MFE: BEHAVIORAL ECONOMICS NOTES

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1. Review

The essence of the previous few lectures may be summarized as follows:

(i) We model an asset as a lottery with multiple uncertain outcomes.

(ii) We specified a decision making model: people make decisions according to expected utility (they have a von Neumann-Morgenstern utility function). More specifically, we postulated that they have constant risk aversion and thus have the constant risk aversion utility function

$$u(x) = \frac{x^{1-\gamma}}{1-\gamma}.$$

We estimate the parameter γ using real world data.

(iii) We construct an economy with identical agents specified above and determine the equilibrium condition: since all agents are identical, at equilibrium there is no trade, and individuals maximize their utility. It turns out that this happens precisely when the asset price is equal to the present discount expected return of the asset, so we determine the asset price to be precisely this value.

(iv) We compare the real-world asset price to that of the model and found the former to be much, much higher — the asset premium puzzle. Alternatively, we may think of the puzzle as follows: to obtain an asset price comparable to that observed in the real world, we need an absurdly large γ.

2. Understanding the parameter gamma

Consider the lottery $[11, 10; .5, .5]$ (that is, the individual gets 11 dollars with probability 0.5 and 10 dollars with probability 0.5) in the standard expected utility framework. The following table gives the minimum γ under which the agent rejects the lottery at different levels of wealth w.

Rejects at $w =$	$\gamma >$
1000	9
2000	18
5000	45

Estimate your own γ by considering the lottery $[11, 10; .5, .5]$ and your own wealth! Given that many would reject such a gamble, we would expect γ to be relatively large.

Next, consider the lottery $[50000, 100000; .5, .5]$ (the individual gets 50000 dollars with probability 0.5 and 100000 dollars with probability 0.5). The following table[1] gives the certainty equivalence (CE), the amount of money the individual would be indifferent to the lottery, at different levels of γ.

γ	W_{CE}
1	70 711
2	66 667
5	58 566
10	53 991
30	51 209

Estimate again your γ and compare it to the previous estimate. Note the disparity!

In fact, we can show mathematically that if a risk averse expected utility maximizer rejects the small gamble $[11, 10; .5, .5]$ at any w, then she will reject a $[-100, \infty]$ lottery.[2]

Now, one immediate idea to fix our decision model would be to say that γ (or even the utility function U) is not fixed. Preferences and perceptions of and/or attitudes to risk changes. This is, however, a dangerous approach. We are pushing sweep something under the rug, so to speak. Unless we develop we develop a theory of how the utility function or γ changes, we can, by changing U or γ, explain everything — and thus nothing.

Before moving on to a potential resolution, let us first get a fuller picture of why expected utility theory might fail. We've already seen the problem of risk aversion above — people seem to be exhibit radically different risk preferences in face of different gambles. There are but only more problems:

3. Problems with Expected Utility Theory

3.1. **Loss Aversion.** Compare the following lotteries:

- $[4000; .8]$ and $[3000, 1]$ (that is, getting 4000 dollars with probability 0.8 or a sure gain of 3000 dollars) — most prefer the latter
- $[-4000; .8]$ and $[-3000, 1]$ — most prefer the former

People seem to be risk-averse for gains and risk-loving for losses. [3]

[1] Taken from Schilbach (2020).

[2] Hint: from $10^{-4} > (10/11)^{11}$ we can show $u'(w + 2100) \leq 10^{-4}u'(w)$.

[3] Schilbach (2020).

3.2. **Framing and Reference Point.** Compare the following:

- $[240, 1]$ and $[1000; .25]$ (a sure gain of 240 dollars or a gain of 1000 dollars with probability 0.25)
- $[-750, 1]$ and $[-1000; .75]$.

Most preferred the former in the first case and the latter in the second case, the this combination ($[-760, 240; .75, .25]$) is in fact dominated by choosing the former in the first case and the former in the second case ($[-750, 250; .75, .25]$)!

How the lotteries are framed matters. (Some call the aggregation of multiple lotteries "bracketing".)

3.3. **Endowment Effect, Status Quo Bias.** We can measure how valuable an object is to someone by asking:

- how much they are willing to pay (WTP) to get the object; or
- how much they are willing to accept (WTA) as compensation for giving up the object.

(You might also know them as EV and CV if you've taken Econ here.)

In the expected utility framework, we would expect $WTP \approx WTA$.

A Kahneman et al. (1991) experiment, however, showed otherwise:

- Cornell mugs given randomly to half of the students.
- On average we expect half of the mugs to be traded.
- Typically $WTP \approx 1/2 \cdot WTA$ and only around half of the expected trading volume was observed.

Owning (being endowed) the mug seems to cause the students to assign it a higher value. This is termed the endowment effect, or loss aversion.

4. Prospect Theory

Prospect theory is the leading alternative to expected utility theory.

Properties:[4]

- A reference point: u is a function not of wealth, but of the change in wealth. It is defined over gains and losses.
- Risk averse over gains and risk seeking over losses (concave on $(0, \infty)$ and convex on $(-\infty, 0)$).
- Loss aversion. Losses are weighted more heavily than gains.

A prospect theory utility function can be modeled by

$$u(x) = \begin{cases} x^{\alpha}, & x \geq 0, \\ -\lambda(-x)^{\beta}, & x < 0 \end{cases}$$

where

- $\alpha, \beta < 1$ gives diminishing marginal utility of gains and losses,
- $\lambda > 1$, the loss aversion factor, captures the idea that losses are weighted more heavily than gains.

Using u, we may, just as expected utility theory, define a utility function over lotteries U as

$$U(G) = \sum pu(x),$$

[4]The interested may read Kahneman and Tversky (2013) for more details.

or alternatively, pass the probabilities through a "subjective probability weighting function" π that captures the idea that people overweight small probabilities and underweight large probabilities:

$$U(G) = \sum \pi(p)u(x).$$

4.1. **A Return to the Equity Premium Puzzle.** Benartzi and Thaler (1995), using the previously estimated[5] parameters $\alpha = \beta = 0.88$ and $\lambda = 2.25$ redid the analysis we covered in the previous few lectures.

4.2. **Myopic Loss Aversion.** The pairing of prospect theory with framing (frequent evaluation of portfolio) is called myopic loss aversion.

Previous research: how risk averse would the representative investor have to be to explain the historical equity premium. Benartzi and Thaler (1995): given these estimated parameters of prospect theory, what evaluation period is consistent with the equity premium? One year. This is highly plausible, given the existence of annual reports, and the tax filings, when one would gain a comprehensive evaluation.

4.3. **Which aspects of prospect theory drive the results?** Loss aversion. Using the identity function as the probability weighting function, 11–12 months to 10 months. Using piecewise linear utility function with loss aversion factor 2.25, 8 months.

4.4. **Objections.** A potential objection. Individual decision making vs. organization decision making. The issue of agency.

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[5] Tversky and Kahneman (1992)