Theories in Financial Economics: Part 1

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Financial Economics (ECON6043)

February 26, 2021

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Tonight's Lecture

- The origins of prospect theory
- An introduction to prospect theory
- The applications of prospect theory
- Time-varying risk aversion: reading & questions
- An experimental look at time-varying risk aversion

Required Reading

- Barberis, N.C., 2013. Thirty years of prospect theory in economics: A review and assessment. Journal of Economic Perspectives, 27(1), pp.173-96.
- Guiso, L., Sapienza, P. and Zingales, L., 2018. Time varying risk aversion. Journal of Financial Economics, 128(3), pp.403-421.

Section 1

Prospect Theory

Prospect Theory: the origins

- The literature begins with the idea of Daniel Kahneman and Amos Tversky in "Prospect Theory: An Analysis of Decision under Risk" in 1979.
- The main finding they presented was that when faced with risky choices, people made decisions that were inconsistent with the basic tenets of expected utility theory.
  - Expected utility is the probability-weighted average utility of all outcomes.
  - A prospect is acceptable if integrating it with one's current assets will give you greater utility than that of your assets alone.
  - Individuals are risk averse.
- To examine this question, they presented individuals with our familiar choices:
  - **A:** 50% chance to win \$1000 and %50 chance to win nothing
  - **B:** \$450 for sure

Prospect Theory: the certainty effect

- People overweight outcomes that are certain relative to outcomes that are merely probable.

PROBLEM 1: Choose between

A:	2,500 with probability	.33,	B:	2,400 with certainty.	
	2,400 with probability	.66,			
	0 with probability	.01;			
$N = 72$	[18]			[82]*	

PROBLEM 2: Choose between

C:	2,500 with probability	.33,	D:	2,400 with probability	.34,
	0 with probability	.67;		0 with probability	.66.
$N = 72$	[83]*			[17]	

- Beginning from $u(0)$, the first preference implies:

$$u(2400) > 0.33u(2500) + 0.66(2400) \quad \text{or} \quad 0.34u(2400) > 0.33u(2500)$$

while the second preference implies the opposite inequality.

Prospect Theory: the reflection effect

- Reflecting prospects around 0 reverses the outcomes.
- Individuals are risk averse in the positive domain and risk seeking in the negative domain.

Positive prospects				Negative prospects			
Problem 3:	(4,000, .80)	<	(3,000).	Problem 3′:	(−4,000, .80)	>	(−3,000).
$N = 95$	[20]		[80]*	$N = 95$	[92]*		[8]
Problem 4:	(4,000, .20)	>	(3,000, .25).	Problem 4′:	(−4,000, .20)	<	(−3,000, .25).
$N = 95$	[65]*		[35]	$N = 95$	[42]		[58]
Problem 7:	(3,000, .90)	>	(6,000, .45).	Problem 7′:	(−3,000, .90)	<	(−6,000, .45).
$N = 66$	[86]*		[14]	$N = 66$	[8]		[92]*
Problem 8:	(3,000, .002)	<	(6,000, .001).	Problem 8′:	(−3,000, .002)	>	(−6,000, .001).
$N = 66$	[27]		[73]*	$N = 66$	[70]*		[30]

Prospect Theory: the isolation effect

- To simplify choices between alternatives, people disregard characteristics that alternatives share and focus on characteristics that distinguish them.

PROBLEM 11: In addition to whatever you own, you have been given 1,000. You are now asked to choose between

A: (1,000, .50), and B: (500).

$N = 70$ [16] [84]*

PROBLEM 12: In addition to whatever you own, you have been given 2,000. You are now asked to choose between

C: (−1,000, .50), and D: (−500).

$N = 68$ [69*] [31]

- Options A and C are equivalent, as are B and D.
- But the majority of individuals chose B and C, because they apparently did not integrate the bonus with their prospects.

Prospect theory: the alternative

- Kahneman and Tversky originally proposed an alternative prospect theory in their 1979 paper.
- They provided us with an update in 1992, which addressed the theory's initial limitations.
- This new formulation of the idea was called "cumulate prospect theory", and tried to address:
  - *Framing effects* based on how questions are described
  - *Nonlinear preferences* over outcome probabilities
  - *Source dependence* over the source of uncertainty
  - *Risk seeking* over small amount and losses
  - *Loss aversion*, implying that losses loom larger than gains

Prospect theory: the theory

- Consider a gamble:

$$(x_{-m}, p_{-m}; x_{-m+1}, p_{-m+1}; \ldots; x_0, p_0; \ldots, x_{n-1}, p_{n-1}; x_n, p_n)$$

  where x is an outcome and p is the probability associated with that outcome.
- Outcomes are arranged in ascending order, so that $x_0 = 0$.
- This implies that outcomes with a negative index have negative outcomes.

Prospect theory: the theory

- Under expected utility theory, we evaluate a gamble as:

$$\sum_{i=-m}^{n} p_i U(W + x_i).$$

- Under cumulative prospect theory, we evaluate the gamble as:

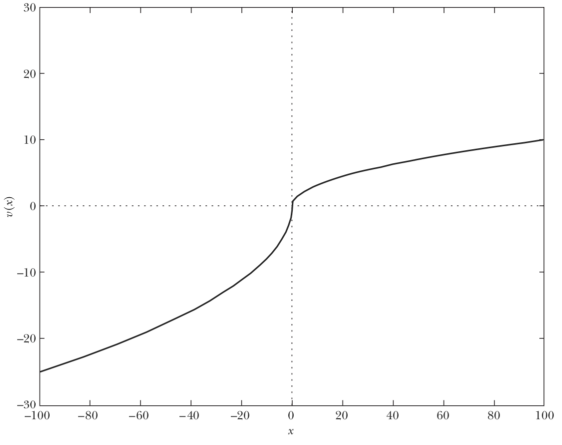
$$\sum_{i=-m}^{n} \pi_i v(x)$$

- $v(.)$ is the **value function** which is increasing, and has $v(0) = 0$.
- π are the **decision weights**.

Prospect theory: the characteristics

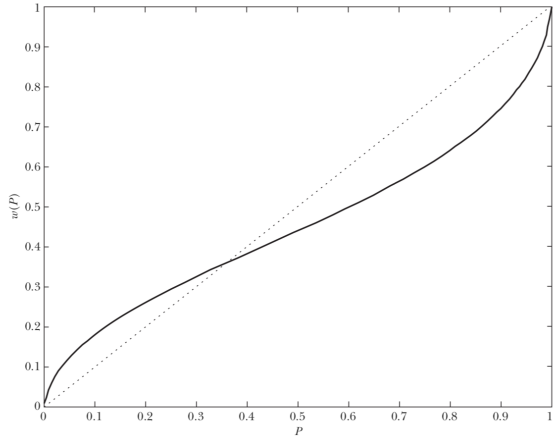
- **Reference dependence:** People derive utility from *gains and losses* measured relative to some reference point, rather than the absolute level of wealth.
- **Loss aversion:** people are more sensitive to losses than to gains, implying the value function $v(.)$ is steeper in the region of losses than in the region of gains.
- **Diminishing sensitivity:** people are risk averse over gains but risk seeking over losses, implying concavity in the region of gains and convexity in the region of losses.
- **Probability weighting:** people do not weight outcomes by their objective probabilities p_i, but rather by transforming the probabilities using a weighting function w_i, which overweights low probabilities and underweights high probabilities.

Figure 1
The Prospect Theory Value Function



Notes: The graph plots the value function proposed by Tversky and Kahneman (1992) as part of cumulative prospect theory, namely $v(x) = x^{\alpha}$ for $x \geq 0$ and $v(x) = -\lambda(-x)^{\alpha}$ for $x < 0$, where x is a dollar gain or loss. The authors estimate $\alpha = 0.88$ and $\lambda = 2.25$ from experimental data. The plot uses $\alpha = 0.5$ and $\lambda = 2.5$ so as to make loss aversion and diminishing sensitivity easier to see.

Figure 2
The Probability Weighting Function



Notes: The graph plots the probability weighting function proposed by Tversky and Kahneman (1992) as part of cumulative prospect theory, namely $w(P) = P^{\delta}/(P^{\delta} + (1 - P)^{\delta})^{1/\delta}$, where P is an objective probability, for two values of δ. The solid line corresponds to $\delta = 0.65$, the value estimated by the authors from experimental data. The dotted line corresponds to $\delta = 1$, in other words, to linear probability weighting.

Prospect theory: application

- Prospect theory has encountered difficulty finding a place as a general theory in economics.
- There are precious few well-known and broadly accepted applications in economics.
- It is difficult to understand exactly *how* to apply it in economics.
  - How do we define what a "gain" or a "loss" is?
  - How do we determine the appropriate reference point?

Prospect theory: application

- Koszegi and Rabin (2006, 2007, 2009) propose the idea that the reference point people use is their expectations, or beliefs held in the recent past about outcomes.
- That is, people care about the difference between consumption and expected consumption, where the utility function exhibits loss aversion and diminishing sensitivity.
- They also propose that we should not only care about gains and losses, *but also consumption levels*.

Prospect theory: application

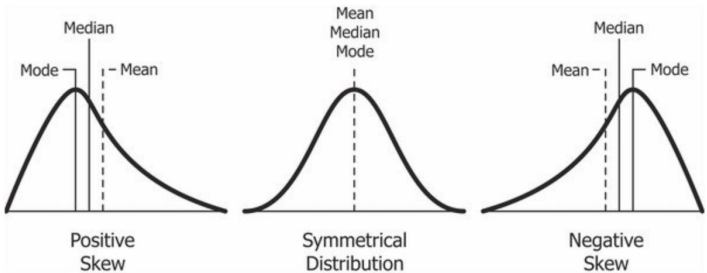
- The question also remains about whether prospect theory holds outside the experimental setting.
- Some researchers conduct experiments where the prizes account for large sums of money relative to participants' incomes.
- Other researcher have examined the decisions of professional golfers over whether to putt for par or not.
- The best approach to prospect theory is to derive its predictions in real-world setting, and then test these predictions with real world data.

Prospect theory in finance

- Why do some securities have higher average returns than others?
- Barberis and Huang (2008) study asset prices in a one-period economy who get prospect theory utility from changes in the value of their portfolio over the period.
- A new prediction arises: a security's skewness in the distribution of its returns matters for the price.
- Because individuals overweight the tails of the returns distribution, they prefer to pay a premium for the small chance that a security will generate a really high return.
- People overweight the possibility that they will become very wealthy because the stock they're holding is "the next Apple"

Prospect theory in finance: skewness

- This means that a security with a positive skew will be overpriced, and therefore generate a lower than average return.
- Empirical work has found that positively skewed stocks have lower average returns.
- This also helps us to understand why stocks that conduct IPOs tend to have lower average returns: because their returns are highly skewed.



Prospect theory in finance: skewness

- Lower values of q imply higher skewness.

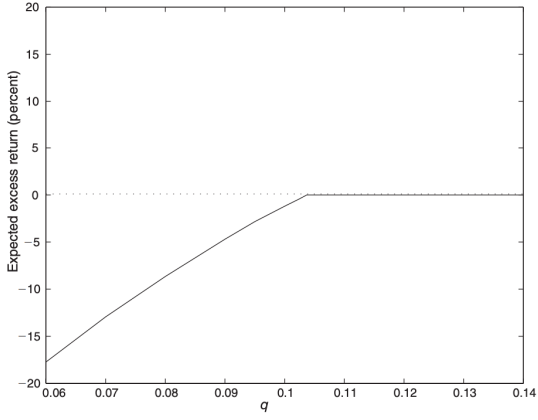


FIGURE 5. SKEWNESS AND EXPECTED RETURN

Notes: The figure shows the expected return in excess of the risk-free rate earned by a small, independent, positively skewed security in an economy populated by cumulative prospect theory investors, plotted against a parameter of the security's return distribution, q, which determines the security's skewness. A low value of q corresponds to a high degree of skewness.

Prospect theory in finance

- Can prospect theory explain the equity premium puzzle?
- Benartzi and Thaler (1995) suggest that because the market's returns are very dispersed, an individual who is loss averse will require a high return in order to compensate for the potential for loss.
- This finding relies not only on prospect theory, but also on narrow framing: the idea that an individual evaluates risks separately from one another, rather than all together.

Prospect theory in finance

- Prospect theory has its most important applications in finance.
- Likely the most important feature of prospect theory for finance is **probability weighting**, since it implies very different attitudes to risk.
- The most important question is: how does the application of prospect theory actually change our policy implications?

Additional Readings

- Barberis, N. and Huang, M., 2008. Stocks as lotteries: The implications of probability weighting for security prices. American Economic Review, 98(5), pp.2066-2100.
- Tversky, A. and Kahneman, D., 1992. Advances in prospect theory: Cumulative representation of uncertainty. Journal of Risk and uncertainty, 5(4), pp.297-323.
- Kahneman, D. and Tversky, A., 2013. Prospect theory: An analysis of decision under risk. In Handbook of the fundamentals of financial decision making: Part I (pp. 99-127).

Section 2

Time Varying Risk Aversion

Time-Varying Risk Aversion

- Markus Brunnermeier and Stefan Nagel (2008): Do Wealth Fluctuations Generate Time-Varying Risk Aversion? Micro-Evidence on Individuals' Asset Allocation

Question 1

- What is the research question of this paper, and how does it tie into a broader research agenda and a policymaking agenda?

Question 2

- Analyse the assumptions of the model and describe the testable prediction it leads us to. Explain the main economic mechanisms in the theoretical model.

Question 3

- What should be the difference between anticipated and unexpected changes in wealth? What do the authors find, and why?

Question 4

- Explain the estimating equation: what are the variables, what are the authors trying to uncover, and what is the variation in the independent variable the authors are using?

Question 5

- What are the authors trying to do by including "conditioning variables"? Do you find them convincing? Do you find this approach convincing? Why or why not?

Question 6

- What are the main findings with respect to stock market participation? Explain the method the authors use to uncover this.

Question 7

- Explain the author's findings about asset allocation. What is the difference between statistical and economic significance?

Question 8

- Why is inertia important, and how do the authors adjust their strategy to account for it? What might explain its existence?

Question 9

- What implications do the findings of this paper have for our understanding of macroeconomic theory? What role do the testable predictions of the model play?

Time-varying risk aversion: an experiment

- Cohn, A., Engelmann, J., Fehr, E. and Maréchal, M.A., 2015. Evidence for countercyclical risk aversion: An experiment with financial professionals. American Economic Review, 105(2), pp.860-85.
- These authors take a very different approach to the same question: they use experimental methods.
- The reason is that market booms and busts are associated with a range of factors changing all at once:
  - Changes in subjective expected asset returns
  - Changes in asset price volatility
  - Changes in overall financial wealth
  - Changes in habits
  - Changes in background risks

Time-varying risk aversion: an experiment

- They give financial professions 200 francs to trade with.
- They create two groups and prime them with either a stock market boom or bust.
- They do this by asking them to fill out a survey showing a fictitious graph representing either a boom or bust, and asking them questions about their investment strategy in either a boom or bust.
- Priming is a psychological tool, used to make the concept of either a boom or bust mentally salient so as to measure the pure psychological impact of the primed concept on behaviour in subsequent tasks.
- One of the tasks, obviously, is designed to measure risk aversion.

Time-varying risk aversion: priming

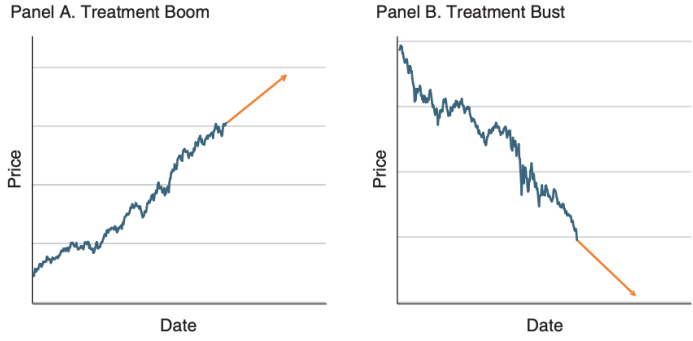


FIGURE 1. BOOM AND BUST TREATMENT

Notes: These animated charts were used to increase the mental saliency of financial booms and busts. We deliberately did not label the time and price axes to prevent subjects from thinking about a specific stock market event, but about booms and busts in general. The arrows were used to illustrate that the market trends were not expected to revert in the near future.

Time-varying risk aversion: an experiment

- They find that financial professionals take substantially fewer risks when they are primed with a financial bust as opposed to a boom.
- When they know exactly the probabilities of the outcomes, those in the bust treatment invest 22% less in the risky asset.
- This changes to 17% less when the probabilities aren't clearly known.

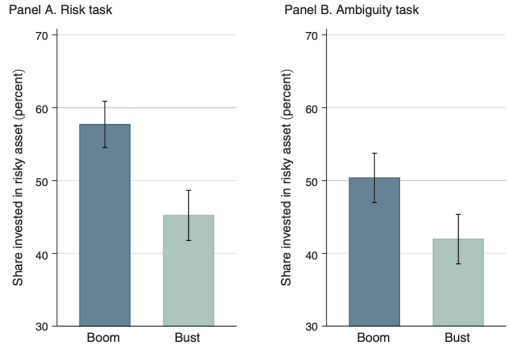


FIGURE 2. BOOMS, BUSTS, AND INVESTMENT DECISIONS

Notes: The figure shows average investments in the risk task (panel A), and the ambiguity task (panel B), by treatments. Error bars indicate standard errors of the mean.

The End.