reference point here is the purchase price.
  - It is pleasant to sell a winner and unpleasant to sell a loser.
  - People are willing to take more risks with stocks that have lost money than with stocks that have made money.
- Is the disposition effect costly?
  - If markets are efficient, past performance shouldn't be predictive of future prices.
  - But there was momentum during the study period (winners did better).
  - Disposition effect may induce excessive trading.
- Investors sell more losers than winners in December. Why?
  - Because losses are tax deductible, this lowers their tax bill.

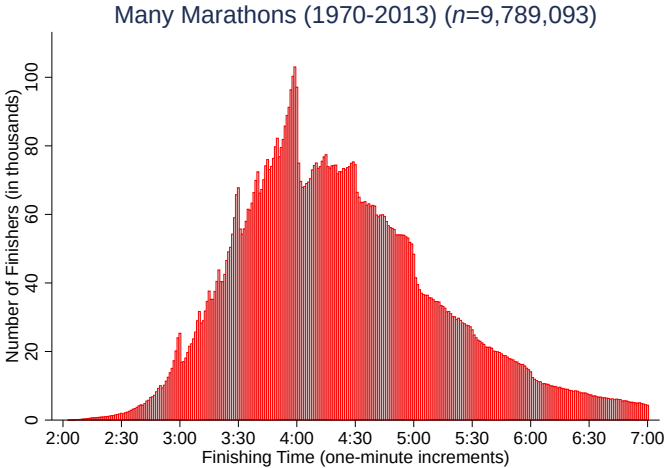
Allen et al. (2014): Finishing in time?



- Law of Large Numbers: would expect finishing times to resemble a smooth distribution

Figures by Eric J. Allen, Patricia M. Dechow, Devin G. Pope, George Wu. Used with permission.

Allen et al. (2014): Finishing in time?



- Law of Large Numbers: would expect finishing times to resemble a smooth distribution
- Actual distribution looks like this. What explains the discrepancy?

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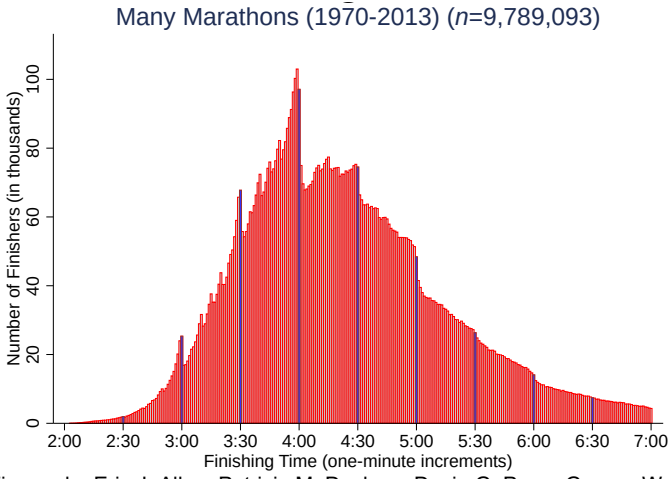
Allen et al. (2014): Finishing in time?



- Law of Large Numbers: would expect finishing times to resemble a smooth distribution
- Actual distribution looks like this.
  - Bunching below round (half-hour) finishing times.

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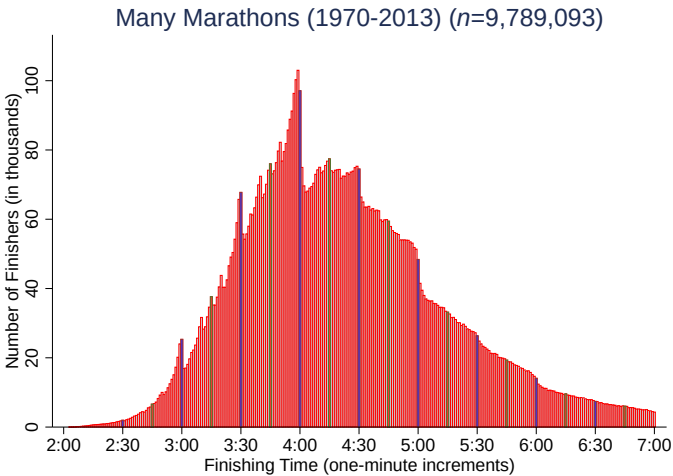
Allen et al. (2014): Finishing in time?



- Law of Large Numbers: would expect finishing times to resemble a smooth distribution
- Actual distribution looks like this.
  - Bunching below round (half-hour) finishing times.
  - Even some bunching around quarter-hour times.
- Consistent with reference dependence where reference point is a goal

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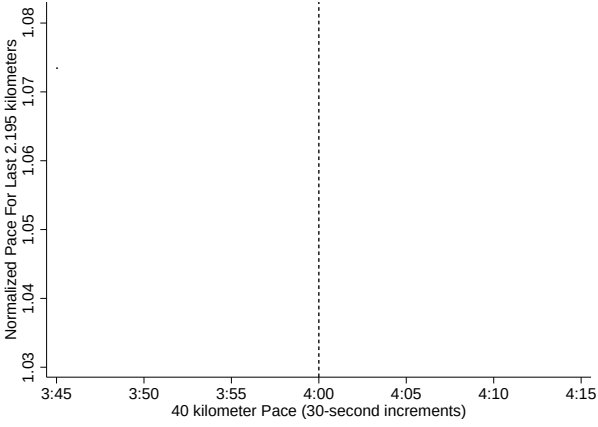
Effort at the end of the race



- Normalized pace (minutes/km) during past 2.195 kms relative to pace in the previous 40 kms.
- What pattern do we expect?

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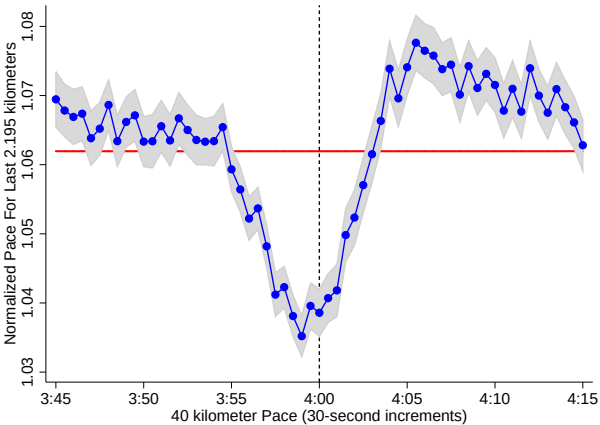
Effort at the end of the race



- Normalized pace (minutes/km) during past 2.195 kms relative to pace in the previous 40 kms.
- Possibility of finishing below 4 hours provides extra motivation to speed up (or not to slow down) at end of race.

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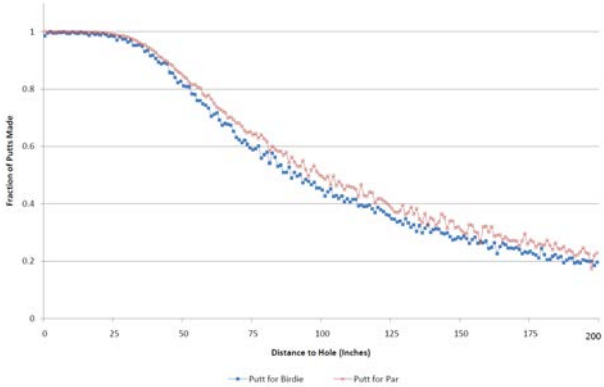
Pope and Schweitzer (2011): Golf

- How does golf work?
  - Hit a ball with a club from a tee into a hole
  - End hole by putting on the green
  - Total number of shots (strokes) determines the winner.
- PGA Tour
  - 40-50 tournaments per year, 4 rounds of 18 holes
  - Very convex incentives
- Par: number of strokes that a very good golfer should require to complete a hole.
  - Eagle (two below par), birdie (one below par)
  - Par (3, 4, or 5 strokes)
  - Bogey (one above par), double bogey (two above par)

Pope and Schweitzer (2011): Reference point

- Fairly obvious reference point for each hole in golf: **par**
- Importantly, all strokes matter to the same degree.
- If golfers are loss averse, do they prefer:
  (a) Birdie, par, bogie
  (b) Par, par, par
- Are putters more likely to make their par putts than their birdie putts?

Par putts are more likely to be made.



- Par putts are 2-3 percentage points more likely to be made, compared to equivalent birdie putts.
- Authors rule out a number of alternative explanations, e.g.
  - Heterogeneity in player ability
  - Learning from earlier putts
  - Hole-specific differences

Deal or No Deal

- Post et al. (2008) analyze player behavior in the Dutch version of Deal or No Deal.
- Almost ideal experiment on risk taking with high stakes
  - Contestant "owns" a suitcase selected randomly from 26 suitcases, with a different prize in each suitcase.
  - All the possible prizes are known.
  - The contestant opens other bags (and hence learns something about what's not in her bag).
  - At each stage, a "bank" offers a risk-less amount of money to replace the amount in the bag.

Loss aversion in Deal or No Deal

- A contestant's acceptance or rejection of the offer is an indication of her risk aversion.
- Can consider contestants' choices depending on the (recent) history of opened suitcases.
- Do individuals become more risk-loving after recent 'losses' (i.e. after opening high-value suitcases)?

Reference-dependent preferences?

- Finding: contestants become more risk accepting after they receive unfavorable news than after they receive neutral news.

- Explanation: reference-dependent preferences.
  (1) What's being evaluated in a reference-dependent way?
    - Winnings from the game
  (2) What's the reference point?
    - Recent expectations about winnings
  (3) What feature of the value function explains the phenomenon?
    - Due to loss aversion and diminishing sensitivity, risk aversion is much greater near the reference point than in the loss domain.

Two other important papers

- Mas (2006): police performance
  - Exploits quasi-random variation in pay due to arbitration
  - Declines in performance in months after NJ police officers lose in arbitration
- Card and Dahl (2011): domestic violence
  - Consider upset wins and losses of home football teams
  - 10% increase in at-home violence by men following upset losses
  - No such effect after upset wins or expectedly close games

Asymmetric price elasticities

- Fact: demand often responds more strongly to price increases than to price decreases of frequently purchased items.

(1) What is being evaluated in a reference-dependent way?

- Expenditure on the product

(2) What's the reference point?

- The product's past price

(3) What feature of prospect theory explains the phenomenon?

- Loss aversion: accepting a price increase is more painful than price decrease is pleasant, so people respond more to increases.

Why are prices sticky?

- Raising your price above past price is very costly, because you will lose a lot of consumers.
- Lowering your price below past prices won't generate that much extra demand (plus raising prices in the future is costly!).
- So just keep prices constant.
- More generally, loss aversion can generate a lot of price equalization (across time and products).

How do companies benefit from/react to loss aversion?

- Offer free return options in the hope that the endowment kicks in once the customer 'owns' the product.
- Make customers feel that they own the product (samples, language used, etc.)
- Insurance product design: offer expensive low deductible options
- Pricing: start with high prices and lower them subsequently
- Avoid wage cuts as much as possible

People have reference-dependent preference. Now what?

(1) Framing of situations can make a big difference.

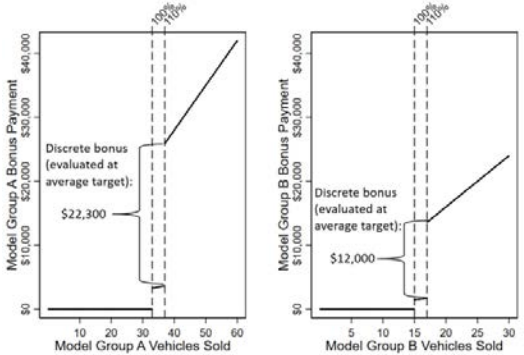
(2) Manage people's expectations so that they receive a gains/losses

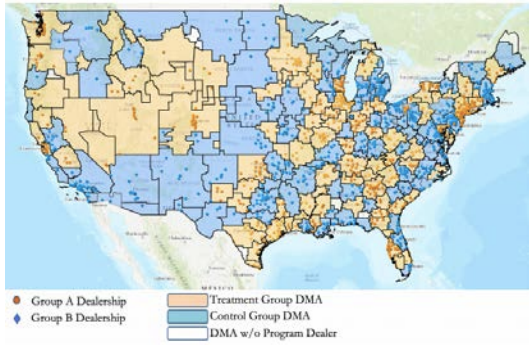
(3) Aggregate (or spread out) losses

Pierce et al. (2020): Loss-framed performance incentives can backfire!

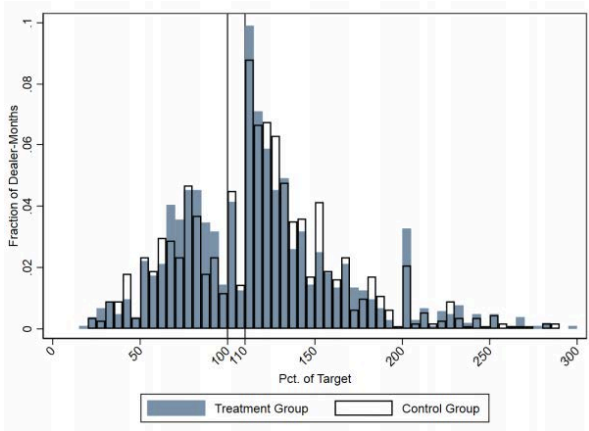
- Car manufacturers in the US:
- Not allowed to sell directly to consumers
- Also limited ability to open/close dealerships or charge different prices
- Since they get fixed price per car, manufacturer wants volume sales while dealership cares about the sales price.

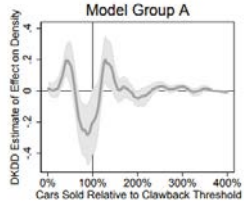
Solution: Loss-framed bonus payments if reach target of vehicles sold

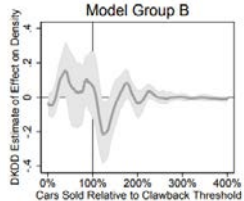




Loss-framed incentives backfire: would have lost $1 billion if scaled







Summary and open questions

- Many applications of reference-dependent preferences
- What is the reference point?
  - Status quo
  - Past values
  - Aspirations/goals
  - Social comparisons
  - Expectations
- (How) do reference points evolve over time?
- Narrow bracketing and mental accounting (Thaler, 1999):
  - How do people bracket choices into different mental accounts?
  - Example: hourly vs. daily vs. weekly income targeting

What's next?

- Wednesday: Introduction to social preferences
- Important: bring your laptop!
- Will send further instructions

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14.13: Psychology and Economics
Spring 2020