PROSPECT THEORY

A quick overview

EE 434 Behavioral Finance, SEM1/2022
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APPLICATIONS RELATED WITH PROSPECT THEORY AND INVESTORS' BEHAVIORS

Prospect Theory and Stock Returns: An Empirical Test

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We test the hypothesis that, when thinking about allocating money to a stock, investors mentally represent the stock by the distribution of its past returns and then evaluate this distribution in the way described by prospect theory. In a simple model of asset prices in which some investors think in this way, a stock whose past return distribution has a high (low) prospect theory value earns a low (high) subsequent return, on average. We find empirical support for this prediction in the cross-section of stock returns in the U.S. market, and also in a majority of forty-six other national stock markets. (*JEL* D03)

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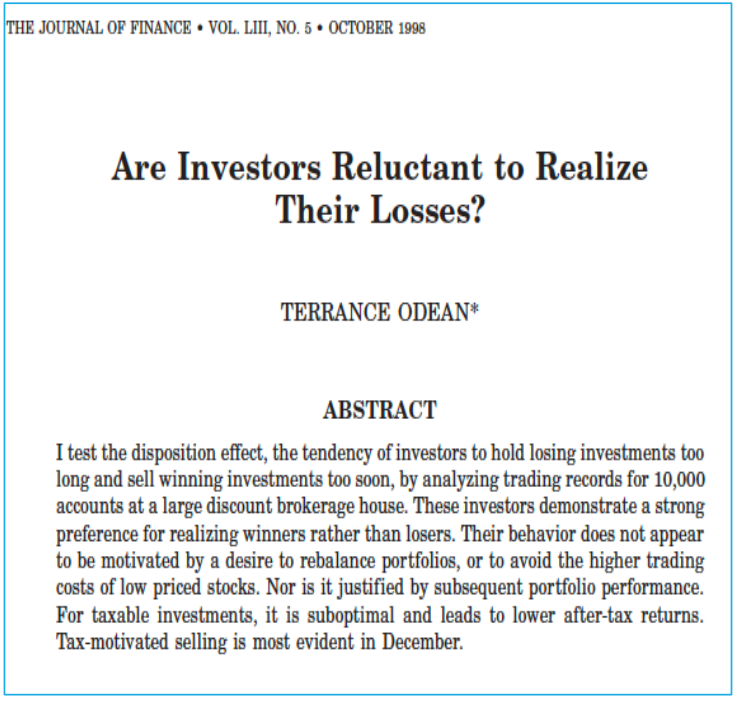
A crucial ingredient in any model of asset prices is an assumption about how investors evaluate risk. Most of the available models assume that investors evaluate risk according to the expected utility framework, and models based

Nicholas Barberis, Abhiroop Mukherjee, Baolian Wang, Prospect Theory and Stock Returns: An Empirical Test, *The Review of Financial Studies*, Volume 29, Issue 11, November 2016, Pages 3068–3107, https://doi.org/10.1093/rfs/hhw049

APPLICATIONS RELATED WITH PROSPECT THEORY AND INVESTORS' BEHAVIORS



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Are Investors Reluctant to Realize Their Losses?

TERRANCE ODEAN*

ABSTRACT

I test the disposition effect, the tendency of investors to hold losing investments too long and sell winning investments too soon, by analyzing trading records for 10,000 accounts at a large discount brokerage house. These investors demonstrate a strong preference for realizing winners rather than losers. Their behavior does not appear to be motivated by a desire to rebalance portfolios, or to avoid the higher trading costs of low priced stocks. Nor is it justified by subsequent portfolio performance. For taxable investments, it is suboptimal and leads to lower after-tax returns. Tax-motivated selling is most evident in December.

Odean, T. (1998), Are Investors Reluctant to Realize Their Losses?. The Journal of Finance, 53: 1775-1798. https://doi.org/10.1111/0022-1082.00072

APPLICATIONS RELATED WITH PROSPECT THEORY AND INVESTORS' BEHAVIORS

MANAGEMENT SCIENCE
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GAMBLING WITH THE HOUSE MONEY AND TRYING TO BREAK EVEN: THE EFFECTS OF PRIOR OUTCOMES ON RISKY CHOICE*

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How is risk-taking affected by prior gains and losses? While normative theory implores decision makers to only consider incremental outcomes, real decision makers are influenced by prior outcomes. We first consider how prior outcomes are combined with the potential payoffs offered by current choices. We propose an editing rule to describe how decision makers frame such problems. We also present data from real money experiments supporting a "house money effect" (increased risk seeking in the presence of a prior gain) and "break-even effects" (in the presence of prior losses, outcomes which offer a chance to break even are especially attractive).
(DECISION MAKING; PROSPECT THEORY; SUNK COSTS; MENTAL ACCOUNTING)

1. Introduction

Imagine that you are attending a convention in Las Vegas, and you walk into a casino. While passing the slot machines, you put a quarter into one machine and, surprisingly, you win $100. Now what? Will your gambling behavior for the rest of the evening be altered? Might you make a few more serious wagers, even if you usually abstain? Suppose

Thaler, R. H., & Johnson, E. J. (1990). Gambling with the House Money and Trying to Break Even: The Effects of Prior Outcomes on Risky Choice. *Management Science*, *36*(6), 643–660.

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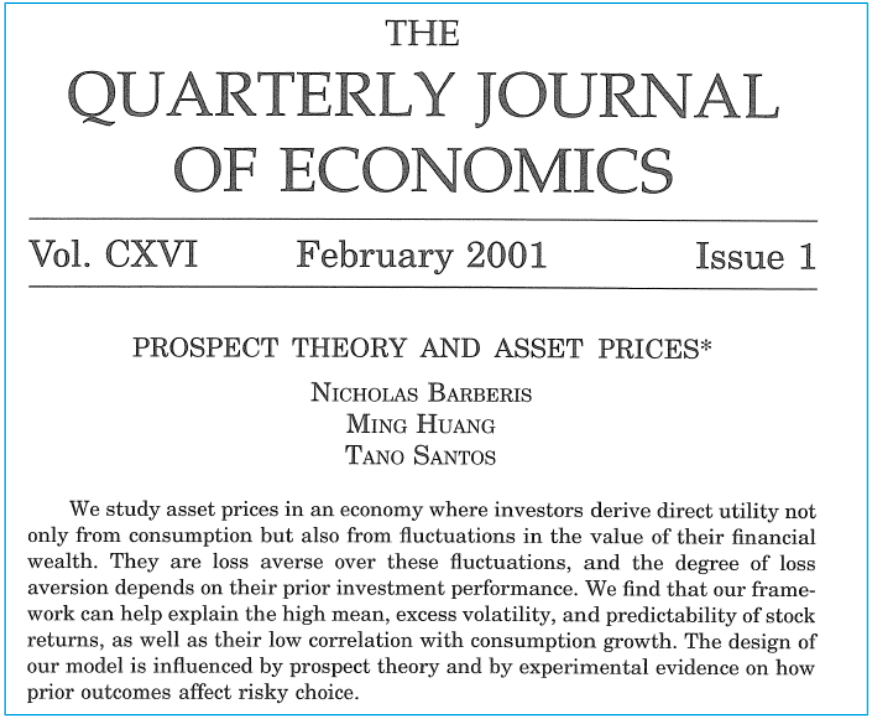

THE
QUARTERLY JOURNAL
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Vol. CXVI February 2001 Issue 1

PROSPECT THEORY AND ASSET PRICES*

NICHOLAS BARBERIS
MING HUANG
TANO SANTOS

We study asset prices in an economy where investors derive direct utility not only from consumption but also from fluctuations in the value of their financial wealth. They are loss averse over these fluctuations, and the degree of loss aversion depends on their prior investment performance. We find that our framework can help explain the high mean, excess volatility, and predictability of stock returns, as well as their low correlation with consumption growth. The design of our model is influenced by prospect theory and by experimental evidence on how prior outcomes affect risky choice.

Barberis, N., Huang, M., & Santos, T. (2001). Prospect Theory and Asset Prices. *The Quarterly Journal of Economics*, *116*(1), 1–53. http://www.jstor.org/stable/2696442

APPLICATIONS RELATED WITH PROSPECT THEORY AND INVESTORS' BEHAVIORS

The Realization Effect: Risk-Taking After Realized Versus Paper Losses

By Alex Imas *

Understanding how prior outcomes affect risk attitudes is critical for the study of choice under uncertainty. A large literature documents the significant influence of prior losses on risk attitudes. The findings appear contradictory: some studies find greater risk-taking after a loss, whereas others show the opposite – that people take on less risk. I reconcile these seemingly inconsistent findings by distinguishing between realized versus paper losses. Using new and existing data, I replicate prior findings and demonstrate that following a realized loss, individuals avoid risk; if the same loss is not realized, a paper loss, individuals take on greater risk.

"A person who has not made peace with his losses is likely to accept gambles that would be unacceptable to him otherwise."

– Kahneman and Tversky (1979)

"Losses that come on the heels of prior losses may be more painful than average...after a prior loss, the person becomes more loss averse."

– Barberis, Huang and Santos (2001)

Imas, Alex. 2016. "The Realization Effect: Risk-Taking after Realized versus Paper Losses." *American Economic Review*, 106 (8): 2086-2109.

APPLICATIONS RELATED WITH PROSPECT THEORY AND INVESTORS' BEHAVIORS

MYOPIC LOSS AVERSION AND THE EQUITY PREMIUM PUZZLE*

SHLOMO BENARTZI AND RICHARD H. THALER

The equity premium puzzle refers to the empirical fact that stocks have outperformed bonds over the last century by a surprisingly large margin. We offer a new explanation based on two behavioral concepts. First, investors are assumed to be "loss averse," meaning that they are distinctly more sensitive to losses than to gains. Second, even long-term investors are assumed to evaluate their portfolios frequently. We dub this combination "myopic loss aversion." Using simulations, we find that the size of the equity premium is consistent with the previously estimated parameters of prospect theory if investors evaluate their portfolios annually.

Benartzi, S., & Thaler, R. H. (1995). Myopic Loss Aversion and the Equity Premium Puzzle. *The Quarterly Journal of Economics*, *110*(1), 73–92. https://doi.org/10.2307/2118511

PROSPECT THEORY

Kahneman & Tversky (1979) develop Prospect Theory to incorporate observed behaviors that cannot be explained by EUT.

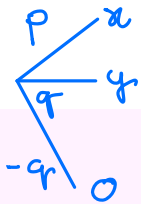
Some key features they emphasize in their model:

1. Evaluation of choices are made relative to a reference point.
2. Diminishing sensitivity (risk-averse in gains, risk-loving in losses)
3. Loss Aversion
4. Probability weighting

$$p = \frac{1}{1,000,000}$$

PROSPECT THEORY

Given a reference point, for example, an initial wealth W



A person evaluates a prospect $(x, p; y, q)$ according to the functional

$$V(x, p; y, q) = \pi(p)\, v(x) + \pi(q)\, v(y) + \pi(1-p-q)\, v(0)$$

usually we assume that $v(0) = 0$

What's new?

$v(\cdot)$ "value function"

$\pi(\cdot)$ "probability weighting function"

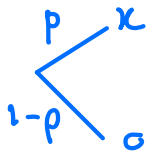
Note: For EUT, evaluate final wealth

$$EU(W, (x, p; y, q)) = p\, u(W+x) + q\, u(W+y) + 1-p-q\, u(W+0)$$

Example,

initial wealth W

prospect $X = (x, p)$ or $(x, p; 0, 1-p)$



Expected value

$$p(w+x)+(1-p)(w)$$

Expected utility

$$pU(w+x)+(1-p)U(w)$$

Prospect theory

$$\pi(p)\, v(x) + \pi(1-p)\, v(0)$$

$v(0)=0$

$$= \pi(p)\, v(x)$$

if we use initial wealth w as a reference point

PROSPECT THEORY

Prospect theory attempts to explain

(1.) risk aversion in gain domain and

(2.) risk loving in loss domain

by positing that the utility function is fundamentally wrong from biological principles as follows:

- The nervous system is set up to primarily detect differences, not absolute levels.

“GAIN”

- A gain is perceived as a pleasurable change from the status quo (reference point) and the nervous system shows a decreasing response both to the intensity and duration of pleasurable stimuli.



“LOSS”

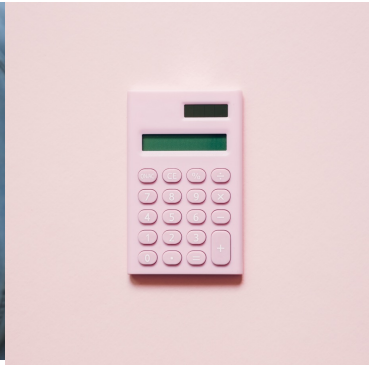
A loss is perceived as a painful change from the status quo (reference point) and the nervous system shows a decreasing response both to the intensity and duration of painful stimuli.

THE "JACKET/CALCULATOR" SCENARIO OF TVERSKY AND KAHNEMAN (1981)

https://www.menti.com/tj9md3k4rn

Imagine that you are about to purchase a jacket for $125, and a calculator for $15. The calculator salesman informs you that the calculator you wish to buy is on sale for $10 at the other branch of the store, located 20 minutes drive away.

How likely would you make the trip to the other store? -$5 -$10

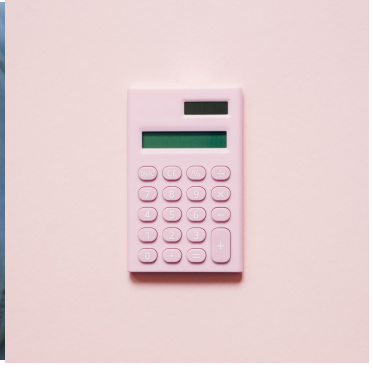


THE "JACKET/CALCULATOR" SCENARIO OF TVERSKY AND KAHNEMAN (1981)

https://www.menti.com/tj9md3k4rn

Imagine that you are about to purchase a jacket for $15, and a calculator for $125. The calculator salesman informs you that the calculator you wish to buy is on sale for $120 at the other branch of the store, located 20 minutes drive away.

How likely would you make the trip to the other store? -$5 -$120



"LOSS"

Tversky and Kahneman (1981) find that people are much more likely to drive 20 minutes to save $5 off $15 than to save $5 off $125.

A discount of $5 has a greater impact when the price of the calculator is low than when it is high.

Source: Tversky, Amos. and Daniel Kahneman (1981), "The framing of decisions and the psychology of choice," Science, 211 (4481), 453–58.

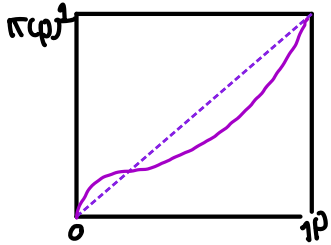
"A REFERENT POINT"

Although Prospect Theory is silent about how reference points are formed, we now know that reference points can arise from many different sources: expectations, goals, the status quo, and salient counterfactuals.

We do not yet fully understand how reference points are determined, but they should be subject to phenomena such as adaptation and social pressure (social norms), etc.

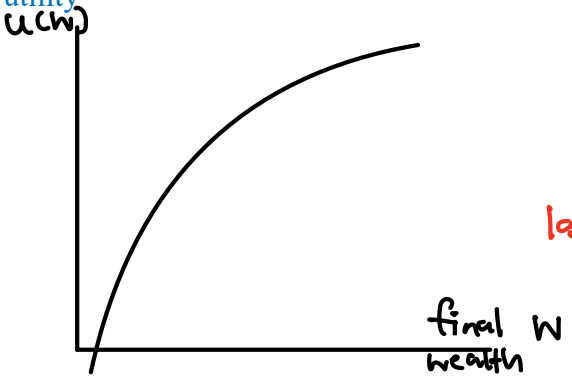
Source: Lewis, J. et al. "Diminishing Sensitivity to Outcomes : What Prospect Theory Gets Wrong about Diminishing Sensitivity to Price." .

UTILITY FUNCTION VS. VALUE FUNCTION



Utility function
Evaluation of choices is made over final states of wealth.

x-axis: final wealth
y-axis: utility



Value function
Evaluation of choices is made relative to a reference point.

x-axis: gain, loss
y-axis: value