Reference Dependent Preferences: Applications

Mark Dean

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- In this final section we will go through a number of applications of reference dependence and loss aversion
- These are active and popular areas of research

1. Optimal defaults
2. Reference dependence in financial markets
3. Information avoidance
4. Loss aversion in the wild
5. Labor markets and effort provision

- The most obvious cause of reference dependence is transaction costs
  - It costs me an amount c to move away from the status quo option
  - Utility of alternative x is $u(x)$ if it is the status quo, $u(x) - c$ otherwise
- Because there is nothing 'psychological' about the impact of reference points, makes welfare analysis staightforward
  - Want to maximize utility net of transaction costs

- We can think of the design problem of a social planner choosing the default in order to maximize welfare of an agent
- In the case of a single agent whose preferences are known, the problem is trivial
- Set the default equal to the highest utility alternative
- Carrol et al [2009] make the problem more interesting in three ways
    - Several agents, each with potentially different rankings
    - Each agent's ranking is not observable to the social planner
    - Agent has quasi-hyperbolic discount function, but the social planner wants to maximize exponentially discounted utility

The Agent's Problem

- Agent lives for an infinite number of periods
- They start life with a default savings rate d
- They have an optimal savings rate s
- In any period in which they have a savings rate d they suffer a loss

$$L = \kappa(s - d)^2$$

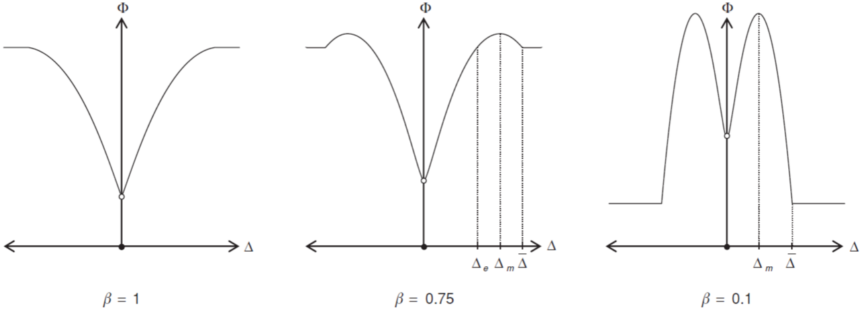
- In any period they can change to their optimal savings rate at cost c
  - Cost drawn in each period drawn from a uniform distribution
- Discounted utility given by quasi-hyperbolic function of expected future losses

The Agent's Problem

- Restrict attention to stationary equilibria
- Agent has a fixed c^*
- Will switch to the optimal savings rate if $c < c^*$
- c^* is
  - Increasing in β
  - Decreasing in $|s - d|$

The Planner's Problem

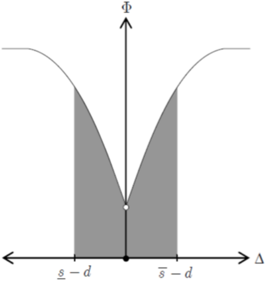
- Facing a population of agents drawn from a uniform distribution on $[s_*, s^*]$
- Cannot observe s
- Wishes to choose d in order to minimize expected, exponentially discounted loss of the population
- Has to take into account two trade offs
  - A default that is good for one agent may be bad for another
  - A default that is too good may lead present-biased agents to procrastinate



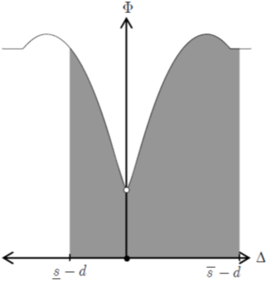
- Expected total loss (from the planner's point of view) based on the distance between default and optimal savings rate
  - If $\beta = 1$ always better to have default closer to optimal
  - if $\beta < 1$ may be better to have default further away to overcome procrastination

The Planner's Problem

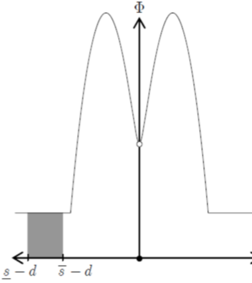
- Leads to three possible optimal policy regimes
  - Center default - minimize the expected distance between s and d
  - Offset default - Encourage the most extreme agents to make active decisions
  - Active decisions - Set a default so bad that all agents to move away from the default.



$\beta = 1$, $\overline{s} - \underline{s} = 0.1$

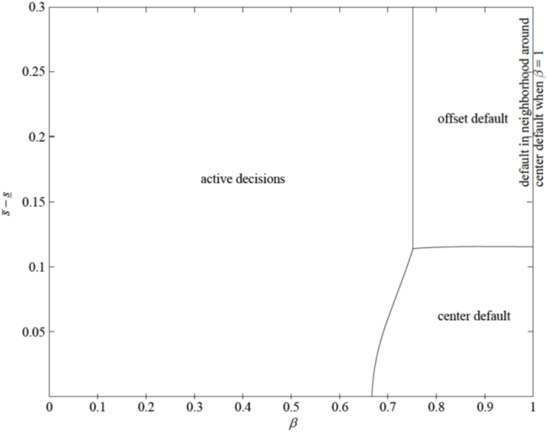


$\beta = 0.75$, $\overline{s} - \underline{s} = 0.25$



$\beta = 0.1$, $\overline{s} - \underline{s} = 0.15$

The Planner's Problem



Narrow Bracketing

- There is, by now, a large literature in behavioral finance using reference dependence (and prospect theory) to explain stock market anomolies
- Don't have the space to review all of it here
  - Will give 2 examples
- Some excellent recent review articles
  - Barberis, Nicholas, Lawrence J. Jin, and Baolian Wang. "Prospect Theory and Stock Market Anomalies." Available at SSRN 3477463 (2019).
  - Barberis, Nicholas C. Psychology-based models of asset prices and trading volume. No. w24723. National Bureau of Economic Research, 2018.
- A key question is whether these models work quantitively, not just qualititively

Narrow Bracketing

- In financial applications, loss aversion is often combined with *Narrow Bracketing*
- Decision makers keep different decisions separate
- Evaluate each of those decisions in isolation
- For example, evaluate a particular investment on its own, rather than part of a portfolio
- Evaluate it every year, rather than as part of lifetime earnings

Applications: Loss Aversion and Narrow Bracketing

- Equity Premium Puzzle [Benartzi and Thaler 1997]
  - Average return on stocks much higher than that on bonds
  - Stocks much riskier than bonds - can be explained by risk aversion?
  - Not really - calibration exercise suggests that the required risk aversion would imply

$$\begin{aligned} & 50\% \;\; \$100,000 + 50\% \; \$50,000 \\ \sim \; & 100\% \; \$51,329 \end{aligned}$$

  - What about loss aversion?
  - In any given year, equities more likely to lose money than bonds
  - Benartzi and Thaler [1997] calibrate a model with loss aversion and narrow bracketing
  - Find loss aversion coefficient of 2.25 - similar to some experimental findings
- See also
  - Barberis, Nicholas, and Ming Huang. The loss aversion/narrow framing approach to the equity premium puzzle. [2007].

Applications: Diminishing Sensitivity

- Disposition Effect [Odean 1998]
  - People are more likely to hold on to stocks which have lost money
  - More likely to sell stocks that have made money
- Losing stocks held a median of 124 days, winners a median of 104 days
  - Is this rational?
- Hard to explain, as winners subsequently did better
  - Losers returned 5% on average in the following year
  - Winners returned 11.6% in subsequent year
- Buying price shouldn't enter into selling decision for rational consumer
- But will do for a consumer with reference dependent preferences
  - Diminishing sensitivity

Disposition Effect and Diminishing Sensitivity

- A simple example
- Consider an investor that bought a stock at price p
- Their utility from selling the stock at price x is given

$$
\begin{aligned}
(x-p)^{\frac{1}{2}} \text{ if } x &> p \\
-\lambda(p-x)^{\frac{1}{2}} \text{ if } x &< p
\end{aligned}
$$

- In every period the price has a 50% chance of going up by \$1 and a 50% chance of going down by \$1
- Say there are 3 periods:
  - Period 1: Buy the stock
  - Period 2: Price goes up or down: can either sell or keep the stock
  - Period 3: Has to sell the stock

Disposition Effect and Diminishing Sensitivity

$$
\begin{aligned}
(x-p)^{\frac{1}{2}} \text{ if } x &> p \\
-\lambda(p-x)^{\frac{1}{2}} \text{ if } x &< p
\end{aligned}
$$

- What will the DM do in period 2 if the stock had **gained** money in period 1?
  - If the sell the stock then they get

$$(x-p)^{\frac{1}{2}} = 1^{\frac{1}{2}} = 1$$

  - If they keep the stock then they get

$$\frac{1}{2}2^{\frac{1}{2}} + \frac{1}{2}0^{\frac{1}{2}} \simeq 0.7$$

  - Will sell the stock

Disposition Effect and Diminishing Sensitivity

$$
\begin{aligned}
(x-p)^{\frac{1}{2}} \text{ if } x &> p \\
-\lambda(p-x)^{\frac{1}{2}} \text{ if } x &< p
\end{aligned}
$$

- What will the DM do in period 2 if the stock had lost money in period 1?
  - If the sell the stock then they get

$$-\lambda(p-x)^{\frac{1}{2}} = -\lambda 1^{\frac{1}{2}} = -\lambda$$

  - If they keep the stock then they get

$$-\lambda\frac{1}{2}2^{\frac{1}{2}} - \lambda\frac{1}{2}0^{\frac{1}{2}} \simeq -0.7\lambda$$

  - Will keep the stock

Loss Aversion and Information Aversion

- Loss aversion can also lead to information aversion
- Imagine that you have linear utility with $\lambda = 2.5$
- Say you are offered a 50% chance of 200 and a 50% chance of -100 repeated twice
- Two treatments:
    - The result reported after each lottery
    - The result reported only after both lotteries have been run.
- Reference point equal to your current wealth

Loss Aversion and Information Aversion

- What would choices be?
- In the first case

$$\begin{aligned} & \frac{1}{4}(200+200)+\frac{1}{2}(200-\lambda 100)+\frac{1}{4}\left(-\lambda 100-\lambda 100\right) \\ = \quad & -200 \end{aligned}$$

- In the second case

$$\begin{aligned} & \frac{1}{4}(400)+\frac{1}{2}(100)+\frac{1}{4}\left(-\lambda 200\right) \\ = \quad & 25 \end{aligned}$$

Loss Aversion and Information Aversion

- With loss aversion and narrow bracketing, risk aversion depends on evaluation period
- The longer period, the less risk averse
- This also provides an 'information cost'
- A similar argument shows that if you owned the above lottery, you would prefer only to check it after two flips rather than every flip
- In general, strong link between non-expected utility and preference for one shot resolution
  - Dillenberger [2011]
- A fair amount of evidence that evaluation period affects risk appetite
  - Lab - Gneezy and Potters [1997], Gneezy et al. [2003]
  - Field - Haigh and List [2005], Larson et al. [2016]

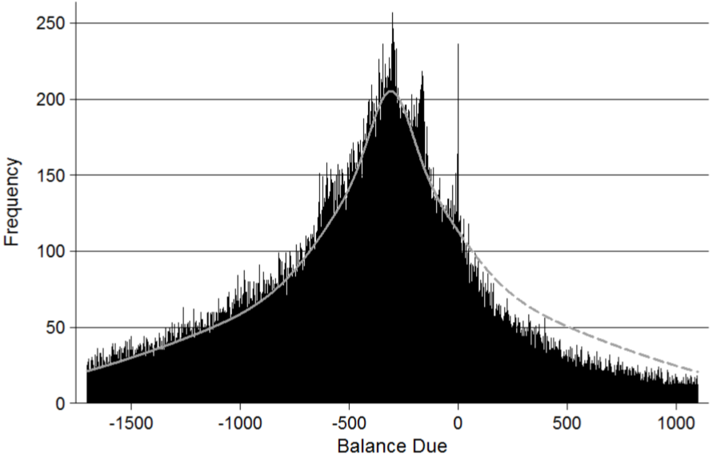
Loss Aversion and Information Aversion

- This observation has been used to explain attention provision in two recent papers
- Andries and Haddad [2019]: A model of information aversion
  - Households check their portfolios only infrequently
  - Do so **less** in more turbulent times
- Olafsson and Pagel [2019]
  - Use amazing data from Iceland to look at when people check their bank balance
  - Ostritch effect: People **more** likely to check balances afert they get paid, **less** likely after spending

Loss Aversion in the Wild

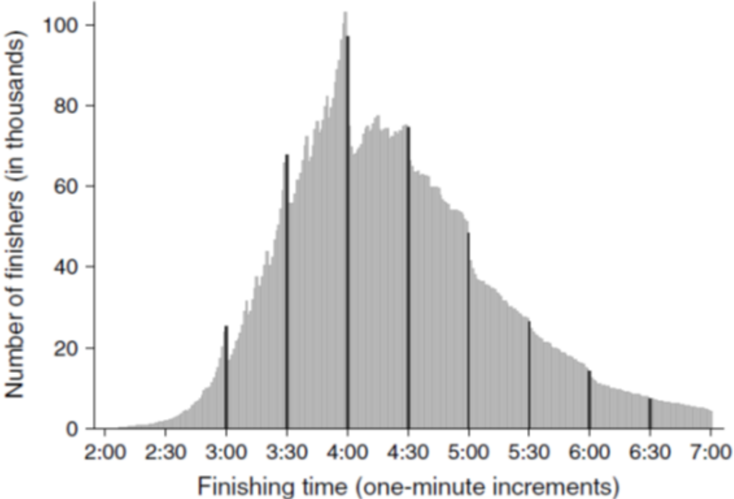
- There are now a number of papers which provide empirical evidence for loss aversion in settings which are
  - High stakes
  - Repeated
- This is important, because early work by List [2003] suggested that market experience can kill the endowment effect

Applications: Reported Tax Balance Due [Rees-Jones 2014]

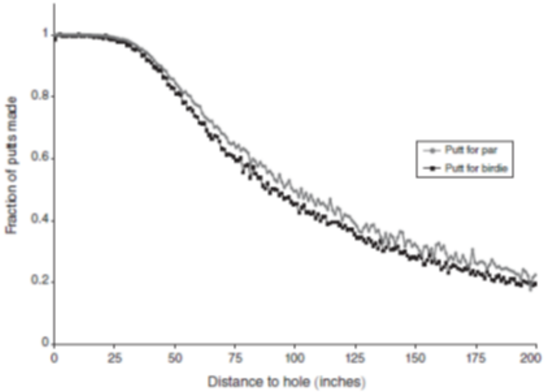


Applications: Marathon Finishing Times [Allen et al 2017]

Figure 2. Distribution of Marathon Finishing Times
($n = 9{,}789{,}093$)



Applications: Golf [Pope and Schweitzer 2011]



Applications: Golf [Pope and Schweitzer 2011]

TABLE 6—THE EFFECT OF DIFFERENT SHOT VALUES ON RISK AVERSION

	Ordinary least squares				
	All missed putts		Missed putts longer than 270 inches		All missed putts
	Putt length (1)	Left short (2)	Putt length (3)	Left short (4)	Make next putt (5)
Putt for eagle	−0.80**	0.013***	−2.44***	0.032***	−0.003
	(0.32)	(0.003)	(0.56)	(0.006)	(0.002)
Putt for birdie	**−0.19****	**0.003*****	**−1.59*****	**0.019*****	**0.001****
	(0.08)	**(0.001)**	**(0.27)**	**(0.003)**	**(0.001)**
Putt for bogey	−0.365	0.007***	0.65	0.000	−0.003
	(0.19)	(0.003)	(0.72)	(0.008)	(0.001)
Putt for double bogey	−0.053	0.008	0.41	−0.001	–
	(0.29)	(0.004)	(0.95)	(0.011)	–
Putt distance: seventh-order polynomial	X	X	X	X	X
Player fixed effects	X	X	X	X	X
Previous-putts-on-green effects	X	X	X	X	X
Tournament-round-hole effects	X	X	X	X	X
R^2	0.968	0.169	0.918	0.127	0.095
Observations	986,963	986,963	406,942	406,942	977,500

Taxi Drivers

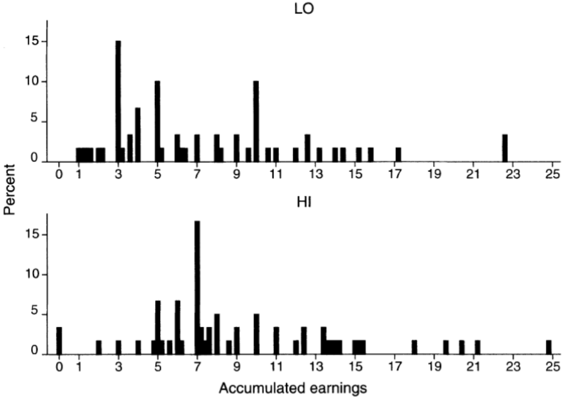
- Taxi driver labor supply [Camerer, Babcock, Loewenstein and Thaler 1997]
  - Taxi drivers rent taxis one day at a time
  - Significant difference in hourly earnings from day to day (weather, subway closures etc)
  - Do drivers work more on good days or bad days?
  - Standard model predicts drivers should work more on good days, when rate of return is higher
    - Note this is because this is a dynamic problem, so substitution effect dominates
  - In fact, work more on bad days
  - Can be explained by a model in which drivers have a reference point for daily earnings and are loss averse

Taxi Drivers

- There have been many many follow up studies with slightly different take
- Thankral and To [2018] explore the question of how reference points adapt
- Argue that the driver's reference point adapts slowly over time
- Consider a driver that has been driving for 8.5 hours
  - A shock to earnings that occured 20 mins ago acts as a surprise relative to reference point, will increase probability of quitting
  - A shock that occured 7 hrs ago will have been encorporated into the reference point
- Estimates : A 10% increase in earnings will
  - Increase probability of stopping by 10% if it occured in last hour of shift
  - Have no effect if it occured in 1st 4 hours.

Loss Aversion and Effort Provision

- Abeler et al [2011] run an experiment on the effect of expectation based reference points on effort
- Subjects perform boring repetitive task
- With 50% chance will get paid piece rate
- With 50% chance will get paid fixed amount f
- Decide how many tasks to do
- Manipulate fixed payment
  - Classical theory: Should have no effect
  - Non-expectations based reference dependent theories: should have no effect
- If expectations act as reference points
  - Can minimzie loss by working till wage is close to f


LO
HI
Percent
15
10
5
0
0 1 3 5 7 9 11 13 15 17 19 21 23 25
Accumulated earnings