Behavioural Economics Notes

Introduction

Normative Theory captures how people **should** make decisions.

Description Theory describes how people **in fact** make decisions.

This then leads to two types of models: **neoclassical models** are characterised by strict commitment to rationality assumptions (also known as a standard model), while **behavioural model** attempts to use more psychologically plausible foundations to improve explanatory power.

- Laboratory experiments:
  psychology (mostly used in early studies) vs. economics experiments

Psychology experiments	Economics experiments
• flat-fee payments • hypothetical context • use deception	• choice-dependent payments • context-free/neutral • prohibit deception

Neoclassical economists believe that people largely act in the matter they should and thus their models are both normative and descriptive, since deviations from perfect rationally are so small they are negligible. In contrast, **behavioural economists** believe that deviations from rationality are large enough, systematic enough to warrant the development of new theories.

Note the example on the right that neatly distinguishes between behavioural economics and neoclassical economics. Many of us **would behave differently in the two situations** (depending on what we paid), despite neoclassical economics justifying exactly the same behaviour (based on the idea of **sunk cost**).

Imagine that you paid $100 for a basketball ticket. The ticket cannot be re-sold or given away. Unfortunately, there is a huge snowstorm on the day of the game.

- Would you choose to drive an hour and go to the game?
- Now Imagine that the ticket instead was given to you for free. Would you be more or less likely to go to the game?

This is a common behavioural economics issue is called the **Sunk-cost Fallacy**, the inability of humans to ignore sunk costs. This bias is often used in marketing or politics to manipulate behaviours of people. For example, the **East-West Link** in Melbourne, Liberal party tried to get Labour to build the road based on a $1 billion sunk cost. Also, in the US, outlet malls are located in the middle of nowhere, so shoppers think of the long drive as an investment and justify more shopping.

F-35 is the US military's fighter jet. Plagued with technical difficulties, the project was $160 billion over budget by early 2014. Critics argue that the project needs to be cancelled.
As a response, the officer in charge of the program said to *the Fiscal Times*: "I don't see any scenario where we are walking back away from this program."... "DOD (US Department of Defense) is so far down the F-35 rabbit hole, both in terms of technology and cost - $400 billion for 2,400 planes - that it has no choice but to continue with the program."

Preferences and Choices

Theory of Rational Choice

Economists use preferences to understand and analyse people's decision-making process. The **theory of rational choice** specifies what types of preferences are considered to be rational (according to neoclassical economics).

The three possible types of preferences (from microeconomics) are shown →

Weak preference

$x \succsim y$: "x is at least as good as y"

Strict preference

$x \succ y$: "x is strictly preferred to y"

$x \succ y \Leftrightarrow x \succsim y$ but not $y \succsim x$

Indifference

$x \sim y$: "x is indifferent to y"

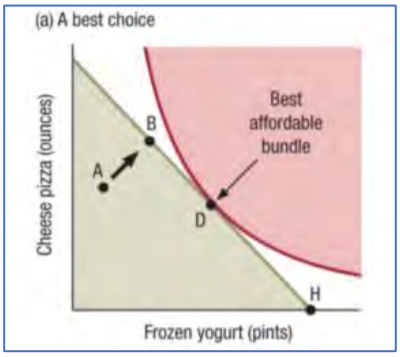
$x \sim y \Leftrightarrow x \succsim y$ and $y \succsim x$

For preference relations to be **rational,** we require **completeness** and **transitivity.** When weak preferences are rational, we get the properties on the right holding in general.

If $\succsim$ is rational, then

1. $\succ$ is
   1. irreflexive: $x \succ x$ never holds
   2. transitive: if $x \succ y$ and $y \succ z$, then $x \succ z$.
   3. anti-symmetric: if $x \succ y$, then $y \succ x$ never holds
2. $\sim$ is
   1. reflexive: $x \sim x$ for all x
   2. transitive: if $x \sim y$ and $y \sim z$, then $x \sim z$
   3. symmetric: if $x \sim y$, then $y \sim x$.

Preferences are often expressed on **indifference curves,** as we have seen many times. **Utility** is a number value assigned to a consumer's well-being and a **utility function** assigns a value to each consumption bundle (preferences are also one-to-one with utility function values).

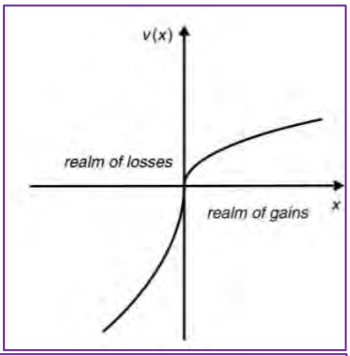


According to the **theory of rational choice,** consumers make choices that mean:

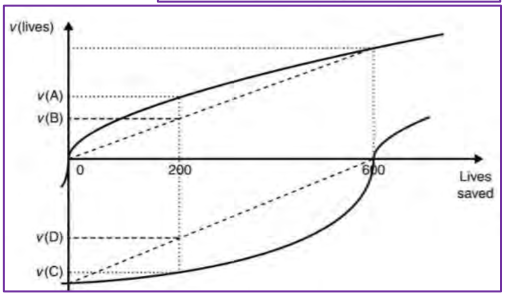
1. you have a **rational preference relation**
2. You choose the most preferred bundle you can afford

This gives us the all-important **revealed preferences** based on observed choices.

Loss aversion is therefore a type of framing effect. Thus, we can model this framing effect using a **value function,** just as we did when we analysed loss aversion or endowment effect. For framing effect, we can add a third feature (in addition to passing through the option and having a kinked curve at the origin) to the value function to create the S-shaped value function shown on the right. This feature is curvature, **people are risk averse in gains and risk seeking in losses**, which represents very common attitudes in practice.

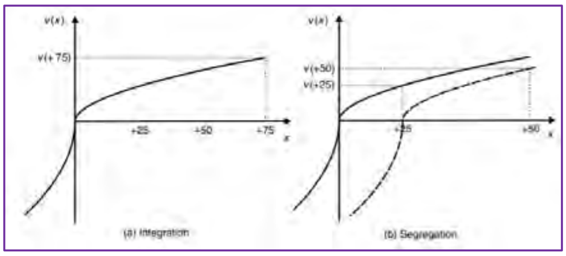


This thinking helps us to solve for the Asian disease example, since **the framing changes the reference point of the value function**. In problem 1, the reference point is that no one is saved (i.e., 600 people die) and so saving lives is a gain and thus people are **risk averse**. Conversely, in problem 2, the reference point is that no lives are lost (600 are saved) and so people dying is a loss and people are **risk seeking**.



Golf is a good setting to analyse loss aversion or framing effect, because people want to minimise their strokes, but each hole also has a reference point (being par). Pope and Schweitzer analysed over 2.5 million putts and compared the results depending on whether the putt was for par or birdie. In general, players are much **more accurate when they are putting for par or bogey** compared to birdie, consistent with loss aversion expectations. Interestingly, the gap in accuracy is much larger in the early tournament rounds. The researchers argue that **later in tournaments other reference points (such as competitor's scores) become more important** and par is less salient. Finally, birdie putts (risk-averse) are on average left short far more often than par and bogey putts (risk-seeking). This is consistent with **prospect theory.**

Bundling



According to neoclassic theory, how outcomes are bundled should not matter. In practice we see that many people's preferences may change compared to whether outcomes are integrated or separated. According to prospect theory, because gains are concave, **people in general prefer separated outcomes to integrated outcomes**. Conversely, **people prefer integrated losses to separated losses**, as losses are convex.

EXAMPLE: TAX ON WINNINGS

Suppose you win a million dollars but have to pay a 10% tax on your winnings. You may feel less intensely about the tax when you integrate:

$$v(+\$1,000,000) + v(-\$100,000) < v(+\$900,000)$$

Extending this further leads to **cancellation,** the idea that people gain more value when they integrate a small loss with a large gain. The converse of this is **silver lining,** where people lose less value when they segregate a large loss from a small gain.

EXAMPLE: CASH-BACK OFFERS

A consumer may be more likely to buy a car with a \$27k price tag and a \$1k cash-back offer than to buy the very same car with a \$26k price tag:

$$v(-\$27,000) + v(+\$1,000) > v(-\$26,000)$$

Bundling explains many phenomena including wrapping Christmas presents individually, "the death of one man is a tragedy, the death of millions is a statistic" (Joseph Stalin), credit cards allow one bill for many items received across a month and rewards programs.

Certainty Effect

(1A) 1 million for sure
(1B) 1 million with probability 89%, 5 million with probability 10%, 0 with probability 1%
(2A) \$1 million with probability 11% 0 with probability 89%
(2B) 5 million with probability 10% 0 with probability 90%

A common response pattern is (1A) and (2B), which is inconsistent with EUT:

$$(1A) \succ (1B) \Rightarrow u(\$1M) > 0.89 \times u(\$1M) + 0.10 \times u(\$5M) + 0.01 \times u(\$0)$$
$$\Rightarrow 0.10 \times u(\$5M) + 0.01 \times u(\$0) < 0.11 \times u(\$1M)$$

$$(2B) \succ (2A) \Rightarrow 0.10 \times u(\$5M) + 0.90 \times u(\$0) > 0.11 \times u(\$1M) + 0.89 \times u(\$0)$$
$$\Rightarrow 0.10 \times u(\$5M) + 0.01 \times u(\$0) > 0.11 \times u(\$1M)$$

The Allais problem on the right conveys another situation where people's common responses are inconsistent with EUT. EUT implicates the **sure-thing principle,** your decisions should not be influenced by sure things.

Certainty effect – the tendency to overweight outcomes that are certain. In the Allais problem, we should view 1A and 2A equivalently relative to 1B and 2B, but the certainty associated with 1A skews our responses. Another example on the right shows how **risk-taking increases in the instance when there is no certainty option**.

EXAMPLE: THE CERTAINTY EFFECT

Question 1: Which of the following options do you prefer?
(A) a sure gain of \$30
(B) 80% chance to win \$45 and 20% chance to win nothing
Result: 78% chose (A) while only 22% chose (B)
Question 2: Which of the following options do you prefer?
(C) 25% chance to win \$30 and 75% chance to win nothing
(D) 20% chance to win \$45 and 80% chance to win nothing
Result: 42% chose (C) while 58% chose (D)

Gambling and Insurance Shopping

One major inconsistency is the fact that many people simultaneously gamble and purchase insurance. EUT says that risk-averse people should buy insurance and not gamble, risk-seeking should gamble and not buy insurance etc.

Behavioural deviations describe how people tend to deviate from predictions based on standard game theory. We will focus on two simple models of social preferences to explain these deviations: **altruism** and **inequity aversion.** For example, in the **ultimatum game** studied above, proposers rarely offer less than 10% and the median amount offered is 40-50%, with the mean 30-40%. Additionally, responders reject offers less than 20% about half the time, depriving themselves of utility to penalise low offers in effect. The majority of these deviations in behaviour can be attributed to responders, though there is some evidence of proposers being marginally more generous than optimal (given the responders propensity to reject low offers).

A person exhibits **simple altruism** if her utility is increasing in other people's material payoffs.
For example, a simple formulation:

$$u_1(x_1, x_2) = x_1 + \varphi \times x_2$$

where $\varphi > 0$

To differentiate this altruistic motive from self-interest avoiding reject, we can use the **dictator game** which eliminates the possibility for the responder to reject. The mean share allocated is around 20% in this game, driven entirely by altruistic. This reveals that the **ultimatum game** has both fear of rejection and altruism at play.

Suppose Player 1 is altruistic

		Prisoner B	
		Confess	Deny
Prisoner A	Confess	$1+\varphi, 1$	$5, 0$
	Deny	$0+5\varphi, 5$	$3+3\varphi, 3$

Choosing Deny hurts oneself but helps the other player. Because an altruist get utility from own payoff as well as the other player's payoff, if the gain to the other from choosing Deny outweighs the diminished own payoff, the altruist will cooperate.
Here, for $\varphi > \frac{2}{3}$, it is optimal for Player 1 to choose Deny

$$3 + 3\varphi > 5$$
$$0 + 5\varphi > 1 + \varphi$$

Another deviation is in **co-operation,** that people are more **co-operative** than standard models would anticipate. In the prisoner's dilemma, around 30% of people choose Deny despite it being a strictly dominated strategy.

Importantly, these deviations are not **fundamental violations** of game theory, we just need more **accurate utility functions** to describe these social preferences. Some utility function options for **simple altruism** and **inequality aversion** are shown above. The simple altruism function is applied to our prisoners' dilemma to explain why 30% of players choose deny despite it being dominated under standard game theory.

Fehr and Schmidt (1999) introduce the model of **Inequality Aversion**: people don't just care about their own payoff, they care about how much they make relative to others
A simple model:

$$u_1(x_1, x_2) = x_1 - g(x_1, x_2)$$

where

$$g(x_1, x_2) = \begin{cases} 0 & \text{if } x_1 = x_2 \\ \alpha(x_2 - x_1) & \text{if } x_1 < x_2 \\ \beta(x_1 - x_2) & \text{if } x_1 > x_2 \end{cases}$$

with $0 \leq \beta < 1$ and $\alpha \geq \beta$

When applying simple altruism to the responder in the ultimatum game, we see a violation, since altruism should make it **even more likely for them to accept low offers**. This leads us to the concept of **inequality aversion** which can explain this deviation.

This attitude is much more widespread and describes how people care about how **their payoffs compare to others,** rather than their payoffs alone. In our inequality aversion model, β captures how averse a person is to **being better off** than other people, while α captures how averse a perso n is to **being worse off** than other people. β's value has different implications for how people will interact, β > ½ implies that people will give up $1, even if the other party receives less than $1. This implies that they will support **inefficient transfers** in the effort to combat inequality.

Suppose Player 1 has $10 and player 2 has $2
$\beta = \frac{1}{4}$ implies that Player 1 is willing to pay $1 to increase Player 2's payoff by $3:

$$u_1(x_1, x_2) = 10 - \frac{1}{4}(10 - 2) = 8$$
$$u_1(x_1 - 1, x_2 + 3) = 9 - \frac{1}{4}(9 - 5) = 8$$

$\beta = \frac{1}{2}$ implies that Player 1 is just indifferent between keeping $1 for himself and giving it to player 2:

$$u_1(x_1, x_2) = 10 - \frac{1}{2}(10 - 2) = 6$$
$$u_1(x_1 - 1, x_2 + 1) = 9 - \frac{1}{4}(9 - 3) = 6$$

More generally, Player 1 is willing to pay $1 to increase Player 2's payoff by $\frac{1-\beta}{\beta}$.

We assume β < 1, since otherwise people would opt to throw money away to reduce inequality which is not common in practice and **sufficiently unrealistic to exclude from analysis**.

Suppose Player 1 has $6 and player 2 has $10
$\alpha = 4$ implies that Player 1 is willing to give up $1 if it would reduce Player 2's payoff by $1.25:

$$u_1(x_1, x_2) = 6 - 4(10 - 6) = -10$$
$$u_1(x_1 - 1, x_2 - 1.25) = 5 - 4(8.75 - 5) = -10$$

More generally, Player 1 is willing to pay $1 to decrease Player 2's payoff by $\frac{1+\alpha}{\alpha}$.
$\alpha \geq \beta$ indicates that if there's going to be inequity, people would rather it be in favor of themselves.

Applying inequality aversion to our games can explain much of the deviation we see in experiments. For example, if both prisoners are inequality averse in the prisoners' dilemma game, we get a second Nash equilibrium at {Deny, Deny}. In the ultimatum game, we get a new lower bound for what responders will accept. Dependent on the α of the responder, they **only will accept offers >** $\boldsymbol{\frac{\alpha}{2\alpha+1}}$**.** The proposer will therefore pick an offer such that the responder accepts, based on their best estimate of their α. Where they do not know the responder, this will be based on the **population distribution of α.**