

Chapter 2

Literature Review

2.1. Introduction

Standard economic principles asserted that markets were efficient and that rational individuals acted in manners that would maximise their economic benefit. Yet, the observed investment behaviours of individuals were often in contradiction with this premise. This had led proponents of a new discipline, known as behavioural finance, to suggest that the anomalies in investor behaviour could be better explained by applying concepts from psychology rather than neoclassical economic theory. Behavioural finance had evolved into an established field of study aimed at bridging the gap between finance and psychology through the examination of investor decision processes and observed investor behaviour.

This chapter reviewed the relevant literature in the field of behavioural finance and consist of two main sections. The first discussed developments in behavioural finance; in particular, behavioural theories that were pertinent to this study, i.e. prospect theory and regret theory. The second highlighted some commonly observed ‘irrational’ investment behaviour along with empirical studies on the relationship between socio-demographic characteristics and behavioural biases. The chapter closed with suggestions of gaps in the current literature in behavioural finance, to be examined in this study.

2.2. Developments in Behavioural Finance

Since the 1960s, the tenets of standard finance had been the dominant theory among academics and financial market participants. It assumed that all investors were *homo economicus* and focused on the optimal and efficient allocation of resources. The pioneering work by Franco Modigliani and Merton Miller (capital structure irrelevance principle), Harry Markowitz (modern portfolio theory), John Lintner and William Sharpe (capital asset pricing theory), and Fischer Black, Myron Scholes and Robert Merton (option-pricing theory) provided most of the solutions in finance for the rational investor. Even so, over the last thirty years, literature on behavioural finance had begun to emerge with the aim of providing an explanation for observed inconsistencies in investor and market behaviour that could not be rationalised by standard finance.

Scholars of behavioural finance applied the principles of psychology to investment behaviour in order to examine and to better understand how emotions, heuristics and biases influenced the decision-making process (De Bondt et al., 2008; Schwartz, 2007; Glaser, Nöth & Weber, 2004; Ritter, 2003; Ricciardi & Simon, 2000). In contrast with standard finance, which was based on actions that maximised utility, behavioural finance was generally based on actions that sought to ‘satisfice’; a term coined by Herbert Simon from the combination of two words, i.e. satisfy and suffice. Satisficing described a decision-making process that utilised heuristics and biases to come up with a good enough choice, particularly when an exhaustive evaluation of all possible outcomes would be impractical.

Simon (1955) in his paper *A Behavioral Model of Rational Choice* introduced the concept known as bounded rationality. It was based on the assumption that decision-

makers possessed limited resources in the form of information and knowledge, which in turn limited their ability to look for the best probable choices. He argued that decision-makers would use simple strategies that focused on a few facets of the available options that would, more often than not, result in decisions that were suboptimal. In essence, the decision-maker would sacrifice maximising utility for a satisfactory alternative choice. It had been acknowledged that much of Simon's work provided the direction for other scholars of behavioural finance. In 1978, he was awarded the Nobel Prize in Economic Sciences for his pioneering research into the decision-making process within economic organisations.

Despite the significance of the theory of bounded rationality, much of the current research in behavioural finance stemmed from the work of two psychologists, Daniel Kahneman and Amos Tversky. Their hypothesis, which they called prospect theory (Kahneman & Tversky, 1979), introduced the notion that people were generally loss averse and exhibited the tendency to value gains and losses differently; i.e. losses had a greater emotional impact than gains of an equivalent amount. Table 2.1 is a summary of the main conceptual differences between standard finance theory and prospect theory. In 2002, Kahneman received the Nobel Prize in Economic Sciences for his contribution to the study of human judgement and decision-making under uncertainty. Other notable contributors in the field were Richard Thaler who was the first to theorise the endowment effect, and Meir Statman and Hersh Shefrin who named the tendency to sell losers and keep winners the disposition effect. The endowment and disposition effects were two of the more widely researched themes in the arena of behavioural finance.

Table 2.1

Standard Finance Theory versus Prospect Theory

Standard Finance Theory	Prospect Theory
Choice based on effect of outcomes on levels of wealth	Choice based on effect of outcomes on changes in wealth relative to a reference point
Objective treatment of risk, by its probabilities	Overweight small probabilities and underweight high probabilities
Choice not affected by framing of alternatives	Choice affected by framing of alternatives
Risk averse all the time	Risk averse when changes in wealth were perceived as gains, but risk seeking when changes in wealth were perceived as losses

Source: Falk, Michael S. (2009). *Behavioral Finance and Neuroscience: Rational Is As Rational Does*. Presentation at CFA Institute Speaker Retainer Programme.

Behavioural decision theory had been used to explain many stock market anomalies like the January effect¹, winner's curse², equity premium puzzle³, dividend puzzle⁴, etc. It had also been used to analyse the causes behind financial bubbles and crashes. Behavioural finance research focused on (i) behaviour of individuals, (ii) behaviour resulting from interactions between individuals, and (iii) behaviour based on socio-demographic and cultural differences. The scope of behaviours under study was also wide-ranging as could be seen from the list in Table 2.2. This list is by no means exhaustive as behavioural finance scholars may, over time, identify new irrational behaviours or practices for further study.

¹ This was a phenomenon where the average monthly return for small firms was consistently higher in January than any other month of the year.

² In competitive bidding, the winning bid might exceed the value of the item and the buyer would have incurred a loss; or the value of the item might be less than the buyer's estimate and the buyer would be disappointed with a smaller net gain.

³ Studies had shown that over a 70-year period, average returns for stocks exceeded government bonds by 6%-7%. Conventional economic models had estimated this premium to be much lower.

⁴ Companies that paid dividends were usually valued higher by investors. Since the investor already owned the stock, he or she should be indifferent whether or not the stock paid dividends. The price of the dividend-paying stock would drop on the ex-dividend date by about the amount of the dividend.

Table 2.2

Behavioural Finance Topics

Anchoring	Framing	Anomalies
Financial Psychology	Hindsight Bias	Market Inefficiency
Cascades	Preferences	Behavioural Economics
Chaos Theory	Fads	Overreaction
Cognitive Bias	Heuristics	Under-reaction
Cognitive Dissonance	Manias	Overconfidence
Cognitive Errors	Panics	Mental Accounting
Contrarian Investing	Disposition Effect	Irrational Behaviour
Crashes	Loss Aversion	Economic Psychology
Fear	Prospect Theory	Risk Perception
Greed	Regret Theory	Gender Bias
Herd Behaviour	Groupthink Theory	Irrational Exuberance

Source: Ricciardi and Simon (2000)

Although behavioural finance had been gaining support in recent years, it was not without its opponents. One of the loudest critics was Eugene Fama, known for his work on the efficient market hypothesis. Fama argued that many of the anomalies were shorter-term chance events that would eventually correct over time. He also maintained that behavioural finance appeared to be a collection of anomalies that could be explained by market efficiency. He stressed that market efficiency should not be abandoned in favour of behavioural finance. In support of Fama, Hirshleifer (2001) commented that the behavioural biases identified and the experimental approach adopted to study these biases were arbitrary, and would not satisfy the rigorousness required for any theory.

On a final note, interesting developments in behavioural finance could come from the field of neuroscience; i.e. the scientific study of the brain and nervous system. Traditionally a branch of biology, neuroscience had become an interdisciplinary science

in support of other fields like psychology. A review of the neuroscience literature presented evidence of specific brain systems that were responsible for biased decision-making under conditions of uncertainty (Goetz & James, 2008; Platt & Huettel, 2008; Peterson, 2007; Tom et al., 2007). Neuroimaging techniques had identified distinct brain systems that set off risk-taking or risk-avoiding investment behaviours. These experiments showed that excessive activation or suppression of either system could lead to errors in judgment when presented with finance-related decision scenarios.

2.3. Prospect Theory

The seminal work of Kahneman and Tversky (1979), which they termed prospect theory, looked at how individuals made decisions under conditions of risk and uncertainty. The theory described decision-making as a two-part process:

- i. an editing phase, which saw the investor framing choices in terms of gains and losses relative to a specific reference point, and
- ii. an evaluation phase where the investor would value the gains or losses according to a value function and a perceived likelihood (i.e. weighting function).

It had also been acknowledged that prospect theory was a descriptive decision model rather than prescriptive decision model of actual choices made (Tversky & Kahneman, 1986).

2.3.1. Editing phase

The purpose of the editing phase was for the individual to organise, simplify and reformulate the choices available, i.e. to help make the decision-making process easier. An important element in this phase was the framing effect, which described how an

option or choice was presented to the decision-maker so as to allow certain interpretations and to rule out others. This meant that the same outcome, presented in either a positive or negative manner, could induce individuals to change their preference; and was equivalent to viewing the glass either half-full or half-empty.

A well-cited example of the impact of framing on choice was the experiment conducted by Tversky and Kahneman (1981) where two groups of respondents were separately presented with one of two scenarios of the same problem. In the 'positive frame' where the first group was given a choice between (A) saving 200 lives for sure, or (B) a $1/3$ chance of saving all 600 with a $2/3$ chance of saving no one, most of the respondents chose A over B. When the scenario was presented to the second group in the 'negative frame' where the choice was (C) 400 people dying for sure, or (D) a $2/3$ chance of 600 dying and a $1/3$ chance of no one dying, most of the respondents chose D over C. It should be noted that A and C, and B and D, were equivalent in terms of lives lost or at risk.

The editing phase also involved mechanisms like segregation, coding, combination and cancellation. Edwards (1996) described these four operations as follows. Segregation referred to the tendency to focus on factors at hand that seemed most relevant to the immediate problem; in other words, to separate the risky components of a prospect from the riskless components. Coding entailed setting a reference point by which all gains and/or losses were measured. Combination involved the aggregation of the likelihood of choices that presented identical outcomes, and cancellation resulted in discarding the components of choices that carried similar outcomes.

2.3.2. Evaluation phase

The evaluation phase of prospect theory consisted of two parts: the value function and the weighting function. The value function is illustrated in Figure 2.1.

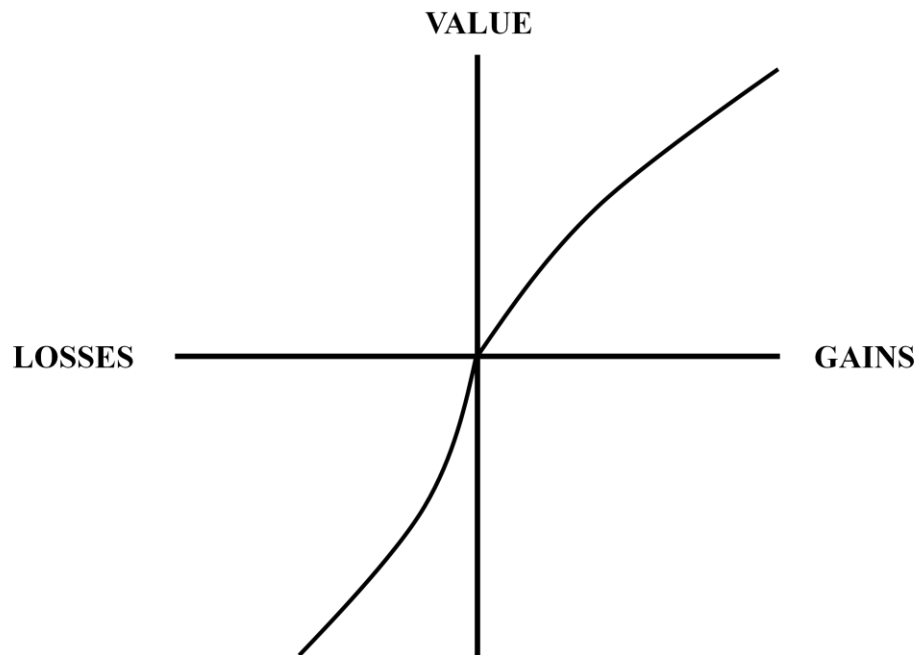


Figure 2.1

A Hypothetical Value Function

Source: (Kahneman & Tversky, 1979)

The value function had three main characteristics.

- i. Investor utility was assumed to be a function of changes in wealth relative to a reference point, rather than a function of absolute wealth. This was significantly different from expected utility theory, which assumed that the final asset position was definitive in calculating subjective utility and predicting choice (McDermott, 1998). To paraphrase an example used by Kahneman to illustrate this point, there were people who would drive across town to save RM5 on a RM10 calculator, but would not do the same to save RM5 on a RM500 dining

set. The absolute amount saved was the same under both circumstances, and based on expected utility theory, the behaviour should not differ.

- ii. The function was concave for gains and convex for losses. This meant that while the individual felt good for making a gain, he or she did not feel twice as good when the gain was doubled. The same was true for losses. Hence, for any given change, there was more impact closer to the starting point than farther away from it. For example, the difference between RM10 and RM110 would have a greater psychological impact than the same RM100 increase from RM10,000 to RM10,100.
- iii. The function was steeper for losses than for gains, which meant that the pain from a loss was greater than the pleasure the individual would feel from a gain of the same amount. As a result, most people exhibited the tendency to be averse to losses, which could be used to explain some behavioural biases that affect investors like the disposition effect, endowment effect and status quo bias.

In short, the value function in prospect theory predicted domain-affected risk propensity, where investors were risk-seeking in situations that presented the prospect of losses, but were risk-averse in situations that presented the prospect of enjoying gains.

In the second part of the evaluation phase, similar to the expected utility model, the value of each outcome was multiplied by a decision weight. The difference, however, was that these decision weights were not based on the traditional concepts of probability. Instead, they represented how individuals actually arrived at their perceived likelihood of an outcome. The weighting function is illustrated in Figure 2.2.

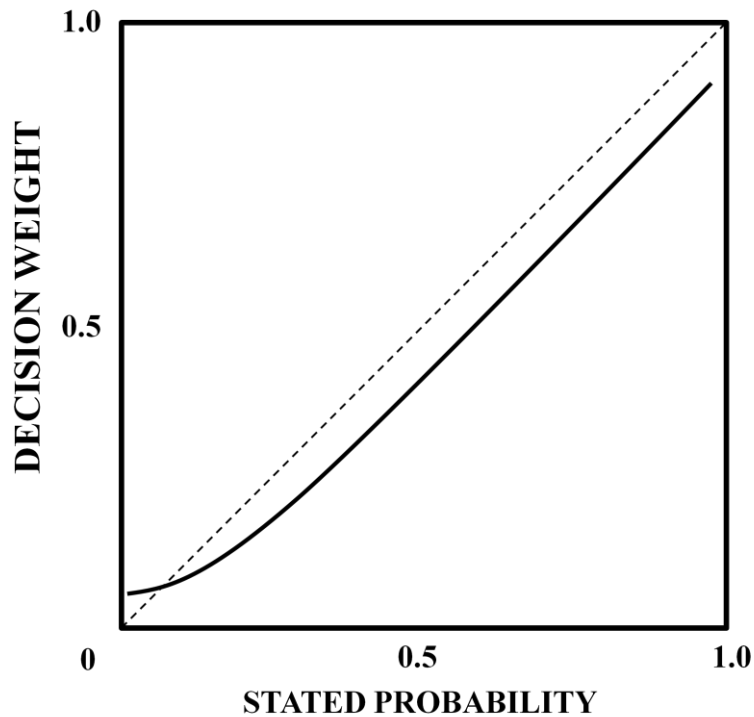


Figure 2.2

A Hypothetical Weighting Function

Source: (Kahneman & Tversky, 1979)

The following characteristics of the weighting function were discussed in Tversky and Kahneman (1981) and McDermont (1998).

- i. The function did not behave consistently at the endpoints, where one end should represent absolute certainty and the other end absolute impossibility. This suggested that individuals had difficulty assessing probabilities at the extreme ranges, and would be more biased in their evaluation of the likelihood of extreme events compared with events that were only somewhat likely.
- ii. Low probabilities were overweighted while moderate and high probabilities were subjectively underweighted. For example, when an individual bought a lottery, he or she would be quite willing to take a sure loss for a practically nonexistent chance of a huge gain. In other words, the individual was overweighting the extremely small probability of winning the lottery.

- iii. The impact from reducing the probability of an outcome by a constant factor was greater when the outcome was certain at the outset than when it was merely probable. This implied that reducing a 50% risk in half would not have the same impact as eliminating a 25% risk.

Harbaugh (2002) in his paper summarised the weighting function as representing a 'four-fold pattern', i.e:

- i. overweighting small probability gains;
- ii. underweighting high probability gains;
- iii. overweighting low probability losses; and
- iv. underweighting high probability losses.

According to Harbaugh, this pattern explained behaviour that was associated with favouring long-shots and taking risky chances to win back large losses (also known as the breakeven effect), avoiding near sure-things and buying insurance against unlikely losses.

One key feature of prospect theory was the role of the reference point in the decision-making process. The idea of a gain or a loss required a reference point from which to compare whether an outcome would be better or worse off. What this reference point was and how it could be changed could determine the outcome. This was because the outcome of a choice could be different if the reference point had been manipulated such that an identical situation could be made to seem different; i.e. from being in the realm of gains in one to being in the realm of losses in the other.

Many of the psychological biases like the status quo bias, anchoring bias, mental accounting bias, endowment effect and disposition effect could be derived from

prospect theory. However, it could not be used to adequately describe behaviours like overconfidence, cognitive dissonance⁵ and streak biases⁶. This lack of a consistent theory that addressed all market anomalies was often cited as a weakness of behavioural finance (Fama, 1998). Another cited weakness was that nearly all the findings from prospect theory had been from laboratory experiments (Wittman, 1991). This raised the issue whether the findings could be generalised to real world situations. Nonetheless, this issue had been put to rest as a number of studies had been conducted using actual trade data that verified the presence of behaviour like the endowment and disposition effects.

2.4. Regret Theory

Regret theory was another model of choice under uncertainty proposed by Loomes and Sugden (1987, 1982), and Bell (1982). Regret had been described as the emotional pain one would feel when the outcome of one's action compared unfavourably with another outcome that one might have chosen. Choice, under regret theory, was modelled on comparisons of the consequences among pairs of options. The decision process involved minimising the difference between the outcome from a given choice and the best choice that could have been achieved in the state of nature. This implied that the individual would anticipate the feeling of regret from a wrong choice, and would take this anticipation into consideration when making the choice. In other words, the individual would select the choice with the greater expected utility, modified by anticipated regret.

⁵ Cognitive dissonance described the mental conflict that individuals would experience when presented with evidence inconsistent with their beliefs or assumptions. These individuals would strive to reduce this feeling of conflict by changing their beliefs.

⁶ Streak biases described people's expectation of a random event as less likely to occur because it had not happened for a long time and vice versa, or more likely to occur because it had recently happened and vice versa.

When faced with a decision, individuals would carry out one of the following – do something or do nothing. Either action could result in regret if the outcome was one that did not match expectations. Nofsinger (2004) offered the following example of a lottery, where players were sold betting tickets with self-selected numbers, to illustrate these two sources of regret. An individual had been selecting the same lottery ticket numbers every week for months but had yet to win a draw. There was a suggestion that the individual change to a different set of numbers. According to standard economic theory, the probability of winning a draw with the old set of numbers was no different than with the new set of numbers. In reality, if the individual had stuck with the old set of numbers and the new set of numbers won, he or she would experience regret of omission. On the other hand, if the individual switched to the new set of numbers and the old set of numbers won, he or she would experience regret of commission. A regret of commission was generally more painful than a regret of omission, because in addition to monetary capital there was also emotional capital invested in the old set of numbers (Baron & Ritov, 1994).

Avni-Babad (2003) conducted experiments to examine the relationship between the degree of losses and time lapsed on the feeling of regret. Two time points were used, where short term was defined as after the event and long term a year later. The findings showed that when the losses were severe, regrets of omission were more significant both in the short and long term. However, when the losses were less severe, regrets of commission decreased significantly as time progressed. The findings of the study implied that the severity of the loss could determine whether or not action would be taken given the anticipated regret.

Another factor that could be linked to the feeling of regret in the event of a loss was the resistance to acknowledge responsibility for the loss. The feeling of regret was generally weaker when individuals could attribute the loss to reasons that were beyond their control. Nofsinger (2001) cited the following example. If the price of a stock declined when the overall market was advancing, the investor would have made a bad choice and the feeling of regret would be strong. The investor would likely be reluctant to sell the stock under such circumstances. However, if the price of the stock declined during a general market decline, the feeling of regret would be weaker, and the investor could be more prepared to sell the stock under this scenario.

Hence, aversion to regret could play a significant role in dissuading or persuading individuals to act. Together with loss aversion, regret aversion was able to adequately provide explanations for the disposition effect, sunk cost effect⁷ and status quo bias. It also helped to explain the demand for insurance against low probability adverse events.

2.5. Investment-Related Behavioural Biases

The literature reviewed in this section covered behavioural biases that would be examined in this study. With the exception of the overconfidence effect, the explanation for these selected behavioural biases could be derived from prospect theory and regret theory. A brief description of other common psychological biases that influence investment behaviour could be found in Appendix 2.1.

⁷ Defined by Arkes and Blumer (1985) as the tendency to persist with an undertaking because of the time, effort or money that had been committed or 'sunk' into that undertaking.

2.5.1. Status Quo Bias

The status quo bias described the human desire for continuity, i.e. to want things to remain the same (Samuelson & Zeckhauser, 1988). This meant that when required to make a decision, individuals would prefer to do nothing or maintain the current or previous position. An explanation for this behavioural bias could be derived from the asymmetric value function in prospect theory, where losses were viewed as steeper compared with gains. As a result, a compelling case would need to be presented before individuals would consider giving up their ownership of a good, as it represented a loss of sorts. In addition, the hypothesis that the anticipated regret from an act of omission was less than from an act of commission further supported the status quo bias.

Samuelson and Zeckhauser (1988) conducted a series of experiments that utilised questionnaires consisting of decision problems with a fixed number of choices to test for the status quo bias. The often mentioned and replicated experiment involved asking a group of undergraduate students how they would invest a hypothetical one million dollar inheritance. One group was told that they received their inheritance in low-risk, low-return bonds, while the other group was told that their inheritance consisted of higher-risk securities. Most of the subjects in both scenarios chose the status quo, i.e. maintained the original portfolio. The results showed that the subjects' choice was not based on their risk preference, but rather on the initial portfolio allocation. Samuelson and Zeckhauser also showed that the status quo bias was present outside the laboratory environment. Their analysis of the data on the selection of health and retirement schemes among employees of Harvard University revealed significant status quo bias.

Another facet of the status quo bias was related to the number of alternatives available for selection. Studies showed that the selection of the status quo was more likely when the set of choices presented was enlarged (Dean, 2008; Kempf & Ruenzi, 2005). As the number of choices increased, the need to process more information could push the decision-maker into taking the easier way out, i.e. to choose the status quo and do nothing.

The status quo bias had been used, outside of academia, to guide people into making decisions that could result in specific, desired outcomes. For example, to ensure a good participation rate in a programme (i.e. retirement plan, health plan, insurance plan, etc.), the default option should be to opt-in and where action had to be taken if the person decided to opt-out. The rationale was that the people would tend to procrastinate on a decision because of the status quo bias (Nofsinger, 2009; Byrne, 2004). Similarly, once a decision has been made, the tendency was for the decision maker to be firmly entrenched to the status quo. This could be a reason why promotional packages from communication and cable television service providers, for example, would include a specified lock-in period. Once the customer had chosen and stayed with the package for a period of time, most would be reluctant to switch to alternatives offered by other service providers which could be giving better value (Kahneman, Knetsch, & Thaler, 1991; Samuelson & Zeckhauser, 1988).

2.5.2. Anchoring Bias

The anchoring bias described the decision process to solve a problem by selecting an initial reference point, that could be a related or unrelated guess, which was then adjusted to come up with a final answer (Furnham & Boo, 2011; Laibson & Zeckhauser,

1998; Tversky & Kahneman, 1974). This bias was one of the more researched applications of prospect theory, where the effects of the bias could be observed in a variety of decision tasks, with different groups, and in both laboratory and real world settings. According to van Exel et al. (2006), anchoring effects were stronger under situations where the ambiguity was high, familiarity, relevance or personal involvement with the problem was low, and the source of information or estimation was more trustworthy. Studies had found that anchor values could be entirely irrelevant, would persist over long periods of time, and would remain even when explicitly told to correct it (Mussweiler, Englich & Strack, 2004).

One classic illustration of the anchoring bias was the Genghis Khan date test, where two groups of people were asked estimate the date of Genghis Khan's death (Calverley, 2009). The answers from the first group who were asked to give a direct response were quite evenly divided between the first and second millennia. The second group was asked to write down the last three digits of their telephone number first before estimating the date of Genghis Khan's death. This time, the results showed a strong correlation between the two numbers, where the estimates for the Khan's death were mostly in the first millennium. Genghis Khan lived from 1162-1227. Variations on this test that were conducted had produced similar results, where asking people to note a series of random numbers influenced their answers to a subsequent question. In other words, people were unconsciously 'anchored' to the most recent piece of information or a previous experience.

A common application of the anchoring bias could be observed in the negotiation process to purchase a good, where the seller would anchor the price of the good at a higher value to be slowly reduced as the negotiation progressed. The objective was to

increase the buyer's willingness to pay more for the good, and in the end, the buyer would still feel he or she got a good deal by getting a lower price (Ariely, 2008). The anchoring bias also offered an explanation for cases where the performances of bank loans were poorly evaluated. Paul Schoemaker, from the Wharton School of the University of Pennsylvania, suggested that the loan review officer could have used the existing rating for the loan as the anchor, and where a downgrade would tend to be an incremental adjustment and not the true assessment (Teach, 2004). The influence of the anchoring bias implied that by the time the loan was identified as problematic, it might be too late to institute remedial action. In general, the investment behaviour of investors would be influenced by anchor values that were based on:

- purchase prices, where investors would be reluctant to sell when prices declined;
- historical prices, where the investors would be reluctant to buy because it was cheaper before; and
- historical perceptions of the performance or value of the security, where investors would over-react or under-react to either good news or bad news.

2.5.3. Mental Accounting Bias

The concept of mental accounting was introduced by Richard Thaler who defined the behaviour as “the set of cognitive operations used by individuals and households to organise, evaluate, and keep track of financial activities” (Thaler, 1999, p. 183). This meant that people had the tendency to compartmentalise their spending and saving behaviour, and would make decisions within the context of these narrow compartments rather than grouping all the decisions together with the aim of optimising their consumption choices.

One cited motivation behind the mental accounting bias was to help people manage their spending in the face of self-control problems (Milkman & Beshears, 2009; Fenton-O'Creevy et al., 2005). The behavioural life-cycle hypothesis proposed by Shefrin and Thaler (1988) assumed that people would classify their wealth into current income, current assets or future income; and where the pull to spend was greatest for current income and least for future income. Empirical evidence from studies by Karlsson (1998) and Graham and Isaac (2002) provided support for this hypothesis. The hypothesis explained why people would resort to setting up mental accounts, which served to act as self-imposed rules to resist temporary or short-term expenditure in order to achieve longer-term financial planning goals.

A common illustration of the self-control mechanism in mental accounting behaviour described how people either mentally or physically set up separate 'accounts' for money allocated for specific purposes; for example, to differentiate monies for living expenses, to buy a house, to buy a car, for vacations, etc. (Morris, 2008). They would not treat the money in each respective account as fungible, which meant that they would willingly take on a high interest rate loan to buy a car, but would not touch the savings designated for retirement that could be earning a lower return. The more cost effective action would be to 'borrow' from the retirement account to pay for the car and to make monthly repayments into the retirement account rather than be burdened with a more expensive loan from an external party. Another example of the mental accounting bias was that people would treat income earned and bonuses or windfalls differently. They tended to be more willing to use the money from bonuses or windfalls for goods and services that they might not have otherwise purchased with their income earned (Milkman & Beshears, 2009).

The mental accounting bias could be used to explain behaviour like the disposition effect, as well as the house money and snakebite effects based on the prospect theory value function, where the shape of the curve was concave for gains, and convex and steeper for losses relative to a reference point. Thaler (1999, 1985) suggested that in the evaluation phase of prospect theory, individuals would mentally segregate or integrate the outcomes of two or more distinct choices depending on which mental representation made them as happy as possible. Based on the shape of the value function of prospect theory (refer to Figure 2.1), Thaler derived the following principles:

- i. segregate gains, as the gain function was concave and individuals could maximise their happiness by savouring gains one by one;
- ii. integrate losses, as the loss function was convex and individuals could minimise their pain by thinking about the overall loss rather than individual losses;
- iii. integrate smaller losses with larger gains, to mitigate the influence of loss aversion; and
- iv. segregate small gains from larger losses, as the happiness from a small gain (the gain function was steepest at the origin) could exceed the pain from slightly reducing a large loss.

Studies by Jervis (2004) and Lim (2006) found evidence that supported behaviour where losses were integrated and gains were segregated.

2.5.4. Disposition Effect

The inclination of human beings is to seek out actions that generate happiness and the feeling of pride, while at the same time to avoid actions that induce pain and the feeling of regret. In cases where investors must choose between two stocks to sell, where one had increased in value and the other had decreased in value, pride favoured selling the

winner and regret kept investors from selling the loser. Shefrin and Statman (1985) termed such behaviour as the disposition effect, i.e. the willingness to recognise gains and the unwillingness to recognise losses.

Prospect theory combined with the mental accounting framework had been used to explain the disposition effect, where the purchase price of the stock was used as the reference point. Prospect theory argued that decision-makers in general exhibited risk aversion behaviour after gains and risk-seeking behaviour following losses. If the price of the stock went above the purchase price, investors were faced with the choice of a sure gain if the stock was sold, and a risky gamble that the price would fall if they continued to hold onto the stock. According to prospect theory, in the domain where people were often risk averse, investors were likely to sell the stock and realise the gain. On the other hand, if the price of the stock dropped below the purchase price, selling the stock would be perceived as incurring a loss for certain while holding onto the stock would be perceived as preferring the risky outcome.

Furthermore, selling the losing stock would close the mental account, thereby triggering the feeling of regret. When faced with a loss it was not just the monetary aspect that pained investors, but also the fact they would have to acknowledge responsibility for the loss. This regret aversion was a powerful block for many investors trying to control their losses, and could be an almost impossible hurdle for some. Investors preferred to take the risk of waiting for their losing positions to improve (however small the likelihood might be), including the risk of being subjected to greater pain when the value of their investments deteriorated further, rather than to take a guaranteed loss. This was how small losses got larger and why investors often tried to average a loss by actually increasing their positions in a downward trending market.

Mental accounting theory (as discussed in Section 2.5.3) also suggested that losses were easier to endure when integrated with prior losses. Due to the diminishing sensitivity in the convex domain of losses of the prospect theory value function, the incremental pain from a larger loss would become less significant when compared with the initial loss.

A number of studies had been conducted on the disposition effect (Weber & Welfens, 2007; Brown et al., 2006; Dhar & Zhu, 2006; Locke & Mann, 2005; Garvey & Murphy, 2004; Jordan & Diltz, 2004; Odean, 1998; Shefrin & Statman, 1985). These studies found evidence of the disposition effect not just in laboratory experiments but also in the financial marketplace, and the behaviour was seen to be pervasive across all categories of investors. Odean (1998) attempted to estimate the opportunity cost that resulted from the influence of the disposition effect on the individual investor from a data set that consisted of the trading records of 10,000 account holders from a large discount brokerage house in the United States from 1987 to 1993. He found that the winning stock that the average investor in his data set had sold generally over-performed the market one year later by an average return of 2.4%, while the losing stock held under-performed the market by an average of 1.1%. Garvey and Murphy (2004) found similar results from their study based on intraday trading data from a proprietary stock-trading team. From their analysis of the intraday prices, the authors concluded that the traders who were affected by the disposition effect realised lower levels of profitability from their portfolios; i.e. the traders could have increased their trading profits by holding winners longer and selling losers sooner.

2.5.5. Endowment Effect

The endowment effect, which described the tendency by individuals to demand more to sell an object than they would be willing to pay to buy it, was first introduced by Richard Thaler. He argued that the discrepancy between the willingness to accept and the willingness to pay was a result of the asymmetric valuations of gains and losses proposed by prospect theory (Shefrin & Caldwell, 2001; Thaler, 1980). If a good was framed as a loss when it was given up and as a gain when it was acquired, loss aversion would encourage owners to demand a higher monetary value to give up the good compared with what a potential buyer would pay to acquire the same good. The endowment effect could also be linked to the status quo bias (refer to Section 2.5.1) and regret theory (Zhang & Fishbach, 2005). Zhang and Fishbach found that anticipated regret could be minimised when the threshold to change the status quo was increased.

Numerous experiments had been conducted that confirmed the existence of the endowment effect, particularly in negotiations or bartering behaviour (Nayakankuppam & Mishra, 2005; Franciosi et al., 1996; Kahneman, Knetsch & Thaler, 1991; Thaler, 1980). A commonly cited experiment by Knetsch (1989) involved giving one group of university students a coffee mug and another group a chocolate bar. These two groups were then given a choice to exchange their coffee mug for the chocolate bar and vice versa, or to keep their respective good. A third group of students were simply offered a choice between receiving the mug or chocolate bar. The results showed that when there was no entitlement, the preference for either good was roughly equal. However, for the first two groups, barely 10% of the students opted to swap one good for another. This showed that people placed more importance on the things that they already owned and were reluctant to give it up.

In the real world, the endowment effect could lead to poor investment decisions. For example, the act of investing required individuals to make buy or sell decisions involving company stocks, bonds, mutual funds, properties, etc. All of these choices could overwhelm some investors, and since people had the tendency to hold on to the investments they already had, these investors would likely choose to avoid making a change. As a result, they might be holding on to failing investments or bad trading positions, or even portfolios that need to be rebalanced⁸ in order to achieve the expected returns. To act would mean triggering regret and the pain of losing the endowment. The endowment effect was best observed in the negotiations of property sales. The seller would almost always inflate the asking price, sometimes even way out of line with the market price, because the emotional attachment to the property would be factored into the price.

2.5.6. House Money, Snakebite and Breakeven Effects

People rarely made decisions in temporal isolation as the choices would be influenced by past experiences or the knowledge of outcomes that preceded those choices. As the prospect theory value function initially proposed by Kahneman and Tversky (1979) was defined for single outcomes, Thaler and Johnson (1990) studied how prior gains and losses would affect subsequent risky choices. The authors found that the choices individuals made, after taking into account the effect of a previous outcome, did not always conform to prospect theory. A prior gain would induce individuals to accept gambles (house money effect), while a prior loss would induce individuals to reject

⁸ Portfolio rebalancing is an investment strategy that involves the buying and/or selling of portions of the investment portfolio in an attempt to adjust the weight of each asset class back to its original asset allocation. Alternatively, investors who decide to change their investment strategy could rebalance the weightings of each security or asset class so the new asset allocation would achieve the new targeted returns.

gambles (snakebite effect). These findings were at odds with prospect theory where people tended to be risk-averse in the domain of gains and risk-seeking in the domain of losses. However, if the individuals were presented with opportunities to recoup the losses, they would accept gambles (breakeven effect). Evidence of behaviours associated with the house money and breakeven effects had been observed in real world situations (Eil & Lien, 2010; Frino, Grant & Johnstone, 2008; Ackert et al., 2006).

The mental accounting framework proposed by Richard Thaler (refer to Section 2.5.3), where individuals would mentally integrate or segregate distinct outcomes, could be applied in the evaluation of choice in the presence of prior gains or losses. The house money effect was consistent with the mental accounting principles proposed by Thaler, where after a gain, subsequent losses that were smaller than the original gain could be integrated with the gain to offset loss aversion and facilitate risk-seeking. When individuals gained a profit, they would segregate the profit (house money) from their initial capital (own money), and would not view the house money as part of their own money. They would willingly gamble the house money until the winnings were completely depleted, and where the losses would be coded as reductions in a gain. They viewed that losing the house's money would not hurt as much as losing one's own money. In fact, Croson (2002) observed that some gamblers in the casino would resort to keeping their money in two separate pockets, one for their own money and the other for their winnings, or the house's money, even though in actuality the money in both pockets belonged to them.

As for the snakebite effect, after a loss, individuals would seek to compensate for the pain from the loss by segregating the loss with small gains, which could explain the subsequent risk-averse behaviour. The gain function in the value curve in prospect

theory was steepest at the origin, and the happiness from the small gain could reduce the pain from the prior loss, if not erase it. Hence, investors with bad experiences with investments tended to be over conservative in their investment decisions going forward, which could negatively impact potential returns.

On the other hand, the motivation behind the breakeven effect could be best reflected in the following quotation, “a person who has not made peace with his losses is likely to accept gambles that would be unacceptable to him otherwise” (Kahneman & Tversky, 1979, p. 287). When an opportunity to breakeven was possible, integration with prior losses would be facilitated, and risk-seeking in the domain of losses occurred. The breakeven effect also suggested that individuals were averse to closing a mental account that showed a loss as it would trigger the feeling of regret and pain.

According to Neilson (1998), the risk-seeking behaviour after a gain in the house money effect was not in contradiction with the risk-seeking behaviour after a loss in the breakeven effect, as both were influenced by loss aversion. In the house money effect, individuals were willing to risk losing some of their winnings but not all their winnings; while in the breakeven effect, individuals were willing to take a gamble only if there was some chance of winning their money back.

One of the most basic of investment strategies is to buy low and sell high, which makes absolute economic sense. However, what was observed was that many investors seemed to buy high and sell low. Redhead (2008) suggested that such behaviour could be predicted by the house money and snakebite effects. The house money effect caused people to be more risk-seeking after a gain, hence people were more willing to buy in an upward trending market. However, the snakebite effect cause people to be more risk-

averse after a loss, hence people would avoid the risk of more loss by selling in a downward trending. Hence, asset bubbles could be caused by the house money effect, while market crashes could be attributed to the snakebite effect.

2.5.7. Overconfidence Effect

Studies in human psychology had consistently shown that people were generally overconfident regarding their own abilities. Overconfidence caused people to overrate what they know, underrate the risks involved, and as a result overestimate their ability to control events. This could frequently lead to bad investment decisions, which generally manifested in the form of excessive trading, risk taking, and ultimately poor performing investment portfolios.

Two factors had been identified that could contribute to overconfident behaviour, i.e. the illusion of knowledge (Barber & Odean, 2001) and the illusion of control (Langer, 1975). The illusion of knowledge occurred when one had a large amount of information, and erroneously assumed that more information increased one's knowledge about something and thereby improved one's decisions. Unfortunately, many investors neither had the skills nor the training to interpret all the accumulated information correctly. The illusion of control referred to the belief that one had influence over uncontrollable events. Some of the factors that encouraged the illusion of control were "choice, outcome sequence, task familiarity, information and active involvement" (Nofsinger, 2001, p. 18).

To illustrate the occurrence of overconfidence in a business environment, Nofsinger (2004) cited a study conducted by Cooper, Woo and Dunkelberg (1988). In the study,

2,994 business owners were asked to evaluate the chances of succeeding in their new business venture. The results revealed that 81% of the respondents thought their business venture had at least a 70% chance of success, but only 39% thought that any business like theirs would be likely to succeed. In other words, the new business owners exhibited overconfidence in believing that they had nearly twice the chance of success as others.

In another study, Dittrich, Güth and Maciejovsky (2005) conducted two experiments to investigate whether people exhibited overconfidence in investment decisions. The participants, 149 in total, were offered the possibility to substitute their own for alternative investment choices. One experiment involved just one risky asset, while the other two risky assets. The results showed that (i) the less accurate their investment decisions were the more prone participants were to overconfidence, (ii) overconfidence increased with task complexity, and (iii) decreased with uncertainty. Chuang and Lee (2006) and Ben-David and Doukas (2006) studied the effect of overconfidence on investors in the financial market. The results from the study by Chuang and Lee showed that when investors became overconfident, they underestimated the systematic risks and were prone to trade more in relatively risky stocks, though refrained from trading in the most risky stocks. In addition, the study by Ben-David and Doukas showed that overconfident investors traded more frequently and lost from 1% to 4.5% per year on their trades.

There had been studies that attributed economic phenomena like asset bubbles and market crashes to the overconfidence effect (Whalen, 2008; Schienkman & Xiong, 2003). In 1996, the phrase “irrational exuberance” rose to notoriety when Alan Greenspan, the then Chairman of the Federal Reserve, used it to describe the excessive

stock-buying behaviour of investors at that time in the face of continued warnings by analysts about overpriced valuations. According to Daniel Kahneman, overconfidence did contribute to “irrational exuberance” (Fuerbringer, 1997). The tendency of people to think that they were better than the average investor made them ignore deteriorating economic fundamentals in the belief that they could continue to profit from their superior stock picks.

More recently, the events behind the subprime mortgage crisis in the United States had been described as a Minsky moment (Whalen, 2008). Hyman Minsky, a professor of economics at Washington University, postulated that during extended periods of speculation and growth in asset prices, investors would become overconfident and would take on more risk through borrowings to fuel speculative activities. However, there would come a time when this growth in asset prices could no longer be sustained and investors could no longer finance their debt when the value of their assets collapsed. Lenders would then be prompted to call in their loans and the ensuing sell-off would trigger a market crash.

2.6. Effect of Experience on Behavioural Biases

The previous section discussed how the influence of emotion and cognitive biases could result in the violation of the basic economic principle of maximising expected utility when presented with risky and uncertain choices. Within the realm of finance, the likely consequences of such irrational behaviours were poor investment decisions and ultimately inferior returns. This could have been the motivation behind research into identifying factors that could moderate the influence of behavioural biases in the investment decision-making process. One such hypothesis was that ‘anomalies’ in

individual choice behaviour could diminish with experience and learning. The study by Nicolosi, Peng and Zhu (2009)⁹ found that, overall, individual investors did learn from their stock trades in the past and would adjust their stock trades in the future accordingly, and hence were able to achieve higher investment returns as they gained experience. However, the evidence from other studies conducted on investors and non-investors for selected biases was mixed.

Experiments conducted by List (2004, 2003) on memorabilia dealers and memorabilia collectors suggested that (i) individual behaviour converged to the neoclassical prediction as market experience increased, and (ii) market experience played a significant role in eliminating the endowment effect. Loomes, Starmer and Sugden (2003) found evidence that as individuals participated in repeated markets, i.e. gained more learning experience, anomalies tended to disappear, with particular reference to the endowment effect. The study involved subjecting 175 undergraduates, from various disciplines and year of study from the University of East Anglia, to repeated lottery auctions under a simulated environment.

While studies on the disposition effect showed that the bias affected both retail and professional investors, Shapira and Venezia (2001) found the behavioural bias significantly weaker among professional investors. This implied that while experience moderated the disposition effect, it did not entirely eliminate the influence of the bias. Similar results were observed from Krause, Wei and Yang (2009) and Weber and Welfens (2007), where the influence of the disposition effect was weaker the more experienced the trader and the more frequent the trades (i.e. learning). Seru, Shumway and Stoffman (2009) analysed a large sample of individual investor records over a nine-

⁹ The analyses were based on a panel data set that contained the trade histories of 77,995 households over a six-year period. The data was obtained from a large national discount brokerage firm in the United States.

year period¹⁰ and concluded that investors did learn by trading but not fast enough to stamp out the influence of cognitive biases on investment decisions. Nonetheless, the authors found that the investment performance of the individual investors improved and the disposition effect declined as the investors became more experienced. Feng and Seasholes (2005) who used account-level data containing information on transactions and stock holdings from a national brokerage firm in the People's Republic of China, found that together, investor sophistication and trading experience could eliminate the reluctance to realise losses.

Other behavioural biases that had been explored in relation to experience and learning were narrow framing or mental accounting (Liu, Wang & Zhao, 2010), anchoring (Kaustia, Alho & Puttonen, 2008) and overconfidence (Gort, Wang & Siegrist, 2008; Gervais & Odean, 2001). Liu, Wang and Zhao (2010) found a negative correlation between traders' professionalism, sophistication and trading experience and the degree of narrow framing. Kaustia, Alho and Puttonen (2008) conducted experiments that involved 300 Scandinavian financial market professionals and 213 university students and found that professionals exhibited a much smaller anchoring effect. The findings from a study conducted by Gervais and Odean (2001) showed that investors were most overconfident early in their careers. However, with more experience, self-assessment by these investors became more realistic and as a result overconfidence was more subdued. Their study involved developing a multi-period market model to describe the process by which traders learned about their ability and how a bias in this learning could create overconfident traders. In addition to behavioural biases, the results from experiments conducted by Myagkov and Plott, (1997) showed that risk-seeking behaviour seemed to diminish with experience.

¹⁰ The data, which consisted of more than 2.2 million trades by individual investors from January 1995 to December 2003, was extracted from the Nordic Central Securities Depository (NCSD). The NCSD is responsible for the clearing and settlement of trades on the Finnish stock market.

On the other hand, Chen et al. (2007, 2004), using individual investor account data from a brokerage firm in China, concluded that investor sophistication did not necessarily mitigate behavioural biases nor improve trading performance. Sophisticated investors in this study was defined as (i) institutional investors, (ii) investors who had some investing experience, (iii) older investors, (iv) active investors, and (v) investors from the more cosmopolitan Chinese cities. Haigh and List (2005) explored the issue of experience in relation to loss aversion and mental accounting behaviour and found that professional traders exhibited behaviour consistent with these two biases to a greater extent than undergraduate students, who were the control group. A study by Allen and Evans (2005) found that approximately 40% of the traders who participated in an experimental bidding exercise exhibited the overconfidence bias and experience did not reduce the bias. Furthermore, studies conducted by Baucells and Rata (2006) and Torngren and Montgomery (2004) showed that individual investment behaviour and ability did not vary among groups of subjects with different levels of investor sophistication.

2.7. Effect of Socio-economic and Demographic Variables on Behavioural Biases

In addition to documenting the different types of cognitive biases, research in behavioural finance also focused on exploring the relationship between demographic and socio-economic factors and irrational investment behaviour. Such information had financial implications as a better understanding of the loss aversion tendencies of individuals based on their demographic and socio-economic background could be useful in efforts aimed at helping these individuals make better investment choices. This

section reviewed some of the studies that had been conducted in relation to the characteristics age, gender, wealth and cultural differences.

2.7.1. Age

It is expected that one's physical and cognitive faculties will decline with age. While older investors may have accumulated greater experience and knowledge about investing compared with their younger counterparts, declining cognitive abilities can hinder the effective application of their acquired investment skills. Studies had been conducted where the results were consistent with this hypothesis.

For example, Agarwal et al. (2007) found that financial sophistication, measured in terms of the cost incurred for financial services, rose and then fell with age; a pattern that was documented for ten financial facilities¹¹. A study of the investment behaviour of 62,387 investors found that older investors had better investment knowledge but worse investment skills (Korniotis & Kumar, 2011). Furthermore, in a study that examined how individuals made choices when faced with multiple options, Besedeš et al. (2011) found that the probability of selecting an inferior option as the number of options increased was more pronounced for older subjects who relied more on suboptimal rules of thumb than younger subjects.

¹¹ The ten financial facilities were – mortgages, home equity loans, home equity credit lines, auto loans, personal credit cards, small business credit cards, balance transfer credit card offers, and three kinds of credit card fees (late payment fees, cash advance fees and over limit fees).

2.7.2. Gender

When required to make financial decisions, women were expected to be more likely to choose the less risky options compared with men. On closer inspection, this discrepancy seemed to be dependent on how the choices were framed (Fehr-Duda, de Gennaro & Schubert, 2006; Schubert et al., 1999), which implied that gender differences in risk propensity could be relevant under specific circumstances. However, experiments conducted by Eckel and Grossman (2008) under three different frames found women significantly more risk averse than men in all three settings. The experiments consisted of (i) a gamble-choice task with substantial financial stakes to determine risk attitudes, (ii) a prediction of others' choices to determine risk-attitude stereotyping, and (iii) a psychological survey to measure risk attitudes for comparison purposes.

The discussion in Section 2.6 suggested that experience could play a role in alleviating the influences of behavioural bases. However, expertise did not seem to have any observable effect on gender-specific behavioural differences. Beckmann and Menkhoff (2008) analysed the survey responses from 649 fund managers in the United States, Germany, Italy and Thailand, and found the results consistent with other gender-related studies, i.e. female fund managers were more risk averse and less competitive. On the other hand, Hibbert, Lawrence and Prakash (2009) found that level of education played a more significant role than knowledge of finance in reducing gender bias in risk aversion. The authors used two different data sets¹² to study the effect of education and financial literacy on gender differences in risk aversion. The findings showed that the tendency of the women in the first data set to be more risk averse was significantly reduced when the sample was controlled for level of education; i.e. given the same level

¹² The first data set was from the 2004 Federal Reserve Board's Survey of Consumer Finances that consisted of 4,519 respondents. The second data set was a survey of 1,382 Finance and English professors from universities across the United States.

of education, there was no significant gender difference in risk aversion. The second data set, divided into two subgroups of Finance and English professors, was used to examine the effect of financial literacy and found no gender difference in risk aversion within the subgroups. However, the study also found that when the choices involved extreme risk assets classes, women were seen to be less likely to invest in these risky assets.

Another often-cited study on gender differences and investment behaviour was conducted by Barber and Odean (2001) who found that men traded 45% more than women, which implied that men could be more prone to the overconfidence bias. The evidence from studies also showed that overconfident investors who tended to over-trade had lower net returns (Ben-David & Doukas, 2006; Barber & Odean, 2001), partly due to the increase in cost for the extra trades with no corresponding increase in profits. Just as women were less likely to exhibit the tendency to be overconfident, Da Costa Jr., Mineto and Da Silva (2008) found that women could be less prone to the disposition effect. In summary, the evidence so far did not suggest that women were more rational or otherwise when making investment decisions; just that men and women were different in their susceptibility to behavioural biases.

2.7.3. Wealth

It had been suggested that the frequency of irrational decision-making behaviour could diminish with increasing levels of wealth. There were several reasons for this hypothesis. High-income individuals had the monetary resources to gain access to pertinent financial information as well as acquire the services of professionals for sound investment advice (Dhar & Zhu, 2006; Vissing-Jorgensen, 2003). Furthermore, it would

be expected that the opportunities for investing for such individuals would increase as wealth increased, which implied acquired experience through learning. The findings from some research studies supported this hypothesis.

Agnew (2006) who used 401k plan¹³ data in his analysis found that higher salaried employees made significantly better choices in their selection of investments for their respective plans. Vissing-Jorgensen (2003) reviewed evidence on the link between behavioural biases and investor wealth, and concluded that many of the biases substantially diminished with wealth. Dhar and Zhu (2006) used demographic and socio-economic data as proxies for investor sophistication and found empirical evidence that wealth and professional occupation tempered the disposition effect.

2.7.4. Cultural Difference

There were not many comparative studies that examined the differences in decision-making behaviour, particularly in relation to financial matters, across various cultures and geographic boundaries. Most of the studies in behavioural finance were based on subjects who grew up or lived and worked in the United States. The question that arose was whether the concepts of behavioural finance were universal. Toshino and Suto (2005) and Chen et al. (2007, 2004) found evidence of behavioural biases among investors in Japan and China respectively. This meant that the findings of research in behavioural finance carried out in the United States could be applied to individual investors in the global marketplace.

¹³ These were defined contribution retirement schemes that allowed employees to make pretax contributions to the scheme. The contributions were invested at the direction of the employees into one or more funds provided in the scheme. Employers often 'matched' the employees' contributions, but were not required to do so.

However, there were views that doubted that the concepts of behavioural finance had universality due to culture-based differences. According to Nisbett et al. (2001), East Asians had the tendency to be more holistic, while Westerners were more analytic in their reasoning process. The authors speculated that the root cause behind this disparity could be the dissimilarities in social values and systems. A study conducted by Levinson and Peng (2007) provided evidence of the influence of cultural background on financial decision-making. The findings showed that the American and Chinese participants in the study did not deviate from expected utility in the same manner. In another study by Sowinski, Schnusenbergr and Materne (2010), the responses from a survey, where the respondents were German and American university students, were analysed to examine the effects of cultural differences on behavioural biases. The survey questionnaire was designed to measure biases related to prospect theory, cognitive reflection¹⁴ and mental accounting. The results showed that the responses from the German group tended to support expected utility theory, except in the area of mental accounting where there was little difference between the American and German groups.

2.8. Conclusion

The literature review looked at two major theories that were widely accepted by researchers for their ability to adequately describe decision-making behaviour under risk and uncertainty. Prospect theory (Kahneman & Tversky, 1979) and regret theory (Loomes & Sugden, 1987, 1982; Bell, 1982) had been used to explain investment behaviour resulting from biases like the status quo bias, anchoring bias, mental accounting bias, disposition effect, endowment effect, house money effect, snakebite

¹⁴ The cognitive reflection test (CRT) was a simple, three-item test created by Frederick (2005) to measure an individual's mode of reasoning and cognitive ability. Individuals with high CRT scores did not exhibit behaviour predicted by prospect theory.

effect and breakeven effect. It had been acknowledged that the consequences of such irrational investment behaviour were poor decisions and suboptimal returns. The review then examined factors that could work to temper the effects of biases in the decision-making process.

Of the socio-economic and demographic variables discussed, the evidence for learning or experience had been quite consistent in being able to moderate the influence of behavioural biases. One area for study could be the role of learning and experience and its effect on other behavioural biases; for example, the sunk cost, house money and breakeven effects. Behaviours related to these biases were commonly observed in situations that involved finance-related decisions both at work and at home. Much of the research so far had been focused on the endowment and disposition effects.

Another area for study could be the relationship between the state of wealth and investment decision behaviour between investment professionals and retail investors. The review provided evidence that financial decision behaviour tended to become more rational, i.e. consistent with standard economic theory, with increasing levels of wealth. However, the subjects of these studies were not investment professionals. One criticism of the global financial crisis in 2007-08 was that the disproportionate remuneration paid to investment professionals could have encouraged certain individuals to act recklessly. Analysis related to income levels of investment professionals could provide insights into efforts to reform executive compensation benefits for the financial services industry.