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ARTICLES /CASES
1. PROSPECT THEORY
Dr. Prasanna Chandra

In the early 1950s, Harry Markowitz, who later got the Nobel prize in economics for his work in finance, proposed a theory in which utilities were assigned to changes of wealth and not to states of wealth. For almost a quarter of a century, this idea did not attract much attention till Daniel Kahneman and Amos Tversky decided that this was the way to go. They developed a theory which defined outcomes as gains and losses, not as states of wealth. As Daniel Kahneman observed, "Knowledge of perception and ignorance about decision theory both contributed to a large step forward in our research." In their 1979 *Econometrica* paper mentioned earlier, Daniel Kahneman and Amos Tversky provided a series of simple but compelling demonstrations of how the predictions of expected utility theory, economists' workhorse model of decision making under risk, are systematically violated by people in laboratory settings. They presented a new theory of risk attitudes, called "prospect theory," which elegantly reflected the empirical evidence on risk taking, including the observed violations of expected utility. In 1992, they published a modified version of their theory, called "cumulative prospect theory," which is now typically used. This version will be discussed here.

Key Tenets of Prospect Theory

The key tenets of prospect theory are:

- Reference dependence
- Diminishing sensitivity
- Loss aversion
- Changes in risk attitude
- Decision weights

For discussing the tenets, we will use the following notation. A prospect $P(pr, A, B)$ is a gamble whose outcomes are A (with a probability of pr) and B (with a probability of $(1 - pr)$). If the second outcome is omitted, as in $P(pr, A)$, it means that it is zero. Finally, if the probability also is omitted, as in $P(A)$, it means that it is a certain (riskless) prospect.

Reference Dependence The value of a prospect depends on gains and losses relative to a reference point, which is usually the status quo.

Consider the following decision situations:

Decision Situation 1: Assume that you are richer by ₹ 3,000 than you are today, and then choose between $P1$ (₹ 1,000) and $P2$ (0.50, ₹ 2,000)

Decision Situation 2: Assume that you are richer by ₹ 5,000 than you are today, and then choose between $P3$ (-₹ 1,000) and $P4$ (0.5, ₹ 2,000)

You can see that the two situations are effectively the same. In both of them, the decision is between a certain ₹ 4,000 and a prospect which has two payoffs, ₹ 3,000 and ₹ 5,000, with equal probabilities. Yet, respondents typically choose $P1$ and $P4$. This

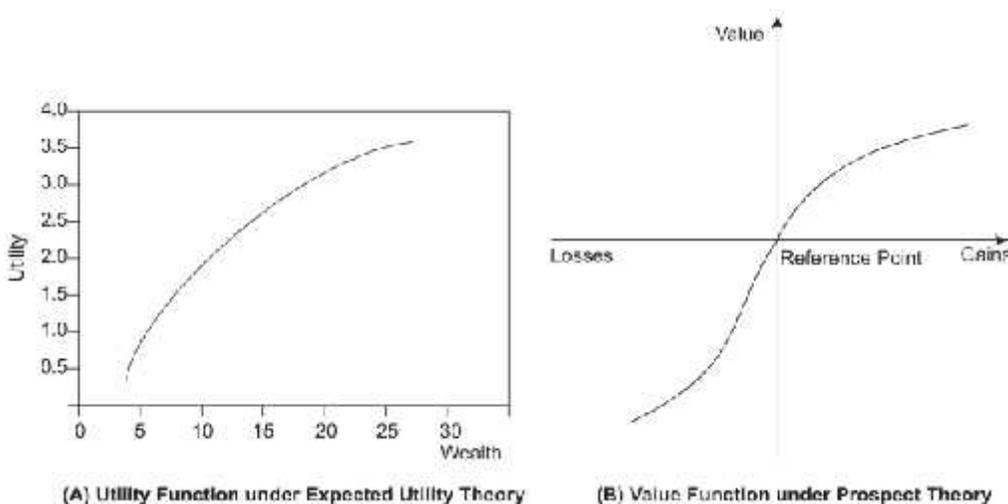
means that in decision situation 1 they shun risk, whereas in decision situation 4, they seek risk. The risk attitude is not the same across gains and losses because what matters to people is not the level of wealth, but the change in wealth. People typically evaluate an outcome in terms of gain or loss, relative to a reference point, which is usually the current wealth. Note that in the above problem, the two decision situations assume different starting wealth position. An important difference between expected utility theory and prospect theory is that the former assumes that people value an outcome based on the final wealth position, regardless of the initial wealth, whereas the latter assumes that people value an outcome in terms of gain or loss relative to a reference point, which is usually the current wealth.

The utility function of a rational person as per expected utility theory is shown in Panel A of Exhibit 1. According to this description, higher wealth provides higher satisfaction or “utility,” but at a diminishing rate. This results in risk aversion. The increase in utility from a gain of ₹10,000 is less than the decrease in utility from a loss of ₹10,000.

The prospect theory provides an alternative description of preferences. According to prospect theory, utility (referred as to value) depends not on the level of wealth as in Panel A of Exhibit 5.1, but on **changes** in wealth from current levels as in Panel B of Exhibit 1.

Diminishing Sensitivity How do people value gains/losses? They value gains/losses according to an S-shaped value function as shown in Panel B of Exhibit 1. Notice the following features of the value function.

Exhibit 1 Expected Utility Theory and Prospect Theory



- The value function is concave for gains. This means that people feel good when they gain, but twice the gain does not make them feel twice as good. The concavity over gains means that people tend to be *risk-averse* over moderate

probability gains: they prefer a certain gain of 1000 to a 50 per cent chance of 2000.

- The value function is convex for losses. This means that people experience a pain when they lose, but twice the loss does not mean twice the pain. The convexity (or diminishing sensitivity) over losses means that people tend to be *risk-seeking* over losses: they prefer a 50 per cent chance of losing 2000 to losing 1000 for sure. While the convexity of the value function over losses captures an important facet of preference, it ignores another. A person facing a loss that represents a large fraction of wealth tends to be very sensitive, not insensitive, to further losses.

Put simply, people experience diminishing sensitivity to gains/losses. The diminishing sensitivity to changes away from status quo reflects a basic human trait called the Weber Fechner Law, one of earliest findings in psychology. According to this law, the just noticeable difference in any variable is directly proportional to the magnitude of that variable. If you gain 100 grams in weight, you won't notice it, but if you are buying gold, the difference, between 100 grams and 200 grams is obvious.

Loss Aversion The value function is steeper for losses than for gains. This means that people feel more strongly about the pain from a loss than the pleasure from an equal gain – about two and half times as strongly, according to Kahneman and Tversky. This phenomenon is referred to as loss aversion. It is quite different from risk aversion.

Kahneman and Tversky infer loss aversion from the fact that most people reject the gamble (-₹1,000, ½; ₹1,100, ½). It is hard to understand this fact in the expected utility framework. The rupee amounts are so small in relation to typical wealth levels that under expected utility theory, the gamble would be evaluated essentially in a risk-neutral way. Since it has a positive expected value, it is attractive. However, for a loss-averse individual, the gamble lacks appeal: the pain of losing ₹1,000 far exceeds the pleasure of winning ₹1,100.

What explains loss aversion? In the ancient laboratory of evolution sensitivity to losses was perhaps more helpful to survive than appreciation of gains. As psychologist Amos Tversky said, “It would have been wonderful to be a species that was almost insensitive to pain and had an infinite capacity to appreciate pleasure. But you probably wouldn't have survived the evolutionary battle.” Over thousands of generations, a “better safe than sorry” reflex has become a deeply ingrained instinct in humans, as it is in other animals.

The concept of loss aversion may be explained from a biological and psychological point of view. As Daniel Kahneman put it, “The brains of humans and other animals contain a mechanism that is designed to give priority to bad news. By shaving a few hundredths of a second from the time needed to detect a predator, this circuit improves the animal's odds of living long enough to reproduce.” He further added, “The negative trumps the positive in many ways and loss aversion is one of the many manifestations of the broad negativity dominance.”

The brain responds to even symbolic threats. Emotionally loaded bad words (war, crime, disaster) attract attention faster than happy words (love, tranquility, peace).

Even if there is no real threat, the mere reminder of a bad event is perceived as threatening.

That we pay more attention to possible losses than gains makes sense. Steven Pinker's book, *How the Mind Works*, quotes social psychologist Timothy Ketelaar as saying, "as things get better, increases in fitness show diminishing returns: more food is better, but only up to a point. But as things get worse, decreases in fitness can take you out of the game; not enough food and you're dead."

Our aversion to pain also encourages a certain human behaviour: to take the most rewarding view of events. We interpret choices and events in ways that make us feel better. We often prefer to hear supporting reasons for our beliefs; think of ourselves as more talented than others; and make the best of bad situations.

The concept of loss aversion is perhaps the most significant contribution of psychology to behavioural economics. Loss aversion is a manifestation of the broad dominance of negativity. As a psychologist put it, "Bad emotions, bad parents, and bad feedback have more impact than good ones, and bad information is processed more thoroughly than good. The self is more motivated to avoid bad self-definitions than to pursue good ones. Bad impressions and bad stereotypes are quicker to form and more resistant to disconfirmation than good ones."

It is worth emphasising that the S-shaped curve captures an enormous amount of wisdom about human nature. The upper portion, which reflects gains, has the same shape as the utility of wealth function (in the standard expected utility theory) capturing the notion of diminishing sensitivity. But notice that the lower portion, which reflects losses, also captures diminishing sensitivity. This means that the difference between losing ₹10,000 and ₹20,000 feels much bigger than the difference between losing ₹100,000 and ₹110,000. This is quite different from the standard model in which starting from a given level of wealth, losses are captured by moving down the utility of wealth line, which is a concave line implying that each loss becomes more painful. If a person cares less and less about increases in wealth, then it means that he cares more and more about decreases in wealth.

In essence the S-shaped curve says that we experience life in terms of changes, we feel diminishing sensitivity to both gains and losses, and losses hurt more than identical gains feel good. As the renowned behavioural economist Richard Thaler said, "There is a lot of wisdom in one image. Little did I know that I will be playing around with that graph for the rest of my life."

Changes in Risk Attitude Depending on the nature of the prospect, people sometimes display risk aversion and sometimes display risk seeking.

To illustrate this aspect of behaviour, imagine that you are presented with the following pair of concurrent decisions situations.

Decision Situation 3 : Choose between P5 (₹2400) and P6 (0.25, ₹10000)

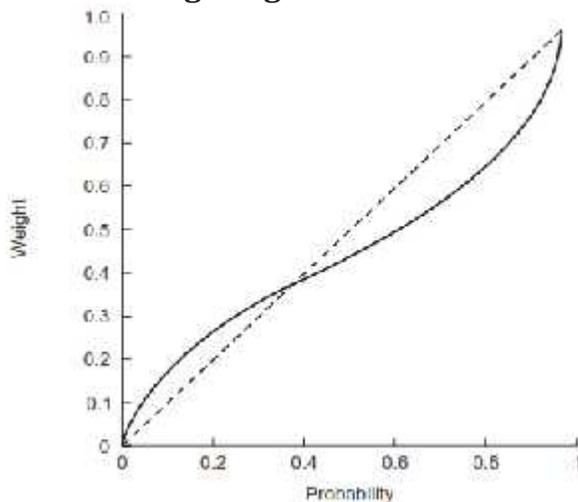
Decision Situation 4: Choose between P7 (-₹7500) and P8 (0.75, -₹10000)

In other words, in the first situation you have to choose between a sure gain of ₹2,400 and a 25% chance of gaining ₹10,000. In the second situation, you have to choose between a sure loss of ₹7,500 and a 75% chance of losing ₹10,000.

When such decision situations are presented to respondents in experiments, the respondents typically choose P5 in decision situation 3, which means that they exhibit risk aversion. However, in decision situation 4, the respondents typically choose P8, which means that they exhibit risk seeking. While expected utility theory does not allow for changes in risk attitude like this, prospect theory allows for variations in risk attitude depending on the nature of the prospect.

Decision Weights In utility theory, people weight outcomes by their objective probabilities p_i , but in prospect theory people weight outcomes by transformed probabilities or decision weights π_j . The decision weights are computed using a weighting function $W(\cdot)$ which is a function of objective probability. In Exhibit 2 the solid line is the weighting function proposed by Tversky and Kahneman, whereas the dotted line (a 45 degree line) represents the objective probabilities used in the expected utility theory. A comparison of the two suggests that the weighting function overweights low probabilities and underweights high probabilities.

Exhibit 2. Weighting Function



It must be emphasised that in cumulative prospect theory, the weighting function is applied to cumulative probability – for example, to the probability of gaining at least 10,000, or of losing 5000 or more. Note that the weighting function shown in Exhibit 2 leads the individual to overweight the *tails* of any distribution. Put differently it overweights unlikely extreme outcomes. Tversky and Kahneman explain this partly from the fact that people like both lotteries and insurance. This means people prefer a 0.001 chance of winning 10,000 to a certain gain of 10, but also a certain loss of 10 to a 0.001 chance of losing 10,000. It is difficult to explain a coexistence of such behaviours with expected utility. In cumulative prospect theory, the unlikely state of the world in which the individual gains or loses 10,000 is overweighted in his mind.

2. Capital Allocation

Prasanna Chandra

Capital allocation is a key responsibility of top management. Unfortunately, many CEOs, though well- intentioned, do not know how to allocate capital effectively. Warren Buffett observed perceptively in his 1987 letter to shareholders: “The point can be important because the heads of many companies are not skilled in capital allocation. There inadequacy is not surprising. Most bosses rise to the top because they have excelled in an area such as marketing, production, engineering, administration or, sometimes, institutional politics.. In the end, plenty of unintelligent capital allocation takes place in corporate America (That’s why you hear so much about “restructuring.”)

Capital Misallocation

There are many reasons for misallocation of capital. The more common one are mentioned below.

- Investment in ambitious projects due to overconfidence.
- Excessive diversification due to herd mentality.
- Overpayment for acquisitions an account of winner’s curse.
- Throwing good money after bad due to sunk cost fallacy.
- Steering investments to initiatives that offer the most tangible and immediate returns and short- changing investments in initiatives that are crucial to long-term health.
- Hoarding of cash for the comfort of liquidity.
- Considering internally generated funds as very cheap.
- Incorrect appreciation of the value of real options.

Five Principles of Capital Allocation

1. **Zero- based Capital Allocation** Capital in most companies is allocated on an incremental basis. For example, a McKinsey study of more than 1,600 U.S. companies found that the correlation between how much capital a business unit received in one year and the next was 0.99. It appears that inertia plays a large role in capital allocation.

Zero- based approach is the proper approach to capital allocation. This approach determines the right amount of capital to support the strategy that will create the most wealth. The thrust is on determining how much should be invested without any reference to how much has been already invest.

McKinsey research suggests that companies that follow a zero- based approach to capital allocation deliver superior TSR than companies that take more of an incremental approach.

2. **Fund Strategies, not Projects** Capital allocation should be concerned with assessing and approving strategies and determining the projects that support the strategies, rather than assessing and approving projects in isolation. This is a critical distinction. There can be value- destroying projects within a sound strategy and value- creating projects within a flawed strategy.

One must be wary of a project approach, as it is easy to manipulate the numbers of a project to make it look good. As Warren Buffett noted: “Any business craving of the leader, however foolish, will be quickly supported by detailed rate- of – return and strategic studies prepared by his troops.” As Richard Brealey et al. observed: “Here is a riddle. Are projects proposed because they have positive NPVs, or do they have positive NPVs because they are proposed? No prizes for the correct answer.”

It must be recognised that a business strategy entails a bundle of projects and what really matters is the value of the bundle. As Michael Mauboussin said, “The CEO and board must evaluate alternative strategies and consider the financial prospects of each.”

3. **No Capital Rationing** Many companies limit their investments to internally generated funds which are considered “scarce but free.” This “scarce but free” mindset must be replaced by “plentiful but costly” mindset. After all, a company can always raise external capital to support valuable investments. Hence no worthwhile investment must be rejected just because there is inadequacy of internally generated capital. Further, it must be recognised that capital, irrespective of whether it is internally generated or externally obtained, has an opportunity cost associated with it.
4. **Zero Tolerance for Bad Growth** Companies that want to grow will invariably make bad investments. Failed investments are no sin; in fact they are essential to the process of value creation. What is sin, however, is to remain committed to a bad strategy that drains human and financial resources.

Companies have an opportunity to create value by promptly exiting businesses where they lack advantage. This will reduce cross- subsidisation and direct managerial energies to businesses that create the most value.

5. **Know the Value of Assets and Act Accordingly** Capital allocation is similar to portfolio management. An intelligent portfolio manager has a good sense of how the value of a security compares with its price. Likewise, an intelligent capital allocator knows the difference between the value and price of each asset. As Warren Buffett famously said, "I am a better investor because I am a manager and I am a better manager because I am an investor."

With a good sense of value and price, management should be ready to take action to create value. As Michael Mauboussin put it. "Sometimes that means acquiring, other times that means divesting, and frequently there are no clear gaps between value and price. As we have seen, managers tend to prefer to buy or sell, even though the empirical record shows quite clearly that sellers fare better than buyers, on average."

3. EVOLUTIONARY ANALOGY¹

Dr. Prasanna Chandra

People think that financial evolution involves consolidation and the emergence of few giants or behemoths. Niall Ferguson, however, argues that it is a lot like natural selection. He draws the following parallels (Exhibit 1).

Exhibit 1. Parallels in the Nature and the World of Finance

Nature	Finance
Genes	Institutional memories of business practices
Spontaneous mutation	Innovation
Competition for finite resources	Competition for customers, market share, and profit
Mechanism of natural selection	Market allocation of capital and human resources and the possibility of death in case of under-performance (differential selection)

Due to these similarities, there is scope for speciation and diversity as well as scope for species extinction in the world of finance as in nature.

For a quarter of century, beginning in early 1980s, finance enjoyed its golden age. As an *Economist* article put it: “As financial globalisation spread capital more widely, markets evolved, businesses were able to finance new ventures, and ordinary people had unprecedented access to borrowing and foreign exchange. Modern finance improved countless lives.”

During this period, we witnessed an incredible proliferation of instruments, institutions, and markets. Just as bio-diversity thrives when natural environment is benign, financial diversity flourishes when the economic conditions are conducive.

• Critical Differences Between Natural Evolution and Financial Evolution

Niall Ferguson says that there are three critical differences between natural evolution and financial evolution.

1. In the natural world, mutation is random whereas in the financial world innovation (or mutation) is conscious and deliberate.
2. In the natural world, **exogenous** shocks such as asteroids hitting the earth or ice ages cause changes in the natural environment that may significantly alter the advantages or disadvantages of certain traits. In the financial world, however, disruptions are **endogenous** not exogenous. The Great Depression of the 1930s, the Great Inflation of the 1970s, and the Great Recession of the 2000s are conspicuous examples of endogenously caused disruptions.

¹Adapted from Niall Ferguson’s lecture on ‘Globalisation’ which was the capstone event of the centennial year celebration of Harvard Business School in 2008.

3. According to the Darwinian theory, in the natural world there is no such thing as an intelligent design or a divine regulator. Evolution is a random process with no moral outlook on the outcome. In contrast, in the financial world, there is supposed to be an intelligent design. Regulators are supposed to be in charge of that design. Of course, it is a different matter that regulators often don't succeed because regulations are nearly always improvised by national legislations in response to a crisis. Such regulations are meant to avoid the crisis that has just happened from happening again, but are ineffective in dealing with the next crisis as it would be very different in nature. Niall Ferguson argues that regulators are tempted to interfere with the process of natural selection that he believes is essential to financial evolution.

Joseph Schumpeter on the Process of Creative Destruction

This evolutionary character is not merely due to the fact that economic life goes on in a social and natural environment which changes, nor is this evolutionary character due to quasiautonomous increases in population and capital or to the vagaries of monetary systems. The fundamental impulse that sets and keeps the capitalist engine in motion comes from the new consumers goods, the new methods of production or transportation, the new markets and the new forms of industrial organization capitalist enterprise creates. The opening of the new markets, foreign or domestic, and the organisational developments from the craft shop and factories to such concerns as the U.S. Steel illustrate the same process of industrial mutation that incessantly revolutionises the economic structure from within, incessantly destroying the old one, incessantly creating a new one. This process of creative destruction... the essential fact about capitalism.*

*Joseph Schumpeter, *Capitalism, Socialism, and Democracy*, Floyd, Virginia: Impact Books, 1942.

B.SNIPPETS

1. Four Classes of Stock Market Players

Paul Samuelson identified four classes of stock market players.

- The “buy and hold” investors. They do reasonably well as long as the economy grows.
- The “hour –to-hour, day-to-day ticker watches.” They mostly make money only for their brokers.
- The “market timers” who try to exploit the changing sentiment of the investment public. They are sometimes successful at it.
- The diligent investors who study companies closely enough to take advantage of “special situations” of which the investing public is unaware. They make the most money, but they have to put in a lot of work or have privileged access to information.

To this list, one may add one more class, viz., the “quant jacks” who use economics and probability theory to gain an edge over the vast majority of market players.

2. Managerial Miscalibration

In one of the most comprehensive studies of managerial judgment, which was published in the fall 2013 issue of *Quarterly Journal of Economics*, Itzhak Ben David, John R. Graham, and Campbell R. Harvey used a unique 10 – year panel that included more than 13,300 expected stock market return probability distributions. They found that executives were severely miscalibrated, producing distributions that are too narrow: realized market returns were within the executives’ 80% confidence interval only 36% of the time.

They further found that:

- Executives reduce the lower bound of the forecast confidence interval during times of high market uncertainty. However, ex post miscalibration is worst during periods of high uncertainty.
- Executives who miscalibrated about the stock market return showed similar miscalibration regarding the prospects of their firms.
- Miscalibrated executives seemed to follow more aggressive corporate policies: they invested more and leverage more.

3. Key Strengths of Berkshire Hathaway

Berkshire Hathaway’s key strengths are:

- An unmatched collection of business, with most of them having favourable economic prospects.
- A cadre of outstanding managers.
- An extraordinary diversity of earnings.
- A first- choice ranking among many owners and managers who are contemplating sale of their business.
- A distinctive culture forged assiduously over 50 years.

4. William Vickrey's Solution

In competitive bidding situations, where the highest bidder pays the price he bids, the “winner’s curse” phenomenon is common and it results in misallocation of resources. William Vickrey offered an ingenious solution to this problem in his paper “Counterspeculation, Auctions, and Competitive Sealed Tenders,” *Journal of Finance*, March 1961. For this seminal contribution and other works, he was awarded the Nobel Prize for Economics in 1996. The Nobel citation said: “He showed that if the highest bidder does not have to pay the price he bids- but the price stated in the next highest bid- then he has a private interest in revealing his true willingness to pay . At the same time, the price paid reflects the social opportunity cost of the item being auctioned. This contributes to social efficiency.”

PART C: WIT AND WISDOM

1. HUMOUR

- We were invited to dinner by a friend and his new bride, who had brought a handsome dowry with her. We were admiring the new acquisitions in the house, particularly a large refrigerator. “What did it cost you?” asked my wife casually. The new groom replied dryly, “My bachelorhood!”
- Conversation between two youngsters. “What does the word ‘coincidence’ mean?” “That’s funny. I was just going to ask you the same thing.”

2. WISE SAWS

- “The best job goes to the one who can get it done without passing the buck or coming back with alibis.”
- “Reputation is what other people know about you. Honour is what you know about yourself.” *Lois McMaster Bujold.*

