

Behavioural Finance

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Abstract

An introduction to behavioural finance, including a review of the major works and a summary of important heuristics.

1 Introduction

Behavioural finance is the study of the influence of psychology on the behaviour of financial practitioners and the subsequent effect on markets. Behavioural finance is of interest because it helps explain *why* and *how* markets might be inefficient. For more information on behavioural finance, see Sewell (2001).

2 History

Back in 1896, Gustave le Bon wrote *The Crowd: A Study of the Popular Mind*, one of the greatest and most influential books of social psychology ever written (le Bon 1896).

Selden (1912) wrote *Psychology of the Stock Market*. He based the book ‘upon the belief that the movements of prices on the exchanges are dependent to a very considerable degree on the mental attitude of the investing and trading public’.

In 1956 the US psychologist Leon Festinger introduced a new concept in social psychology: the theory of *cognitive dissonance* (Festinger, Riecken and Schachter 1956). When two simultaneously held cognitions are inconsistent, this will produce a state of cognitive dissonance. Because the experience of dissonance is unpleasant, the person will strive to reduce it by changing their beliefs.

Pratt (1964) considers utility functions, risk aversion and also risks considered as a proportion of total assets.

Tversky and Kahneman (1973) introduced the *availability* heuristic: ‘a judgmental heuristic in which a person evaluates the frequency of classes or the probability of events by availability, i.e. by the ease with which relevant instances

come to mind.’ The reliance on the availability heuristic leads to systematic biases.

In 1974, two brilliant psychologists, Amos Tversky and Daniel Kahneman, described three heuristics that are employed when making judgments under uncertainty (Tversky and Kahneman 1974):

representativeness When people are asked to judge the probability that an object or event A belongs to class or process B, probabilities are evaluated by the degree to which A is representative of B, that is, by the degree to which A resembles B.

availability When people are asked to assess the frequency of a class or the probability of an event, they do so by the ease with which instances or occurrences can be brought to mind.

anchoring and adjustment In numerical prediction, when a relevant value (an anchor) is available, people make estimates by starting from an initial value (the anchor) that is adjusted to yield the final answer. The anchor may be suggested by the formulation of the problem, or it may be the result of a partial computation. In either case, adjustments are typically insufficient.

The second-most cited paper ever to appear in *Econometrica*, the prestigious academic journal of economics, was written by the two psychologists Kahneman and Tversky (1979). They present a critique of expected utility theory (also called von-Neumann Morgenstern utility) (Bernoulli 1738; von Neumann and Morgenstern 1944; Bernoulli 1954)¹ as a descriptive model of decision making under risk and develop an alternative model, which they call *prospect theory*. Expected utility theory is unable to explain why people are often simultaneously attracted to both insurance and gambling. Kahneman and Tversky found empirically that people underweight outcomes that are merely probable in comparison with outcomes that are obtained with certainty; also that people generally discard components that are shared by all prospects under consideration. Under prospect theory, value is assigned to gains and losses rather than to final assets; also probabilities are replaced by decision weights. The value function is defined on deviations from a reference point and is normally concave for gains (implying risk aversion), commonly convex for losses (risk seeking) and is generally steeper for losses than for gains (loss aversion) (see Figure 1 (page 3)). Decision weights are generally lower than the corresponding probabilities, except in the range of low probabilities (see Figure 2 (page 4)).

Thaler (1980) argues that there are circumstances when consumers act in a manner that is inconsistent with economic theory and he proposes that Kahneman and Tversky’s prospect theory be used as the basis for an alternative descriptive theory. Topics discussed are: underweighting of opportunity costs, failure to ignore sunk costs, search behaviour, choosing not to choose and re-

¹Bernoulli (1954) is a translation of Bernoulli (1738) by Louise Sommer.

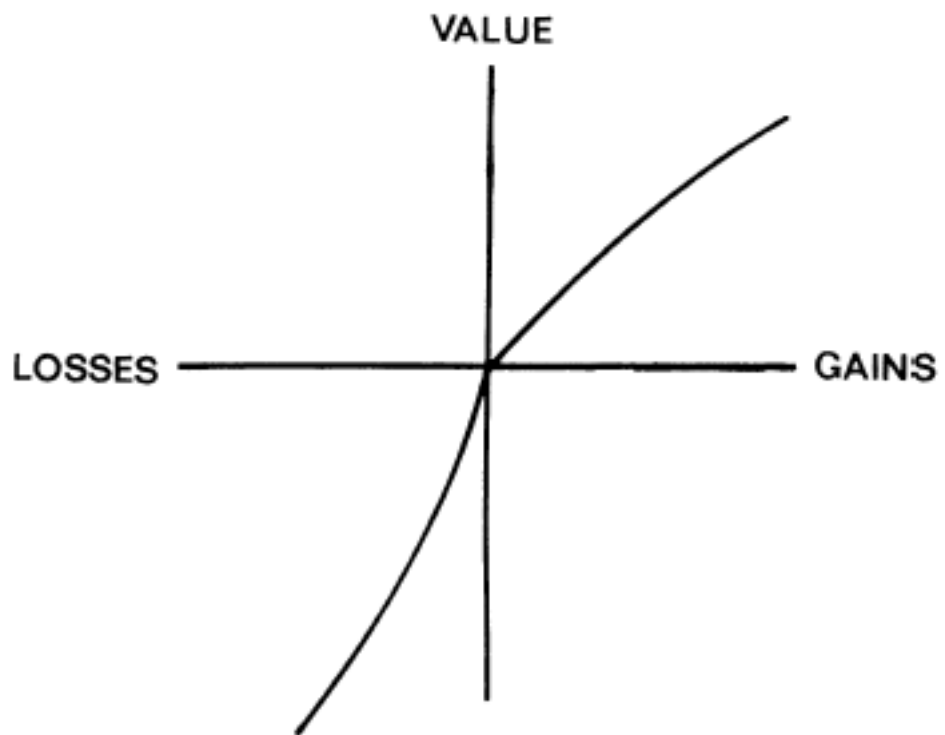


Figure 1: A hypothetical value function (Kahneman and Tversky 1979)

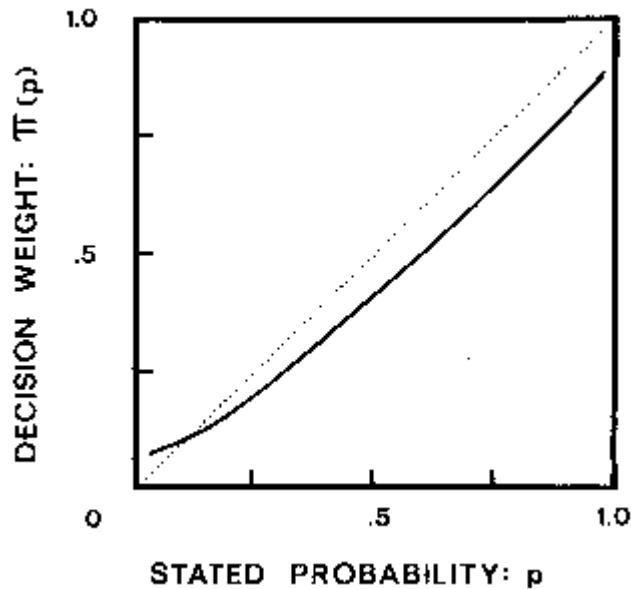


Figure 2: A hypothetical weighting function (Kahneman and Tversky 1979)

gret, and precommitment and self-control. The paper introduced the notion of ‘mental accounting’ (described below).

In another important paper Tversky and Kahneman (1981) introduced *framing*. They showed that the psychological principles that govern the perception of decision problems and the evaluation of probabilities and outcomes produce predictable shifts of preference when the same problem is framed in different ways. Shiller (1981) discovered that stock price *volatility* is far too high to be attributed to new information about future real dividends.

Kahneman, Slovic and Tversky (1982) edit *Judgment Under Uncertainty: Heuristics and Biases*, thirty-five chapters which describe various judgmental heuristics and the biases they produce.

In 1985 Werner F. M. De Bondt and Richard Thaler published ‘Does the stock market overreact?’ in the *The Journal of Finance* (De Bondt and Thaler 1985), effectively forming the start of what has become known as *behavioural finance*. They discovered that people systematically overreacting to unexpected and dramatic news events results in substantial weak-form inefficiencies in the stock market. This was both surprising and profound. *Mental accounting* is the set of cognitive operations used by individuals and households to organize, evaluate and keep track of financial activities. Thaler (1985) developed a new model of consumer behaviour involving mental accounting.

Tversky and Kahneman (1986) argue that, due to *framing* and *prospect theory*, the rational theory of choice does not provide an adequate foundation for a descriptive theory of decision making.

Yaari (1987) proposes a modification to expected utility theory and obtains a so-called ‘dual theory’ of choice under risk. De Bondt and Thaler (1987) report additional evidence that supports the overreaction hypothesis.

Samuelson and Zeckhauser (1988) perform a series of decision-making experiments and find evidence of *status quo bias*. Poterba and Summers (1988) investigate transitory components in stock prices and found positive autocorrelation in returns over short horizons and negative autocorrelation over longer horizons, although random-walk price behaviour cannot be rejected at conventional statistical levels.

Kahneman, Knetsch and Thaler (1990) report several experiments that demonstrate that *loss aversion* and the *endowment effect* persist even in market settings with opportunities to learn and conclude that they are fundamental characteristics of preferences.

Gilovich (1991) wrote *How We Know What Isn't So*, a book about the fallibility of human reason in everyday life. Tversky and Kahneman (1991) present a reference-dependent model of riskless choice, the central assumption of the theory being *loss aversion*, i.e. losses and disadvantages have greater impact on preferences than gains and advantages. Fernandez and Rodrik (1991) model an economy and show how uncertainty regarding the identities of gainers and losers can lead to *status quo bias*. Kahneman, Knetsch and Thaler (1991) discuss three anomalies: the endowment effect, loss aversion and status quo bias.

Thaler (1992) publishes *The Winner's Curse: Paradoxes and Anomalies of Economic Life*. Banerjee (1992) develop a simple model of herd behaviour. Tversky and Kahneman (1992) developed a new version of prospect theory, which they called *cumulative prospect theory*. It employs cumulative rather than separable decision weights, applies to uncertain as well as to risky prospects with any number of outcomes and it allows different weighting functions for gains and for losses (see Figure 3 (page 6)). The theory—which they confirmed by experiment—predicts a distinctive fourfold pattern of risk attitudes: risk aversion for gains and risk seeking for losses of high probability; risk seeking for gains and risk aversion for losses of low probability. I have developed a cumulative prospect theory calculator, which is the first and only version online that can deal with greater than four outcomes (in theory it can deal with any number) (Sewell 2004).

Plous (1993) wrote *The Psychology of Judgment and Decision Making* which gives a comprehensive introduction to the field with a strong focus on the social aspects of decision making processes.

A *value* strategy involves buying stocks that have low prices relative to earnings, dividends, book assets, or other measures of fundamental value. Lakonishok, Shleifer and Vishny (1994) conjecture that value strategies yield higher returns because these strategies exploit the suboptimal behaviour of the typical investor.

The *equity premium puzzle* refers to the empirical fact that stocks have outperformed bonds over the last century by a far greater degree than would be expected under the standard expected utility maximizing paradigm. Benartzi and Thaler (1995) offer an explanation based on behavioural concepts: *loss*

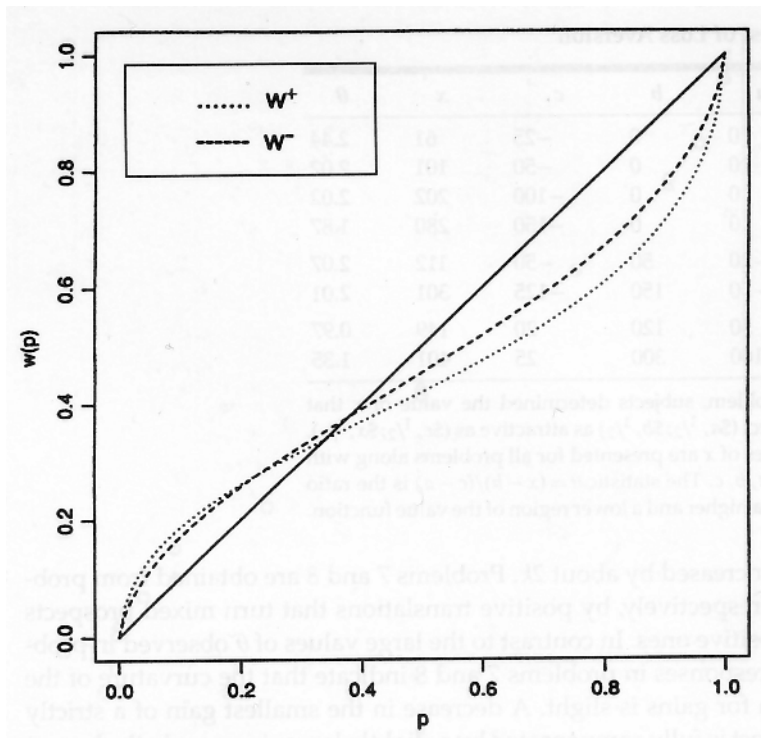


Figure 3: Weighting functions for gains (w^+) and losses (w^-) based on median estimates of γ and δ (Tversky and Kahneman 1992)

aversion combined with a prudent tendency to frequently monitor one's wealth. They dub this combination *myopic loss aversion*. Grinblatt, Titman and Wermers (1995) analysed the behaviour of mutual funds and found evidence of *momentum* strategies and *herding*.

Amos Tversky, one of the world's most respected and influential psychologists died on 2 June 1996, of metastatic melanoma, at the age of 59. Ghashghaie, *et al.* (1996) claim that there is an *information cascade* in FX market dynamics that corresponds to the energy cascade in hydrodynamic turbulence. The study of heuristics and biases in judgment was criticized in several publications by G. Gigerenzer. Kahneman and Tversky (1996) reply and claim that contrary to the central criticism, judgments of frequency—not only subjective probabilities—are susceptible to large and systematic biases. Chan, Jegadeesh and Lakonishok (1996) found that both price and earnings *momentum* strategies were profitable, implying that the market responds only gradually to new information, i.e. there is *underreaction*.

In the accounting literature, Basu (1997) finds evidence for the *conservatism* principle, which he interprets as earnings reflecting 'bad news' more quickly than 'good news'.

Bikhchandani, Hirshleifer and Welch (1998) argue that the theory of observational learning, and particularly of *informational cascades*, can help explain phenomena such as stock market crashes. Motivated by a variety of psychological evidence, Barberis, Shleifer and Vishny (1998) present a model of investor sentiment that displays underreaction of stock prices to news such as earnings announcements and overreaction of stock prices to a series of good or bad news. In his third review paper Fama (1998) defends the efficient market hypothesis that he famously defined in his first, and claims that apparent overreaction of stock prices to information is about as common as underreaction. This argument is unconvincing, because under- and overreactions appear to occur under different circumstances and/or at different time intervals. Odean (1998) tested and found evidence for the *disposition effect*, the tendency of investors to sell winning investments too soon and hold losing investments for too long. Daniel, Hirshleifer and Subrahmanyam (1998) propose a theory of security markets based on investor overconfidence (about the precision of private information) and biased self-attribution (which causes changes in investors' confidence as a function of their investment outcomes) which leads to market under- and overreactions.

Camerer and Lovallo (1999) found experimentally that *overconfidence* and *optimism* lead to excessive business entry. Wermers (1999) studied *herding* by mutual fund managers and he found the highest levels in trades of small stocks and in trading by growth-oriented funds. Thaler (1999) summarizes the literature on mental accounting and concludes that mental accounting influences choice, that is, it matters. Gigerenzer, Todd and the ABC Research Group (1999) publish *Simple Heuristics That Make Us Smart*, a book about fast and frugal heuristics. Odean (1999) demonstrated that overall trading volume in equity markets is excessive, and one possible explanation is *overconfidence*. He also found evidence of the *disposition effect* which leads to profitable stocks being sold too soon and losing stocks being held for too long. Hong and Stein

(1999) model a market populated by two groups of boundedly-rational agents: ‘newswatchers’ and ‘momentum traders’ which leads to underreaction at short horizons and overreaction at long horizons. Nofsinger and Sias (1999) found that institutional investors positive-feedback trade more than individual investors and institutional *herding* impacts prices more than herding by individual investors. Veronesi (1999) presented a dynamic, rational expectations equilibrium model of asset prices in which, among other features, prices overreact to bad news in good times and underreact to good news in bad times.

There is a commonly observed but unexpected negative correlation between perceived risk and perceived benefit. Finucane, *et al.* (2000) concluded that this was due to the *affect heuristic*—people tend to derive both risk and benefit evaluations from a common source. Hong, Lim and Stein (2000) propose that firm-specific information, especially negative information, diffuses only gradually across the investing public, and this is responsible for momentum in stock returns. Shleifer (2000) publishes *Inefficient Markets: An Introduction to Behavioral Finance*, a quality book that considers behavioural finance vis-à-vis the EMH. In considering descriptive theories of choice under risk, Starmer (2000) reviews alternatives to *expected utility theory*. Shefrin (2000) wrote *Beyond Greed and Fear*, an excellent book on behavioural finance and the psychology of investing. In 2000, in his book *Irrational Exuberance*, Robert J. Shiller presented a persuasive case that the US stock market was significantly overvalued, citing structural factors, cultural factors and psychological factors (Shiller 2000). Kahneman and Tversky (2000) edit the book *Choices, Values, and Frames*, which presents a selection of the research that grew from their collaboration on prospect theory. Rabin (2000) provides a theorem showing that *expected utility theory* is an utterly implausible explanation for appreciable *risk aversion* over modest stakes. Lee and Swaminathan (2000) showed that past trading volume provides an important link between ‘*momentum*’ and ‘*value*’ strategies and these findings help to reconcile intermediate-horizon ‘*underreaction*’ and long-horizon ‘*overreaction*’ effects.

Rabin and Thaler (2001) consider *risk aversion* and pronounce the *expected utility hypothesis* dead. Psychological research has established that men are more prone to overconfidence than women (especially in male-dominated areas such as finance), whilst theoretical models predict that overconfident investors trade excessively. Barber and Odean (2001) found that men trade 45 per cent more than women and thereby reduce their returns more so than do women and conclude that this is due to *overconfidence*. Barberis, Huang and Santos (2001) incorporate *prospect theory* in a model of asset prices in an economy. Grinblatt and Keloharju (2001) identify the determinants of buying and selling activity and find evidence that past returns, reference price effects, tax-loss selling and the fact that investors are reluctant to realize losses are all determinants of trading. Barberis and Huang (2001) compare two forms of *mental accounting* by incorporating *loss aversion* and *narrow framing* into two asset-pricing frameworks: individual stock accounting and portfolio accounting. The former was the more successful. Gigerenzer and Selten (2001) edited *Bounded Rationality: The Adaptive Toolbox*, a collection of workshop papers which promote bounded

rationality as the key to understanding how real people make decisions. The book uses the concept of an ‘adaptive toolbox,’ a repertoire of fast and frugal rules for decision making under uncertainty. Huberman (2001) provide compelling evidence that people have a propensity to invest in the familiar, while often ignoring the principles of portfolio theory.

Gilovich, Griffin and Kahneman (2002) edited *Heuristics and Biases: The Psychology of Intuitive Judgment*, a book that compiles the most influential research in the heuristics and biases tradition since the initial collection in 1982 (Kahneman, Slovic and Tversky 1982). In the Introduction (Gilovich and Griffin 2002) identify six general purpose heuristics (affect, availability, causality, fluency, similarity and surprise) and six special purpose heuristics (attribution substitution, outrage, prototype, recognition, choosing by liking and choosing by default), whilst two heuristics have been superseded (representativeness (replaced by attribution-substitution (prototype heuristic and similarity heuristic)) and anchoring and adjustment (replaced by the affect heuristic)). Slovic, *et al.* (2002) describe and discuss the *affect* heuristic: the specific quality of ‘goodness’ or ‘badness’. Daniel Kahneman won the 2002 Bank of Sweden Prize in Economic Sciences in Memory of Alfred Nobel for his work on prospect theory, despite being a research psychologist and not an economist. If it were not for his untimely death, Amos Tversky, Kahneman’s collaborator, would have almost certainly shared the prize. Holt and Laury (2002) conducted a simple lottery-choice experiment and found differences in *risk aversion* between behaviour under hypothetical and real incentives.

Barberis and Thaler (2003) publish a survey of behavioural finance.

3 Important Heuristics

Affect The affect heuristic concerns ‘goodness’ and ‘badness’. Affective responses to a stimulus occur rapidly and automatically: note how quickly you sense the feelings associated with the stimulus words *treasure* or *hate*.

Availability Availability is a cognitive heuristic in which a decision maker relies upon knowledge that is readily available rather than examine other alternatives or procedures.

Similarity The similarity heuristic leads us to believe that ‘like causes like’ and ‘appearance equals reality’. The heuristic is used to account for how people make judgments based on the similarity between current situations and other situations or prototypes of those situations.

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