The Disposition Effect, Emotion, and Mindful Emotion Regulation

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ABSTRACT

The disposition effect is investors’ propensity to sell more gains than losses. Prior research shows this divestment pattern to be associated with inferior investment performance. Using a free trading simulation in an online, 2 × 2 factorial experimental study, this research investigated the respective roles of mindfulness and cognitive reappraisal in influencing retail investors’ disposition effect and its behavioural components, at the state and trait levels. At the state level, mindfulness was hypothesised to lessen the disposition effect, and perspective-taking as a financial advisor was hypothesised to reduce the disposition effect (via participants’ felt responsibility for their trading decisions), relative to the role of trading for their account. At the trait level, trait mindfulness and trait positive reappraisal were hypothesised to reduce the disposition effect, while trait catastrophising was proposed to increase the disposition effect.

The primary hypotheses for the thesis were broadly disconfirmed. Findings suggest that state mindfulness does not reduce the disposition effect. The think-as-an-advisor cognitive reappraisal intervention failed its manipulation check, so hypotheses associated with this variable could not be adequately tested. Reasons for the failure were explored, as were implications for interpreting prior research using the perspective-taking intervention. Trait mindfulness, trait positive reappraisal, and trait catastrophising showed no significant association with the disposition effect. A reasonably large sample (N = 820) combined with the randomised control experiment lends credence to these null results.

However, significant effects were detected when examining the cognitive-affective processes with the constituent divesting behaviours. A heightened state of mindfulness caused significantly reduced levels of selling of gains and losses. Trait catastrophising was associated with increased divestment of gains and losses, and elevated state mindfulness correlated to a lower tendency to catastrophise. It is well established that a common reason for investor under-performance is overtrading. The findings suggest that cognitive-affective processes helping investors become more mindful or less vulnerable to the tendency to catastrophise can be fruitful in reducing overtrading and thus, improving performance.
ACKNOWLEDGEMENTS

First and foremost, I would like to express my cordial gratitude to my supervisors, Professor Mark Fenton-O’Creevy, Dr Henry Lahr, and Dr Cristina Quinones, for their valuable guidance and support in different phases of my PhD journey. Being co-supervised in a research study across cognitive psychology and behavioural finance by experts in the two disciplines has decidedly been to my advantage. I specifically thank them for accepting my ideas and helping me become a conscientious researcher.

I am grateful to the eighteen fellow students at the University who supported me by taking part in a demanding pilot-testing of an experimental setting, without which the main study may not be viable. I cannot name them here due to the anonymity of participation, but their names have been remembered by me all along in the current research.

I have not thanked enough my wife, Wendy. She showed patience in the protracted hours of total occupation that I immersed myself in and delved into numerous pieces of literature in my endeavour to interpret behaviour observed in the research. Her endurance was required, particularly during the Covid-19 lockdown when almost everybody was kept at home.

The pandemic has been unforeseen adversity to many people. In retrospect, I was fortunate enough to finish data collection briefly before the outbreak, failing which I might not have secured a dataset free from the potential contamination by contemporaneously disturbed emotions. Given this opportunity, I extend my heartfelt appreciation to the 820 participants who shared their thoughts and experience in participating in the online survey, especially those who had no prior stock trading experience and availed themselves to perform a challenging exercise they might not have undertaken otherwise.

My sincere thanks also go to Professor Eric Garland, who gave me the mindfulness and mind-wandering instructions which rendered the manipulation viable. I must stress that he is not the least to whom I am indebted.
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<table>
<thead>
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<th>Abbreviation</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>ANOVA</td>
<td>Analysis of variance</td>
</tr>
<tr>
<td>CERQ</td>
<td>Cognitive Emotion Regulation Questionnaire</td>
</tr>
<tr>
<td>ESG</td>
<td>Evaluative Space Grid</td>
</tr>
<tr>
<td>FFMQ</td>
<td>Five-Facet Mindfulness Questionnaire</td>
</tr>
<tr>
<td>GGzLM</td>
<td>Gamma Generalized Linear Model</td>
</tr>
<tr>
<td>GzLM</td>
<td>Generalized Linear Model</td>
</tr>
<tr>
<td>MBCT</td>
<td>Mindfulness-based cognitive therapy</td>
</tr>
<tr>
<td>MBSR</td>
<td>Mindfulness-based stress reduction</td>
</tr>
<tr>
<td>PANAS</td>
<td>Positive and Negative Affect Scales</td>
</tr>
<tr>
<td>PFR</td>
<td>Proportion of funds realised, measured at prior period price</td>
</tr>
<tr>
<td>PFRWAC</td>
<td>Proportion of funds realised, measured at weighted average cost</td>
</tr>
<tr>
<td>PGR</td>
<td>Proportion of gains realised, measured at prior period price</td>
</tr>
<tr>
<td>PGRWAC</td>
<td>Proportion of gains realised, measured at weighted average cost</td>
</tr>
<tr>
<td>PLR</td>
<td>Proportion of losses realised, measured at prior period price</td>
</tr>
<tr>
<td>PLRWAC</td>
<td>Proportion of losses realised, measured at weighted average cost</td>
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<tr>
<td>Q-Q plot</td>
<td>Quantile-quantile plot</td>
</tr>
<tr>
<td>TMS</td>
<td>Toronto Mindfulness Scale</td>
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<tr>
<td>WAC</td>
<td>Weighted average cost</td>
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1 INTRODUCTION

1.1 Motivation for this study

The disposition effect, which is investors’ tendency to sell gains more than losses, tends to result in small gains but large losses. The leading explanation of this divestment preference by Prospect Theory shows that investors are loss-averse and risk-acceptant when they trade losses but risk-averse when they trade gains in their investment portfolios. Odean (1998) argues that on average the assets disposition-effect investors sold outperform the investments they then bought. Accumulating evidence of inferior returns to disposition investors is the prominent reason to explain why studying the disposition effect matters.

Previous research investigating the psychological mechanisms of Prospect Theory and the disposition effect suggests that affect plays a key role in motivating the disposition effect (e.g., Summers and Duxbury, 2012). Recent evidence suggests the role of habitual cognitive reappraisal in reducing the disposition effect (e.g., Richards et al., 2018). The studies described in this thesis investigate whether the deployment of effective regulation for the emotions arising from portfolio trading may reduce the disposition effect. In parallel, contemporary research shows that mindfulness may cause a change in people’s emotions towards things they like or dislike, thus altering their habitual responses to them. Hence, the current research aims to investigate the potential roles of mindfulness and cognitive reappraisal as two forms of emotion-functioning processes in lessening the disposition effect.
1.2 Background of the research study

1.2.1 The disposition effect – an investor predisposition

The disposition effect is an amply documented behaviour pattern that describes investors’ disposition to sell gains sooner, or more, than losses (Shefrin and Statman, 1985), which typically results in inferior investment outcomes. A disposition is ‘a recurrent behavioral, cognitive,¹ or affective² tendency that distinguishes an individual from others’ (American Psychological Association, n.d.). Numerous studies have provided evidence for the behaviour’s disadvantageous impact on investors’ wealth (e.g., Odean, 1998; Grinblatt and Keloharju, 2001; Seru, Shumway, and Stoffman, 2010). Shefrin and Statman (1985) proposed Prospect Theory (Kahneman and Tversky, 1979) as the primary explanation. When deciding risky decisions, investors are more risk-tolerant in the domain of losses, due to loss aversion, than in the domain of gains (where gains and losses are compared to an earlier reference point). Loss aversion refers to investors’ perspective that ‘the disutility of giving up an object is greater than the utility associated with acquiring it’ (Kahneman, Knetsch, and Thaler, 1991: 194).

Disposition investors are prone to bear costly consequences because it is likely that they do not capture further gains due to their premature realisation and suffer further loss when they are reluctant to realise sunk losses in failing investments. This behaviour is contrary to sound investment management practice widely adopted by institutional investors, which embraces the motto “cut the losses and let the profits run.” Reasonably, professional traders are believed to have higher financial sophistication and more experience than retail investors, but this may not be the only reason for their superior

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¹ Cognition refers to all forms of knowing and awareness, such as perceiving, conceiving, remembering, reasoning, judging, imagining, and problem-solving (American Psychological Association, n.d.).

² Affect is the umbrella term for human feelings of emotion and mood (Gross, 2015). Emotion differs from mood as the former is stronger, momentary, and activated by specific causes (Forgas, 1995).
performance in general. Fenton-O'Creevy and colleagues (2011) found that experienced traders are more able to regulate their emotions and become less affected by them. Summers and Duxbury (2012) offered empirical evidence for the arguments of Shefrin and Statman (1985) on pride and regret in connection with the disposition effect. Summers and Duxbury (2012) show that elation motivates investors to realise gains, while regret is associated with reluctance to cut losses. Some other studies have also offered evidence for the influence of emotion in portfolio trading (e.g., Seo, Goldfarb, and Barrett, 2010; Fenton-O'Creevy et al., 2012). However, the disposition effect should be explained from both cognitive and affective perspectives because each process, mental or emotional, has an equal footing in explaining economic behaviour (Weber and Johnson, 2009).

1.2.2 Overview of cognitive-affective aspects in dynamic decision-making

The financial market operates in a world of risk and uncertainty. A risk, particularly a financial risk, is a type of hazard that can lead to a gain or a loss of capital and is measurable and quantifiable (e.g., by probabilities attributed to the occurrence of events), whereas uncertainty is the situation of not knowing future events, even probabilistically (Knight, 1921). A risky decision becomes uncertain if the investor cannot assess the expected value of an outcome. Static decision-making differs from dynamic decision-making in that the latter is a decision-making process occurring in a situation that changes over time due to dependence on the decision-maker’s previous actions or outside of the decision-maker’s control, and the decisions must be made in real-time (Brehmer, 1992). Respectively, buying a disability insurance policy and financial planning for retirement are examples of static and dynamic decisions. Investment decision-making is dynamic because the features of an investment decision fulfil all the criteria stipulated by Brehmer (1992). Such decisions must be made in real-time, in response to changing information, including changing prices, and in response to the outcomes of prior decisions and actions of the investor.
Conventional wisdom has it that decision-making processes require cognitive evaluations based on knowledge or available information. Recent judgement and decision-making literature emphasises how psychological mechanisms influence behaviour by studying cognitive processes and variations across people of different characteristics (Weber and Johnson, 2009). Neuroscience evidence suggests that cognitive and affective processes interact and modulate each other at all stages of decision-making from perception to action (Phelps, Lempert, and Sokol-Hessner, 2014), and perceptions contain emotions (Zajonc, 1980). Thus, affective processes play a crucial role in decision-making in general and more prominently in dynamic situations under uncertainty (Weber and Johnson, 2009). For example, professional traders use emotion regulation strategies to maintain suitable levels of emotion activation so that they can react optimally in dynamic environments of the financial market (Vohra and Fenton-O’Creevy, 2014). It seems that the reliance on intuition or “gut-feel” is encouraged in dynamic decision situations, and this is mediated through emotion.

It is, perhaps, not surprising that retail investors are prone to use heuristics if they face uncertainty (Tversky and Kahneman, 1974). A heuristic is a problem-solving shortcut whereby the decision-maker uses partial information according to a rule. For instance, Simon’s (1957) satisficing strategy selects the first satisfactory option rather than the optimal option. Much of the judgement and decision-making literature characterises the reliance on heuristics, instead of optimal use of full information, as irrational (e.g., Kahneman, 2011). In contrast, Gigerenzer and Brighton (2009: 134) advocate that decision-makers can rely on heuristics as effective decision-making tools ‘based on an adaptive toolbox of heuristics rather than on traits, attitudes [...] and similar internal explanations.’ Thus, they argue, less-is-more strategies can lead to more appropriate decisions than strategies using full information.

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3 Perception refers to one’s consciousness in response to external stimuli received through the five senses (Depraz, Varela, and Vermersch, 2000; cited in Brown and Ryan, 2004).

4 A trait is a habitual pattern of emotion, thought, and behaviour (Kassin, 2003), whereas an attitude refers to a psychological construct consisting of cognitive and affective elements that characterise an individual (Perloff, 2016).
Whilst the beneficial use of heuristics in decision-making is contentious, Finucane and colleagues (2000) argue that emotion is pivotal in the judgement of risks and benefits as people largely rely on affective evaluations of the situations they encounter. Emotion, whether adaptive or maladaptive, plays a role in decision-making that in turn influences behaviour. Emotion is considered maladaptive when it is of the wrong type, occurs at the wrong time, or comes in the wrong intensity (Gross, 1998a). The effects of maladaptive emotion appear to be more pronounced when people are involved in a difficult task, such as trading an investment portfolio where gains and losses are inevitable and these outcomes may cause negative emotional impacts (Kahneman, 2011). Maladaptive emotion seems to be the suspected cause leading to suboptimal behaviour through its influence on the decision-making process (e.g., regret may cause the deferral of loss realisation without due regard to probable further loss).

Initial evidence suggests that emotion-functioning processes are relevant to financial decision-making. As discussed, experienced traders use emotion regulation to contain maladaptive emotion so that they are less influenced by it (e.g., Fenton-O’Creevy et al., 2011). It seems reasonable to argue that approaches which improve investors’ management of their emotions and the link between their emotions and behaviour may be able to attenuate their susceptibility to the disposition effect. Thus, the focus of the thesis is the management of emotion instead of emotion per se.

A different approach to reducing the influence of maladaptive emotions is represented by mindfulness, a special deployment of attention that cultivates a detachment from maladaptive emotional reactivity. Emotional reactivity is the propensity to feel intense activation of emotions. Mindfulness weakens the link between emotional reactivity and habitual behavioural responses (Dreyfus, 2011). For instance, Lakey and colleagues (2007) argue that mindfulness reduces the severity of habitual gambling problems and supports adaptive decisions, especially in risk-relevant contexts. Still, no prior research has been conducted for the effect of mindfulness on the disposition effect. The current research identifies it as a knowledge gap to be filled. Given the disposition effect is affect-related, I examine whether mindfulness lessens the disposition effect. Also, I seek further evidence for the influence of emotion regulation processes on the disposition effect.
1.3 The research problem and research question

1.3.1 Statement of the research problem

Despite decades of research has supported the pervasiveness of the disposition effect since Shefrin and Statman popularised it in 1985, not all inter-personal differences in individual investors’ exhibition of the disposition effect have been fully explored. Two affect-related modifiers are considered candidates to attenuate the susceptibility to the disposition effect: cognitive reappraisal (a kind of emotion regulation) and mindfulness. Whilst recent evidence has found cognitive reappraisal to lessen the disposition effect (e.g., Richards et al., 2018), researchers have yet to examine the role of mindfulness in ameliorating the disposition effect though mindfulness practice is becoming increasingly popular among professional investors (Peterson, 2014; Fenton-O’Creevy, personal communication, January 2018). I identify the knowledge gap in the interaction between the disposition effect and mindfulness. Thus, the current research addresses this gap and aims to contribute to the theory about the respective roles of emotion regulation and mindfulness in alleviating the disposition effect.

1.3.2 The research question

This integrative research attempts to provide additional insight into emotion and its interaction with cognition in the domains of cognitive psychology and behavioural economics. Adaptive use of emotion through emotion regulation and mindfulness may alleviate the affect-related disposition of selling gains more than losses. Cognitive reappraisal entails altering people’s way of thinking about their experiential emotions, whereas mindfulness is likely to cause changes in how people relate to the perception of
emotions (Chambers, Gullone, and Allen, 2009). Thus, this thesis addresses the following research question:

_Do mindfulness and emotion regulation reduce the disposition effect exhibited by individual investors, and what does each of them contribute to changing individual investors’ susceptibility to the disposition effect?_

**Chapter Two** discusses how five sets of hypotheses are developed from the research question, along with various literature reviewed for the disposition effect, emotion, emotion regulation, and mindfulness. The first two sets of hypotheses attempt to determine whether inter-personal differences in the disposition effect are predicted by situational variations when decisions are made. At the state level, mindfulness is hypothesised to reduce the disposition effect, and perspective-taking as a financial advisor is hypothesised to lessen the disposition effect (*via* participants’ felt responsibility for their trading decisions), compared to the role of trading for their own account. The last three hypothesis sets seek to explain whether people differ in their tendencies to decide in certain ways. At the trait level, trait mindfulness and trait positive reappraisal are hypothesised to reduce the disposition effect, while trait catastrophising is proposed to increase the predisposition. I discuss the methods used to address the research question and the related hypotheses in the next section.

### 1.4 Methods used to address the research question

To address the research question and related hypotheses, I adopt a post-positivist epistemological approach using experimentation to collect data. In a $2 \times 2$ factorial design, I manipulate mindfulness and cognitive reappraisal in a randomised control experiment. Using a free trading simulation to obtain the measurement of participants’ trading data in an online, experimental survey, the current research investigates the respective roles of mindfulness and emotion regulation in influencing individuals’ disposition effect and its
behavioural components, the realisation of gains and the disposal of losses. Further evidence is collected via the measurement of individual participant traits relating to emotion regulation and mindfulness. Two pilot studies are used to iteratively develop the design of the main study. Then, data collected for the main study are used to test the hypotheses.

1.5 Structural outline of the thesis

This chapter has provided an introduction to the thesis and concludes below with an outline of the remaining chapters.

Chapter Two discusses the possible reasons for retail investors’ disposition effect. Also reviewed is the extant literature on the cognitive psychology of financial decision-making, specifically, the disposition effect. Features of emotion (e.g., valence and priming effect) are examined. Studying the influence of emotion on decision-making involves directly using it as the only antecedent or investigating the cognitive-affective functioning processes that affect investors’ decisions. Having evaluated these two approaches, the chapter assesses whether emotion regulation and mindfulness, two cognitive-affective processes, can explain the inter-personal variations in the disposition effect. The research question is developed, and hypotheses are generated from this question and prior theory.

Chapter Three discusses the research philosophy and justifications for using experimentation as the research design. Research design and ethical considerations are reviewed. Methods used in the pilot studies are discussed. The chapter finishes with a discussion of issues raised by the two pilot studies and the power and sample size required for the main study.

Chapter Four begins with an outline of the main study design and an account of the experimental manipulations of reappraisal and mindfulness. It describes how the online survey was conducted and the various measurements of the independent and dependent
variables for the main study, which are the core data of the current research. The chapter examines data quality, scale reliability, and variable inter-correlations in preparation for hypothesis-testing.

Testing the effects of the reappraisal and the mindfulness manipulations on the disposition effect and its constituent divesting behaviours is the essence of Chapter Five. Sample characteristics and demographic differences are reviewed before discussing the measurement and the distribution of the disposition effect. The effectiveness of the manipulations and their influences on the disposition effect and its constituent selling behaviours are examined. An alternative measurement of the disposition effect, which serves as a robustness check, is discussed. Then, an evaluation of the manipulation hypotheses based on findings from statistical analyses forms the later part of the chapter.

Chapter Six continues the testing of hypotheses on the psychometric variables at the trait level. It starts with a review of the dispositional psychometrics: trait mindfulness and two habitual emotion regulations, trait positive reappraisal and trait catastrophising. An examination of why the reappraisal manipulation has not worked as intended leads to the revisiting of the two manipulations and their relationships with emotions triggered after the manipulations, and the different levels of responsibility felt for trading decisions. The thesis briefly reviews the cognitive process of de-reification on the putative deconstruction of conditioned roles evolved from the two manipulations. The effects of state mindfulness and trait catastrophising on selling behaviours are discussed. Evaluations of findings for the trait emotion-regulatory mechanism and findings for hypotheses conclude the chapter.

Chapter Seven begins with a review of key findings for hypothesis-testing and their significance. There are two novel contributions found from these results. The first is the reductive effect of state mindfulness on the divestment of gains and losses. The second is the positive correlation between the habitual emotion-regulatory process of trait catastrophising and the divesting behaviours. The chapter discusses the theoretical implications of these results. Then, it examines the limitations of the current research and the methodological and practical implications of the research findings for future research. The chapter ends with a summary of contributions and a conclusion.
2 LITERATURE REVIEW

2.1 Overview of the literature reviewed

Chapter One introduced the disposition effect as a pattern of divestment preference typically observed in retail investors, characterised by the selling of gains sooner, or more, than losses, which potentially leads to inferior performance. As this chapter explores, the leading explanation for the disposition effect behaviour, Prospect Theory, may not fully explain the disposition effect as evidence shows that the behaviour results from a combination of cognitive and affective processes.

This chapter reviews relevant prior work on the disposition effect and the two cognitive-affective functioning processes, mindfulness and emotion regulation. It starts by outlining existing explanations for the disposition effect behaviour.

In examining accounts of the disposition effect, the chapter does not begin from the prescriptive assumptions of normatively rational behaviour common in neo-classical financial economics. Rather, it starts from the large body of descriptive research which establishes that such “rationality” assumptions poorly describe human financial behaviour.

The chapter first considers Prospect Theory as an explanation of the disposition effect and then reviews evidence that the disposition effect is chiefly driven by thoughts and feelings of regret and responsibility arising from a fall in the price of assets they bought, and the desire to savour gains from purchased assets that have risen in value.
Following a discussion of the role of emotion in financial decision-making, I discuss the Process Model of emotion regulation and justify cognitive reappraisal and attentional deployment as the processes that may, by intervening in the relationships among emotion, attention, and behaviour, reduce the disposition effect. Mindfulness, a special deployment of attention, is reviewed in particular reference to its attributes that may lessen the disposition effect.

I then review mindful emotion regulation and related theory for the interactive effect of the two cognitive-affective processes. Based on these discussions, I formulate the research question to reflect the focus on the study of inter-personal differences in the predisposition by mindfulness and cognitive emotion regulations, at the state and trait levels. I develop hypotheses from the revised research question, showing how they build on prior theory and research, and address the knowledge gap for the effect of mindfulness on the disposition effect.

Previous research evidence suggests that the behavioural components of the disposition effect, the realisation of gains and the disposal of losses, may have different antecedents. Hence, the hypotheses are expanded to test the effects on the disposition effect and its constituent divesting behaviours by i) mindfulness and situational reappraisal at the state level, and ii) mindfulness and positive reappraisal and catastrophising at the trait level.

2.2 The disposition effect

The disposition effect refers to a recurring pattern of behaviour, or a disposition, exhibited by investors – the deferral of loss realisation without due regard to probable further loss and prompt realisation of gains irrespective of their prospective growth potential. Shefrin and Statman (1985) popularised their discovery of this behaviour when they studied US retail investors. Given the advantageous tax implications of selling underperforming assets by the last month of a tax year, retail investors should have sold
the losses they held. Yet, the researchers found that in general retail investors had a predisposition to sell winning assets sooner than losing assets. The most prominent explanation of the disposition effect is Prospect Theory, which is a descriptive theory characterising how investors make decisions. It is different from the normative approach of neo-classical economic rational financial decision-making prescribed by Expected Utility Theory, which assumes that individuals seek maximum utility with a decreasing, but positive, marginal increase in utility with increasing wealth (Bernoulli, 1738/1954). Within this approach investors are risk-averse, requiring a risk premium, and make ex ante, expectation-based evaluations of the investments’ prospective values as comparators for potential profit and loss positions when making trading decisions.

Accumulating evidence shows that the disposition effect influences investors’ performance in financial and property investments (e.g., Odean, 1998; Genesove and Mayer, 2001), resulting in substantial economic cost due to the tolerance of increasing sunk losses and the opportunity cost of forgoing future capital growth because of premature realisation of gains. In a ground-breaking study on field data from around 10,000 accounts of US retail investors in the period between 1987 and 1993, Odean (1998) found that stocks that investors sold mainly outperformed those they held. Having methodically ruled out alternative rational explanations (as discussed in Subsection 2.2.4), he found gains were more likely to be sold than losses by around 50%. He also found that the investors showing a disposition effect tended to underperform the rest by an average of 3% per year.

Shefrin and Statman (1985) theorise the causes leading to the disposition effect, which include, inter alia, Prospect Theory (Kahneman and Tversky, 1979), Mental Accounting (Thaler, 1985), and seeking pride and avoiding regret, when taxes and transaction costs are disregarded. Among these theoretical accounts, Prospect Theory, a descriptive theory for financial decision-making under risk, offers the most cited explanation.
2.2.1 Prospect Theory

Contrary to the reference-independent theory of Expected Utility, Prospect Theory uses a reference point to determine gains and losses. A reference point is an investor’s internal valuation based on which a utility is calculated in the wake of a change in the investment value. Figure 2-1 below plots the Prospect Theory value function curve. The x-axis represents wealth in monetary value while the y-axis represents the utility of each level of wealth. Changes in wealth from the reference point are assumed to affect investor perceptions such that levels of wealth to the left of the reference point are seen as in the domain of losses, and to the right in the domain of gains.

Figure 2-1 Prospect Theory value function

The reference point, situated at the kink, is normally considered to be based on the acquisition cost or purchase price of an investment. Above the reference point, the value function shows (as in Expected Utility Theory) declining marginal utility with increasing wealth. Below the reference point, there is an increasing marginal utility with increasing wealth. Prospect Theory predicts that an investor who has a loss, relative to their reference point, tends to take more risk than in a gain or neutral position with respect to their reference point. Thus, above the reference point investors are risk-averse, below the reference point they are loss-averse and thus willing to bear the risk to recover losses.

Positions A, B, the reference point, C, and D are all equally spaced on the x-axis. Prospect Theory considers investors to be more risk-averse when facing gains above the reference point (e.g., C and D), compared to losing positions below (e.g., A and B). They exhibit risk aversion in the gain domain and loss aversion in the loss domain, as seen from the curvature of the convex slope upwards in the gain domain and the concave slope downwards in the loss domain (Kahneman and Tversky, 1979).

To explain the behaviour, an increase of value function in the gain domain from C to D on the y-axis is lower than the decrease in value function by returning to the reference point. This may prompt the realisation of the gain, given the diminishing marginal utility of the value function perceived by investors in holding the gain. The investors are prone to sell gains to lock in the profit, which is more satisfying than the pleasure of expecting a greater gain. They tend to realise gains too early, failing to capture the investment's prospective growth.

A reverse situation is seen in the loss domain. The movement from B back to the reference point leads to a greater increase in value function than the reduction in value function from a further loss towards A, even though a larger monetary loss occurs from B to A as shown on the x-axis. Investors are inclined to hold losses as the pain of a further loss is less than the pleasure of returning to the reference point.

In consequence, the Prospect-theory investor’s utility value, not their wealth, is enhanced by holding a loss instead of cutting it or selling a gain instead of keeping it.
2.2.2 Mental Accounting

Mental Accounting (Thaler, 1985) refers to the situation whereby investors assign different utility values to the same amount of money, depending on the mental account in which it is held. Mental Accounting is another explanation for the disposition effect. For an investor, each investment has its own mental account opened when the investment is bought, and it is differentiated from other investments. The performance outcome of each mental account is evaluated relative to a reference price, which is initially the purchase price and remains so till the asset is sold. For instance, when an asset is bought at £100 the mental account is zero and the reference price is £100. If the asset price falls to £90, the mental account of the investment reckons a diminution in value of £10, and a loss position is framed. The investor has to decide whether to sell the asset forthwith or keep it. Whereas the outright disposal of the failing investment results in the closing of the mental account, the investor’s expected utility of holding the loss requires a probabilistic estimation of the asset’s valuation for the intended period of holding. This is the point where Prospect Theory is theorised to operate, which postulates that people exhibit loss aversion in the loss domain so the investor tends to keep the losing investment. If, instead of price fall, the asset rises in value, say by the same amount of £10, the investor’s risk aversion (manifested in the gain domain) may prompt the realisation of the gain.

Mental Accounting becomes more complicated as investors can divest their gains and losses partially or totally. Since an investor’s reference point forms the basis on which the investor evaluates gain or loss, they may segregate gains and integrate losses in their hedonic editing of mental accounts, preventing mental account closing by partial sales of gains and losses (Arkes et al., 2008). This approach is a means to defer the closing of mental accounts in which the respective reference points are reset. Buying investments in tranches and partial sales of investments held are practical realities of portfolio trading. As discussed in the next subsection, this practice would further complicate the explanation of investors’ adoption of their respective reference points in the occurrence of the disposition effect.
The reference point is the price of an investment that an investor uses to reckon gain or loss due to changes in the investment prices. An investor’s reference point typically rests between the purchase price and the current price. Prospect Theory suggests that when an investor is in the domain of losses relative to their reference point, they will be loss-averse, willing to bear the risk to have the chance of recovering the loss. Conversely, in the domain of gains, they will be risk-averse, preferring to sell gains to lock in the gain rather than take the risk of losing the gain they have made. Naturally, no disposition effect occurs if the investor treats the current price as the reference point (Weber and Camerer, 1998). The disposition effect is considered a projection of Prospect Theory, subject to the pivotal assumption that investors do not adapt to losses due to loss aversion and anchor the reference point at a level higher than the current price (Chiyachantana and Yang, 2013). Reference point adaptation is ‘a shift in the reference point in the direction of a realized outcome’ (Arkes et al., 2008: 67). It may be that investors adjust their reference points as investment prices change over time. Investors are expected to sell gains to lock in the profit, which is more satisfying than the pleasure of expecting a greater gain. Likewise, investors are likely to hold losses as the pain of a further loss is less than the pleasure of returning to the purchase price. These phenomena are observed as the asymmetric adaptation of the reference point.

Arkes and colleagues (2008) suggest that investors are prone to segregate gains (to savour them individually) and integrate losses (to offset the pain of loss) in their hedonic editing of mental accounts, preventing mental account closing by partial sales of gains and losses.

Investors tend to shift reference points in the Prospect Theory value function curve upward after previous gains and downward after prior losses. Empirically, prior trading outcomes influence reference point adaptation, and investors exhibit a more significant disposition effect in large losses than in small losses (Shi et al., 2015). The findings reflect the magnitude-dependent nature of investors’ behavioural loss aversion as ‘prior gains
cushion subsequent losses and can reduce loss aversion, but double losses (a loss that follows other losses) increase loss aversion’ (Oehler et al., 2003: 508). It seems that the greater the loss, the greater the negative emotional impact and hence, the greater the loss aversion. Emotion, especially negative feelings experienced when one faces adversity, such as encountering a financial loss, may play a crucial role in exhibiting the disposition effect. I examine the affect account of the behaviour in Subsections 2.2.5 and 2.3.5.

The above discussion raises questions about the nature of reference points that should be assumed in disposition effect research. However, this may be less concerning, given Odean (1998) reported that the disposition effect occurred with a variety of different assumptions about reference points. He used the average purchase price as the primary reference point for disposition effect measurement. Still, he found the same result for alternative measurements calculated from the highest purchase price, the first purchase price, and the most recent purchase price. Thus, whilst the disposition effect is reference-point dependent, it seems fairly robust to different assumptions about how the reference point should be calculated (see further discussion in Subsection 4.5.2 of Chapter Four).

As I discuss below, Odean and other researchers went on to consider whether alternative explanations of the disposition effect would be plausible.

2.2.4 The disposition effect is not explained by portfolio rebalancing or mean reversion

Odean (1998) extended his study to test portfolio rebalancing as a rational explanation of the disposition effect. To maintain portfolio diversification, which is a purpose of rebalancing, investors need to sell some portion of an asset in their portfolio when its weight exceeds some predetermined limits due to the asset’s appreciation in value and buy more of the asset when it has depreciated. The disposition effect still happened after controlling for portfolio rebalancing as Odean found a prominent realisation of gains related to the investors’ entire holding of an asset. In a related vein, Brown and Kagel
(2009) studied the extent to which the disposition effect caused investors to differ from optimal trading behaviour in holding a single asset. Participants did not succumb to the disposition effect because they had to compare their existing holding to other available choices and changed their holding.

Alternatively, investors’ belief in mean-reverting returns could be considered a rational explanation for the disposition effect. Mean reversion is an assumption that the price of an asset tends to oscillate around its average price over time. Thus, assets increasing in price will tend to fall in price subsequently, and vice versa. Investors will sell gains and hold, or even buy, losing investments if they believe that the expected return will improve for assets that have dropped in value and subsequently will outperform those that have risen in value (Odean, 1998). Investors who act on mean reversion are likely to sell an asset with a paper loss if the asset price has improved lately, and they should still hold on to an asset with an overall paper gain if it has currently faltered. These activities paradoxically produce a reverse disposition effect. In this thesis, a reverse disposition effect refers to selling losses more quickly than gains or selling more losses than gains.

Nevertheless, Kaustia (2010a) disproves this postulation and argues that the propensity to hold onto recently rising assets below purchase prices is consistent with the expectation to avoid crystallising a loss. Lehenkari (2012) rejects the mean reversion belief because it fails to account for the impact of investors’ responsibility felt for their decision-making. Similarly, the clean-slate scenario deployed by Weber and Camerer (1998) refuted the mean reversion perspective. They set up automatic selling in their experiment where shares held at the end of a period were sold automatically at the start of the next period, which was compared with the setting without automatic selling. This research setting was used to test whether a smaller disposition effect occurs when assets were sold compulsorily than when selling was deliberate. Were the disposition effect caused by belief in mean reversion, participants should repurchase assets trading at a loss. Typically, participants did not reinstate their previous holding after being forced to sell it. Based on these findings, the researchers concluded that people generally do not like to realise losses when they are free to do so.
2.2.5 Emotion-based explanations of the disposition effect

The Prospect-theory explanation of the disposition effect does not include the influence of emotion (except tacitly, in the utility associated with emotion experience) despite Shefrin and Statman (1985) integrating the idea of regret aversion with Prospect Theory.

Emotion refers to a short-lived but intense affective experience reacting to events (Forgas, 1995). Such reactions are multifaceted and include physiological and behavioural response inclinations relevant to the causes (Russell, 2003; Gross, 2015). Two emotions are involved in the disposition effect according to Shefrin and Statman (1985). Investors’ seeking pride and avoiding regret are among the causes of the disposition effect. Pride-seeking can be found in some investors who sell their investments that have risen in value from the reference point, since the motivation to experience elation (a feeling akin to pride) is sufficient to drive investors to realise gains (Summers and Duxbury, 2012).

Investors sell their assets to derive utility from realising gains but are reluctant to experience the regret associated with crystallising losses – a concept called “Realization Utility” (Barberis and Xiong, 2012). Investors normally prefer selling gains to selling losses and even on special occasions; for example, when they face a liquidity shock where they run out of cash (which is typical in a financial crisis) and need to liquidate assets in their portfolios. Their experience of elation or enjoyment upon gain realisation (Frydman et al., 2014) adds substance to the claim of Barberis and Xiong (2012) that higher utility is derived from selling gains than losses.

Frydman and Camerer (2016: 3109) argue that the ‘disutility from realizing a loss is driven by regret.’ Regret is a ‘feeling associated with the ex post knowledge that a different past decision would have fared better than the one chosen’ (Shefrin and Statman, 1985: 781). It is natural for investors to compare what has happened to counterfactual situations. They derive utility from what these counterfactual outcomes imply for their competence rather than based on the actual outcomes (Loewenstein and Lerner, 2003).
This expected outcome of a decision (and associated expected emotions) plays a role in influencing the investor’s immediate emotion that is formed at the precise moment of decision making (Rick and Loewenstein, 2008). An expected emotion is an emotion anticipated to be felt for a decision outcome to materialise (Rick and Loewenstein, 2008).

In this view, investors try to avoid experiencing regret for the possible situation where they observe that a rising asset that they decided to hold for further gain falls to a value lower than the then market price when they made the holding decision. This situation might lead to a risk-avoiding decision. On the other hand, investors may face the dilemma that selling a rising asset too soon causes regret if it continues to rise after being sold. Then, they tend to take a risk-seeking choice. This psychology of avoiding anticipated regret is regret aversion (Janis and Mann, 1977; Fenton-O’Creevy et al., 2005). Regret aversion is the tendency, when making decisions, to choose options that avoid the pain of experiencing future regret.

Regret aversion may also be observed in the loss domain. Owing to Mental Accounting, regret may be put on hold when the loss is still on paper but will be experienced instantly when the failing investment is sold (Summers and Duxbury, 2012). Asset prices may rise following a sale. This situation would aggravate the regret to be experienced. Thus, the desire to avoid the anticipated regret of crystallising a loss by selling the asset influences investors to be more risk-acceptant than at or above the reference point of their purchase price, so they stick to the failing investment.

These arguments are consistent with the viewpoint of Zeelenberg, van Dijk, and Manstead (1998: 269) that ‘the anticipation of regret can promote risk-seeking as well as risk-avoiding choices, depending on which choice would minimize the possible regret.’ Taken together, I argue that regret aversion experienced by disposition investors may have two aspects. They wish to avoid selling a gain too late and thus seeing it depreciates. They also wish to avoid selling a loss too soon to miss a subsequent recovery. In the next subsection, I discuss how regret is related to investors’ felt responsibility and cognitive dissonance due to adverse decision outcomes.
2.2.6 Responsibility, cognitive dissonance, and the disposition effect

The decision-related emotion of regret emerges when investors feel responsibility for their losses (or foregone gains) and is a necessary condition for investors to hold onto underperforming assets (Lehenkari, 2012; Summers and Duxbury, 2012). ‘Regret is particularly pronounced if the person feels responsible for a decision’ (Shefrin, 2008: 490) because assuming responsibility means admitting mistakes should an investment turn sour. ‘For some investors, the tendency to hold losers may be driven on a more basic level than probabilities of gains and losses. We live in a world in which most decisions are judged ex post, and most people find it psychologically painful to acknowledge their mistakes’ (Barber et al., 2007: 425). Shefrin and Statman (1985) did not cover personal responsibility in their theoretical accounts of the disposition effect. Yet, later research shows that investors endeavour to shake off the psychological tension that emerged from past mistakes they are responsible for. The repurchase effect is an example.

The repurchase effect is the reluctance to repurchase assets that have risen in value after a sale. It may be attributed to the regret for the premature realisation of gains that appreciate, following their sale. Frydman and Camerer (2016) found significant correlations across participants between measures of the disposition effect and the repurchase effect, and between regret and the neural signals that stimulated them. According to these researchers, participants with a high repurchasing effect exhibit a significant disposition effect. Strahilevitz, Odean, and Barber (2011) draw on cognitive dissonance to explain the repurchase effect as repurchasing these assets would compel them to admit that the selling decision was a mistake. Cognitive dissonance is a state of mental discomfort that occurs when people justify their actions and decisions inconsistent with their cognitions (Festinger, 1957).

One of the ways to alleviate cognitive dissonance is to change either or both of the contrasting cognitions so that they become consistent, for example, lowering the estimate

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5 The repurchase effect is an investor bias coined by Frydman and Camerer (2016). It is different from corporate share repurchase.
of financial skill or sophistication level by the investor who bought an investment that underperforms (Seru et al., 2010). Alternatively, investors may try to demonstrate their ability to make sound financial decisions by their performance based on the realisation of gains as another way of coping with cognitive dissonance. Coping with cognitive dissonance by decision-makers’ aligning their actions with their beliefs is termed self-justification (Festinger, 1957; cited in Kaustia, 2010b). According to cognitive dissonance theory, decision-makers use various self-justification strategies to justify their behaviour and deny any negative feedback related to the behaviour, so that they can restore positive self-evaluation and self-integrity (Holland, Meertens, and Vugt, 2002).

One of the self-justification strategies available for use by dissonant investors is a change in the way they ‘perceive and evaluate their actions and the consequences associated with it’ (Holland et al., 2002: 1714). Dissonant investors tend to avoid the psychological cost of selling a loss, which amounts to admitting an ex post mistake (Barber et al., 2007). They try to reinforce their self-evaluation in terms of the gains they have got and realise these gains in preference to losses, exhibiting a disposition effect. In contrast, fund managers exhibit a reverse disposition effect in portfolio trading delegated to them as they would perceive a lower psychological cost in admitting to mistakes (Chang, Solomon, and Westerfield, 2016). Additionally, dissonant investors may not have an ex ante belief in mean reversion, yet they typically adopt this unjustified belief to rationalise their poor performance when they have a loss in an investment (Chang et al., 2016).

Echoing the regret-led argument (Shefrin and Statman, 1985; Lehenkari, 2012) and Realization Utility (Barberis and Xiong, 2012), the work of Chang and colleagues (2016) lends support to the self-justification theory in coping with investors’ cognitive dissonance regarding retention of losses. In addition to the need for self-justification, I argue that the pronounced tendency of selling more gains than losses is attributable to a hedonic pursuit to cancel out the displeasure due to holding losses by cashing in gains.
2.2.7 Is the disposition effect a single effect?

This raises the question: are investors who tend to cut gains the same as those who hold losses? Studies by Weber and Welfens (2008) and Grayson (2017) suggest that the two groups of investors are different from one another. Richards (2013) argues that the tendencies to sell gains and hold losses have different antecedents. The controversy – whether the disposition effect should be deemed as opposite sides of a unitary disposition or as two independent behaviours – is relevant to the current research because separating the treatments of divesting gains and losses may have different implications for the underlying emotions from those conventionally held by a unitary approach.

By investigating the decision-making processes involved in the divestment of gains versus losses separately, the current research may be able to assess whether the tendency to sell gains is affected by different factors to the intention to hold losses so that individual differences among people under different cognitive-affective conditions are studied. In the next section, I discuss the interaction of cognition and emotion in investors’ decision-making and the implications for decisions about divesting financial assets.

2.3 Emotion and financial decision-making

2.3.1 Cognitive psychology of the disposition effect

Much judgement and decision-making theory adopts a cognitive approach and emphasises the important role of decision choices, and how memory or information and options comparison influence judgement in path-dependent trajectories (Weber and Johnson, 2009). However, most human decisions result from an affective evaluation that happens before any elicitation of a higher level of cognitive reasoning (Kahneman, 2003). People may prefer using System 1 processing to System 2 processing in their decision-
making since emotion provides quick access to the memory of relevant experiences (Slovic et al., 2007). System 1 processing refers to people’s intuitive system that is automatic, effortless, emotional, and implicit; whereas System 2 reasoning is conscious, effortful, explicit, and slower (Stanovich and West, 2000).

Kahneman (2011) argues that the effortful System 2 cognitive reasoning deploying slower deliberative processing can override the output from the low-effort System 1 processing for fast intuitive judgements that are typically affected by emotions. The work of Richards and colleagues (2018) appears to support this position. These researchers found that investors with higher dependence on System 1 processing exhibited a higher disposition effect while those relying on System 2 reasoning were not associated with the tendency to sell gains more than losses, indicating the critical role of System 1 processing in financial decision-making.

In contrast to work that sees System 1 and System 2 as separate processes, Phelps (2006: 46) argues that cognition and emotion modulate each other, and ‘the mechanisms of emotion and cognition appear to be intertwined at all stages of stimulus processing and their distinction can be difficult.’ Such intertwined functioning includes emotion’s influence on attention and perception and changing emotional responses (Phelps, 2006). Further, System 1 processing is not isolable from System 2 reasoning (Keren and Schul, 2009; Phelps et al., 2014), which advocates Phelps’s (2006) argument of intertwined functioning of emotion and cognition. Taken together, attributing the cause of a disposition effect solely to System 1 processing would oversimplify the story behind the scenes. Integrative cognitive-affective processing seems to be the right approach to describe the underlying mechanism for financial decision-making.

Neither Prospect Theory nor Mental Accounting offers an all-encompassing explanation for investors’ preference for selling gains to losses. Some scholars supplement Prospect-theory explanations with arguments about the role of emotions, such as regret (e.g., Shefrin and Stateman, 1985). More recent accounts have considered the role of emotion, in the mechanisms by which the disposition effect arises, in more detail (e.g., Summers and Duxbury, 2012).
In more recent literature, Kahneman (2011: 286) has proposed that the emotional impact of gains and losses is a primary mechanism through which the patterns of risk preferences and loss aversion described by Prospect Theory arise as ‘humans described by Prospect Theory are guided by the immediate emotional impact of gains and losses.’ Despite evidence that the disposition effect is affect-related, the specific mechanisms are yet to be well explained.

Nevertheless, there are important arguments and evidence that emotions aroused by gains and losses and the related anticipated future emotions play a central role in processes that lead to the disposition effect. Not only have researchers repeatedly found evidence that Prospect-theory explanations of the disposition effect should be supplemented by accounts of emotional dynamics, but one of the originators of Prospect Theory has carried on arguing for the central role of emotions in understanding Prospect Theory effects (see Kahneman, 2011).

In consequence, it is reasonable to argue that approaches which facilitate investors’ management of their emotions and the link between their emotions and behaviour may be capable of ameliorating susceptibility to the disposition effect. Hence, the focus of the study becomes the management of emotion instead of emotion per se. Before examining how people can manage their emotions during financial decision-making in Sections 2.4 to 2.6, I review that positive and negative emotions could account for risk aversion or loss aversion in this section, where generic emotions, rather than specific emotions, are examined (see Subsections 2.3.3 and 2.3.5). Affective priming, cognitive appraisal, and their evaluations are discussed in Subsections 2.3.4, 2.3.6, and 2.3.7.

Next, I discuss whether emotion can act as an antecedent to influence decisions.

2.3.2 Integral emotion and carryover effect in financial decisions

Emotions can both support and harm effective decision-making. The role of emotion in investment performance can be advantageous or disadvantageous. For instance,
Seo and Barrett (2007) found that experiencing more intense emotions was associated with better decision-making (the researchers used positive and negative affect as antecedents and trading performance as outcome), concluding that people, who better understand what is going on with their emotions and can manage the resulting impacts on their decisions, achieve better decision outcomes. Later, in a separate analysis of the same dataset, Seo and colleagues (2010) argue that Prospect Theory explains significantly less variance in risk-taking behaviour alone than in combination with data on emotions experienced during trading. In contrast, Shiv and colleagues (2005) found that patients with impaired emotional response, compared to a control group with normal affective functions, experienced less short-term loss aversion, regardless of whether they won or lost in the previous round. The target patients’ behaviour was due to a subdued capacity to feel emotion, thus enabling them to make more advantageous decisions under uncertainty.

Then, it is helpful to differentiate the categories of emotions that are elicited in financial decisions. The emotion felt at the time of decision-making (as discussed in the preceding studies) is called current emotion or immediate emotion. Immediate emotion is influenced by the conscious or non-conscious evaluation of a decision (Lerner et al., 2015). It encompasses integral and incidental emotions that are normatively relevant or irrelevant to a current decision, respectively (Rick and Loewenstein, 2008). Emotions that relate to crucial consequences of a decision outcome are deemed to be integral. Four factors contribute to the activation of integral emotion: i) characteristics of the decision-maker (e.g., personal preferences), ii) characteristics of options (e.g., probability of occurrence of events), iii) conscious or non-conscious evaluation of the decision, and iv) expected outcomes which include their respective expected emotions (Lerner et al., 2015). As discussed, investors do not just feel expected emotions for potential outcomes; they also ascribe feelings to the decisions they make (i.e., immediate emotions).

Incidental influences unrelated to the decision at hand can have a significant impact on judgement and choices. Incidental emotion is attributed to normatively unrelated factors; for example, a mood that carries over from previous experiences (Lerner, Small, and Loewenstein, 2004). Typically, a mood is a diffuse and prolonged affective state unrelated to any specific causes (Forgas, 1995), but a carryover effect riding on a mood
may be attributed to the incidents that caused the initial emotion. The carryover effect of an incidental emotion on future decisions can best be understood by its intensity. For example, an investor who lost a fortune in the stock market during the last financial crisis may still have a memorable bitterness towards stock trading. The investor will still be panicked by re-instantiation even after a lengthy period. Effects of incidental and integral emotions may coexist and interact in high stake decisions (Cavanaugh et al., 2007).

2.3.3 Adaptive and maladaptive emotions

To understand whether investors are less risk-averse in the gain domain or loss-averse in the loss domain (the two attitudes posited by Prospect Theory as the causes leading to the disposition effect) using immediate emotions as the antecedents, I review previous evidence to identify the situations in which emotions are used adaptively or maladaptive. In most situations, people prefer to experience positive affect over negative affect, although the latter may sometimes be pursued due to self-verification motives for advocating information consistent with people’s beliefs about themselves, for example, sustaining the sense of self through sad feelings (Arens and Stangier, 2020). Negative affect is not always disadvantageous as the emergence of emotion-driven behaviour may be contextual. For instance, unpleasantly primed simulation forex (foreign currency exchange) traders are found to be more accurate in their decisions but conservative in their trading relative to traders affected by positive or neutral emotion, whereas the pleasantly primed traders exhibit risk-seeking but less accurate decisions (Au et al., 2003).

When formulating hypotheses, Au and colleagues (2003) drew on contemporary affect theory, among others, the work of Weiss and Cropanzano (1996) which postulates that positive affect facilitates the recall of positive information and lessens the tendency to remember negative information, and negative affect impedes the recall of positive information but does not promote the recollection of negative information. However, Au and colleagues (2003) found different results. The better trading performance of the unpleasantly primed traders in comparison with others may be attributed more to cognitive
activity evoked by adverse incidents than to positive outcomes (Taylor, 1991). On the other hand, the poorer performance of the pleasantly primed traders could be attributed to their risk-tolerant tendency to hold losses.

Au and colleagues (2003) used affective priming as the antecedents to evoke positive and negative emotions. Typically, participants are aware of the supraliminal exposure to stimuli that influence their minds (e.g., being shown a picture of joyful faces to induce positive emotion). As a caveat, research using affective priming to induce emotions in studying risk sensitivity can result in conflicting results. For example, Kuhnen and Knutson (2011) asked participants to choose between investing in a bond and a stock (which is riskier than a bond) and applied positive, neutral, and negative primes before they chose. The researchers found that positive priming, compared to neutral primes, led to risk-neutral behaviour, while negative priming resulted in risk-avoiding behaviour showing a preference for the safer bond. Yet, these results disagreed with their earlier research, which found that positive emotion promoted risk-seeking, whereas people with negative affect were risk-neutral (Knutson et al., 2008). These researchers attributed the different results from their earlier work to the deployment of more arousing negative pictures used as primes in their later study.

Contrary to Au and colleagues’ (2003) work, Cassotti and colleagues (2012) found that positive emotional priming predominantly reduced behavioural risk-seeking in the loss decision frame, claiming that positive affect can reduce loss aversion. The framing effect refers to the propensity for people to avoid risk when a decision is framed in terms of potential gains and to seek risk when a judgement is framed in terms of potential losses (Tversky and Kahneman, 1992; cf. Prospect Theory).

Rather than using affective priming to induce emotions, Seo and colleagues (2010) relied on the emotions arising endogenously from trading activities as the antecedents to study risk affinity. The researchers argue that the reported experience of emotion intensity reflects the differences in the awareness of emotions and the ability to discriminate emotions, an important element of emotion regulation capability. It is likely that emotions are elicited by the cognitive-affective functioning processes during trading without
necessitating the exogenous deployment of priming. To this end, the current study would not use exogenous affective priming so that any emotions detected must have emerged from the trading exercise used to study the disposition effect.

Prior to the cognitive-affective functioning processes relevant to a disposition effect are being identified, it is helpful to understand how emotion emerges when an individual makes judgements and decisions. This is discussed in the next subsection.

2.3.4 Intensity, valence, and priming of emotion

Russell’s (2003) psychological construction of emotion offers a relatively comprehensive account for the elicitation of emotion. The ten components in an emotional episode are antecedent event, affective quality, core affect, attribution, appraisal, physiological and expressive changes, subjective conscious experiences, emotional meta-experience, and emotion regulation (Russell, 2003). Reviewing the inter-connectedness of intensity and valence in core affect and appraisal is helpful before discussing emotion and its regulation underlying the emergence of a disposition effect.

Figure 2-2 below shows a diagrammatic presentation of the core affect (or affective circumplex). Its conceptualisation is an orthogonal (i.e., independent or non-overlapping), bipolar dimensions having hedonic and activation values (Russell, 2003). The primary reason for constructing hedonics and activation concurrently in core affect is that an affect can be more specifically described by the degree of pleasure (or displeasure) and the extent of activation (or deactivation) than just generic positive and negative affect (Russell, Weiss, and Mendelsohn, 1989). To differentiate the two positive emotions of elation and calm as an example, an elated individual experiences pleasant and is modestly activated, whereas a calm person feels modestly pleasant but deactivated emotion. Yet, studying emotion with this model may have limitations in research operationalisation. Despite much research on valence, past research has relatively fewer contributions to activation. For instance, Seo and colleagues (2010) found that participants who
experienced deactivated feelings and concurrently had losses in an investment simulation sought more risk. However, the researchers could not make a fruitful contribution thereon as they did not find relevant interpretations due to the lack of corresponding literature.

Figure 2-2 Core Affect

As discussed, evidence for predicting risk-avoiding and risk-seeking behaviours from positive and negative affectivity is contrasting. Cassotti and colleagues (2012) echo the claim of Summers and Duxbury (2012) that positive affect (e.g., elation) leads to risk-avoiding/gain-cutting behaviour. In contrast, decision-makers in positive affect exhibit risk-seeking/loss-holding behaviour (Au et al., 2003; Seo et al., 2010). On the other hand, negative affect may underlie risk-avoiding/gain-cutting behaviour (Au et al., 2003; Kuhnen and Knutson, 2011). It seems that only a few studies support decision-makers’ risk-seeking/loss-holding behaviour when they are in the negative emotion of regret (e.g., Summers and Duxbury, 2012). Further, Lerner and colleagues (2015) criticise the efficacy of valence-based models in influencing decision-making as they cannot account for all
impacts of emotion upon decision-making, and emotions of the same valence may differ in their influences (e.g., loss aversion may be affected by fear but not anger).

There are differences in the reviewed studies as to whether they rely on (incidental) primed emotions or emotions that are integral to the decision tasks. The use of affective priming broadly advocates the Affective Primacy Hypothesis, which posits that emotional reactions precede the cognitive assessment of an incident (Zajonc, 1980; see Subsection 2.3.7). Researchers deploying affective priming treat the emotion being studied as the sole antecedent leading to the intended findings. They induce the required emotion by exogenous means and need a good theory about the core affect on the behaviour. Yet, emotion studies using affective priming may be problematic. It is not clear whether the primed emotions will operate in the same way as emotions that are integral to a task, producing potential problems of ecological validity. For example, the intensity of the activated emotion may differ in different studies even though the studies are conducted by the same researchers (cf. Knutson et al., 2008; Kuhnen and Knutson, 2011).

It follows that the overriding principle for ascribing a causal relationship between a stimulus (e.g., trading task perceived by investors) and the emergence of a behaviour (e.g., the disposition effect) is that the decision-related emotions should arise endogenously (e.g., Seo et al., 2010; Frydman and Camerer, 2016) because cognitive processing occurs during trading when the related emotions are elicited. Correspondingly, Richards and colleagues (2018) consider cognitive reappraisal a priming tool. I specify that reappraisal is a kind of conceptual priming, which is a means to activate mental concepts through situational cues to influence people to think and act according to the primed concepts in the task being studied (Cohn and Maréchal, 2016). Situational cues are contextual cues indicating to an individual that an incident may occur, requiring the individual to respond in specific ways. The prime is typically composed of meanings in words that induce the corresponding reactions. This technique is particularly useful in the study of social identity, which aims to alter the relative weight people ascribe to a primed identity. Interpersonal differences between treatments reveal the marginal behavioural effect of the primed identity appraised by individuals (Cohn and Maréchal, 2016).
I discuss appraisal after the next subsection on positive and negative affectivity.

2.3.5 Positive and negative affectivity in the disposition effect

The valence condition of a disposition effect in portfolio trading is more complex when the ambivalent elation (a positive affect) and regret (a negative affect) are co-activated synchronously – a concept called mixed emotions (Kreibig and Gross, 2017; Schneider and Schwarz, 2017). Built on this concept, the Evaluative Space Model of Cacioppo and Berntson (1994) posits differential activation functions for positive and negative affect. There are two asymmetries in affective processing. The positivity offset results from a more significant response to positive than negative affect at low levels of emotional stimulus. In contrast, the negativity bias results from a stronger response to negative than to equally intense positive stimulus at higher levels of activation. Figure 2-3 exhibits the activation functions for positivity offset and negativity bias.

Figure 2-3 Activation functions of positivity offset and negativity bias

Adapted with permission of Elsevier, from ‘Better (or worse) for some than others: Individual differences in the positivity offset and negativity bias’ by Norris and colleagues, *Journal of Research in Personality*, 45(1), p. 101, Copyright 2011; permission conveyed through Copyright Clearance Center, Inc.
It may be that these emotional processes relate to the exhibition of the disposition effect. Trading of assets involves decision-making that evokes responsibility, which in turn triggers emotion. The emotion experienced in a mono-stock portfolio (Brown and Kagel, 2009) largely depends on the movement of market prices of the stock bought relative to its purchase price, which is unidirectional at a given time. In contrast, the emotion experienced in stock portfolio trading depends on multiple outcomes and may be affected by various forms of mental accounting (e.g., partitioning the experience of gains from the experience of losses). Possibly, a negativity bias fuelled by regret, rather than an elation-led positivity offset, prevails when the overall portfolio is not performing well as compared to the original portfolio value. More likely, a sufficiently strong performance is required to drive an elation-led positivity offset. These propositions echo the claim of Shefrin and Statman (1985) that regret is stronger than pride (alternatively, elation).

The “mixed emotions” notion implies that studying regret and elation at different times (e.g., Summers and Duxbury, 2012) may not fully account for the emotions experienced in portfolio trading. Conversely, the non-synchronous occurrence of regret and elation will demonstrate neither positivity offset nor negativity bias if loss-holding and gain-selling activities are independent of each other. Hence, rather than examining the impacts of gains and losses in portfolio trading, the study of ambivalence should be based on resolving conflicting goals arising from the pursuits of investment performance and hedonic balance.

An investor tries to maximise investment return as an economic goal. At the same time, they may pursue hedonic goals, such as minimising regret, concurrently during trading, as would be seen in the disposition effect. Ambivalence elicits conflicting signals that need to be resolved by an investor before they can continue goal pursuit. During the course of goal pursuit, the investor may need to down-regulate negative emotions for unfavourable outcomes, amidst the concurrent pleasant feelings that are activated when they have gains. Insofar as there are inter-personal differences in their propensity to exhibit negativity bias or positivity offset, investors with a greater capacity for emotional complexity (or mixed emotions space) are expected to deliver effective goal pursuit (Berrios, Totterdell, and Kellett, 2017). Correspondingly, ambivalence regulation might
focus on a relatively short-term objective of coping with the opposing emotions arisen from conflicting evaluations (DeMarree et al., 2014). Given these complications, the current research will confine its focus on how people regulate their emotions when exhibiting the disposition effect and account for inter-personal variations when different cognitive emotion-regulatory strategies are used.

2.3.6 Appraisal

This subsection considers the cognitive computation that occurs between an antecedent event and the emotion — appraisal. An appraisal is the perceptual-cognitive process of assessment that comes after the attribution of core affect to the antecedent event. It functions beyond the core affect qualities of valence and activation (Russell, 2003). Appraisal, as Phelps (2006) postulates, largely resembles emotion’s influence on the cognitive aspects of perception. Yet, Lazarus (1991a, 1991b) argues that emotion is a result of appraisal (discussed below). There are two major theories for appraisal: the resource-directed Cognitive-Motivational-Relational Theory (Lazarus, 1991a, 1991b) and the goal-directed Appraisal Tendency Framework (Lerner and Keltner, 2001; Lerner et al., 2015).

Lazarus (1984, 1991a) theorises that appraisal precedes cognitive computation, triggering the experience of the emotion per se (the Cognition Primacy Hypothesis; cf. Zajonc’s (1980) Affective Primacy Hypothesis). Two phases complete appraisals of an incident. A primary appraisal seeks to establish the situated meaning and significance of an incident to the appraiser’s well-being, whereas a secondary appraisal assesses the coping abilities along with the appraiser’s resources for all possible outcomes of the incident (Lazarus, 1991a, 1991b). These cognitive processes control the quality and intensity of an emotion, which modulate the relationship between the appraiser and the situation through various coping strategies, forming the basis of the emotional reaction.
The application of appraisal used in decision-making under risk essentially adopts the goal-driven Appraisal Tendency Framework because emotions influence people to appraise the situation in specific ways towards similar functional ends (Lerner et al., 2015). According to the Appraisal Tendency Framework, appraisal tendencies associated with specific emotions influence judgement and choice by providing a perceptual lens for interpreting future situations, which tends to direct behaviour towards the goal. Unsurprisingly, emotions of the same valence can exert different effects on judgement and decision. A dimension, such as certainty, may affect behaviour by triggering the pertinent appraisal tendency. For instance, uncertainty appraised by fearful decision-makers leads to pessimistic assessment while certainty appraised by angry decision-makers ends up with optimistic judgement, as the differential effect of the two emotions on risk affinity depends on the certainty dimension (Lerner and Keltner, 2001). In contrast, emotions with different valences, such as anger and happiness, may have similar consequences. The manifestation of contextual emotion functioning hinges on decision-makers’ cognitive appraisal of the situation whereby the judgement or decision is made (Lerner and Keltner, 2001).

In either theory, cognition-driven appraisal dimensions provide the best basis for explaining the experience of a situation that takes place in an emotional episode when they are regarded as observations, instead of causes, of situated meaning (Barrett et al., 2007). Yet, appraisals alone cannot fully predict what people feel when they experience emotions. It bears noting that the two appraisal theories should not be considered conflicting as they serve different purposes.

On the one hand, Lerner and colleagues (2015) consolidate the Appraisal Tendency Framework and related theory to postulate the Emotion-Imbued Choice Model that encompasses all relevant factors leading to a financial decision under risk (i.e., the four constituents leading to the activation of integral emotion as discussed in Subsection 2.3.2).

On the other hand, Lazarus’s (1991a, 1991b) appraisal theory seems to be essential for financial decision-making mainly in situations when the probabilities of occurrence of outcomes are neither discernible nor available. The differentiation of decision-making situations between under risk and uncertainty is often blurred, warranting a resource-based
approach for appraisal. His theory appears to pave the way for developing contemporary emotion regulation theory in decision-making.

2.3.7 Using cognitive appraisal instead of affective priming

In this section on emotion and decision-making, I review the role of emotion in affecting financial decision-making in general and the disposition effect in particular. Financial decision-making under risk using emotion as the sole antecedent tends to rely on the Affective Primacy Hypothesis (Zajonc, 1980). In this view, affective priming is typically deployed to elicit the intended emotion. Yet, the use of affective priming can have contrasting results broadly due to the varying intensities of emotion experienced by decision-makers. Evidence also shows that emotions of the same valence may lead to different results when affective priming is used, rendering its predictability unreliable. More importantly, a disposition effect, which emerges from portfolio trading, is closely associated with different intensities of positive and negative emotions due to the varying outcomes of gains and losses, making it impracticable to predict the intensity levels of such emotions by exogenous means. Furthermore, achieving ecological validity in studying the role of emotion and its regulation in financial behaviour requires that emotion should endogenously emerge in the decision-making process and such emotion is considered to be elicited through cognitive engagement with the task.

The Cognition Primacy Hypothesis (Lazarus, 1984) seems to be more suitable than the Affective Primacy Hypothesis to account for situations where cognitive input is required to align the underlying resources to cope with the situations, particularly stressful ones, such as financial decision-making under uncertainty wherein the probabilities of occurrence of outcomes are neither available nor discernible. Moreover, Lazarus (1991b: 172) argues that since emotion comes with the corresponding cognition as a response to a particular meaning in a given situation, the cognition-emotion relationship is treated as ‘synthetic causality.’ To further this argument, he posits that ‘certain patterns of appraisal cause particular emotions’ (ibid), and ‘the resulting emotion also influences later
appraisals reciprocally’ in an iterative process (Lazarus, 1991b: 173). Thus, examining relevant approaches to cognitive appraisals may reveal the individual differences in how emotion is managed or regulated during decision-making, as discussed in the next section.

2.4 Emotion regulation

2.4.1 Why is emotion regulation relevant?

Emotion regulation is generally regarded as an emotion-functioning mechanism to fulfil the common hedonic goals of upregulating positive affect and downregulating negative affect. In addition to the valence and activation dimensions, emotion regulation targets the change of emotion along with approach-avoidance considerations (Cacioppo and Berntson, 1994; Koole, 2009). Approach emotions are those which motivate an approach to situations with desired outcomes. Avoidance emotions are emotions which motivate avoidance of situations with aversive outcomes. An approach-avoidance consideration is a situation that involves one goal having concurrently desirable and undesirable impacts and outcomes, leading to conflicting approach and avoidance motivations. The approach-avoidance conflict applies in many situations, for example, the approach emotions associated with potential profits and the avoidance emotions related to the risky decisions required to achieve them, as observed in portfolio trading. The need to resolve these conflicts probably arose early in human history, for instance, the benefit of killing a large prey animal balanced against the risk of casualty in attacking it. It appears that a decision-maker’s cognitive appraisal of an emotion’s antecedents plays a critical role in regulating their emotion, which is congruent with Lazarus’s (1991b) argument on synthetic causality of the cognition-emotion relationship as discussed in the preceding section.
In this section, I evaluate which emotion regulation strategies are suitable candidates for alleviating the disposition effect when both positive and negative affective states co-occur in portfolio trading.

2.4.2 Emotion regulation as a trait and a state

A trait emotion regulation is a cross-situational, mainly stable, and habitual pattern of awareness and control of emotion; whereas a state emotion regulation refers to a situation-bound and goal-directed awareness and control process (Maxwell, Lynn, and Strauss, 2019). Trait and state emotion regulations correspond to emotion traits (attitudes or dispositions) and emotion states (the momentary experiences felt, which are contextual), respectively. An emotion trait is stable in reacting to circumstances, while an emotion state is variable depending on the particular context that elicits it. An attitude eventuates when an emotion state is evoked in an encounter with a specific object or a situation (Lazarus, 1991b). Thus, the relationship between state emotion regulation and trait emotion regulation is inter-connected with the state-trait emotion continuum. Researchers can increase the predictability of the inter-personal variations when contextual variables are added to their studies on emotion.

There are the one-factor and two-factor models for the relationships between emotion and emotion regulation. The one-factor model posits that there are no emotions that are not regulated, and the same processes that generate emotions also regulate them (Campos, Frankel, and Camras, 2004). This view is, in essence, tantamount to Lazarus’s (1991b) emotion state and trait theory (as discussed above), which argues that an emotion state and an emotion trait are two sides of the same coin.

In contrast, the two-factor model advocates a clear distinction between emotion processes and emotion regulation processes (Gross, 1998a; Cole, Martin, and Dennis, 2004). This model embraces the use of effortful and habitual regulatory strategies, such as
cognitive reappraisal, to alter emotion trajectories, thus subsequent behavioural change (Gross, 1998a; Gross and John, 2003). The two-factor approach sees the generation of emotion and the regulation of emotion as distinct processes. In this view, trait or habitual emotion regulation tendencies are considered pre-existing affective coping mechanisms (Gross and John, 2003). Researchers typically use trait measures of emotion regulatory processes to study their effects on psychological outcomes (e.g., Aldao, Nolen-Hoeksema, and Schweizer, 2010) and task performances (e.g., Richards et al., 2018). People high in trait emotion regulation ‘can voluntarily adjust their use of regulatory efforts as needed in a given context’ (Diaz and Eisenberg, 2015: 38). Diaz and Eisenberg (2015) argue that inter-personal differences in emotion regulation abilities appear to be contextual or relate to the individuals’ habitual emotion regulation in reciprocal ways.

In examining emotion regulation, I mainly rely on the two-factor model but admit some accounts that suggest the generation and regulation of emotion are not two separate processes as there are “no unregulated emotions.” Cole and colleagues (2004: 320), advocates of the two-factor model, concede that ‘emotion regulation is not only applied when emotion processes are thought to influence other processes; it is also applied to convey that emotions have the capacity to be regulated.’

A trait emotion regulation involves “habitual regulatory strategies” consistently used by an individual across contexts, whereas a state emotion regulation deployed by an individual is a dynamic process of situational emotion regulation that aims to change momentary emotion and hence, behaviour (Gross, 2015). What matters to the current research is whether a situational emotion regulation can override one’s habitual emotion regulations. As a caveat, research on situational emotion regulation that applies emotion regulation measures normally used in habitual emotion-regulatory situations may create confusion if the goals of the two emotion regulations differ. Different emotion-regulatory strategies targeting different goals should have different effects on people’s behaviour.

Good evidence in the research literature shows that increased habitual emotion regulation is related to increased experience of positive affect and decreased experience of negative affect (e.g., Gross and John, 2003). James Gross is the originator of the Process

2.4.3 The Process Model of emotion regulation

The popular Process Model of emotion regulation refers to a series of processes that individuals use to influence when, what, and how emotions emerge, are experienced, and are expressed (Gross and Thompson, 2007). Specifically, these processes modify core affect as the basic states of feeling pleasant or unpleasant, energised or drained. Emotion regulation has two components: a set of antecedent-focused processes (i.e., before emotional responses become fully activated) comprising situation selection, situation modification, attentional deployment, and cognitive change; and the response-focused process of response modulation that occurs after emotional responses have been activated (Gross and John, 2003). Figure 2-4 below is a diagrammatic illustration of the Process Model adapted from the work of the originators.

Figure 2-4 The Process Model of emotion regulation

Situation Selection  Situation Modification  Attentional Deployment  Cognitive Change  Response Modulation

Attention  Appraisal


Situation selection is a strategy in which the decision-maker chooses to encounter or avoid a situation, whereas situation modification is another antecedent-focused strategy
in which the decision-maker alters the situation to influence emotions (Gross, 1998a, 1998b). These two strategies essentially concern avoiding oneself from, or changing, the situations that provoke unwanted emotions. For instance, Fenton-O’Creevy and colleagues (2005) found that emotionally overwhelmed traders would leave their desks to avoid maladaptive emotions from affecting their decisions because they could not change the situation once money had been invested. Since this research studies inter-personal differences in the disposition effect through a trading process, I do not consider situation selection and modification, which are strategies avoiding the antecedents.

Antecedent-focused emotion regulation processes are considered more effective than response-focused processes (e.g., expressive suppression) because the former changes the trajectory of emotion early in the emotion generative process (Gross and John, 2003), whereas the latter entails behavioural regulation by effortful inhibition of the expression of unwanted emotions but rarely changes negative emotion experience (Ochsner and Gross, 2005). Recent evidence finds that using cognitive reappraisal reduces the disposition effect and using expressive suppression does not affect the disposition effect (e.g., Richards et al., 2018). Hence, this research considers antecedent-focused cognitive reappraisal but not response-focused expressive suppression.

In the next subsection, I evaluate cognitive reappraisal processes for studying individual differences in the disposition effect. I will examine whether attentional deployment is another candidate in Subsection 2.4.5.

2.4.4 Cognitive reappraisal

Cognitive reappraisal as a cognitive change process involves a cognitive re-evaluation of situations or stimuli (i.e., the context of the emotion) for changing the emotional trajectory of an already triggered response or generating an emotional response where none has been ongoing (Ochsner and Gross, 2005). Cognitive reappraisal is generally aimed at downregulating negative affect, but it can be used to increase or
decrease negative or positive affectivity (Ochsner and Gross, 2005). When comparing the effectiveness of the three strategies of reappraisal, either “reappraising an emotional stimulus” or “perspective-taking” is higher than “reappraising an emotional response” (Webb, Miles, and Sheeran, 2012).

In reappraising an emotional stimulus, participants typically reinterpret the emotional stimulus, such as imagining that an adverse event has a positive outcome (Webb et al., 2012). Such a strategy can alter the emotional impact by changing a stimulus's situational meaning so that the reappraised can control related maladaptive emotions and thus become less affected by them. For instance, in a qualitative study of 118 investment traders in London, Fenton-O'Creevy and colleagues (2011) found that experienced traders who used cognitive reappraisals, such as reconsidering losses in the context of profit and loss over a year or their entire career, facilitated decision-making and improved their trading. This finding is consistent with that of Lo and Repin (2002): experienced traders exhibit less emotion activation and better investment decisions than novice traders.

In perspective-taking, people are asked to change the influence of the emotional stimulus by adopting a relatively objective lens, such as viewing the stimulus from the standpoint of a detached observer (Webb et al., 2012). A goal-directed perspective can also be used. For example, Sokol-Hessner and colleagues (2009) gave the perspective-taking instruction of “thinking like a trader” for portfolio building to two separate groups of 30 participants each and found that such instruction (which aims to reduce participants’ felt responsibility for decision outcomes of gains and losses, by thinking to act as a trader who buys and sells investments with other people’s money as their everyday business and not be obsessed by the outcomes of trades as gains and losses are business as usual; see Appendix-1 for the full text of the instruction), compared to a matched control, significantly reduced participants’ loss aversion. Their findings are consistent with those from subsequent work by Richards (2013) and Grayson (2017), which argue that reappraisal reduces loss-holding (risk-taking) behaviour but does not affect gain-selling (risk-avoiding) behaviour.
In contrast, Panno, Lauriola, and Figner (2013) found that decision-makers took more risks and were less sensitive to unfavourable outcomes in real-life settings when cognitive reappraisal was used habitually for decisions involving cognitive-deliberative processes. Based on the study of 53 participants, these researchers argue that cognitive reappraisal may increase decision-makers’ optimism and take effect to reduce the attention given to negative aspects of risky choices. On balance, they do not appear to produce a good counterclaim as Fenton-O’Creevy and colleagues’ (2011) field study is much more plausible because of its larger sample and high ecological validity achieved based on real-life trading activities. Furthermore, a bioscientific experiment studying traders by Fenton-O’Creevy and colleagues (2012) found that high-frequency heart rate variability which indexed effective emotion regulation during trading had a positive relationship with trader expertise and an inverse relationship with market volatility. Taken together, these findings lend support to the benefits of habitual use of adaptive emotion regulation by experienced traders.

In reappraising emotional response, participants may be instructed to interpret the emotion in a specific manner (Webb et al., 2012), such as treating negative emotion as usual so that they accept or do not judge the feeling. Yet, I consider that this strategy is not suitable for this research as people may exhibit different behaviour that is beyond my prediction, in contrast with the perspective-taking strategy where the hypothesised effect is known beforehand.

Accordingly, cognitive reappraisal via perspective-taking seems to be the relevant emotion-regulatory strategy to reduce the exhibition of the disposition effect and account for inter-personal variations at the state level. I examine whether attentional deployment is an apt candidate for influencing the cognitive-affective conditions that explain individual differences in the disposition effect in the next subsection.
2.4.5 Attentional deployment

Attention is an initial stimulating process in upstream cognitive functioning where the facilitation and alignment of cognitive resources by emotion occurs (Phelps, 2006). The attentional deployment process refers to attention directed to feelings and consequences (Gross, 1998a). It has two main strategies – concentration and distraction. Concentration draws attention to the emotional aspects of a situation; it tends to re-immerses the decision-maker in the recalled experience, intensifying the emotion (Webb et al., 2012). Concentration may be supported by instructions or interventions: i) to focus on or relive emotional experiences (i.e., experiential processing); and ii) to deliberate about the causes, meanings, or consequences of the emotions (i.e., conceptual-evaluative processing) (Watkins, 2004). Experiential concentration is more adaptive than conceptual-evaluative concentration because the latter causes more harmful effects due to maladaptive ruminations about past events (Teasdale, 1999; Watkins, 2004).

Experiential concentration is one of the applications of multifaceted mindfulness techniques. For example, experiential concentration is used to improve individual well-being in the mindfulness-based cognitive therapy (MBCT) (Webb et al., 2012). Teasdale and colleagues (2000) argue that one of the applications of the MBCT is to train recovered patients with repeated episodes of depression to become more aware of their disturbing experiences to reduce relapse.

It seems that concentration is preferable to distraction in regulating negative emotions emerged from the taxing experience of a laborious task, such as portfolio trading, because the negative affect derived from the trading task, if any, precludes the task from being a neutral cognitive distracter. ‘For a distracter task to be effective, it should not elicit negative feelings by itself’ (van Dillen and Koole, 2007: 721). As a caveat, concentration may intensify emotion. It should be used with caution to study decision-making processes.
A key property of mindfulness, as I explore in the next section, is its role in cultivating the attentional process, which breaks the link between emotions and habitual reactions. This may increase the choice of different alternatives about how to respond. Thus, mindfulness has specific properties that are considered relevant to dealing with financial decision-making rather than just its therapeutic aspect as aforementioned.

2.5 Mindfulness

In this section, I look in more depth at work on mindfulness. In particular, I look at mindfulness as a particular deployment of attention that reduces the reliance on habitual responses to emotions and cognitions in decision-making. I argue that by reducing the link between emotional responses and behaviour, mindfulness can reduce affect-related behavioural patterns, such as the disposition effect. I also consider trait and state aspects of mindfulness since, in the current research, I would manipulate state mindfulness and measure trait mindfulness to explain inter-personal variations.

2.5.1 The practice and theoretical background

Mindfulness, as contemporarily defined, refers to ‘the awareness that emerges through paying attention on purpose, in the present moment, and nonjudgmentally to the unfolding of experience moment by moment’ (Kabat-Zinn, 2003: 145). Jon Kabat-Zinn introduced mindfulness to clinical psychology as an intervention practice called the mindfulness-based stress reduction (MBSR), which has become the most studied form of mindfulness training in the Western world during the last four decades since his first publication on mindfulness (1982). Present-day mindfulness training has been developed from the Buddhist psychology of Samatha and Vipassana, two approaches that have been practised for centuries by Buddhists. Samatha is the state of tranquillity resulting from
acute concentration that entails the unifying focus of the mind on its object; whereas Vipassana is the insight into impermanence, suffering, and the no-self nature of sentient beings (Thrangu, 1993; Dreyfus, 2011). The “no-self” concept is drawn from the Buddhist teaching that the mind of a self is ever-changing, so the perception of a self is a series of ongoing mental processes which in return treats the self as merely an agent of actions (Hölzel et al., 2011). One’s behaviour is distorted due to ignorance evolved from one’s deeply ingrained ego-centred cognitions (whether desirable or undesirable, cause suffering); therefore, lessening ego-clinging is effective to withdraw oneself from ignorance and increase clarity, which ultimately relieves suffering in life (Kongtrul, 1987; Thrangu, 1993; Jinpa, 2002). Instead of applying these eudaemonic⁶ and soteriological⁶ practices, Brown, Ryan, and Creswell (2007) study mindfulness as experiential processing that entails attention to internal thoughts and emotions or external stimuli as observed by the individual (see Teasdale, 1999; Subsection 2.4.5). This particular kind of “attentional deployment” is contrary to conceptual-evaluative processing, which is self-referential and repetitive (e.g., rumination) (Watkins, 2004). In the following subsection, I discuss why mindfulness as a special deployment of attention is considered more effective than experiential processing in judgement and decision-making processes.

2.5.2 Mindfulness is more than attentional deployment

Mindful processing of perception entails non-interference with experience: it does not categorise or compare; nor does it contemplate, reflect, or ruminate (Brown et al., 2007). Instead, appreciating the impermanent nature of one’s experiences as a detached observer enables one to see them from a different perspective. This insight needs to occur at a nonconceptual level where mindfulness plays a decisive role (Dreyfus, 2011). Yet, Garland and colleagues (2015a) critique the notion that mindfulness is strictly nonconceptual attention and nonjudgemental awareness. They argue that “nonconceptual”

⁶ Eudaeemonism refers to the ethical doctrine that personal happiness is the chief good and the proper aim of action, especially such happiness is conceived of in terms of well-being based on virtuous and rational self-realisation. Soteriology is the doctrine of salvation (Collins dictionary).
should not be construed as *nonevaluative*; otherwise, the much grander eudaemonic purpose of mindfulness would have been undiscovered. The encounter of mindfulness with phenomenological experience leads to the reduction of emotional distortions during perception (Garland *et al.*, 2015a). This encounter is explicitly cognitive and evaluative. Like an individual’s experience of emotion, mental factors qualify this awareness and identify it as pleasant or unpleasant, activated or deactivated.

It appears that mindful awareness includes emotion regulation components such as increased attentional deployment and cognitive change and decreased expressive suppression. People’s knowledge of their emotion and their understanding of how it arises enable them to decide whether it is in their best interest to regulate the emotion that has just emerged (Farb *et al.*, 2014). Hence, the limited scope of experiential processing, which mainly focuses on or relives past emotional experiences, is revealed. Importantly, Dreyfus (2011) proposes the reductive effect of mindfulness on people’s reliance on habitual responses to encountered experiences by situational cues can be an antidote to lessen the habitual tendency. Thus, mindfulness is considered to be a suitable candidate to reduce the susceptibility to the disposition effect, as discussed in the following subsection.

### 2.5.3 Reduction of habitual emotional reactivity

By treating thoughts and their accompanying emotions as mere objects of attention and awareness, mindfulness facilitates the liberation of consciousness from cognitive or affective evaluations, enabling the mind to either engage or disengage thoughts more choicefully. For example, instead of reacting to encountered experiences by situational cues or according to one’s habits, a mindful individual responds in ways that promote their values or goals (Brown *et al*., 2007). This cognitive-affective attribute is a *cognitive shift* that reduces ‘the mesmerizing character of our experiences so that pleasant events are seen as fleeting rather than permanently satisfactory, and unpleasant encounters are seen as temporary setbacks rather than deeply upsetting defeats’ (Dreyfus, 2011: 52). The cognitive shift process also echoes the notion of appraisal’s experiential treatment as an
independent observation, instead of the cause of a situation (Barrett et al., 2007), suggesting that a detached and unbiased stance away from self-referential cognitions is adaptive. Thus, mindfulness, by supporting detachment from thoughts and emotions through present-centred and nonjudgemental awareness, reduces habitual emotional reactivity to information or incidents that stimulate emotion and promotes a better choice in coping with the cognitive-affective environment without solely resorting to habitual responses to such incidents (Thrangu, 1993; Dreyfus, 2011).

Putatively, the above attributes of mindfulness suggest they may be used to affect investors’ attention, and perhaps their emotions, which might reduce the disposition effect. It is then helpful to explore how mindfulness can achieve these benefits as described. I examine mindfulness through its operationalisation in the following subsections.

2.5.4 Understanding mindfulness through its operationalisation

In Western psychology, mindfulness seems to be narrowly regarded as a hedonic regulation mechanism. It has been widely practised to improve individual well-being, such as the MBCT and the MBSR practices. That said, mindfulness is a rather novel concept in Western psychology, and new theories about its properties and applications are still being discovered, although it is a time-honoured practice in the East. As a skilful deployment of attention, mindfulness is proposed to alleviate the disposition effect. I examine its characteristics by focusing on this premise.

Brown and Ryan (2003, 2004) consider mindfulness as mainly consisting of consciousness (having inter-connected functions of attention and awareness), experiencing present reality, clarity, and nonjudgemental acceptance. Nonjudgemental acceptance starts with nonjudgemental observation and then accepting whatever arises within the stream of consciousness (Dreyfus, 2011). However, Dreyfus (2011) critiques the inadequate Western scholarly conceptualisation of mindfulness as merely “present-centred, nonjudgemental awareness.” He argues that treating the concept as the ultimate purpose fails to account for
the retentive nature of mindfulness to increase clear comprehension. The Buddhist practice of retentive focus (i.e., mindfulness proper) is a means to a cognitive end, the attaining of Vipassana to free one’s mind from defilements, by cultivating clear comprehension of impermanence, suffering, and no-self concept through one’s sensory and mental experiences with the outside world (Dreyfus, 2011). Vipassana is a high-level proficiency in mindfulness. The practice enables its practitioners to develop the ultimate enlightenment through successive progression into different levels of attainments. De-automatisation of habitual responses to experiences, as discussed in the preceding subsection, is one of the early attainments (Thrangu, 1993; Dreyfus, 2011).

The practice of mindfulness meditation, which entails repeated attention to an object alongside continuous awareness and letting go of thoughts and emotions without ruminations, generates a temporary state of mindfulness that lasts beyond the meditation itself. This condition develops into trait mindfulness when mindfulness meditation is practised constantly over time (Davidson, 2010; Garland et al., 2010; Hanley, Garland, and Black, 2014; Kiken et al., 2015). In the next subsection, I examine the prominent properties of mindfulness through its operationalisation in the state and trait levels.

2.5.5 Mindfulness at the state and trait levels

Mindfulness as a momentary, state quality is maintained only when attention to experience is volitionally cultivated with an open, nonjudgemental orientation to experience (Lau et al., 2006). When its cultivation accumulates, it develops into dispositional or trait mindfulness (e.g., Kiken et al., 2015). Trait mindfulness is a habitual tendency to demonstrate nonjudgemental and nonreactive awareness of moment-to-moment experiences in daily life (Baer et al., 2006). Mindfulness can be studied by examining its constituent traits (e.g., Curtiss et al., 2017). A mindfulness trait refers to one’s disposition or trait rooted in cognitive, developmental, and personality discipline (Rau and Williams, 2016). Findings from some psychometric measures of mindfulness
traits (e.g., the FFMQ; Baer et al., 2006) lend support to studying the mindfulness concept as separate components that are stable in different populations (Bergomi, Tschacher, and Kupper, 2013), and stable over time if no mindfulness intervention precedes the reporting of the measures (Brown and Ryan, 2003). Notably, the second evidence implies that the effect of an acute state of mindfulness may override that of trait mindfulness.

The practice of mindfulness meditation, a formal way to develop metacognitive insight embedded in the state of mindfulness (Bishop et al., 2004), is deployed as a typical intervention to cultivate state mindfulness. This mindfulness state cultivated in meditation may have an instantaneous (but perhaps transient) effect on meditators’ attitudes (Kiken and Shook, 2011) and cognition (Alberts and Thewissen, 2011). Remarkably, a relatively short duration of mindfulness meditation can generate observable changes in various neuro-cognitive and neuro-affective functions (Chambers et al., 2009) and emotion regulation (Arch and Craske, 2006).

For operationalisation purposes, state mindfulness and trait mindfulness are measured by different constructs as they have different attributes (Thompson and Waltz, 2007). The Toronto Mindfulness Scale mainly measures state mindfulness (Lau et al., 2006). In developing the TMS, Lau and colleagues (2006: 1452) conceptualise the Decentring construct as a state measure of ‘awareness of one’s experience with some distance and disidentification rather than being carried away by one’s thoughts and feelings.’ Interestingly, a brief mindfulness intervention increases both state and trait mindfulness related to decentring (Tanay, Lotan, and Bernstein, 2012). As discussed in the next subsection, decentring is a property that tends to reduce emotional reactivity.

The Mindful Attention Awareness Scale (Brown and Ryan, 2003) is an extensively used measure of trait mindfulness. Yet, it is criticised for under-representing trait mindfulness – the scale has only two facets, presence and acceptance. Brown and Ryan (2004: 245) even preclude acceptance because of its limited incremental validity and claim that ‘acceptance is functionally redundant in mindfulness.’ In parallel, the more exhaustive Five-Facet Mindfulness Questionnaire (FFMQ; Baer et al., 2006) is increasingly popular as it encompasses five measures of mindfulness traits: Observing, Describing, Acting with
Awareness, Nonjudgement, and Nonreactivity. The first three attributes relate to present-centred focus, whereas the last two attributes refer to observing internal or external experiences by avoiding impulsive responses to thoughts or emotions in a reactive manner without taking a stance or being fixated on the experience (Baer et al., 2006). The work of Rau and Williams (2016: 34) lends support to the multidimensional FFMQ measure of trait mindfulness and argues that ‘acting with awareness and nonreactivity provide the strongest theoretical and empirical association with the mindfulness construct’ because these two attributes reflect the focus and quality of attention deployed in mindfulness.

2.5.6 Decentring and reduction of emotional reactivity

The state of mindfulness is best understood by illustrations from long-term meditators. Theravada Buddhist monk Henepola Gunaratana (1996), a veteran mindfulness practitioner, describes how a meditator acts as an ongoing, detached observer to their momentary, ever-changing internal experiences in an acute state of mindfulness:

Mindfulness is awareness of change [...] seeing how that thing makes us feel and how we react to it [...]. In mindfulness, one is an unbiased observer whose sole job is to keep track of the constantly passing show of the universe within [...]. Mindfulness is objective, but it is not cold or unfeeling. It is the wakeful experience of life, an alert participation in the ongoing process of living (p. 141).

Meditators in this mindfulness state are deemed to engage in a decentred view, in which experiences are perceived as less self-referential. Decentring as a key attribute of state mindfulness facilitates the dissolution of internal ego-clinging experiences, and the attachment of such experiences leads to suffering (Thrangu, 1993; Lama Zangmo, 2021). The disidentification from inner experiences, an attribute of decentring, is closely related to reduced reactivity to thought content, which in turn affects meta-awareness in a tripartite loop (Bernstein et al., 2015) as illustrated in Figure 2-5 below. Meta-awareness is the deliberate attention directed to the processes eventuating from momentary experiences. The
quality of ‘attention by itself may be focused, but only when coupled with meta-awareness – an apprehension of the current state of the mind that monitors that focused attentiveness – does it become mindful’ (Good et al., 2016: 117). Thoughts and feelings, in particular negative ones, can lead to different cognitive-affective and behavioural consequences than if they are construed on a self-referential basis (Teasdale et al., 2002). A reduction of emotional reactivity to thought content is achieved when meta-awareness of subjective experience is interpreted through a decentred mindset (Bernstein et al., 2015). The control of emotional reactivity in a meta-awareness condition is the theoretical base on which the hypothesised reductive effect of state mindfulness on the disposition effect is drawn.

Figure 2-5 The metacognitive process model of decentring

Adapted from Bernstein and colleagues (2015: 600)

2.6 Mindful Emotion Regulation

2.6.1 The Mindful Coping Model

Since ‘the defining feature of emotion regulation is the activation of a goal to influence the emotion trajectory’ (Gross, 2015: 5), it may be beneficial to match and blend
various emotion-regulatory strategies, such as cognitive reappraisal and mindfulness, to cope with environmental situations (Gross, 2015). This process of matching and blending seems to be automatic at the trait level and can be manipulated at the state level. Mindfulness is considered a unique form of emotion regulation involving specific attention deployment, which appears to lead other regulatory processes (Brockman et al., 2017). Together, emotion, appraisal, and attention are inter-connected as a reciprocal process of co-construction (Barrett, 2013).

The mindful use of emotion regulation at the right intensity would be adaptive. Garland, Gaylord, and Fredrickson (2011) conceptualise that Positive Reappraisal, an emotion regulation strategy which mentally attributes a positive meaning to an event (Garnefski, Kraaij, and Spinhoven, 2002), can be enhanced by mindfulness where stressful events are reconstrued as benign or meaningful to meditators. Cognitive emotion regulations of Positive Reappraisal and Catastrophising (two subscales of the Cognitive Emotion Regulation Questionnaire; Garnefski and Kraaij, 2007) are used as adaptive and maladaptive cognitive coping strategies, respectively. Cognitive coping strategies change the way wherein the relationship between emotion and stimulus is attended to (e.g., avoid thinking about a threat) or interpreted (e.g., psychological distancing of a threat) (Lazarus, 1991b). An adaptive cognitive coping strategy, such as Positive Reappraisal, helps ‘people to keep control over their emotions during or after the experience of threatening or stressful events’ (Garnefski and Kraaij, 2007: 147). In contrast, Catastrophising, a maladaptive cognitive coping strategy, tends to amplify the experience of negative emotions and thoughts that arise in response to adverse events. The stress-reductive effect due to an increase in Positive Reappraisal is mediated by increased trait mindfulness, and vice versa (the Mindful Coping Model; Garland, Gaylord, and Park, 2009; Garland et al., 2011).

The essence of the Mindful Coping Model is embedded in the “mindful decentring and attentional broadening” capacities. Garland and colleagues (2015a) posit a slightly different perspective that mindful decentring allows psychological distancing from self-referential cognition (e.g., responsibility felt for decisions made) by taking a broad view to generate insight into the cause of incidents without relying on conceptual information or
belief (see Subsections 2.5.2 and 2.5.3). Mindful decentring entails the disengagement of self-consciousness and mental context, which supports the notion that improving cognitive performance attributed to mindfulness is driven by awareness or attention instead of self-referential cognition (Brown et al., 2007).

In line with the “orientation to experience” component (Bishop et al., 2004) operated during state mindfulness, mindful decentring appears to broaden attention to accommodate an expanded set of positive and negative incidents being experienced. The efficacy of this capacity rests in the reconstruction of cognitive structures in working memory capacity through the successive unfolding of a cognitive set-shifting process. Such a process enables flexible data reorganisation to form new appraisals in coordinating adaptive emotion-functioning and effective goal pursuit (Garland et al., 2015b).

2.6.2 Mindfulness-to-Meaning Theory and cognitive performance

Mindfulness meditation practice facilitates decentring and attention-broadening, transforming stress appraisals into a state of mindfulness wherein Positive Reappraisal works reciprocally with mindfulness in an upward spiral process (Garland et al., 2011; Garland et al., 2015a). Garland and colleagues (2011) name this process “Mindful Reappraisal,” which exists at multiple levels of temporal resolution and keeps pace with iterative process models of emotion regulation (e.g., Gross’s Process Model).

The theoretical foundation for Mindful Reappraisal is the Mindfulness-to-Meaning Theory that addresses a decentred mode of awareness in which thoughts and emotions are considered from a metacognitive perspective, which confers flexible construction of more adaptive appraisals (Garland et al., 2015a). This psychological condition is different from the putative interaction of mindfulness and cognitive reappraisal with which I intended to manipulate financial behaviour, but it may be helpful in interpreting the research findings as state mindfulness may influence habitual cognitive reappraisal (Hanley et al., 2014; Garland, Hanley et al., 2015). Mindful Reappraisal promotes eudaemonic well-being with
a sense of purpose and positive engagement with life that emerges, especially when one’s experiences are predisposed by deeply held values (Garland et al., 2015a). The theory can also be applied to improve cognitive performance. Rather than controlling the relevant emotion, improving cognitive performance by mindfulness interacting with habitual emotion regulations essentially facilitates changing the way of thinking due to the de-automatisation of habitual patterns in responding to emotional reactivity and the emergence of adaptive appraisals when the emotion is experienced, so as to achieve effective goal pursuit (Dreyfus, 2011; Garland et al., 2015b).

2.6.3 Mindful Emotion Regulation at the state and trait levels

Mindful Emotion Regulation is a convenient term for the combination of mindfulness and emotion-regulatory strategies. As coined by various scholars, Mindful Emotion Regulation represents different notions, for example, integrating the constructs of mindfulness and emotion regulation (Chambers et al., 2009). Alternatively, Guendelman, Medeiros, and Rampes (2017) provide a formal conceptualisation for Mindful Emotion Regulation as a unique approach to emotion regulation composed of two separate processes, a cognition-based top-down process and a sensory-perception-based bottom-up process. Decades of research has already established the effectiveness of separately deployed cognitive reappraisal and mindfulness-based intervention in promoting psychological well-being and psychotherapeutic treatments (as evidenced in the meta-analysis of Guendelman et al., 2017). Yet, literature that combines emotion regulation and mindfulness in studying cognitive-affective processes of financial decision-making, particularly at the state level, is scarce. Garland and colleagues’ (2011) Mindful Coping Model offers a sound theoretical framework for mindfulness and cognitive emotion regulation at the trait level, whereas the Mindfulness-to-Meaning Theory offers explanations on how mindful emotion regulation might work at the state level (Garland et al., 2015a; Garland et al., 2015b).
To summarise, mindfulness and cognitive emotion regulation co-exist and both attributes may not be isolable. Mindful emotion regulation is an iterative process aiming to cope with stressful situations using attention and adaptive appraisals to distance self-referential cognitions so as to mitigate the activation of maladaptive emotions. This iterative process facilitates changing the way of thinking due to adaptive appraisals, which may improve cognitive performance or change the trajectory of a habitual pattern in responding to the same situation. Based on the various theories and evidence reviewed above, I develop the hypotheses for the current research in the next section.

2.7 Development of hypotheses

2.7.1 Salient arguments reviewed and the research question

As discussed in Section 2.3, the use of exogenous affective priming can have contrasting results mainly due to the varying intensities of emotion felt by individuals (cf. Knutson et al., 2008; Kuhnen and Knutson, 2011). More importantly, perhaps, it is fruitful to study the disposition effect in ways that account for how emotions arise endogenously in the trading process. Thus, I study the regulation of emotions and their effects which arise in a trading process rather than manipulating emotions directly.

Prior research has established that maladaptive emotions play an important role in the generation of the disposition effect (e.g., regret and elation found in the disposition effect by Summers and Duxbury, 2012). As discussed, good evidence shows that cognitive reappraisal is an emotion regulation strategy associated with a less intense experience of maladaptive emotion, and mindfulness attenuates the link between emotion and habitual action. Hence, the higher use of cognitive reappraisal strategy and higher state mindfulness would be associated with a lower disposition effect. First, by reducing the intensity of experienced negative emotion when encountering losses, a cognitive reappraisal that lessens loss retention would reduce the exhibition of a disposition effect (Richards, 2013;
Grayson, 2017). Second, state mindfulness, which cultivates a detachment from emotional reactivity in a nonjudgemental manner, weakens the link between emotions and habitual behavioural responses (Dreyfus, 2011), perhaps, reducing the disposition effect.

Taken together, the disposition effect as a pattern of behaviour is hypothesised to be affected by cognitive-affective functioning processes of cognitive emotion regulations and mindfulness at the state level (by changing the appraisals perceived or disidentifying inner experiences by investors) and the trait level (which explain whether people differ in their tendencies to decide in certain ways due to the use of different habitual cognitive coping strategies). I reformulate the research question to specify the kind of emotion regulation to be investigated, by adding “cognitive” before emotion regulation, as follows:

Do mindfulness and cognitive emotion regulation reduce the disposition effect exhibited by individual investors, and what does each of them contribute to changing individual investors’ susceptibility to the disposition effect?

2.7.2 Hypothesis for state mindfulness

At the state level, the proposed reductive effect of mindful decentring on emotional reactivity is achieved by an unbiased stance of observation and disidentification of the subject matter (selling gains and losses) from the meditator’s inner experiences (Bernstein et al., 2015; see Subsection 2.5.6). Decentring promotes awareness of affective and cognitive processes as transient mental events without intrinsic reality, equipping one with cognitive flexibility to respond to demanding situations (Hanley et al., 2014). If, as prior research suggests, emotional reactivity affects the functioning of the disposition effect in the taxing experience of portfolio trading, then effective management of that reactivity can be helpful. Mindfulness lessens automatic reactions to emotions such as regret and elation, which may, in turn, reduce the selling of gains (by reducing the need to savour realised gains) and increase the selling of losses by decreasing the emotional reactivity to the anticipated regret of crystalising a loss. Furthermore, rigorous underpinnings for the
capacity to improve cognitive performance in a mindfulness condition are supported by real-life practice. Some renowned investors, for example, professional traders at PIMCO, regularly practised mindfully noticing thoughts and emotions embedded in their decision-making to assess disadvantageous patterns in their behaviour and devised measures that correct such anomalies (Peterson, 2014). Hence, this research tests:

**H1. State mindfulness affects the disposition effect such that the higher the state mindfulness, the lower the disposition effect.**

2.7.3 Hypothesis for the situational reappraisal

By reducing the intensity of experienced negative emotion, a cognitive reappraisal may reduce the exhibition of a disposition effect. The skill in cognitive reappraisal can be acquired by experience to facilitate sound financial decision-making. Previous evidence shows that experienced traders tend to use cognitive reappraisal to contain maladaptive emotions arising from adverse outcomes of their trading (Fenton-O'Creevy et al., 2011). Richards and colleagues (2018) have found that investors using reappraisal show a lessened disposition effect. They argue that reappraisal is a kind of conceptual priming. Similarly, as a goal-oriented emotion regulation (Koole, 2009), perspective-taking is a situational reappraisal that may reduce the decision-maker’s perceived responsibility for their decisions (henceforth “Perceived Responsibility”) (Sokol-Hessner et al., 2009). Distancing the self-referential cognition of Perceived Responsibility is beneficial to performing portfolio trading as investors would not realise gains to justify the mistaken holding of losses. They would think and act according to the “primed concepts” in the task being studied (Cohn and Maréchal, 2016). Overall, these arguments suggest that perspective-taking to act as an advisor is inversely related to Perceived Responsibility, and it can alleviate the disposition effect. Thus, I hypothesise the following:

**H2. Situational reappraisal affects the disposition effect such that the stronger the influence of the situational reappraisal, the lower the disposition effect.**
2.7.4 Hypotheses for trait mindfulness and habitual emotion regulations

Emotion, appraisal, and attention are intertwined as a reciprocal process of co-construction for experiences perceived by individuals (Barrett, 2013). Neurobiological evidence supports the alleviating effect of mindfulness on emotional reactivity in which emotion regulation is enhanced (e.g., as measured by reduced amygdala activity; Goldin and Gross, 2010). In parallel, the Mindful Coping Model (Garland et al., 2011; Garland et al., 2015a; see Subsection 2.6.1 for a detailed discussion) provides a theoretical basis for the integrative functioning of trait mindfulness and habitual emotion regulation to draw on. The researchers used a longitudinal study to investigate changes in mindfulness on differences in stress, mediated by changes in Positive Reappraisal, controlling for the changes in Catastrophising (another cognitive coping strategy). They argue that ‘Positive Reappraisal and mindfulness appear to serially and mutually enhance one another’ (Garland et al., 2011: 59). The two major functions of cognitive coping, problem-focused coping and emotion-focused coping, respectively include the coping strategies directly addressing the stressor and the coping strategies aiming to regulate the emotions related to the stressor (Garnefski et al., 2002). Positive Reappraisal and Catastrophising are respectively task-oriented and emotion-oriented coping strategies for adverse situations (Garnefski et al., 2002).

Portfolio trading of buying and selling investments is an uphill task, and the experience can be taxing to decision-makers. Gains and losses resulting from trading inevitably cause positive and negative emotions. Positive Reappraisal is associated with upregulating positive emotion. Catastrophising, the setting of emotional expectations effectually to a less positive level, may lead to more experience of negative emotions, including regret and anticipated regret, which motivates the savouring of gains to increase the appreciation of positive emotion by realising them and the avoidance of the negative emotion triggered by sales of losses. Catastrophising acts in tandem with, but opposite to, Positive Reappraisal in achieving hedonic balance.
Trait mindfulness has the property to lessen the mesmerising character of one’s experiences so that one’s thoughts and emotions are not attached to favourable or unfavourable outcomes perceived because of one’s usual patterns of evaluative reactivity (Dreyfus, 2011). This de-automatisation of habitual patterns of emotional reactivity is eventuated by constant awareness of the present moment without immediate reactivity and may induce one to promote adaptive emotion and regulate maladaptive emotion so that one has a greater choice in whether to respond according to habitual tendencies or to act differently to adapt to a new situation. The overall process facilitates changing the way of thinking due to adaptive appraisals, which may improve cognitive performance or change the trajectory of a habitual pattern in response to the same situation. Taken together, the coping capacities of Positive Reappraisal and Catastrophising in influencing the disposition effect will be investigated in conjunction with mindfulness, at the trait-level cognitive emotion-regulatory mechanism. The following are hypotheses for trait mindfulness, trait positive reappraisal, and trait catastrophising:

**H3.** Trait mindfulness affects the disposition effect such that the higher the trait mindfulness, the lower the disposition effect.

**H4.** Trait positive reappraisal affects the disposition effect such that the higher the use of trait positive reappraisal, the lower the disposition effect.

**H5.** Trait catastrophising affects the disposition effect such that the higher the use of trait catastrophising, the higher the disposition effect.

### 2.7.5 Further elaboration of hypotheses

It adds value to study effects on each component of the disposition effect separately as prior research shows that they may have different antecedents as those who tend to cut gains are different from those who hold losses (Weber and Welfens, 2008; Grayson, 2017). The behavioural components of the disposition effect, the realisation of
gains and the disposal of losses, should be examined independently. Thus, the research question is revised as follows:

Do mindfulness and cognitive emotion regulation reduce the disposition effect and its behavioural components exhibited by individual investors, and what does each of them contribute to changing individual investors’ susceptibility to the disposition effect?

The five hypotheses are expanded to include auxiliary hypotheses for the constituent behaviours of the disposition effect, namely, the realisation of gains and the disposal of losses, as set down below:

H1a. State mindfulness affects the disposition effect such that the higher the state mindfulness, the lower the disposition effect.

H1b. State mindfulness affects the realisation of gains such that the higher the state mindfulness, the lower the realisation of gains.

H1c. State mindfulness affects the disposal of losses such that the higher the state mindfulness, the higher the disposal of losses.

H2a. Situational reappraisal affects the disposition effect such that the stronger the influence of the situational reappraisal, the lower the disposition effect.

H2b. Situational reappraisal affects the realisation of gains such that the stronger the influence of the situational reappraisal, the lower the realisation of gains.

H2c. Situational reappraisal affects the disposal of losses such that the stronger the influence of the situational reappraisal, the higher the disposal of losses.

H3a. Trait mindfulness affects the disposition effect such that the higher the trait mindfulness, the lower the disposition effect.
H3b. Trait mindfulness affects the realisation of gains such that the higher the trait mindfulness, the lower the realisation of gains.

H3c. Trait mindfulness affects the disposal of losses such that the higher the trait mindfulness, the higher the disposal of losses.

H4a. Trait positive reappraisal affects the disposition effect such that the higher the use of trait positive reappraisal, the lower the disposition effect.

H4b. Trait positive reappraisal affects the realisation of gains such that the higher the use of trait positive reappraisal, the lower the realisation of gains.

H4c. Trait positive reappraisal affects the disposal of losses such that the higher the use of trait positive reappraisal, the higher the disposal of losses.

H5a. Trait catastrophising affects the disposition effect such that the higher the use of trait catastrophising, the higher the disposition effect.

H5b. Trait catastrophising affects the realisation of gains such that the higher the use of trait catastrophising, the higher the realisation of gains.

H5c. Trait catastrophising affects the disposal of losses such that the higher the use of trait catastrophising, the lower the disposal of losses.

Figure 2-6 and Figure 2-7 below show the diagrammatic illustrations of the five sets of hypotheses for the disposition effect, and the realisation of gains and the disposal of losses, respectively. State mindfulness and situational reappraisal have an intersection, which represents the potential interaction between the two manipulations. The diagrams also show the directions of hypothesised effects. H1c, H2c, H3c, H4c, H5a, and H5b are hypothesised to exhibit additive effects; whereas a reductive effect is proposed for H1a, H1b, H2a, H2b, H3a, H3b, H4a, H4b, and H5c.
Figure 2-6 Diagrammatic illustration of hypotheses for the disposition effect
Figure 2-7 Diagrammatic illustration of hypotheses for divestments of gains and losses

- H2b  - H1b  + H2c

- H3b  + H3c

- H4b  + H4c

+ H5b  - H5c

State Mindfulness
Situational Reappraisal

Trait Mindfulness

Proportion of Gains Realised

Proportion of Losses Realised

Trait Positive Reappraisal

Trait Catastrophising

Proportion of Losses Realised

Trait Positive Reappraisal

Proportion of Gains Realised

Trait Mindfulness

Situational Reappraisal

State Mindfulness
2.7.6 Regret aversion and ambivalence regulation were not studied

Initially, I hypothesised the mediating roles of regret aversion (as Hypothesis 6) in predicting the disposition effect. Based on the hypothesised relationship between regret and responsibility (Zeelenberg et al., 1998; Lehenkari, 2012), I consider that the dual antecedent of the reappraisal and the mindfulness manipulations may affect regret aversion during portfolio trading, which in turn influences the realisation of gains and losses. In my final study design, I did not study regret, a prominent emotion that is related to the disposition effect as posited by Shefrin and Statman (1985) because, among others, the effect of emotion can disappear once participants are made aware of it (Schwarz and Clore, 2003). Additionally, manipulating regret may require pre-set choices for participants, compromising Perceived Responsibility because the choices are not regarded as investors’ own decisions (see Chapter Three for a detailed discussion). A change in the trading exercise design from a pre-set trading selections model to a free trading simulation may preclude the occurrence of regrettable outcomes.

As discussed in Subsection 2.3.5, I initially intended to investigate the mediating role of mixed emotions or ambivalence regulation (as Hypothesis 7). Later, I abandoned the investigation of ambivalence regulation because the change of research design in collecting trading data may render the co-activation of positive affect and negative affect uncertain. Repeat measurements of the two emotions may be required, which would add cognitive load to participants and compromise their trading performance and risk distorting the experienced salience of the emotions they report.

Having evaluated the findings from the two pilot studies, I eventually discarded these two hypotheses as they were not central to my planned contribution.

The next chapter outlines how the research was conducted.
The chapter starts with an overview of the philosophy and methodology adopted by the current research. The deployment of an experimental survey is evaluated and justified as the research method. Target participants and how they were recruited are discussed along with related issues in ethics. The manipulations of mindfulness and reappraisal used in two pilot studies and the main study are discussed. The main study was implemented in the wake of the improvements suggested by findings from the pilots. The two pilots, a researcher-attended, self-administered student pilot (henceforth “Student Pilot”) and a researcher-absent, self-administered pilot that recruited participants from Qualtrics’s panels (henceforth “Qualtrics Pilot”), were required because they addressed different issues. The design of a pre-set trading model as the initial metric of the disposition effect and the refinement of the survey questionnaire by cognitive testing in the Student Pilot are examined. The cognitive testing led to the development of a free trading simulation for use in the Qualtrics Pilot as a replacement for the pre-set trading selections model, along with other improvements advised by findings from the Student Pilot. The questionnaire was further revised after reviewing findings from the Qualtrics Pilot. This revamped questionnaire was subsequently implemented in the main study (henceforth “Main Study”). Data from the two pilots were not used to test the hypotheses due to their small sample size. Rather, the various improvements to the pilot studies adopted in the Main Study rendered the latter viable. Key features of the revamped questionnaire are discussed along with their pertinent measurements in **Chapter Four**. The chapter finishes with a discussion of the power and required sample size for the Main Study.
3.1 Research philosophy

3.1.1 Ontology and epistemology

The operation of a research study begins with the identification of a suitable methodology to be used to answer research questions. To this end, researchers are concerned with positioning the ontology and epistemology of their research because different research paradigms prescribe different ways that data are collected and analysed, thereby yielding results to address research questions. Ontology is the set of philosophical perspectives about the nature of reality, whereas epistemology refers to the assumptions about the most appropriate ways of enquiring into the knowledge required to explain phenomena or behaviour (Easterby-Smith, Thorpe, and Jackson, 2015). Ontologically, this research adopts the view of an internal realist who believes that the truth exists but that its observation can be indistinct (Putnam, 1987; cited in Easterby-Smith et al., 2015) because the current research has to study psychological conditions such as mindfulness and perceived responsibility. Despite sharing the same view as a realist holds about reality – that it is independent of the observer’s interpretation and social interaction – the internal realist conducts measurement rather indirectly, focusing on the accuracy that contemporary methodologies afford (Easterby-Smith et al., 2015).

A compatible epistemology, which prescribes a relevant set of methodologies, is required to accommodate the research ontology. I consider that phenomena in the world are operated by laws of cause and effect. A post-positivist approach using deductive reasoning to postulate theory that can be tested by scientific methods seems to be the correct epistemology. This approach primarily requires that research is hypothesis-driven and recognises that hypotheses cannot be proven but can only be subjected to tests of whether they can be falsified. To this end, specific hypotheses have been developed in Chapter Two so that they can be supported or falsified by measuring and testing relevant observations and key variables, respectively. In this context, being “supported” means that they have not been falsified, not that they have been established as objective truth.
3.1.2 Adopting post-positivism as the epistemology

Post-positivists are considered to reject the central principles of positivism because they adopt a falsification strategy that seeks disconfirmatory evidence rather than confirmatory evidence. Testing falsifiable hypotheses is at the heart of the Popperian approach to science (Popper, 1959). Researchers adopting a falsification strategy are still required to exhaust all plausible measurements of observations in their work, despite being more confident in holding their perspectives should they fail to discover disconfirmatory evidence (Easterby-Smith et al., 2015). Accordingly, the current research adopts a post-positivist epistemology.

Generally speaking, positivists have been dealing with a critical issue of induction, that it is impossible to prove a theory conclusively no matter how abundant the data available to support the theory are. Owing to the fallibility of literally all kinds of measurement, a post-positivist stresses the importance of multiple observations and measures. In spite of this, measurements may have different errors; the post-positivist may try to grasp what is occurring in reality by triangulation. Triangulation refers to the application of multiple observations, methods, and empirical materials to the study of the same phenomenon to minimise biases and problems caused by using a single observation, method, or theory (Denzin, 1970).

Observation and measurement are the cruxes of the scientific method of experimentation. Since I cannot directly observe emotions and thoughts relating to the disposition effect, I resort to experimental measurements of behaviour combined with self-reporting of orientations and feelings. For the current research, I have focused on manipulating people’s internal reactions to stimulus situations that can trigger changes in behaviour. When compared with bioscientific experiments using neurobiological parameters (e.g., functional magnetic resonance imaging, fMRI) that can only be applied to a relatively small sample, this approach is a more cost-effective way of studying the effects of emotion regulation and mindfulness on the disposition effect from a larger sample intended by the current research.
Although direct observations of mindfulness or felt responsibility are problematic because of their indistinct appearances, the properties of these phenomena or behaviour can still be reliably measured by objective methods. Rather than conducting a scientific experiment, an internal realist typically infers the nature of reality based on scientific reasoning through less strong forms of positivist methods, such as conducting a quantitative survey to assess behavioural patterns and inter-personal differences in the sample studied (Easterby-Smith et al., 2015).

The disposition effect has been robustly studied in experimental settings (e.g., Weber and Camerer, 1998; Summers and Duxbury, 2012). I discuss how I applied methods used in previous research, specifically Odean’s (1998) metric, to reliably measure the disposition effect in Subsections 4.5.1 and 4.5.2.

The measurement of emotion, emotion regulation, and mindfulness poses a different situation. Contemporary evidence shows that emotion can be measured by biological parameters, such as fMRI. Experimental techniques, such as affective priming, are often used to induce the required emotions. Yet, such emotions are exogenously activated and only suitable for studies treating the affective conditions as antecedents. As discussed in Subsection 2.3.7, emotions felt in the present research should be endogenously developed from participants’ inner experience of the divesting behaviour; hence, the use of affective priming should be avoided.

When an emotion emerges as a naturally occurring phenomenon, it can be measured by relatively less objective but still reliable methods, such as self-report measures from participants when the behaviour being studied is performed (see Subsection 3.2.3). Experimentation and self-reporting can be used collectively or independently, depending on the desired sample size and resources available to the researchers. In the following sections, I critically review the strengths and weaknesses of the design and methodology applied to test the hypotheses developed from the literature reviewed in Chapter Two.
3.2 Field and experimental methods

3.2.1 Evaluating field methods

Field studies and experimental methods are the two main approaches to studying the disposition effect. When using field methods, the secondary data used to study trading behaviour are collected from brokerage houses or share registries. The major advantage is that field data achieve high external validity. Typically, a large sample is available to researchers for generalising the behavioural pattern across individuals, such as in Odean’s (1998) work (discussed further in Chapter Four). Data are naturally occurring; therefore, researchers can justify the claim of ecological validity. It is also effective to identify trait-like characteristics for behavioural differences among individuals in the sample, for example, demographic characteristics such as gender. Yet, this approach is not without measurement issues. For instance, Richards (2013) critiques the reliability of gender distribution in his sample because the names of domestic partners may be borrowed for trading to reduce tax exposure and other reasons.

3.2.2 Basic features of an experiment

Unless carried out more than one time as in a longitudinal study, field method research on the disposition effect is mostly a cross-sectional study that can only establish an association, but not causation, between key variables and behaviour. This approach is contrary to experimentation, which aims to establish cause and effect relationships by manipulating predictors or independent variables and controlling for remaining variables of interest through randomisation of treatments, thus achieving high internal validity (Easterby-Smith et al., 2015).
Another major advantage of experimentation is that it is tractable and enables researchers to set the scenes for their studies, for example, the clean-slate scenario in which participants are asked to make trading decisions afresh without due regard to the outcomes of previous decisions (Weber and Camerer, 1998). Experimentation also allows the controlling of epiphenomenal variables, such as demographic characteristics (e.g., age). Taken together, experimental methods enable the testing of theories underpinning psychological models, which is not possible with historical data. For instance, not until Summers and Duxbury (2012) and Frydman and Camerer (2016) conducted their experiments on emotions has the “regret and pride-taking” claim of Shefrin and Statman (1985) been supported by concrete evidence. Pragmatically, while large datasets on trading behaviour can be accessed in fieldwork, it is often difficult or impossible to collect concurrent psychometric data from the market actors represented in such datasets, discussed as follows.

3.2.3 Studying emotion with experience sampling

When emotions have been activated at the time of decision-making, they should be measured synchronously. Hence, experience sampling procedures, in which thoughts and feelings are momentarily measured when they are being experienced, should be used (Seo et al., 2010). Experience sampling is carried out under simultaneous and conscious awareness. It is preferred to retrospective self-report measurement by recalling because the synchronous method minimises memory biases as remembering information constitutes a reconstructive process (Barrett and Barrett, 2001).

Self-report measures can be used in both experimental and field (though occasionally applied) settings to study emotion-related phenomena. There can be issues in establishing external validity of a nomothetic finding in the latter setting, however. For instance, Richards (2013) extended his field research to study retail investors’ underlying psychological conditions associated with the disposition effect by self-report measurement using the Emotion Regulation Questionnaire (Gross and John, 2003), years after the
trading activities. He ended up with a low response from 7% of the population. Nevertheless, he was fortunate enough to have adequate variability in the key variables between respondents and non-respondents to generalise results from the inferential survey sample to the field data population.

3.2.4 Suitability of an experimental survey and avoidance of priming

Gaining access to respondents or participants could be problematic for both field studies and experiments. Researchers need to negotiate access with powerful (relative to researchers) institutional gatekeepers in a field study or numerous individuals in an experiment. The sample size can be small, as seen in a scientific experiment, but requires intensive resources. Since biological inter-connectedness of emotion and the disposition effect exists (e.g., Frydman and Camerer, 2016), using bioscientific experiments to test all the formulated hypotheses is possible but not cost-effective within the resource base of a PhD student.

Given the complexity of studying the state-level mindfulness and situational reappraisal, and the trait-level mindfulness and emotion regulation processes, the present research needs to make sure that participants are subjected to the relevant manipulations and reliable measurements when their cognitive-affective processes are being examined. I argue that experimentation complemented by inferential survey methods is the most suitable methodology. This setting enables investigation into the effects of cognitive-affective processes on the disposition effect at the trait and state levels.

For the trait-level investigation, self-reporting data from the inferential survey are used. An inferential survey assumes a positivist stance next in strength to experiment. It attempts to establish meaningful relationships between key concepts and variables (i.e., dependent and independent variables) from the findings of a cross-sectional study (Easterby-Smith et al., 2015). An inferential survey would be uniformly administered to participants to establish any cross-sectional relationships.
For the state-level investigation, participants’ behavioural performance can be measured under different controlled experimental conditions, using randomisation to treatment groups, to mitigate problems of unmeasured confounding variables. I discuss in the next subsection the experimental approach to studying the effects of manipulation of variables, at the state level, on the disposition effect.

Although I initially planned to collect emotion state measures in each round of trading, I dropped this idea for two reasons. First, it would make the experiment too lengthy and arduous for participants. Second, I was concerned with the inadvertent priming effects from constantly asking about participants’ emotional states. This would render the experience of emotional reactions more salient than if fewer or no enquiries were made (as priming may cause unreliable measurements). Work on the cognitive aspects of survey methodology shows that participants often rely on cues found in one part of a study to influence responses later as a way of reducing cognitive demand. Thus, making inadvertent priming effects is a significant cause of concern (Krosnick, 1991). In particular, constantly asking participants about their emotions may prime them to focus more on their emotions, making them more salient to decisions, which might cause unintended changes to their decision processes and outcomes that are the object of study.

Since my primary focus is on the regulation of emotions rather than emotion per se, I conclude that the benefits of including regular measures of experienced emotion throughout the experiment have been outweighed by these disadvantages.

3.2.5 Randomised control experiment and causal inference

Experimentation is intended to fulfil Mill’s (1875) three key criteria for establishing causation, namely, correlation of cause and effect, precedence of cause over effect, and the internal validity criterion. The internal validity criterion demonstrates how well the treatments can establish cause and effect relationship with the outcome. A causal
effect refers to ‘a contrast between the outcomes of a single unit under different treatment possibilities’ (Greenland, Robins, and Pearl, 1999: 30). An experiment controls for unmeasured variables by random allocation of participants to control and manipulated conditions, aiming to eliminate systematic biases (Levin, 1998). The beneficial effect of randomisation is that the previous history of individuals is separate from an experimentally induced manipulation, so any change of observations in treatment groups that is not paralleled by an equal change in the control group is due to the manipulation (Easterby-Smith et al., 2015).

In the current research, behavioural data were measured from a trading simulation (see Subsection 3.7.3) and transformed into variables of the disposition effect and its constituents, the realisation of gains and the disposal of losses. Each of these datasets is categorised under a dichotomous variable (i.e., 1 and 0 for with and without the treatment, the latter is the control) for each of the mindfulness and reappraisal manipulations. Let variables $A$ and $Y$ respectively represent the manipulated variable of mindfulness and the outcome variable of the disposition effect. $Y^{\wedge}a = 0$ stands for the value of $Y$ observed under treatment $a = 0$. $Y^{\wedge}a = 1$ denotes the value of $Y$ observed under treatment $a = 1$. Hernán and Robins (2020) argue that these variables may have different values for different individuals in the sample as random variables. Then, the causal effect of mindfulness manipulation for an individual $i$ is present if $Y_i^{\wedge}a = 1 \neq Y_i^{\wedge}a = 0$. Identifying individual causal effects does not have a significant meaning and is not practicable to do so. It is more meaningful to assess the average causal effect of a treatment on the sample of interest. An average causal effect of treatment $A$ on outcome $Y$ exists if the proportion of individuals having outcome $Y^{\wedge}a = 1$ is not equal to the proportion of individuals having outcome $Y^{\wedge}a = 0$. Here, the average causal effect in the sample is non-null. We can reject the null hypothesis of no average causal effect. Then, inter-personal differences between the treatment and control groups are established for the behaviour concerned.

Furthermore, Hernán and Robins (2006, 2020) argue that in ideal randomised experiments, association suffices to demonstrate causation, whereas exchangeability is not guaranteed in the absence of randomisation. Exchangeability means that the counterfactual outcome and the actual treatment are independent as randomisation ‘ensures that the
independent predictors of the outcome are equally distributed between the treated and the untreated groups’ (2020: 27) so that the treated and the untreated are exchangeable.

Hernán and Robins (2020) stipulate that confounding and selection bias are two systematic biases due to lack of exchangeability. Confounding is a bias where the association measure differs from the effect measure when the treatment and outcome share a common cause. A selection bias occurs when an association is created consequent to the process whereby participants are selected for the experiment. While randomisation controls for the confounding bias, a selection bias may occur in randomised experiments. Accordingly, the sampling method and research design have essential bearings on the experimental survey and the research methodology used by the current study. They are discussed in the following sections.

3.3 Participant recruitment

In the UK, retail investors’ propensity to the disposition effect has been relatively less researched when compared with their equivalents in the US, Finland, and China. It may be that empirical underpinnings provided by the studies of American retail investors (e.g., Odean, 1998; Dhar and Zhu, 2006) are considered sufficient to predict individual investors’ susceptibility to the disposition effect in Britain, which has a similar social structure. On the other hand, the US financial market strongly influences the UK market because about half of the UK quoted shares are invested by investors abroad, around half of whom come from North America, according to the Office for National Statistics (2013). Owing to insufficient evidence from the extant literature, I paid attention to the samples used in the PhD theses by two previous students at the University.
3.3.1 Participant characteristics of two previous studies

Work by Richards (2013) on UK retail investors shows that, on average, they are susceptible to the disposition effect and provides demographic analysis for a sample of more than 4,000 individuals. In contrast, based on two experimental studies, Grayson (2017) argues that most individual investors know about the disposition effect and regard it as a poor investment practice. He agrees with Richards’s (2013) argument that investment experience reduces investors’ disposition effect. He criticises the use of student samples because students do not have a similar level of financial sophistication as retail investors, whom the research results aim to generalise. Grayson (2017) also found that it was difficult to access a large number of retail investors in his experimental studies. Experienced investors would like to spend their time trading their investment portfolios instead of participating in an experiment. He justified the use of distance learning, part-time student participants in one of his studies, which collectively encompassed a much more heterogeneous and life-experienced sample than is typical in higher education students. He then found that cognitive reappraisal was effective only on those who were unfamiliar with trading techniques. Given that investment experience (a measure of financial sophistication) varies among participants, whether the former influences inter-personal differences in exhibiting the disposition effect is revealing.

3.3.2 UK graduates or qualified professionals as recruits

The representativeness of samples and the methodology of data collection are important issues for the current research. The current research study required participants with a relatively high level of cognitive abilities to understand the research requirements and collaborate with data collection so working graduates or qualified professionals were recruited. Another reason for recruiting this group of participants was that, in terms of
their average income, they represented a purposive sample that had more surplus for financial planning and investment purposes than non-graduates or non-professionals.

This research used Qualtrics as the platform for two pilot studies and the Main Study, and its survey panels for recruiting participants in one pilot and the Main Study. A pilot study was used to test the research design and participant understanding of what was required from the research prior to launching the Main Study. The first pilot recruited fellow postgraduate students, whereas the second pilot used participants registered in Qualtrics’s panels who took online surveys in exchange for compensation. Panel providers have key demographic information about their members, which renders the provision of researcher-specified samples effective: a relatively large number of responses from a target population can be secured in a relatively short time (Johnson, 2016). This recruitment method is vital for a randomised experiment targeting specific demographics, such as the current research. More importantly, by using the Qualtrics platform, I have the leverage to set criteria for intended participants who take part in a web-based experiment that supports randomisation to groups and enables different manipulations to apply to these groups. Web-based experimentation allows access to participants with representative variations on demographic (e.g., age) and cognitive variables (e.g., financial sophistication) across individuals and groups (Weber and Johnson, 2009). Notably, using various tools available from the Qualtrics platform, such as skip-logic and conditional branching, makes web-based experimentation practicable.

3.4 Ethics

3.4.1 Basics of ethics and informed consent

The current research followed the primary ethical principles and procedures advised by Oliver (2003). The procedures were applied in the two pilots and the Main Study through a survey questionnaire, for example, obtaining informed consent from
participants before the commencement of the survey. Likewise, freedom of withdrawal was available to participants as a pre-requisite for promoting participation. Participants were assured that their data were handled pursuant to the latest provisions of the General Data Protection Regulation. The administration of the questionnaire was performed on the internet through Qualtrics’s system. I strictly adhered to participant confidentiality in the Student Pilot, whereas participant anonymity in the Qualtrics Pilot and the Main Study was guaranteed because I had neither direct access to these participants nor a means to know their identities.

The ethics procedures implemented were subjected to compliance approval by the University’s human ethics review committee. Clearance procedures include the screening of the questionnaire to guard against sensitive questions that may cause harm to participants. Since the current research (including the two pilot studies) involved human beings and questions about their psychological conditions, the questionnaire was reviewed and approval was obtained from the committee.

In devising the survey questionnaire, I followed some salient ethics guidelines for internet-mediated research from the British Psychological Society (2017), outlined as follows. The informed consent states the purpose of research at the start and lists the items to which participants acknowledge their consent if they are willing to proceed further. These instructions include, among others, an explicit right of withdrawal at any point of the survey. A final debrief communicates the benefits of participation in the survey. For the current research, I just mentioned the role of emotion regulation in rectifying some decision biases in investment. Of note, I did not disclose the target behaviour being studied, the disposition effect, because participants may let other people know about the objective so the latter could participate in the survey later, causing biases in the data.

In the debrief, participants were reminded of their right to withdraw before submission. The withdrawal was possible even after they had submitted their data. My email contact at the University was made known to participants so that they could notify withdrawal from participation within one month of submission by quoting the IP address of the telecommunication equipment they used to carry out the survey. Eventually, no
participants withdrew from the survey. The instructions to participants included a statement that there were attention check questions for quality assurance to promote genuine response.

3.4.2 Financial award to performers in the Main Study

In real-life financial markets, investors either gain or lose. The research must not penalise losing participants due to the ethical principle of causing no harm to them, however. Instead, a financial reward was used to motivate active interest from participants to take part in the experimental survey. The current research had limited resources to spend on participant recruitment. I evaluated previous research that provided significant rewards to facilitate participants’ endogenous elicitation of emotion, such as Seo and colleagues (2010). These researchers provided an initial amount of $200 plus performance-linked incentives to each of the 101 participants. As a result, participants gained a bottom-line reward in the range of $100 to $800. This incentive package considerably exceeds my research budget. Further, an excessive incentive as such and the absence of downside risk of loss are likely to promote risk-seeking behaviour, thus affecting participants’ decisions.

On the other hand, I could not penalise participants should they deliver poor performance in portfolio trading due to the ethical reason of causing no harm. The justified way would be to give an attractive reward to a very few participants who perform well in the financial exercise to encourage their engagement with the online experiment. To this end, the top two performers of the trading simulation were each awarded £100 from the research budget to motivate overall participation with engaging affective reactions in the Main Study. When a sufficiently high potential reward is available, participants’ positive emotion would increase, compared to research that does not provide a reward, as if they had a net gain in the trading exercise. This potential award may be a proxy for real trading gains perceived by participants. In parallel, their negative emotion would be increased when encountering losses in the trading simulation, as if they lost in actual trading.
Participants may weigh the length and sophistication against the amount of compensation for completing a survey, thus affecting attrition (Crump, McDonnell, and Gureckis, 2013). An attractive potential reward may help balance participants’ perception of the complexity of the work required. On the other hand, the relatively small compensation paid to each participant (in the form of redeemable points worth around £3 of merchandise) for the time spent to complete a survey did not compromise data quality (Keith, Tay, and Harms, 2017). Likewise, the conditional award as a financial incentive should neither be considered an unreasonable remunerative inducement to participants because it was only meant to encourage genuine engagement, nor would it jeopardise data quality.

Before participants were requested to acknowledge the informed consent statement, they had been led to the first screen of the online survey, where the online survey commenced. Participants were asked to carry it out in a quiet, comfortable, and well-lit place where they could concentrate and were not involved in any distracting activities. The following section discusses how participants were engaged in the experimental survey.

3.5 Participant engagement and the two manipulations

As discussed, only UK graduates or professionals were admitted to participate in the experimental survey. People who were interested to participate were asked where they lived and about their gender and qualifications. The question on gender was set along with a uniform quota, approximating one-half as female and the rest male. Having responded and met the residence, gender, and qualification requirements, participants were randomly assigned to the mindfulness manipulation and then the reappraisal manipulation, which effectively ended up in three treatments and the control conditions: the mindfulness-only intervention (mindfulness = 1, reappraisal = 0), the reappraisal-only intervention (mindfulness = 0, reappraisal = 1), the joint mindfulness and reappraisal intervention (mindfulness = 1, reappraisal = 1), and the control condition (mindfulness = 0, reappraisal
In this quasi-experiment, the most crucial area to be monitored was the mindfulness and mind-wandering instructions administered for manipulating participants’ mindfulness states. Mind-wandering, a psychological condition where one's attention sways away from the current task, tends to recede when mindfulness kicks in (Mrazek, Smallwood, and Schooler, 2012). A mind-wandering induction was set up in a similar setting parallel to the mindfulness induction to synchronously engage participants in a ten-minute duration immediately after they were randomly allocated to either induction by the randomisation protocol in the Qualtrics survey platform.

In this section, I illustrate how mindfulness was manipulated in the two pilots and the improvements made according to observations taken from the pre-testing, which were subsequently implemented in the Main Study. Subsections 3.5.1 to 3.5.4 discuss how participants were engaged in the mindfulness manipulation. Then, Subsection 3.5.5 describes how the reappraisal manipulation was applied in the current research.

3.5.1 Choosing a suitable mode of delivering the mindfulness manipulation

The many meanings of mindfulness imply multiple ways of attaining the state of mindfulness (e.g., by body scan and loving-kindness meditation) – but one thing is common – only slow and gradual cultivation through continual mental training is required to deepen mindfulness (Grossman and van Dam, 2011). People having a regular, preferably prolonged, meditation practice would be a valuable constituent group in the participants, but they are not readily available in large numbers and would be very difficult to recruit as their value system could be different from people who are on the panel lists of survey platforms. Alternatively, using a structured mindfulness-based intervention, such as the MBCT (which requires eight weeks of 45-minute daily guided mindfulness meditation exercises with CD for self-practice and a full-day retreat), would not be practical for the current research due to time and resource constraints in recruiting participants. For these reasons, I focused on how the mindfulness manipulation should be delivered.
The mode of delivery of a mindfulness intervention becomes a challenge to researchers in general as they have to balance the resource input against the effect they intend to achieve (Roemer and Orsillo, 2003). Therefore, I sought the most appropriate method of manipulating mindfulness effectively and in a short time. The work of Feldman, Greeson, and Senville (2010) to study the differential effects on decentring by using mindful breathing, loving-kindness meditation, and progressive muscle relaxation lends support to mindful breathing as the most appropriate mode of delivering a mindfulness intervention because greater decentring is found from mindful breathing than the other two modes of interventions. Meditators, particularly beginner practitioners, need an object to focus their attention. Breathing serves as an anchor into consciousness. It is not a cognitive distracter that creates people’s feelings towards it, as they must breathe anyway. The focus on breathing facilitates the resulting stability and calmness of the mind because such focus avoids stupor (dullness or drowsiness) and agitation (represented by emotional reactivity), which are distracters from concentration that lead to emotional instability (Thrangu, 1993).

On the other hand, body scan (e.g., by way of muscle relaxation) and loving-kindness meditation may not serve as compatible interventions because their primary objectives (i.e., physical and mental relaxation and cultivation of loving-kindness) do not match with those offered by mindful breathing. Therefore, I decided not to use them in the current research.

3.5.2 Conducting the mindfulness manipulation

The following describes how the mindfulness manipulation was conducted in the online survey. Immediately after the qualification question had been asked, participants were randomly allocated to a ten-minute audio induction of two different contexts: the mind-wandering (mindfulness = 0) and mindfulness (mindfulness = 1) inductions. The random assignment was subjected to a quota protocol in the Qualtrics platform to mitigate uneven distribution. The mind-wandering induction advised the audience to let their mind
drift without focusing on anything particular. In contrast, the mindfulness induction was basically a mindful breathing instruction. As discussed in the ensuing paragraphs, after the Student Pilot, I improved the mindfulness intervention by adding a text on deep and slow breathing and related breath counts.

In search of a suitable instruction for the mindfulness induction, I drew on the conceptualisation of the two-component Operational Model of self-regulation of attention and orientation to experience (Bishop et al., 2004). Self-regulation of attention entails that mindfulness is operated and maintained on immediate experience to allow enhanced recognition of mental incidents in the present moment. Orientation to experience refers to how state mindfulness is cultivated – the meditator is ‘not trying to produce a particular state such as relaxation or to change what he or she is feeling in any way. Rather, [...] to make an effort to just take notice of each thought, feeling, and sensation that arises in the stream of consciousness’ (Bishop et al., 2004: 233).

Importantly, I secured the original scripts for the two inductions and the permission for their dissemination from Professor Eric Garland (the lead originator of the Mindful Coping Model; Garland et al., 2009). Appendix-2 and Appendix-3 exhibit the mind-wandering and mindfulness inductions, respectively. The rhetoric of the mindfulness induction is in line with the conceptualisation of the Operational Model (Bishop et al., 2004).

Since English is not my native language, I enlisted the support from one of my supervisors in recording the audios. The instructions were articulated and audio-recorded by Professor Mark Fenton-O’Creevy, who has experience creating mindfulness recordings. They were used throughout the experimental study.

Whilst a researcher-attended mindfulness induction was deployed in the Student Pilot, the effectiveness of this intervention was not 100% satisfactory since some of the students did not meditate seriously, as revealed during cognitive interviewing (see Section 3.6). I needed to consult previous research on the online delivery of mindfulness intervention to improve its effectiveness before its implementation in the Main Study. Meta-analyses on studies using internet-based mindfulness interventions and recruiting
different types of participants, such as patients and non-patients (e.g., university students and employees at work) in randomised controlled trials, support the efficacy of mindfulness-based interventions in improving mental health (Spijkerman, Pots, and Bohlmeijer, 2016) and alleviating stress (Jayawardene et al., 2016). The first meta-analysis found minor effects for most outcomes in improving individual well-being and embraced the wider reach and lower cost accorded to online interventions. In addition to improving mental well-being, the second meta-analysis argues that preventive online mindfulness interventions enhance work or academic performance in the research participants being studied. From these successful examples, I consider that the delivery of a short-duration, web-based mindfulness intervention should be focused on the robustness of the behavioural measurement. The requirements are minimisation of the easy elusion of the quality of state mindfulness (even among participants who seriously meditate) and appropriateness of the self-report measure. I discuss these two issues in the following subsections.

3.5.3 Breath count and timer as attention checks

The cultivation of a momentary state of mindfulness can be facilitated by introducing breath counting (a breath count consists of one inhalation and one exhalation) into the induction (Levinson et al., 2014). Levinson and colleagues (2014: 6) argue that ‘breath counting accuracy tracked with naturally occurring variations in self-reported mindfulness, distinguished well-practiced meditators from novices.’ Breath counting can be used as a scale to measure behavioural mindfulness, which explains an individual’s meta-awareness beyond what is possible with other scales alone (Levinson et al., 2014).

To facilitate the cultivation of state mindfulness, I added a clause to ask participants to count their breaths in the mindfulness instruction. Participants undergoing mindfulness induction were required to follow the pace of deep and slow breathing as instructed in the early part of the induction. They would count their breaths by heart at the
point they were asked to and continued until the induction ended (see the mindfulness instruction in Appendix-3). I set a question on the number of breaths immediately after the mindfulness induction in the questionnaire. To provide flexibility for the accuracy of counts, I allowed results with ±10 counts from a mean of 30 (i.e., acceptable counts range from 20 to 40 counts). It takes 21 breaths to settle the mind (Kongtrul, 1987). The breath count began after participants had carried out three deep and slow breaths so the number of admissible breaths that allowed a participant’s mind to settle was within the permissible range. Participants who fell outside of the range would be exited from the survey.

Since the Qualtrics Pilot (and subsequently the Main Study) would be conducted without the researcher’s presence, it was helpful to build in an attention check for participants’ attendance of the mindfulness induction before conducting the Qualtrics Pilot. The Toronto Mindfulness Scale ‘assesses the level of mindfulness during a single point in time and thus may not reflect a respondent’s true or average capacity to evoke a state of mindfulness’ (Lau et al., 2006: 1462). Therefore, participants had to read and respond to the state mindfulness measure immediately after the induction (as I did for the face-to-face Student Pilot). To this end, I set up a timer for the mindfulness instruction that allowed progression after a stipulated time had passed. A next page button would only appear ten minutes after the instruction began (Question 6 of the questionnaire). Additionally, I set up an auto-advance function to trigger the exit from the survey after 780 seconds had elapsed (Questions 7 and 8) from the start of the mindfulness induction (Question 5). I restricted participants to 13 minutes (a ten-minute induction and three minutes of slack time) on the induction page by setting the timing feature to auto-advance to the next page 13 minutes after the induction screen was shown. This protocol excluded participants who were inactive in the mindfulness induction because the inactivity was a distraction or due to non-attendance during the mindfulness induction, which had to be precluded. Participants were allowed a three-minute slack time in case they wanted to do some exercise (e.g., stretching their legs) after holding themselves in a sedentary posture during meditation.

On the other hand, the mind-wandering instruction with a timer to control the required time of ten minutes for participant compliance was installed (Question 3). The
non-attendance check by auto-advance was not required because inattention during the mind-wandering induction did not make a difference in participants’ state of mindfulness.

The breath count measure and the timer as attention checks were both introduced in the Qualtrics Pilot, and they worked as intended. Their applications continued in the Main Study.

3.5.4 Operationalisation and measure of state mindfulness

Different mindfulness scales measure different constructs. ‘Western psychology mandates that constructs must be explicated and operationalized to be accurately assessed. However, most Buddhist traditions dictate that mindfulness cannot be easily extracted and analyzed in isolation from inherently interrelated concepts’ (Buddhadasa Bhikkhu, 1988; quoted in Grossman and van Dam, 2011: 220). Further, the limitations of self-reports (e.g., bias due to priming) and problems such as the replicability crisis are two major criticisms against self-report mindfulness scales (van Dam et al., 2018). Therefore, the reliable measurement of state mindfulness depends largely on using a suitable measure and on participants’ collaboration in entering and maintaining the state of mindfulness.

The State Mindful Attention and Awareness Scale, one of the two popularly used state mindfulness measures, is derived from the Mindful Attention and Awareness Scale (Brown and Ryan, 2003). The development of the former is intended to measure a current manifestation of mindful attention and awareness of day-to-day activities. This scale is useful to measure the level of mindfulness in recent mindfulness practice, but ‘it does not entail attention and awareness of physical and mental qualia of one’s experience’ (Tanay and Bernstein, 2013: 1286-7), which are properties central to mindfulness practice. Hence, this scale was not chosen for the current research due to insufficient content validity.

Drawing on Bernstein and colleagues’ (2015) metacognitive process model of decentring, I consider decentring to be an essential quality in state mindfulness for
studying the cognitive emotion regulatory mechanism as decentring has the property of disidentifying inner experiences from external circumstances (see Subsection 2.5.6). I decided to use the TMS (Lau et al., 2006) to measure state mindfulness mainly because it contains decentring as one of its two subscales (the other is Curiosity). The scale is formulated on the conceptualisation of the mindfulness condition as ‘an intentional, reflective style of introspection or self-observation that [...] differs from concentrative meditation in that the focus of attention is unrestricted’ (Lau et al., 2006: 1448; emphasis added). Additionally, the application of the TMS was motivated by Garland, Hanley, and colleagues’ (2015) study on the emotion regulatory quality of mindfulness. These researchers found that ‘state mindfulness during mindfulness meditation was prospectively associated with increases in reappraisal’ (p. 234) when participants under a mindfulness intervention experienced higher levels of state mindfulness than those under a mind-wandering condition. For the current research, this scale also served as a check for the effect of state mindfulness, compared to that of the mind-wandering condition.

Garland, Hanley, and colleagues (2015) used the 13-item TMS in a longitudinal study and found significant effects of state mindfulness on habitual cognitive reappraisal in progressive meditation practice. The full TMS scale was required for a small sample (N = 44). Yet, evidence from their study only serves as a reference for the TMS’s viability in checking the mindfulness manipulation’s efficacy, rather than as a basis of comparison with the shorter version measure that I used in the current research because of economical reasons and the mitigation of potential priming.

By streamlining the scale, I could maximise my budget for a sample of 800 intended by the Main Study. Also, I sought to mitigate the potential effect of priming by using a shorter version of the state mindfulness measure because the application of an extensive scale may make the behaviour described by the measure more salient and affect the later behaviour of participants (Krosnick, 1991). The setting in the Student Pilot was that six items selected from the TMS were administered immediately after the intervention (the mindfulness or mind-wandering induction). I chose these items from the full scale based on their (high) ranking in factor loadings and item reliability. This parsimonious use of the mindfulness scale was time and cost effective and had less risk of priming mindful
attention. For instance, using a full measure such as the State Mindfulness Scale (Tanay and Bernstein, 2013; a relatively new but increasingly used scale) may prime participants to be more mindful than they would otherwise be (Upton and Renshaw, 2019), introducing errors to the measurement of the effects of the mindfulness manipulation.

Listed below are the six chosen items from the TMS (Lau et al., 2006). The first three are for Curiosity, and the last three relate to Decentring:

i) You were curious about your reactions to things.
ii) You were curious to see what your mind was up to from moment to moment.
iii) You were curious about what you might learn about yourself by just taking notice of what your attention gets drawn to.
iv) You were more concerned with being open to your experiences than controlling or changing them.
v) You were more invested in just watching your experiences as they arose than in figuring out what they could mean.
vi) You approached each experience by trying to accept it, no matter whether it was pleasant or unpleasant.

Responses were scored ranging from 0 (not at all) to 4 (very much) on the original Likert scale. I adjusted them to read from 1 to 5 to maintain consistency with measures of other independent variables. I used the past tense to measure participants’ reactions to the respective audio instructions they had just attended. Subsequently, items iii) and vi) were removed for the Main Study to cut the length of the scale further, to save space, and minimise the salient experience of mindfulness (see Subsection 4.5.3).

In the Student Pilot, the mean scores of Curiosity (2.97) and Decentring (3.31) were moderate on a 5-point Likert. It is reasonable to expect lower mean scores from an online mindfulness manipulation than from an experimenter-administered induction, along with a parsimonious scale reduction from six to four items in a further attempt to lessen potential priming.
After undergoing the mindfulness manipulation, participants would be led to read either of the two instructions for the reappraisal manipulation, discussed as follows.

3.5.5 The reappraisal manipulation

Following the mindfulness manipulation and its measurement, participants were randomly assigned to a situational reappraisal manipulation. They were instructed to take either of two given roles. One of the roles was to trade for their financial interest, and participants should have a sense of responsibility for decisions they had made (reappraisal = 0). The other was to think of acting as a financial advisor and not be obsessed with the outcomes of individual trading decisions they had made (henceforth “Perspective-taking,” reappraisal = 1). Again, a quota protocol was applied in the random assignment to minimise uneven distribution.

The reappraisal = 1 group was given the Perspective-taking instruction to act as a financial advisor who invests money on behalf of many different clients. The instruction for the reappraisal manipulation was adapted from the supporting information in the work of Sokol-Hessner and colleagues (2009) (see Appendix-1 for the full text of the “thinking like a trader” instruction). Primarily, the text was aimed at distancing participants’ felt responsibility for their trading decisions, set out as follows:

As your goal is to make as much money as possible, you should adopt the strategy of a financial advisor who treats each trading transaction as one of a series of decisions that they make with clients' money. You should not be obsessed with the outcomes of individual trading decisions you have made – you win some, and you lose some. Anyhow, you take risks with money every day, and you are on top of it. So, don’t keep a running total but simply approach the following eight rounds of trading as a very small part of many monetary decisions you make regularly (Item 24 of the questionnaire).
The instruction for Perspective-taking as an advisor intervention had a similar effect to conceptual priming (see Subsection 2.3.4). The instruction may not directly influence participants’ emotions, but it could change participants’ appraisal of the task they were required to perform. The Perspective-taking as an advisor instruction was meant to indoctrinate a “primed identity” of being a different socio-economic capacity (Cohn and Maréchal, 2016) as a financial advisor having rich experience in investment trading, so that participants may treat the trading task “business as usual” and distance their Perceived Responsibility for the trading decisions. As a caveat, people tend to think about what they are told not to think about. Participants might become more obsessed with their trading results than they would be even if they were instructed not to be as such.

In parallel, the following was the instruction given to the remainder of the participants who were advised to trade on their account (reappraisal = 0). I wrote the instruction to mirror the differences from the Perspective-taking instruction as explicated above. Participants were asked to take responsibility for their decision and expressly reminded of the incentive that they could potentially secure:

To maximise the scores of this financial decision exercise, you should focus on the gains and losses of individual funds. As your goal is to make as much money as possible, you should have a sense of responsibility for decision-making in every trading transaction. Any one of the transactions may be the one that you get paid for, so do approach each trading decision seriously and treat each of them in isolation from others. Ask yourself how you would feel if you had some gains and how you would feel should you have some losses. Think also about the incentive that you would get if you got your decisions right.

There are only eight rounds of trading so try your best in making the decisions. Remember, the INCENTIVE of £100 is out there for you! (Item 22).

The instruction for trading own assets advised participants to take in “a sense of responsibility for decision-making in every trading transaction” and asked them to try their best in making the decisions.
As money primes people to pursue individualism (Kahneman, 2011), the reminder on the incentive of £100 emphasised the potential award that participants may get, so they would aspire to it. This motivation was expected to bring about their undertaking of more responsibility for their decisions than they would be if they were not instructed as such.

As discussed in Chapter Five, the instructions for Perspective-taking as an advisor and trading own assets turned out to prime participants, but they did not work as intended.

After reading the respective reappraisal texts, participants were asked to perform a trading simulation. Soon after they had completed the trading exercise, participants were asked the following question to measure the level of Perceived Responsibility and serve as a check on the reappraisal manipulation:

*You felt that you were responsible for the gain or loss when you were making trading decisions for the investment portfolio* (Question 97).

Responses were scored on a five-point Likert, ranging from 1 (strongly disagree) to 5 (strongly agree).

A one-item measure, instead of multiple-item measures, was used because there was no need to separate the responsibility for gains from the responsibility for losses and the item was used only as a manipulation check. The measure asked about the overall responsibility felt for trading decisions between the two treatment groups.

Of note, Sokol-Hessner and colleagues (2009) did not check the responsibility level felt by their participants between the perspective-taking as a trader and control conditions. The current research has had no previous evidence to compare the manipulation effect.

In the following sections, I assess key findings from the two pilots. Importantly, I discuss the rationale of designing a free trading simulation for use in the Qualtrics Pilot as a substitute for the pre-set trading selections due to the findings from the Student Pilot.
3.6 The Student Pilot

The previous section on the mindfulness manipulation illustrated how it was devised initially in the Student Pilot. I sought improvements from the Student Pilot and implemented the refined manipulation in the Qualtrics Pilot and the Main Study. The purposes and methodology of the Student Pilot and improvements suggested from its findings are discussed in the following subsections.

3.6.1 Abstract of the Student Pilot

The Student Pilot was used to test participants’ understanding of the research requirements. The pre-set trading selections served as the metric for measuring the disposition effect (refer to Subsection 3.6.3). The student participants were subjected to a ten-minute mindfulness induction along with a randomised allocation to one of the two situational reappraisals (Perspective-taking to act as a financial advisor vs trading one’s assets). In the researcher-attended online survey, I conducted face-to-face cognitive testing of participants to ensure that what the latter understood of the survey questionnaire corresponded to what was intended by the present research (see Subsections 3.6.5 to 3.6.7). Also, I observed how participants underwent the manipulations and carried out probing if required, so as to devise improvements to address weaknesses. Consequently, I implemented a timing protocol and a breath count measure as attention checks on the mindfulness intervention (see Subsection 3.5.3). I replaced the pre-set trading selections model with a free trading simulation to measure the disposition effect for use in later studies. This replacement was required chiefly due to a critical complaint from participants that the pre-set trading selections were not their decisions so they should not assume any responsibility for the outcomes (discussed in Subsection 3.7.3). The refined setting was used in a self-administered pilot for further improvements.
3.6.2 The research design of the Student Pilot

Eighteen fellow PhD students at the Open University participated in the Student Pilot in Spring 2019. It took about three weeks to administer the 18 cases in separate survey interviews. Every participant was invited to a room on the University campus explicitly booked for the researcher-attended online survey. I briefed them about the pilot's objectives and asked them to administer the survey using the computer facility provided by the campus. After giving consent to the survey, they underwent a ten-minute mindfulness induction (mindfulness = 1) and reported their scores for the TMS. Then, they were randomly allocated to read either of the reappraisal instructions, trading their investments (reappraisal = 0) or thinking to act as a financial advisor (reappraisal = 1).

Having responded to the instructions on the two manipulations, the student participants were advised that they had £24,000 to trade four stocks. They were requested to maximise the portfolio’s return in a series of four performance reviews. The initial purchase of the four stocks in equal amounts (at £6,000 each) was made as a pre-set portfolio. Participants were asked to make trading decisions as performance reviews of investments bought and sold for a series of four pre-set decision rounds. They were also asked to report on the levels of positive and negative emotions immediately after the outcome of each round of decisions was made known to them. After trading, they were asked to answer questions on their orientations about the trading exercise. The questionnaire continued with enquiries about feelings or thoughts on everyday lived experiences. These self-reports measured habitual emotion-functioning attributes: trait mindfulness, trait positive reappraisal, and trait catastrophising.

The survey had two types of measurements. The first type was the set of psychometric measures adapted from relevant research, which measured participants’ dispositional characteristics (e.g., mindfulness traits) and orientations towards the cognitive task (e.g., participants’ Perceived Responsibility for their trading decisions). All these psychometric data were in the form of self-reports, which were essentially attitudinal data. The second type was the set of behavioural measures of participants’ cognitive task
performance – investment selling and buying behaviours (particularly the former that measures the disposition effect) under manipulations. These measurements were obtained from participants’ scores in the trading exercise, devised as a pre-set trading selections model (henceforth “Pre-set Trading Model”) for measuring the disposition effect.

3.6.3 Design of the Pre-set Trading Model

Participants made trading decisions as performance reviews of investments bought and sold in a series of four pre-set decision rounds, with restricted choices about what could be bought and sold. Although the ecological validity of this setting was compromised, there were two good reasons for providing pre-set trading selections. First, inter-personal differences in participants’ behaviour could be measured and compared under the same set of conditions. Second, the setting facilitated survey administration and data analysis. Given the presumed condition to provide all concomitant choices to participants for studying emotions in the exhibition of the disposition effect (the initial plan to be achieved for the research), the pre-set trading selections design devised for the Student Pilot was preferred to random trading selections accorded to simulation.

Financial information was available to participants progressively at every trading point and performance review. Participants were given the market prices of four stocks at these stages. Four rounds of decision-making comprised trading behaviour of selling gains and losses and buying these stocks again in pre-set volumes. Participants were asked to select from these given trading choices immediately after the trading outcomes of a previous decision were made known to them. I understood that a setting in which decision choices were fixed might not provide an environment that was as emotionally arousing as in real-life trading. Instead, participants were given charts on stock prices and portfolio profit and loss positions when they were asked to make trading selections. This setting was similar to the stock market. I selected four stocks from the FTSE and used their historical prices in 12 months as the stock prices for the simulation-based questions. Four stocks were used because this is the average number for individual investors’ portfolios (Barber
and Odean, 2001). This mimic setting improved the research’s ecological validity as participants were trading a historic FTSE portfolio. Participants were asked to carry out periodic reviews for the performance of a portfolio of four pseudonym stocks, A, B, C, and D, by making trading decisions of buying and selling them in four successive periods of three months each.

The rationale of the trading selections design is that participants are presented with a pair of gains and losses to decide their divestment until they keep either the gains or losses, with cash proceeds realised from any sales of assets. **Figure 3-1** below shows the decision paths of trading selections. Stocks A and C are on ascending trend while prices of stocks B and D are falling. Decision-making (DM) 1 asks participants to sell either the AB or CD gain-loss pair or choose a no-change selection. Out of these three choices, 11 trading decisions are presented to participants in DM2. Among them are options to enhance the holding of either the AB or CD pair by buying more of the stocks. The figure shows the design in two parts which reflect successive trading choices: Part I displays the decision tree branching from DM1 to DM4, whereas Part II shows the 18 scenarios and their trading selections from the outcomes of the second decision round (DM2). The little numbers (17 – 34) adjacent to the outcome/decision boxes represent item numbers in the decision tree. The blue lines between decisions denote the flow of the experiment, where participants are presented with the choice of a set of trading selections at their respective outcome positions. The number in front of a letter represents the portion of shares to be bought or sold. For example, a participant who chooses to sell stocks C and D in DM1 (Item 17 in the figure) will have the outcome consisting of the original portions of stocks A and B and the sale proceeds from stocks C and D (i.e., “A, B, Cash,” Item 18). If the participant keeps a no trading or no change (NC) strategy, they will end up with a zero disposition effect, which is a position where neither losses are held more than gains, nor the reverse. I specifically classify the decisions of just repurchasing gains without subsequent trading (i.e., a buy-and-hold strategy) as a zero disposition effect. When participants continue to keep a portfolio of mainly equal portions of gains and losses or perform no trading till the end of trading, 27 outcomes show a zero disposition effect in the model. Each of them has one of the following outcomes: “A, B, Cash,” “2(A, B),” “A, B, C, D,” “2(C, D),” and “C, D, Cash.”
**Figure 3-1 The decision paths of trading selections**

### PART I

**DM1**

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<th>A</th>
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<td>B</td>
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### PART II

**SUBSEQUENT SELECTIONS SHOWING NO-CHANGE PATHS, SEE OTHER PATHS IN PART II**

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**Key:**

- P = Purchase, S = sell, NC = no change, DM = decision making

- Sell gains
- Purchase gains
- Purchase gains, sell losses
- A disposition effect is determined in DM4
- Sell losses
- Purchase losses
- Purchase losses, sell gains
- A reverse disposition effect is determined in DM4

**Note:** Stocks A and C are on ascending trend while stocks B and D on descending trend.

Part I shows the parade of the 4 decisions with the No Change option leading to DM3, while Part II demonstrates how other choices branch out and their respective results.

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In the total of 139 decisions cumulating at the end of trading (the fourth round), 76 result in a disposition effect, 36 exhibit a reverse disposition effect, and the remaining 27 represent a zero disposition effect as described above. The following explains how they evolve, with a supporting illustration from Figure 3-1 above.

A participant makes the second decision at the blue line leading to three choices with the first one to buy gains using the available cash at hand (two portions of stock A, Item 21), which results in a total of three portions of stock A and the original portion of stock B (i.e., “3A, B,” Item 22). Then, the participant chooses from the three trading selections: selling stock B which results in “3A, Cash,” not acting (i.e., “3A, B”), or selling stock A which ends up with the outcome “2A, B, Cash,” as shown in the first item of Part II. The first outcome will lead to three results after buying, not acting, or selling the gains: “4A,” “3A, Cash,” and “Cash” (see the first trading selection in the mid-column of Part II). Trading choices and outcomes may occur iteratively. When these outcomes occur in the last round of trading, the participants concerned are considered to exhibit a reverse disposition effect.

In DM3, participants face 43 choices: selling gains and buying losses, selling losses and buying gains, and just selling gains or losses. These 43 decisions branch out into 139 scenarios in DM4, where participants face similar selection choices as in DM3. Decision-making ends at DM4 when participants choose to keep one or two stocks or cash in their portfolios. This is the point where the financial behaviour is measured, when a disposition effect, a reverse disposition effect, or zero disposition effect is determined.

The formulation of these series of trading decisions, as discussed in the next subsection, was derived from conceptualisations of the theory-originators’ asymmetries in risk affinity towards gain and loss (Shefrin and Statman, 1985). Additionally, I have drawn on the argument of Weber and Camerer (1998, an experimental study) that the reference point should be fixed for participants, so the decision path model adopted the purchase price standing at the start of Month 1, the time when DM1 was made.
3.6.4 The rationale of the Pre-set Trading Model

The design of the model presents at least a pair of a gain and a loss concurrently to decision-makers so that emotions arising from gains and losses can be instantly measured. Unlike the work of Seo and colleagues (2010) which studied affect as one of the predictors leading to changes in risk affinity under different decision frames, I used mindfulness and cognitive reappraisal as the antecedents that may cause inter-personal differences in the disposition effect. So, I used a one-item measure for positive and negative emotions (the Evaluative Space Grid; Larsen et al., 2009) to measure changes in the two emotions felt by participants when they faced gains and losses in trading and different emotional intensities among different treatment groups. The primary reason for using the one-item measure was to reduce any unintended priming effect due to salient experience of emotion by repeated enquiry of its various facets (discussed further in Subsections 3.7.8 and 4.5.5).

The trading design restricts how much decision-makers wish to sell, and they may be asked to choose to sell everything or nothing. The application of these trading choices, along with the price charts adopted from four FTSE stocks at contemporaneous periods, tried to present an ecologically valid setting for participants to make trading decisions.

Outcomes of the Pre-set Trading Model selections were expressed in £ values. These value positions could be used to compare participants’ performance (for awarding the planned incentives to performers). The research design also enabled the measurement of participants’ emotions concurrently with their realisation of decision outcomes. This set-up would overcome the difficulties of catching and registering instant emotions at the respective points of disposition effect scores (i.e., -1, 0, and +1). Initially, the series of positive and negative emotions measured were considered as repeat measurements for emotion activations. This design originally aimed to obtain panel data for measuring mixed emotions, but the ambivalence study was curtailed later (see Subsection 2.7.6).

For participants who were presumably non-professional investors, selecting from multiple choices was relatively easier than gauging and calculating the proportions of money to invest and divest in the four rounds of trading. Free trading might introduce
cognitive load and learning effects for those without investment experience. By prescribing a pre-determined decision path for participants, they could act on a level playing field without requiring arduous input from them as in a trading simulation, allowing their cognitive-affective mechanism to play during trading. This setting may provide a ceteris paribus condition for the influence of the mindfulness and the reappraisal manipulations to work on participants’ exhibition of the disposition effect, so that between treatments group differences could be revealed.

Figure 3-1 above shows more possibilities for a disposition effect than a reverse disposition effect (i.e., more orange than blue trading outcomes). If a participant made choices randomly, this could lead to a measurement of a positive disposition effect without the participant having such a disposition. However, the hypotheses did not depend on the overall average disposition effect, but on inter-personal variations among manipulation groups. Participants’ trading decisions were considered to depend on how they perceived gains and losses. Trading choices were produced in pairs of gains and losses when they made decisions, albeit the complexity of the decision tree selections.

It is logical to expect bimodality in the distribution of the disposition effect scores using the Pre-set Trading Model. Yet, its application would not render the use of correlation and regression inappropriate (Howell, 2007). I then needed to examine the Student Pilot data carefully and evaluated critical implications for the Main Study.

Nevertheless, as discussed later in Section 3.7, based on findings, participant feedback, and my further reflection, I subsequently used a free trading simulation to measure the disposition effect in the Qualtrics Pilot and the Main Study.

3.6.5 The rationale for cognitive testing

Attitudinal data are not naturally occurring because they are not collected from behaviour that would happen even if such collection was not there. Attitude measurement is contextual; for instance, question context and order may shape the answers (Schwarz,
Online surveys do not allow participants to go back to previous questions, so the notion that subsequent questions influence responses to preceding ones does not apply to the current research. Regarding the context, the development and testing of a survey questionnaire through cognitive testing require that originators of the questionnaire anticipate how participants think and feel about the questions to be answered (Schwarz, 1999). To solve this issue, the current research first adopted validated measures from established research that had proven construct validity. Second, 18 fellow students were asked to pre-test the content validity of the questionnaire in the first pilot study. A researcher-supervised online survey with the student sample afforded data to be collected from them in a setting that was, as far as possible, real-life.

It is imperative to test participant understanding of the questionnaire where words, spoken either by participants or by the researcher, are used to guide data collection. In this way, the researcher can delve into these data to understand whether the participants’ words correspond with what the research intends. This qualitative refinement of survey responses is the essence of cognitive interviewing. Cognitive interviewing can be conceptualised as mixed-method research that entails qualitative and quantitative approaches (Tashakkori and Teddlie, 2003). The deployment of a mixed-method design provides a valuable tool in overcoming the limitations found in a single method of either a qualitative or a quantitative approach. Understandably, this research study did not overly emphasise the qualitative aspect of the methodology. Rather, using a highly structured questionnaire enabled the present research to utilise the totality of information obtained to assess participants’ interpretations and understanding of the research objectives.

Cognitive interviewing is used to detect disconnections between what the researcher means and what the participants understand about the questions being asked (Willis, 2015). Essentially, it is reparative, targeting the reduction of response errors. The purpose is to determine which attributes of the survey questionnaire will be reliably measured. The second purpose of cognitive interviewing is to eliminate features that cannot be reliably measured (e.g., Perceived Responsibility measured under the deployment of the Pre-set Trading Model, see Subsection 3.6.8). Findings from cognitive interviewing facilitate improvements of the questionnaire by rewording, reordering, and
reconceptualising questions so as to minimise misinterpretations and defects (Willis, 2015). Additionally, cognitive interviewing reduces redundant or superfluous data that may lead to conflicting results.

In the Student Pilot, cognitive interviewing aided the evaluation of the viability of measures, for instance, the evaluation of emotion activation when participants performed portfolio trading as initially intended by the research. Measures of positive and negative emotions were asked and evaluated. Nevertheless, as revealed later in the Qualtrics Pilot (see Section 3.7), the study of experienced emotions and ambivalence at each round of trading was discarded after assessing the related measures from cognitive interviewing.

3.6.6 The think-aloud protocol

Data obtained from the refined questionnaire were subjected to quantitative analysis. Yet, biases may underlie self-reports from a survey. A good way to avoid the problem was to request participants to concurrently verbalise their thinking when they took part in the survey in the researcher's presence. In the face-to-face survey interview, I encouraged participants to think aloud, a protocol endorsed by Ericsson and Simon (1980, 1984) to externalise the functioning of cognitive processes. This think-aloud process may elicit immediate expression of participants’ thoughts when making the trading decisions. The process is ‘the only nonreactive method of collecting the verbalized contents of thoughts while participants focus on completing challenging tasks’ (Fox, Ericsson, and Best, 2011: 338) without altering the accuracy of objectively measurable performance.

I did not secure a 100% collaboration from participants to interview using the prescribed think-aloud protocol. I needed to use cognitive probing to complement the cultivation of verbal responses from participants when completing the questionnaire, for example, an exploratory probe such as “why did you select this choice?” Importantly, participants’ concurrent responses to why-questions in quick succession to a task required by the survey were much desired because after-the-fact reconstructions could be
misleading. To avoid potential confabulations, simultaneous recall of the thinking process added cognitive load to participants and made sense of what they were doing (Willis, 2015; Ericsson, 2018). Another undesirable effect to avoid was reactivity, which refers to a change in participants’ behaviour after the probing even though such change was within the interview context. To this end, I focused on participants’ responses to key questions and reduced interjecting probes only to superficially contradicting answers to these questions so as to maintain a reasonable degree of adherence to the survey flow and participant engagement.

I conducted survey interviews in three phases, consistent with a reparative or refinement approach for cognitive interviewing. In the first phase, I stopped after the second interview and assessed the results. I carried out rewording, reordering, and reconceptualising of questions according to the findings from the notes of the first two interviews. Then, I went on to interview another three fellow students with the refined questionnaire. Again, I revised target questions, if required, from the verbatim quotes of the three participants. The cognitive interviewing process was an iterative sequence composed of testing, analysing, and revising, which repeated one cycle after another (Willis, 2015). By executing this process, I ensured that what each question meant to participants was the same as the research intended. I managed to consolidate a refined questionnaire after the second phase and used it in the third phase, in which I conducted 13 interviews.

3.6.7 Addressing issues in the Student Pilot

Before launching a full study, I used the findings from the Student Pilot to revise the survey questionnaire, making it more understandable and user-friendly. This was crucial because I could not physically observe and keep track of how participants administered the subsequent online experiment. On the other hand, self-administered participants might tend to cut corners for various reasons (to be discussed in ensuing paragraphs); hence, results could be compromised.
I identified that some of the participants did not read the questions aloud after being asked to do so. Also, I obtained feedback from the student participants after each interview. Their general comments were that more explanatory materials were required, especially for the financial decision exercise, and financial information could be presented in other ways. These issues were particularly pronounced for non-finance students who did not know how to use financial data to make trading decisions. The problem was that participants might behave differently if they did not understand the context of the survey requirements. This problem would cause measurement errors in the research. All these issues may cause threats to the validity of the disposition effect measurement.

To ensure that the questionnaire asked what was required, I went through the various feedback and the approximate time spent on selecting trading choices. I obtained the information from the student sample to check which parts of the questionnaire they found difficult to understand. I discuss this analysis further in the next subsection.

3.6.8 Participant characteristics and financial information required

I differentiated participants into disposition and non-disposition investors. Generally speaking, most participants from both groups had no investment experience (a proxy for financial sophistication). Two participants from the non-disposition group used financial advisors to handle their investments. A relatively high proportion of participants from each group agreed that price movements seemed to show a trend for some stocks, but the pattern might reverse shortly due to correction. Both groups had no regular meditation practice before, except for three meditation practitioners having experience of three years or more in the group of non-disposition participants (17% of the sample) and one who had practised meditation for a similar duration among the disposition participants (6%).

7 Hence, a category for using financial advisors was added to the investment experience question in the final questionnaire.
From the interview notes recorded in the Student Pilot, some of the participants said they had insufficient trading choices, so they just selected “no action” all along. For example, Liza (pseudonym), a non-disposition participant who was knowledgeable in finance as she had a professional qualification in banking and had belonged to an investment club with friends in the finance sector for over ten years, asked if a stop-loss option were available to her. She commented that information and trading choices were insufficient for her to make decisions. These requirements were in stark contrast with those of Kimberley (pseudonym) who was financially naïve; for example, she needed an explanation of a stock’s price-earnings ratio.  

I understood that it was not easy to balance the amount of information available to different participants, but the research design should provide sufficient trading opportunities for participants. Typically, the students who complained that they did not have enough choices to select from argued that they should not be held responsible for their decisions as a result. This disclaimer would have a critical impact on the measurement of their Perceived Responsibility for trading decisions. Consequent to this finding, I re-devised and replaced the disposition effect measurement from the Pre-set Trading Model with a free trading simulation to rectify the flawed design that led to the wrong perception of responsibility for trading decisions. This is discussed in the ensuing section.

3.7 The Qualtrics Pilot

3.7.1 Abstract of the Qualtrics Pilot

The Qualtrics Pilot chiefly aimed to test participants’ performance of a free trading simulation as the metric for measuring the disposition effect (see Subsection 3.7.5), which

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8 Price-earnings ratio is a measure for valuing a company based on its current share price relative to its earnings per share.
was conducted in a self-administered online survey by participants recruited through Qualtrics’s panels. A second objective was to test whether randomised allocations of participants in the mindfulness and the reappraisal manipulations worked as intended in the absence of the researcher. Specifically, I tested the application of a timing protocol and a breath count measure as attention checks on the mindfulness intervention (refer to Subsection 3.5.3). Other objectives included testing the revised questionnaire (based on findings from the Student Pilot) and monitoring the time required to complete the survey (see Subsections 3.7.6 to 3.7.9). Having achieved these objectives, I used the revamped questionnaire including the free trading simulation in the Main Study.

3.7.2 The research design of the Qualtrics Pilot

Forty participants recruited from Qualtrics’s panels participated and completed the Qualtrics Pilot on 3rd September 2019. The participants carried out the online survey in a place and at a time of their choice. They started by giving their informed consent. Then, they all underwent two randomised manipulations. The first was a ten-minute induction of either a mind-wandering instruction (mindfulness = 0) or a mindfulness instruction (mindfulness = 1). The second was reading a reappraisal instruction of either own trading (reappraisal = 0) or thinking as a financial advisor (reappraisal =1). After they had responded to instructions on the two manipulations, they were advised that they had a sum of £24,000 to trade four investment funds and were requested to maximise the portfolio’s return by carrying out a free trading simulation. Participants were asked to make trading decisions as performance reviews of investments bought and sold for eight rounds. They were asked to report on the levels of positive and negative emotions before trading and immediately after the outcome of the last trading was made known to them. Having finished the trading simulation, they were asked to report their thoughts or orientations about the trading exercise and trait measures of mindfulness, positive reappraisal, and catastrophising.
3.7.3 The rationale of a free trading simulation

As the disposition effect is hypothesised to be an affect-related tendency influenced by gains and losses experienced by investors, I initially designed the experiment using a Pre-set Trading Model to measure the disposition effect (see Subsection 3.6.3). In designing the initial pilot survey, I considered the studies of Weber and Camerer (1998) and Summers and Duxbury (2012). Weber and Camerer (1998) deployed six stocks with pre-determined stock price movement patterns made known to participants, but the researchers did not identify which stocks rose or fell. They used an alpha coefficient⁹ to measure the disposition effect in 14 trading rounds by investigating whether participants used the last period’s stock price as the reference point for trading in a current round. I did not adopt the design used by these researchers as it did not measure participants’ emotions, and the complexity of such a design might not be suitable for an online survey.

On the other hand, Summers and Duxbury (2012) conducted separate experiments to study felt responsibility and emotions using a simpler setting aided by stock price charts to imitate an investment trading environment. I borrowed the idea of using stock price charts and elaborated the design with price-earnings ratios as financial information provided to participants in the Pre-set Trading Model. The Student Pilot found this setting too complicated for most participants, although some claimed that insufficient information was provided to them.

The Pre-set Trading Model was intended to provide a set of relatively simple decision paths for participants to exhibit a disposition effect. Initially, I tried to produce an ecologically valid setting of a stock trading environment using price charts for four stocks. Participants had to trade stocks in pairs of rising and falling stocks, and I measured, in each round, both positive affect (e.g., elation) and negative affect (e.g., regret) using self-

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⁹ \( \alpha = \frac{(S+ - S-)}{(S+ + S-)} \), where \( S+ \) stands for a sale of gain if the price has gone up from the last period, and \( S- \) represents a sale of loss when the price has gone down from the last period.
report. Elation and regret are two of the emotions studied by Summers and Duxbury (2012). However, having reviewed the responses and comments collected from the Student Pilot, I found that the design might be flawed. First, participants claimed that they did not feel responsible for their trading performance as they were not the decision-makers who bought the stocks in the first place and subsequent trading. Second, limiting the choices for stock trading participants would not likely be emotionally engaging as they would consider that these were not their choices, or there might be insufficient choices for them to select from. Chang and colleagues (2016) let participants trade freely in the real-life market, thus providing abundant trading choices to participants. So, these participants did not have the problem as observed in the Student Pilot. Nevertheless, I did not have high financial resources to research in a similar setting.

In the Student Pilot, the survey asked participants to register their emotions immediately after making a trading decision. This approach may have primed their feelings to change the impact of emotions, making them more salient. As a result, it would cause measurement errors in the study. Avoiding measurement errors was one of the reasons why Summers and Duxbury (2012) did several experiments to conclude the effects of various emotions on participants’ behaviour. In addition to the potential occurrence of priming, asking about participants’ emotions after every trading round would make the experiment too lengthy and onerous for participants. Hence, I would only measure the baseline emotions, positive and negative, immediately before the first trading decision (which was shortly after the two manipulations) and the emotions instantly after recognising the final trading outcome, since my focus was primarily on how the cognitive-affective processes of emotion regulation and mindfulness affected individuals’ divesting behaviour.

It was not until the completion of the Student Pilot did I realise that the restriction of trading selections had resulted in a reduction in felt responsibility by some participants, since they considered the restricted choices not the decisions they would have made. Hence, a free trading simulation was used as the medium to collect trading data from participants (henceforth “Free Trading Simulation”). This was also a contributor to my increasing conviction that the study should be as ecologically valid as possible. Further, I have become more aware of the implications of the restrictions on participants’ perceptions
as a consequence of the pilot (as hindsight is always more accurate than foresight). Another reason for replacing the Pre-set Trading Model was that data collected from it were to be analysed by multinomial logistic regression or probit regression, as the disposition effect was measured on a “negative-zero-positive” scale. Logistic regression analysis was not novel to the study of the disposition effect (e.g., the fieldwork of Grinblatt and Keloharju, 2001, which studied a large dataset). Yet, data analysis using multinomial logistic regression was not preferred, especially when a smaller sample was obtained in an experimental study than field data. In devising the new simulation, I was expecting a bell-shaped, normal distribution for the disposition effect measurement due to a reasonably large sample to be secured in the Main Study.

3.7.4 The Free Trading Simulation and cognitive-affective issues

There were three reasons for replacing the Pre-set Trading Model with a Free Trading Simulation. The first was the restriction of trading selections in the Pre-set Trading Model. Second, measuring the propensities in holding and selling assets prescribed by the Pre-set Trading Model did not resemble real-life decision-making by retail investors. The third and most important of all, pilot participants claimed that these were not their own decisions, which rendered them unable to assume responsibility for the decision outcomes. I continued to evaluate the new setting to be used in the Main Study and its relationships in measuring the disposition effect further. Issues of participants’ cognitive load and emotion against a trading simulation programme are discussed as follows.

Initially, I did not consider using a trading simulation partly due to the steep learning curve to be experienced by participants in completing the highly laborious and cognitively demanding task of portfolio trading through the internet (as reviewed in Grayson’s 2017 study). I consulted previous experimental research on the disposition effect that deployed a trading simulation and studied emotion. The work of Chang and colleagues (2016) suggests that trading is not an easy task as the student participants communicate
among themselves about the financial information involved in trading. Using simulation may not reliably measure the right kind of emotions. Either the simulation may not be sufficiently salient to elicit the required emotions for participants to exhibit the disposition effect, or too much emotion may be activated due to excessive cognitive load exerted on participants (Grayson, 2017). The cognitive load experienced by participants may even alter the valence of emotion.

To address the cognitive issue, I simplified the financial information provided to participants by cutting out price-earnings ratios for assets. Also, I cut down questions on self-report emotions during trading to reduce cognitive load and interferences for participants. The Free Trading Simulation turned out to be a medium for dynamic decision-making under uncertainty. The decision-making process operative in the present research met Brehmer’s (1992) conditions: i) the process occurs in a situation that changes over time due to dependence on the decision-maker’s previous actions or outside of the decision-maker’s control, and ii) the decisions must be made in real-time. Participants had no financial performance indicators to assess prospective price changes. They could just use current and historical fund prices and charts to make trading decisions. Eventually, the simulation went satisfactorily in the Qualtrics Pilot. Its use in the Main Study fulfilled the overriding requirement of reliable measurement of the disposition effect.

3.7.5 Designing the Free Trading Simulation

When the preceding considerations were taken into account, the best solution was to use a trading simulation that provides a practicable number of trading occasions to reduce complexity, given that a trading simulation requires in-depth cognitive input from participants. I preferred a simulation design using historical stock data to real-life interactive trading (e.g., as used in Chang et al., 2016) because the latter was highly resource-demanding. As did Braga and Favero (2017), the simulation limited the number of investments to four. Price charts were used to emulate a trading platform to improve
ecological validity. The price charts used in the current research were developed from four FTSE stock data during the eight months between 15\textsuperscript{th} October 2018 and 21\textsuperscript{st} June 2019. I reversed their price records chronologically, thus the resulting price patterns, so that no participants would have ever seen such charts before.

To describe the nature of the four investments: Fund A is investing in the finance industry, Fund B is a biotech fund, Fund C holds energy conglomerates, and Fund D is a fund for the construction sector. These descriptions of underlying assets for the funds have been fabricated, and they do not represent the sectors where the four FTSE stocks belong. Funds A and B do not show a pattern of overall growth or decline, but they are not mean-reverting either. Funds C and D are on momentum patterns: where the former is falling, and the latter is rising. Their price patterns are shown in the series of charts displayed progressively to participants in the simulation. Eight months of data mean eight rounds of periodic reviews in the simulation. \textbf{Table 3-1} displays the prices and ratios of price changes for the four funds in the eight trading rounds and potential sales of gains and losses in each round.

\begin{table}[h]
\centering
\begin{tabular}{lcccccccc}
\hline
\textbf{Period} & \textbf{1} & \textbf{2} & \textbf{3} & \textbf{4} & \textbf{5} & \textbf{6} & \textbf{7} & \textbf{8} \\
\hline
\textbf{Price £:} \\
FUND A & 105.50 & 101.24 & 95.00 & 99.50 & 100.39 & 101.30 & 109.00 & 98.67 \\
FUND B & 99.79 & 113.00 & 107.90 & 110.81 & 106.32 & 95.00 & 97.98 & 96.51 \\
FUND C & 105.28 & 97.43 & 102.36 & 95.79 & 89.68 & 81.00 & 79.16 & 73.80 \\
FUND D & 97.00 & 110.66 & 128.47 & 136.80 & 145.51 & 156.06 & 158.43 & 149.48 \\
\hline
\textbf{Price change:} \\
FUND A & 1.055 & 0.960 & 0.938 & 1.047 & 1.009 & 1.009 & 1.076 & 0.905 \\
FUND B & 0.998 & 1.132 & 0.955 & 1.027 & 0.959 & 0.894 & 1.031 & 0.985 \\
FUND C & 1.053 & 0.925 & 1.051 & 0.936 & 0.936 & 0.903 & 0.977 & 0.932 \\
FUND D & 0.970 & 1.141 & 1.161 & 1.065 & 1.064 & 1.073 & 1.015 & 0.944 \\
\hline
FUND D & S- & S+ & S+ & S+ & S+ & S+ & S+ & S- \\
\hline
\end{tabular}
\caption{Price changes of four funds showing whether sales would be a gain or a loss}
\end{table}

\textbf{S+} Sale of a fund when a gain resulted from its prior period
\textbf{S-} Sale of a fund when a loss resulted from its prior period
Every fund is priced at £100 at the start of Period 1 (P1). The table shows price changes progressively from a prior period to the following period. For example, Fund A changes to £105.50 at the end of P1, so the price change is 1.055, as shown. It then changes to £101.24 at the end of Period 2 (P2), representing 96% of the P1 price. S+ stands for a sale of gain if the price has gone up from a prior period, whereas S- represents a sale of loss when the price has gone down from a previous period. The table demonstrates a reasonable and comparable distribution of potential outcomes of S+ and S-.

The trading simulation prescribed that participants gauged the proportions of money to invest or divest in each round of periodic reviews. Information given to participants in the simulation is best appreciated by inspecting the survey questionnaire. Appendix-4 exhibits a full rubric of the online questionnaire used in the Main Study. In particular, the screenshot specimens of questionnaire items illustrating the information given to participants for selling funds (Q34) and buying funds (Q36) are extracted from the entire questionnaire and appear below in Figure 3-2 and Figure 3-3, respectively.

To illustrate, at the start of P1, participants are asked to use the available cash of £24,000 to buy any of the four funds in the amounts they wish. The investment simulation begins with a uniform purchase price of £100 for each unit of funds. At the end of P1 (the start of P2), the performance of funds is reviewed as fund prices change. Details of prices, price charts, and the various outcomes of fund values for the four funds and cash (if not used) are shown to participants, as exhibited in Figure 3-2. Participants can sell the funds they hold using the slider bars (a Qualtrics survey tool) to set the proportion of investment in a fund they wish to sell in the question item. They are advised that the cash released from the selling of funds may be used to re-invest the funds again in the next round.

Participants’ repurchasing of funds in P2 is illustrated in Figure 3-3 below. I have used coding facilities on the Qualtrics platform to display information on the values of current holdings to participants in each round. The first paragraph shows the coding texts for cash and investment values of the four funds at the start of P2 after selling funds. Details of prices, price charts, fund values for the four funds, and available cash for individual participants are displayed to them for making purchase decisions from that point.
**Figure 3-2 Specimen question for participants to sell funds (Q34)**

Below are the charts for the 4 funds showing the price movements during the previous period (P1). Now at the start of period 2, the unit prices of Funds A, B, C, and D are £105.50, £99.79, £105.28, and £97.00, respectively.

You can sell the funds you currently hold by using the sliders below to set the proportion of your investment in a fund you want to sell. You will then have an opportunity to re-invest the cash you have released.
Figure 3-3 Specimen question for participants to buy funds (Q36)

You now have cash of £$e\{\text{round(e://Field/Cash1postsalesvalue, 0)}\}$ and the following investments: £$e\{\text{Field/FundA1postsalesvalue}\}$ in Fund A; £$e\{\text{Field/FundB1postsalesvalue}\}$ in Fund B; £$e\{\text{Field/FundC1postsalesvalue}\}$ in Fund C; and £$e\{\text{Field/FundD1postsalesvalue}\}$ in Fund D. (Note: the coding texts above are used to display dynamically calculated values to participants.)

Below are the price charts for the 4 funds during the previous period:

The current prices of Funds A, B, C, and D are £105.50, £99.79, £105.28, and £97.00, respectively.

Please use the sliders below to show what percentage of your cash you will invest in each fund and what proportion (if any) you will leave as cash.

If you don't have cash to buy any fund because you have bought funds without selling them in the previous round, please pull the cash slider to the right end to continue.

_______ Fund A (1)
_______ Fund B (2)
_______ Fund C (3)
_______ Fund D (4)
_______ Cash (5)
The selling and buying processes shown in the two figures constituted the first performance review. In every review, participants were asked to decide the portion(s) of funds they held that they wished to sell before they were asked to buy any new funds again.

When entering the third period, participants were asked to carry out the second performance review. The price of Fund A changed to £101.24 (see Table 3-1). It was used to compare with £105.50 (the price at the start of P2) to assess gain or loss. This process was repeated in the subsequent reviews until the eighth round.

As shown in Figure 3-3, participants were advised of the current values of investments after making a trading decision (a buying decision in this example). The use of current investment values to ascertain gain or loss as a costing method also measured the disposition effect (i.e., being measured at the last period pricing, which is the primary measurement for hypothesis-testing in the current research).

I discuss how I used the number of fund units as the basis units to calculate the disposition effect measurement in Subsection 4.5.2.

3.7.6 Simplifying financial information in the trading simulation

In devising the Free Trading Simulation, I considered the issues encountered in the Student Pilot and refined the setting, especially the part relating to financial information provided to participants, based on the field observations. Typically, in the Student Pilot, participants paused longer for price charts and price-earnings ratios describing prior year financial information of the four stocks than the time participants were advised to have bought them. For example, in Kimberley’s transcription, she claimed that the price-earnings information did not help her to decide which stock to buy or sell. She had neither finance knowledge nor investment experience, yet she ended up as a non-disposition participant. I, therefore, removed the information about price-earnings ratios for trading questions. The effect was to reduce the amount of financial information and directed
participants’ attention to just current and historical price information as the latter is readily understood by novice and experienced investors alike.

Participants needed current stock price charts showing price movements to make trading decisions for two reasons. First, the student sample generally did not express any problems with price charts: some even complained that information was insufficient (e.g., Liza). Second, previous literature used them to shape the experimental setting close to a real-life situation to elicit emotions (e.g., Summers and Duxbury, 2012).

To avoid adding people’s cognitive load, I removed historical financial information (Kimberley’s case in Subsection 3.6.8) but retained price charts for the Qualtrics Pilot and the Main Study. I included a phrase in the intervention instructions – although past pricing of an investment may suggest a trend of price movement, it is not a guarantee of its future performance – to advise participants, in a subtle manner, to disregard historical information for the stocks and focus on imminent price movement in the financial decision exercise.

Eventually, the Free Trading Simulation turned out to be a successful medium to collect trading data from participants in the Qualtrics Pilot. A further account of how the Free Trading Simulation measured participants’ selling activities in the Main Study is discussed later in Chapter Four.

3.7.7 Refining the revised questionnaire in the Qualtrics Pilot

As discussed in Subsection 3.5.5, participants received either of the two instructions in the reappraisal manipulation. One group was asked to imagine trading their investments (reappraisal = 0, own trading). The other group was instructed to put themselves into the shoes of a financial advisor and trade for their clients (reappraisal = 1, Perspective-taking as an advisor) to effect a cognitive change in decision-related emotions, particularly Perceived Responsibility for decisions they had made in the trading
simulation. I adapted the “Perspective-taking as an advisor” script from the supporting information to the work of Sokol-Hessner and colleagues (2009), which is meant to reduce people’s felt responsibility. Further, participants were instructed that the market price of an asset reflected its current value as trading results were marked to market. This advice may aid participants to figure out the approximate sizes of (unrealised) gains or losses in their portfolios when evaluating profit or loss positions.

After the Student Pilot, I changed some wording to avoid confusion, for example, ‘…outcome of a decision you have just made is “known”’ (replacing “realised” in Item 22 of the questionnaire). The trading periods were renamed months instead of periods. Some paragraphs were rearranged to make the focus more pronounced than in the original version. I have discussed how the two instructions were used in Subsection 3.5.5.

The measure of Perceived Responsibility served to check the effectiveness of the reappraisal manipulation as the latter has been hypothesised to reduce the former. Participants were asked about their response regarding the degrees of their agreement with the question: ‘you felt that you were responsible for the gain or loss when you were making trading decisions for the investment portfolio’ (Q97). It is helpful to investigate the reason for disagreement (“somewhat disagree” and “strongly disagree”) to felt responsibility in the group of participants who were subjected to their own trading scenario in Question 98. Conversely, reasons for answers of a strong agreement to felt responsibility (“somewhat agree” and “strongly agree”) from people in the Perspective-taking as an advisor intervention need to be enquired into (Q99).

When analysing participants’ trading behaviour, I found that participants’ gains and losses during stock trading were small. If I assumed a gain or loss of 5% from a previous round by taking an average percentage of the amount invested in a fund, say, 22% of the portfolio, the resulting gain or loss (£264) was small. To produce a more pronounced effect on the gain or loss felt by participants, I increased the initial endowment from £24,000 to £60,000 in the Main Study. Gain or loss of the same percentage would be 250% in value greater than the Qualtrics Pilot sample. Such magnitude would have a more salient effect to activate relevant emotions in the Main Study participants.
To avoid potential denial of taking up ownership or responsibility for the trading decisions by some participants as revealed in cognitive interviewing, the Pre-set Trading Model was subsequently replaced by a Free Trading Simulation as discussed above. The Free Trading Simulation required more time for participants to work as the new design had to provide more trading opportunities for participants to learn the required task (eight rounds of trades, each comprising separate buying and selling decisions vs four combined trading decisions in the old design), which demanded a higher cost than before as participants were paid for the time they spent on the survey. To overcome the issue of resource constraints in time and cost, I abolished the complex set of questions for studying mixed emotions co-activation. Another crucial reason for abandoning the study of mixed emotions was that the Free Trading Simulation might not always trigger synchronous positive and negative affectivity. Participants could opportunely pick investments that were chiefly rising or falling (i.e., Fund C or Fund D) on a random rather than a deliberate basis. Repeat measures for mixed emotions may be a solution. Yet, this method was not justified due to the high complexity of measurement and analysis.

3.7.8 Measuring participants’ emotions before and after trading

I adapted the Evaluative Space Grid (the ESG; Larsen et al., 2009) to measure the valence and intensity of participants’ positive and negative emotions in the Student Pilot. Despite abandoning the study of mixed emotions after the Qualtrics Pilot, I carried on using the ESG to investigate pre-trading and post-trading emotions. The measures of pre-trading emotions formed the baseline conditions before participants experienced gains and losses in the trading activities, whereas the measures for post-trading emotions served as a check whether participants’ emotional states would change after the trading simulation. This check was important as it was used to confirm whether emotions were endogenously elicited from the trading activities (cf. Seo et al., 2010).

The adapted ESG is presented as a 5 × 5 grid as shown in Figure 3-4 below. I used extended questions to form a matrix table in the Student Pilot. Participants selected a point
from the matrix to represent their emotion immediately after they had learned the outcome of the last trading but before they needed to make a new decision. However, after reviewing the data from the pilot, I found that the matrix table used in the original survey could cause the problem of multiple selections (a technical limitation of the survey platform). Therefore, a side-by-side, five-point Likert scale for the levels of emotions described was displayed to participants in the later studies (see Subsection 4.5.5).

**Figure 3-4 Evaluative Space Grid**

![Figure 3-4 Evaluative Space Grid](image)

Adapted from Larsen *et al.* (2009: 456)

In the original ESG, emotion was measured using a set of five Likert anchors ranging from “not at all” to “extremely.” After the pilot studies, I made some minor modifications to the Likert scale anchors by changing the last item to “very much” because people may feel too drastic to go to the extreme and tended to take a prior level measurement of “quite a bit,” which did not describe the choice correctly. Furthermore, the modified anchors corresponded to those used in the state mindfulness scale (the TMS,
Lau et al., 2006) administered earlier than the ESG, so the consistency of the overall rhetoric of the survey questionnaire was maintained.

3.7.9 Time estimated for the Main Study survey

The revised trading simulation and questionnaire were pre-tested by the Qualtrics Pilot. Results were found to be satisfactory. In the Qualtrics Pilot, I recorded the time taken by participants to complete some particular items of the survey, for example, buying and selling of funds (see Subsection 3.7.5 for a discussion of the design of the trading simulation). Its measurement demonstrates how participants came to terms with the financial decision-making process. I then worked out the average time participants spent on these recorded items and responded to other questionnaire items in the Qualtrics Pilot. Some additions (e.g., the reference point questions, Q89 and Q92) and deletions (e.g., the five ambivalence questions) were made.

Based on the actual time spent on specified activities, I extrapolated the required time to complete the revised experimental survey. An estimate of the time for the Main Study is produced and exhibited below in Table 3-2, which shows the average time spent by the Qualtrics Pilot participants in specific activities and an estimate for the rest of the items after taking up various adjustments to be deployed in the Main Study survey.

The average time required (1,407 seconds) was within the time per participant I bought from Qualtrics (i.e., 1,500 seconds), with some slack time allowed. The purpose of allowing for a slack time was to avoid participants’ perceived unfairness towards the compensation for completing the survey, though low payments generally do not affect the quality of psychometric data (Keith et al., 2017). Also, the survey advised participants that it took about 25 minutes to complete and asked them to be available for the survey in the next half an hour. In the end, all participants were subjected to an overall time limit of an hour to complete the online survey, after which data submission would not be permitted.
Next, I discuss the power and the sample size required for the Main Study.

### 3.8 Power and sample size

Findings of research studies are subjected to statistical tests which produce either significant or negligible (non-significant) results. A non-significant result means that either
the test correctly rejects the alternative hypothesis, or the test is not sufficiently powerful to detect deviations from the null hypothesis ($H_0$) when the alternative hypothesis ($H_1$) is true. The latter situation is a Type II error (Howell, 2007). The current research used different methods to obtain the dependent variable (i.e., data from a trading simulation) and independent variables (i.e., attitudinal data from self-reports). Correlations of these variables obtained from different methods may be underestimated, leading to Type II error (Conway and Lance, 2010). High power is required to contain Type II error exposure. The power of testing a hypothesis is the probability of correctly rejecting a false null hypothesis. A large sample is needed to reject the null hypothesis when it is false.

Correlation analysis was used to ascertain the sample required to achieve a desired level of power to be used in a quantitative research study. I scrutinised the Pearson correlations ($r$ values) between the disposition effect and some key predictors’ measurements in the Qualtrics Pilot sample ($N = 40$). The pivotal state mindfulness measure (i.e., the TMS; Lau et al., 2006) has the lowest $r$ value ($r = .104$, $p = .438$, one-tailed), which was not statistically significant for the pilot sample. Hypotheses about mindfulness worked in one direction so I applied a one-tailed G*Power calculation (Faul et al., 2009) to determine the sample size required for the Main Study. The G*Power is a statistical tool to estimate the required sample size if it cannot be obtained from previous literature. As shown in Figure 3-5 below, the required sample size would be 996.

Owing to resource constraints, I could only afford a sample of 800 for the Main Study. That means the proposed sample size may not have sufficient power to contain Type II error entirely because the probability of exposure to the latter is 9.6% (see below Figure 3-6 G*Power calculation of the $\alpha$ error probability for a sample of 800). The retrospective test for power offers no additional information for explaining the occurrence of non-significant findings (Howell, 2007). Increasing the sample size would be the only solution for further investigation. Nevertheless, this sample still exceeded those studies that investigated emotions as reviewed in Chapter Two (e.g., Grayson, 2017). I expected the sample reasonably large to yield significant results even if they were small. Any undetected effects would be minimal and should not warrant attention.
Figure 3-5 G*Power calculation of the required sample for the Main Study

Figure 3-6 G*Power calculation for a proposed sample of 800
3.9 Summary of the pilot studies

This chapter has described the improvements suggested from the findings of the researcher-supervised Student Pilot and the self-administered Qualtrics Pilot survey to identify necessary refinements to the Main Study. Both pilots were conducted by an experimental survey through the internet. The Student Pilot applied a ten-minute mindfulness induction, whereas the Qualtrics Pilot deployed randomised allocation to the mindfulness and mind-wandering interventions on an even distribution basis. Both pilots randomly manipulated reappraisal (Perspective-taking as a financial advisor vs own trading). The Student Pilot used a Pre-set Trading Model to provide selections for a student sample to bring about the disposition effect measurement. Cognitive interviewing protocols such as thinking aloud were used to test participants’ understanding of the questionnaire, and refinements were made. Evaluations of these findings indicated that a free trading simulation should be deployed to facilitate participants’ trading decisions and engage their responsibility felt for the latter. Accordingly, the refined questionnaire was used, and the Free Trading Simulation was devised. They were used in the Qualtrics Pilot sample.

The success of both pilots hinged on the efficacy of the mindfulness manipulation. Therefore, emphasis was placed on assuring participant attention and using the correct measurement for state mindfulness. To this end, a timing protocol and a breath count measure were implemented as attention checks on the mindfulness intervention for use in the Main Study. I tested other issues on participant understanding of the questionnaire and the depth of financial information by cognitive probing (in the Student Pilot) and the time measured to complete the trading simulation (as reviewed in the Qualtrics Pilot). These methods were developed in both pilots. Then, the revamped experiment and questionnaire incorporated with these protocols were made available in the self-administered Main Study survey, which consequently generated the core data for the current research.

Chapter Four discusses how participants’ data were collected through the internet from the Qualtrics portal, focusing on survey monitoring and data quality. Measurements of the dependent and independent variables are examined before hypothesis-testing.
4 COLLECTING ONLINE DATA

The chapter starts with a discussion of the Main Study design, focusing on how the two manipulations were implemented in the self-administered online survey for participants recruited through Qualtrics’s designated panels. It discusses how the online data collection was performed and monitored. In addition, the chapter evaluates the impacts of potential biases on the quality of these data. Measurements of the dependent variables (i.e., the disposition effect and its behavioural components) and their predictor variables (e.g., trait psychometrics) are evaluated. These are the core data for the present research. Finally, the preparation work prior to data analysis of the Main Study is illustrated, which includes the evaluation of construct reliability for various psychometrics and correlation analysis for the dependent and independent variables and the covariates.

4.1 The design of the Main Study survey

The online survey deployed two manipulations, mindfulness and situational reappraisal, in a randomised control experiment with a 2 × 2 factorial design. I developed the design of the manipulations for the Main study from the test results of the two pilot studies (see Section 3.5 in Chapter Three). I focused on the effects of both manipulations on the financial behaviour of divesting assets. The measures constructed from such behaviour were the disposition effect and its behavioural components, the proportions of
gains and losses realised. The factorial design provided the two manipulations to test the first two hypothesis sets (i.e., effects of state mindfulness and situational reappraisal on the disposition effect and the proportions of losses and gains realised). Dichotomous variables (i.e., 0 and 1) were categorised in each of the two manipulations to differentiate participants’ behaviour under both manipulations for testing Hypothesis sets 1 and 2.

As with the pilots, the random assignment operative in the manipulations of the Main Study was subjected to a quota protocol (in the Qualtrics platform) which minimised uneven distribution. It was not practical to achieve a perfectly even distribution due to dropouts during and after a manipulation while other participants participated in the survey. Having excluded non-completions and attention check failures, data from 820 participants provided by Qualtrics’s panels were admitted for analysis. In the Main Study, the numbers of participants for the mindfulness = 0 group and mindfulness = 1 group were respectively 399 and 421. The numbers of people in reappraisal = 0 group and reappraisal = 1 group were 413 and 407, respectively.

After undergoing the manipulations, participants proceeded to the Free Trading Simulation where they gauged the amounts of money they wished to invest and divest in each of the four investment funds for eight rounds of trading. These performance data were used to measure purchases and sales of assets, which led to the measurement of the dependent variables, the disposition effect and its constituents, the realisation of gains and the disposal of losses.

In addition to the measurement of the disposition effect, the Main Study dataset provided self-report measures for the manipulation check variables of the two manipulations (i.e., the state mindfulness and felt responsibility measures), participants’ emotions before and after trading, dispositional psychometrics (i.e., trait mindfulness and two habitual emotion regulations, trait positive reappraisal and trait catastrophising), and demographics. These trait-level psychometric measures served as independent variables for testing Hypothesis sets 3 to 5.

In the next two sections, I illustrate how the experimental survey was monitored (e.g., the use of attention checks) and participant attrition with particular reference to how
the mindfulness manipulation was managed. Section 4.4 evaluates data quality and efforts to mitigate potential biases, such as the common method variance. The measurements of both dependent and independent variables are discussed in Section 4.5.

4.2 Monitoring the online survey

4.2.1 Time as a quality control measure

Data collected from the survey study need to be scrutinised. Defective data should be removed. One vital tool to check on data quality is the time spent by participants on the survey as a whole and specific tasks of research interest. The Qualtrics portal records the time used by each participant in completing a survey. The general principle is to identify and assess participants who spent a very short time, compared to the average time to complete the survey as found in the Qualtrics Pilot, and those using an overly long time. A very short completion time implies that the participant concerned did not take the exercise seriously or read the instructions and questions before responding. Using excessive time may mean that the participant was not fully engaged – they might be doing something else during the survey. Measurement errors may exist in both situations. Participants responding too quickly were not reporting their genuine attitudes, while those responding too slowly did not reflect their momentary emotions and thoughts during trading, thus compromising the measurement of the underlying cognitive emotion-regulatory processes. Hence, data collected from these participants were removed before conducting analysis.

4.2.2 Attention check and speeding

In the Main Study survey, I used an attention check question to filter out participants who did not seriously read and answer the question. Only seven people failed
the attention check set up in Question 108, which asks: ‘The answer to this question must contain fourteen – you will exit the survey if you choose otherwise.’ The five answers range from “there are eleven players in a team” to “there are fifteen players in a team.” The correct score is 4, which is “there are fourteen players in a team.” Although they had completed the greater part of the online survey (i.e., the two manipulations and the trading simulation), these seven participants seemed not serious about reading survey questions or just responded as quickly as possible to finish the survey. This participant behaviour is known as speeding (Johnson, 2016). The attention check question excluded the seven speeders from participation.

An alternative explanation to these participants’ non-thoughtful, stereotypical responses is straightlining (i.e., responding with the same score to survey questions regardless of content), resulting in artificial inflation of the item loadings and increased construct intercorrelation (Johnson, 2016). While the response to one question cannot determine the occurrence of straightlining, I deal with this error thoroughly in Subsection 4.6.1.

Other biases commonly observed in an online survey are discussed in Section 4.4. Before then, I analyse participant attrition occurred at the initial and interim stages of the online survey.

4.3 Attrition analysis

Though participants were rewarded for their time spent on a survey, this did not guarantee that they would complete the online survey. Participants dropped out for various reasons. The Qualtrics portal reported the number of dropouts at each specified point, such as the quota protocol and attention check questions implemented by the researcher. These dropouts were not included in the participant numbers purchased from Qualtrics.

I obtained the following attrition statistics for the Main Study from Qualtrics:
i) 62 were not living in the UK.

ii) 209 were not allowed to enter the survey as the gender quotas had been filled at the time of entry.

iii) 121 identified that they were neither a graduate nor a qualified professional.

iv) 224 spent more than 780 seconds in the mindfulness intervention (Q6 auto-advance function and Q8 timing check) because they did not pay enough attention to it; consequently, they were skipped to the text ‘You have not attended closely to the mindfulness induction. Please press the forward arrow to exit survey’ (Q7) and left the survey (see Appendix-4 for detail of the survey flow).

v) 587 were screened out for failing the attention check on the number of breaths counted in the mindfulness intervention (Q9) as discussed in Subsection 3.5.3.

vi) 2,151 dropped out of the survey at the start or during the mindfulness/mind-wandering intervention.

vii) 7 failed the Q108 attention check, which screened speeders out (see Subsection 4.2.2).

The first three items of attrition were attributable to systematic screening before the manipulations. The numbers are reasonable given that data were collected over two months. Understandably, it appears that the quality assurance checks exercised in items iv), v), and vi) worked for the mindfulness/mind-wandering intervention – a substantial number of partly completed participants (N = 2,962) left or were filtered out. Among these dropouts, a considerable number of 2,151 unenthusiastic participants quit at the beginning or during the mindfulness/mind-wandering induction, suggesting that they may be deterred from committing just ten minutes to activities they did not like.

The 587 dropouts who failed the breath count check outnumbered those who passed the check (N = 421), lending support to the importance of the compliance check on the mindfulness manipulation. In parallel, a moderately large dropout (N = 224) occurred in the attention check using an auto-advance tool, suggesting these participants may multi-task during the online survey to “maximise” the use of their time.
Participants who did not drop out continued to complete the survey. One participant took more than an hour to complete it, so she was exited due to possible inattention when administering the survey.

To guard against repeat participation, I scrutinised participants’ IP addresses to ensure they only took part in the survey once. Repeat participation was excluded as it may inflate measures of performance data because of practice effects (Keith et al., 2017).

4.4 Quality of online data

4.4.1 Common method bias and self-report measures

When the measures of variables are obtained by the same method, it may cause a systematic variance in the observed relationships among measures, a phenomenon known as a common method variance or common method bias (Podsakoff et al., 2003). Although the dependent variable was obtained by assessing participants’ performance, which differs from self-reporting, a common method bias may still occur in this research because all attitudinal measures (i.e., the independent variables) were secured from the same source and method, self-reporting. An effective way to reduce this potential bias is to avoid conceptual overlap in items used to measure different constructs (Conway and Lance, 2010). For example, the TMS (Lau et al., 2006) and the FFMQ (Baer et al., 2006) respectively measured state mindfulness and trait mindfulness, which are of different constructs measuring different attributes (Thompson and Waltz, 2007). Additionally, the two scales were placed in different parts of the survey. The manipulation check for state mindfulness was measured immediately after the audio inductions when the manipulation’s effects from the mind-wandering and mindfulness inductions were still fresh, whereas trait mindfulness was measured after the trading exercise. As a trait measure, it should be less susceptible to being altered by the experience of the experiment.
(it asked about habitual responses). Participants would not be primed by repeated enquiry of their mindfulness condition, but the setting could not rule out some carryover effects.

4.4.2 Attrition and self-selection in the experiment

Participation in the online survey was open to a large number of people with varying demographics except for some specified requirements (e.g., education level). Open participation is subject to the risk of self-selection bias, which can jeopardise internal validity. Uneven distribution of gender is a typical example. In the Main Study, I resolved the issue by setting a uniform quota for each gender in the survey. Non-uniform distribution among people of different age groups and financial sophistication (measured by investment experience) would be controlled for when conducting hypothesis-testing, except to the extent that a non-representative sample may have implications for the generalisability of the results due to the non-uniform demographic differences.

Overall, the online data collection that the current research has sought out appears to be a useful tool in securing valuable data about the target participants, despite encountering challenges such as sampling representativeness (Johnson, 2016). One critical factor that potentially jeopardised generalisation was selective attrition observed in the mindfulness manipulation. I consider that the dropouts at the mindfulness or mind-wandering induction and those who failed in the mindfulness compliance and attention checks are examples of disagreement to participate in the experimental survey (see Section 4.3). This attrition may amount to voluntary election against participation. Self-selection becomes a bias only if participation is restricted to those who elect to participate. However, the selection bias does not exist in a randomised experiment wherein participants are randomised after agreeing to participate (Hernán, Hernández-Díaz, and Robins, 2004). As observed in the Main Study, randomisation took effect before the start of the reappraisal manipulation, following participants’ completion of the mindfulness manipulation.
I did not have the demographics other than gender and education level for these early dropouts as enquiries about demographics were made in the last part of the questionnaire. The selective attrition might come from the financially sophisticated if they did not like to spend ten minutes in an online mindfulness or mind-wandering induction before doing simulated trading because they preferred to use their time to trade in the real-life market, as suggested by Grayson (2017). This interpretation suggests that recruiting willing participants is always a challenge to researchers and may explain why most participants had not traded before. Different levels of financial sophistication may have different influences on participants’ divesting behaviour and felt responsibility, which are discussed in Subsections 5.3.2 and 5.5.3.

Ultimately, older people (50+) formed the majority of participation in the experimental survey. Their self-selection for the research mattered more than attrition. As discussed, this unintended self-selection did not constitute a bias in the randomised experiment, although it may have some implications for generalisability to younger populations. Older people’s disproportionate participation had not been anticipated before the research; hence, age was recorded and controlled in the analysis (see Subsection 5.3.2).

The invitation sent by Qualtrics’s panels did not advise participants about the objectives of the survey. To be fair to participants, they were informed of the survey’s purpose at the end. Also, they were given a chance to withdraw before submitting the full survey and even after submission (see Section 3.4 on ethics). Selective attrition may occur at this point of the survey, given that free withdrawal has been part of the informed consent procedure. Allowing participant withdrawal after submission may help reduce attrition at the last minute as those unsure of withdrawing understood that they had the chance to do so later (this understanding usually reconfirms submission). Eventually, no post-submission withdrawal happened.
4.4.3 Mitigating other common biases

In Section 3.6, I examined cognitive interviewing to accommodate the contextual nature of attitudinal measurement (Schwarz, 1999). Undependable attitudinal data may be attributed to the participants themselves. They may know what answers are expected from them. Naturally, they wish to be seen as behaving rationally or emotionally balanced – a bias called the social desirability effect (Podsakoff et al., 2003). The social desirability effect is serendipitously mitigated in a self-administered survey without face-to-face interactions between the researcher and participants. This setting also eliminates the experimenter effect by which participants’ behaviours or responses can be influenced by the presence of an observer (Easterby-Smith et al., 2015; Keith et al., 2017).

As evident in Sections 4.2 and 4.3, using attention checks increased the accuracy and reliability of the performance of the mindfulness intervention. The checks also improved the quality of psychometric data by filtering out inattentive responses (Keith et al., 2017). Keith and colleagues (2017) argue that data reliability in satisfactory internal consistency is demonstrated in participants’ responses to psychometric measures. To the extent that I am satisfied with the efficacy of the attention checks, I tend to accept these researchers’ postulation and seek confirmation of data reliability for state mindfulness and other psychometric measures (see Subsection 4.6.2). On the other hand, the survey used validated measures that had proven construct validity in previous studies; hence, participants’ tendency for testing effects was under control (Easterby-Smith et al., 2015).

4.5 Measurements of the dependent and independent variables

4.5.1 Evaluating various approaches to measuring the disposition effect

Determining gain or loss positions is important for a Free Trading Simulation to measure the disposition effect. To this end, I used two different measurements, prior period
pricing and weighted average cost, to assess whether assets were at a gain or a loss position before selling. These measurements are commonly used methods of calculating the profit or loss of portfolio trading. The reference points used in these two costing methods would lie between the purchase price and the current price of the investment concerned. In the first approach, the reference point is taken to be the price in the previous period. In the second approach, the reference price is calculated as the mean price across all periods in which assets were previously purchased and held, weighted by the proportions purchased at those prices.

The most common measurement of the disposition effect was originated by Odean (1998), which has been widely used or adapted by research of similar interest for data collected from both field and experimental studies (e.g., Summers and Duxbury, 2012; Frydman et al., 2014; Chang et al., 2016). Odean obtained a sample of 6,380 with a massive volume of trades (97,483). He used the values of stocks involved in every trade as the basis for calculating investors’ gain or loss positions. This measurement advised the frequency of decisions investors made from every trading opportunity available. The basis was reasonable given that retail investors typically did not monitor their portfolios daily. He differentiated the trades as either gains or losses and calculated two ratios, the proportion of gains realised (henceforth “PGR”) and the proportion of losses realised (henceforth “PLR”), and obtained the disposition effect measure as the difference between the two ratios (i.e., PGR - PLR). Details of the approach to calculating the disposition effect I adapted from Odean’s method are discussed in the next subsection.

Weber and Camerer’s (1998) measure, another ratio-based approach, is the simplest of all measures (see details in Subsection 3.7.3). The ratio uses the difference between the number of gain sales and the number of loss sales (S+ - S-) as the numerator and the total number of sales (S+ + S-) as the denominator. Yet, the method is oversimplified as it is based on the frequency of divesting gains and losses without due regard to the sales volumes. It fails to differentiate entire sales from partial sales of a stock though the latter is common among investors. This approach may contradict the observed behaviour of the disposition effect – selling more gains than losses – when investors are allowed to trade freely any portions of investments they buy or repurchase, such as in the current research.
Although the work of Dhar and Zhu (2006) recognises the necessity to regress results on some covariates, such as trading activity, the resulting measurement might link to these covariates and cause problems (e.g., sensitivity to trading frequency). Financial sophistication is another covariate to control for as it may relate to the disposition effect measurement. Notably, trading frequency and financial sophistication slightly reduce the disposition effect (De Winne, 2021).

When analysing various measurement approaches, De Winne (2021) favours the use of hazard models and argues that their use with a daily frequency may avoid the issue caused by models with frequency dependent on actual sales (e.g., Dhar and Zhu, 2006). Hazard models are a class of survival analysis that is used to predict the length of time for the occurrence of a stipulated event. For example, a hazard model depending on a baseline hazard function accounts for how long an investor holds a position and allows varying probabilities for selling a position over time. Research has mostly used two such models to study the disposition effect: the Weibull proportional hazards model (e.g., Feng and Seasholes, 2005) and the Cox proportional hazards model (e.g., Richards, 2013). The latter model is preferred to the former as it is semi-parametric and enables the estimation of hazard ratios without necessitating distribution-free analysis methods. Hazard models appear to have useful characteristics as a measure. Yet, they should be used with caution for field data because the actual levels of disposition effect are unknown, especially when a bullish market prevails (De Winne, 2021).

Since the current research used a trading simulation that provided data for initial positions when participants started to trade, I did not need to infer trading positions by measuring the daily frequency as required by hazard models. Given that Odean’s measure is more straightforward than the hazard models and my aspiration for a dataset suitable for parametric analysis was strong, I adapted his measure for the current research. For the measurement, I used the number of trades down to individual investment units, which essentially means the same rationale used by Odean (1998) that every trading opportunity available to participants was considered in the periodic reviews. On the other hand, the potential learning effect of trading frequency over time on the disposition effect was not anticipated because the trading simulation contained only eight rounds of trades.
Additionally, I controlled for financial sophistication measured by investment experience in the analysis (see Subsections 4.5.6 and 5.3.2).

4.5.2 Measuring the dependent variables

The disposition effect measurement was adapted from Odean’s (1998) metric. The current research has used the measurement at the last period pricing as the primary dependent variable and the measurement at weighted average cost as a robustness check. I now discuss calculation using last period pricing, then weighted average pricing.

The measurement of the PGR sums up all fund units sold as gains (calculated by a specified costing method), which becomes the numerator, and all fund units available for disposal at a profit as the denominator, aggregated in the successive rounds of reviews for the four investment funds. The PLR is the corresponding item measured with the same principle for assets at loss, with respect to the specified costing method. Thus,

\[
PGR = \text{realised gains} / (\text{realised gains} + \text{unrealised gains})
\]

\[
PLR = \text{realised losses} / (\text{realised losses} + \text{unrealised losses})
\]

The disposition effect = PGR - PLR

I used SPSS syntax to calculate the disposition effect measurements from the trading data to identify gains and losses for the two costing methods: the last period pricing (the primary measure) and weighted average cost (the alternative measure as a robustness check). Below, I illustrate the calculations of these measures, starting from the primary one:

First, I calculate the gain and loss indicators for the four funds A, B, C, and D from the first performance review (see Figure 3-2 and Figure 3-3 in Subsection 3.7.5 for an illustration) to the eighth review. For example, the first item to be calculated, the gain indicator A1, is calculated by comparing the price of Fund A at the beginning of the first
review (Price A2) and the fund’s price when it was bought (Price A1). The indicator returns with 1 if the condition is true and 0 if the condition is false.

Second, I calculate the units of funds available for sale at various rounds of performance review. For example, Aunits1R, the number of units for Fund A at the start of the first review, is a quotient that equals the value of Fund A (FundA1Valuex) divided by the price of Fund A at the time of review.

Third, I calculate the units of funds sold in the various rounds of review. For example, the number of units of Fund A sold in the first review (Aunits_sold_1R) is calculated by the total units of Fund A available for sale in the first review (Aunits1R) × the portion determined by the participant in response to the performance review question concerned.

Fourth, I calculate the total units of each fund available for sale as gains and losses from the first review to the eighth review by multiplying the gain indicator and the loss indicator of every review concerned, respectively.

Fifth, I calculate the total units of each fund sold as gains and losses in the first review to the eighth review by multiplying the gain indicator and the loss indicator of every review concerned, respectively.

Sixth, I calculate the total units of the four funds available for sale as gains and losses in the chosen review periods. As I shall discuss in Chapter Five, gain/loss units in the first and the eighth reviews are excluded due to the avoidance of the boundary effect (see Subsection 5.2.1). Only data from the second to the seventh reviews are used to calculate the PGR and PLR in the current research. The resulting gain/loss units are the denominators for the PGR and the PLR, respectively.

Seventh, I calculate the total units of the four funds sold as gains and losses in the six reviews (from the second to the seventh). They are the numerators for the PGR and the PLR, respectively.
Eighth, the PGR and the PLR ratios are calculated. The disposition effect is the difference between the two ratios (i.e., PGR - PLR).

The alternative measurement at weighted average cost is chiefly in line with that for the last period pricing, calculated as follows:

First, I calculate the weighted average cost per unit for each fund at each review point. I divide the aggregate purchase costs incurred at and before the review point by the number of units sold (determined by the sales value divided by the current price of the fund) at the time of review for the fund. The weighted average cost per unit at a particular round for a fund is the basis by which I assess profit or loss against the current price. As a result, a list of gain and loss indicators is produced for each fund at each round. Second, I calculate the total units of each fund sold as a gain or a loss from the second review to the seventh review by multiplying the gain indicator/loss indicator in terms of units sold in every review concerned. Third, I add up the total units of the four funds available for sale separately as gains and losses in the six reviews. They are respectively the denominators for the PGR and the PLR measured at weighted average cost. Fourth, I sum up the total units of the four funds sold as gains and losses in the six reviews. They are the numerators for the PGR and the PLR measured at weighted average cost, respectively. Then, the disposition effect equals the PGR minus the PLR, measured at weighted average cost.

As a worked example, Table 4-1 below illustrates how the disposition effect measurements using both costing methods are computed for case identifier 15. The calculation of numbers of fund units sold from the second to the seventh trading rounds is based on steps 1, 3, and 5 for the last period pricing measurement, whereas steps 1 and 2 in the weighted average costing calculation are used to determine the gain or loss status of the equivalent units sold. Save for the differences in calculations of the gain/loss indicators for Fund B in rounds 3 and 5, the gain and loss indicators for all funds from the second to the seventh trading rounds are the same for the participant. For Fund B in both rounds 3 and 5, a loss indicator is computed in the prior period pricing measure, while a gain indicator is obtained in the weighted average costing measure. These differences are seen in the 133 units and 12 units of Fund B sold as losses in respectively rounds 3 and 5 under the prior
period pricing measurement, which are reckoned as gains under the weighted average costing. All these numbers are shown in the six columns under “Units sold in trading rounds.” The two columns under “Total units sold” exhibit the numbers of all fund units totalled as units sold as gains and as losses. They are the numerators for the PGR and PLR ratios for the last period pricing (step 7) and weighted average costing (step 4).

Table 4-1 Disposition effect measurements for case identifier 15

<table>
<thead>
<tr>
<th>Costing method</th>
<th>Fund</th>
<th>Units sold in trading rounds</th>
<th>Total units sold</th>
<th>Total units for sales</th>
<th>PGR</th>
<th>PLR</th>
<th>Disposition effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prior period pricing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td></td>
<td>-133</td>
<td>65</td>
<td>-12</td>
<td>13</td>
<td>68</td>
<td>237</td>
</tr>
<tr>
<td>B</td>
<td></td>
<td>-133</td>
<td>65</td>
<td>-150</td>
<td>65</td>
<td>135</td>
<td>-384</td>
</tr>
<tr>
<td>C</td>
<td></td>
<td>-133</td>
<td>65</td>
<td>-173</td>
<td>65</td>
<td>135</td>
<td>-242</td>
</tr>
<tr>
<td>D</td>
<td></td>
<td>-133</td>
<td>65</td>
<td>-173</td>
<td>65</td>
<td>135</td>
<td>-242</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>211</td>
<td>-323</td>
<td></td>
<td></td>
<td>804</td>
<td>-626</td>
</tr>
</tbody>
</table>

| Weighted average costing |      |                              |                  |                       |      |      |                    |
| A                       |      | 133                          | 65               | -12                   | 13   | 55   | 237                |
| B                       |      | 133                          | 65               | -5                    | 13   | 55   | 237                |
| C                       |      | 133                          | 65               | -6                    | 13   | 55   | 237                |
| D                       |      | 133                          | 65               | -6                    | 13   | 55   | 237                |
| Total                   |      | 356                          | -178             |                       |      | 1132 | -298               |

Negative signs before fund units denote units were sold as losses.

The same set of gain/loss indicators, determined by their respective costing methods, are also used to calculate units of funds available for sales as gains and losses. In Table 4-1, the two columns under “Total units for sales” display the total numbers of fund units available for sales as gains and losses. They are calculated in steps 2, 4, and 6 for the last period pricing and step 3 for the weighted average costing. These are the denominators for the PGR and PLR ratios for both costing methods.

Then, the PGR and PLR ratios and the disposition effect are calculated for both measurements accordingly.

Finally, I reconcile the calculations of the two disposition effect measurements. The number of total divestments inclusive of gains and losses is 537,168 fund units for either costing method. Table 4-2 below shows a reconciliation of gains and losses sold for the
four funds under the two costing methods. Under the last period costing convention, 248,654 and 288,514 units constitute realised gains and losses. The figures for the alternative measurement are 254,946 and 282,222 units, respectively. The sums of units sold as gains and losses between the two measurements at the last period pricing and weighted average costing are the same. In general, more losses were sold than gains under both conventions for the Main Study sample, but a statistical test is required to confirm the significance of the difference in the divesting behaviours.

Table 4-2 Reconciliation of gains and losses sold for the two measurements

Number of units sold when funds are cost at prior period pricing

<table>
<thead>
<tr>
<th></th>
<th>FUND A</th>
<th>FUND B</th>
<th>FUND C</th>
<th>FUND D</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Units of gains sold</td>
<td>93072</td>
<td>57469</td>
<td>13444</td>
<td>84669</td>
<td>248654</td>
</tr>
<tr>
<td>Units of losses sold</td>
<td>65479</td>
<td>84026</td>
<td>139009</td>
<td>0.0</td>
<td>288514</td>
</tr>
<tr>
<td>Total units sold</td>
<td>158551</td>
<td>141495</td>
<td>152453</td>
<td>84669</td>
<td>537168</td>
</tr>
</tbody>
</table>

Number of units sold when funds are cost at weighted average costing

<table>
<thead>
<tr>
<th></th>
<th>FUND A</th>
<th>FUND B</th>
<th>FUND C</th>
<th>FUND D</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Units of gains sold</td>
<td>76660</td>
<td>81680</td>
<td>11937</td>
<td>84669</td>
<td>254946</td>
</tr>
<tr>
<td>Units of losses sold</td>
<td>81891</td>
<td>59815</td>
<td>140516</td>
<td>0.0</td>
<td>282222</td>
</tr>
<tr>
<td>Total units sold</td>
<td>158551</td>
<td>141495</td>
<td>152453</td>
<td>84669</td>
<td>537168</td>
</tr>
</tbody>
</table>

The Free Trading Simulation turned out to be a successful medium to collect trading data from participants, but free trading meant that outcomes were not pre-determined as participants had the freedom to buy and sell assets in any proportions throughout the simulation (cf. data from the Pre-set Trading Model where the number of trading selections for participants was pre-determined). The new design allowed for various kinds of trading strategies, for example, a buy-and-hold strategy whereby participants would not perform further trading after buying some initial investments. They kept the assets for the entire trading duration no matter how prices fluctuated. I kept the data of these participants because by holding certain investment funds, participants still had the opportunities to sell them against the backdrop of the rise and fall in fund prices, compared to their respective costs. I discuss this type of non-trading activities further in Subsection 5.2.1.
During data collection, I removed 19 responses that did not provide a measurement of the disposition effect because these participants did not trade at all. Over a two-month collection period, 821 participants completed the survey, which ended on 19th December 2019. The Main Study sample was subsequently reduced to 820, after removing one participant who just bought and sold up the funds in the first round without any subsequent trading (refer to Subsection 5.2.1 for a detailed discussion).

4.5.3 State and trait mindfulness measures

As discussed in Section 3.5, the efficacy of the mindfulness manipulation was measured by the TMS (Lau et al., 2006; a state mindfulness measure). To mitigate the potential effect of priming and streamline the mindfulness scale, I further reduced one item from each of the two subscales, Curiosity and Decentring, by their respective rankings in factor loadings. The following are the items used in the Main Study. They were set up as questions in the survey, numbered from Q10 to Q13:

Curiosity

During the induction, you were curious about your reactions to things.

During the induction, you were curious to see what your mind was up to from moment to moment.

Decentring

During the induction, you were more concerned with being open to your experiences than controlling or changing them.

During the induction, you were more invested in just watching your experiences as they arose than in figuring out what they could mean.
Responses were scored on a five-point Likert, ranging from 1 (not at all) to 5 (very much). The state mindfulness measure was administered immediately after the mindfulness (mindfulness = 1) or mind-wandering (mindfulness = 0) induction.

On the other hand, the trait mindfulness measure used in the online survey was extracted from the Five-Facet Mindfulness Questionnaire short-form (a 24-item short scale of the FFMQ; Bohlmeijer et al., 2011), which is a scale reduced from the original full 39-item scale (the FFMQ; Baer et al., 2006). The measure was administered after participants had completed the trading simulation. I chose not to use the full scale before trading as it increased the likelihood of priming mindfulness by asking participants to engage in extended thinking about mindfulness-related items. To alert participants to the enquiries for trait measures, they were explicitly instructed that all trait psychometrics (including the two habitual emotion regulations) enquired about their lived experiences in general.

The five subscales of the FFMQ are Observing, Describing, Acting with Awareness, Nonjudging of Experience, and Nonreactivity to Inner Experience. They are used to ascertain participants’ psychometric properties of the five mindfulness traits. The five-factor scale is a unique measurement of dispositional mindfulness per se. By comparing with the items analysed by Gu and colleagues (2016), items of the highest two standardised factor loadings in the pertinent confirmatory factor analysis for the FFMQ short form (Bohlmeijer et al., 2011) were selected from each subscale. These subscale items were numbered Q109 to Q118 in the survey, listed as follows:

Observing

You pay attention to physical experiences, such as the wind in your hair or the sun on your face.

You notice visual elements in art or nature, such as colours, shapes, textures, or patterns of light and shadow.

Describing

You are good at finding the words to describe your feelings.
It’s hard for you to find the words to describe what you’re thinking. (R)

**Acting with awareness**

You do jobs or tasks automatically without being aware of what you’re doing. (R)

You find yourself doing things without paying attention. (R)

**Nonjudging of experience**

You tell yourself you shouldn’t be thinking the way you’re thinking. (R)

You think some of your emotions are bad or inappropriate, and you shouldn’t feel them. (R)

**Nonreactivity to inner experience**

When you have distressing thoughts or images, you don’t let yourself be carried away by them.

When you have distressing thoughts or images, you just notice them and let them go.

Each subscale consisted of two items that were measured on a five-point Likert scale ranging from 1 (almost never) to 5 (almost always). Scores were reversed for analytical purposes for items marked “R”. These items are negatively phrased, which means that the lowest score of 1 to the item indicates the attribute being measured is positively perceived, relative to other scores, by the participant. When compared with positively phrased items, low scores correspond to high scores, and *vice versa*. Before combining responses to form a subscale or scale, reverse-scored items were transformed to be in the same direction as other positively phrased items by subtracting the score from 6 (*i.e.*, number of Likert anchors + 1) for every response to “R” items.

The use of positive and reversed items in tests is motivated by the intention of mitigating response bias, such as the acquiescence bias (*i.e.*, responding positive agreement to all questions). However, when a scale has both positive and reversed items,
its scale reliability may be flawed. The variance of the scale’s scores is reduced, and its mean differs from that of a scale that has either regular or reverse-scored items (Suárez-Álvarez et al., 2018). On the other hand, Podsakoff and colleagues (2003) argue that combining positive and reversed items can mitigate the effect of common method bias.

Reverse-scored items are not welcome by some survey participants as the items may not be readily understood, and certainly by speed-readers who do not want to spend time to understand a question before they answer it, as reverse-scored questions slow down their pace in completing a survey. This phenomenon may be pronounced when participants are paid by the estimated time they spent on the survey. Hence, reliable measurement matters more than the inconvenience caused by reverse-scored items. To this end, I guarded against responses that were not genuine measurements due to participants’ lack of attention in understanding and responding to questions by building in attention checks as aforementioned and scrutinising for straightlining (see Subsection 4.6.1).

Furthermore, the use of the trait mindfulness scale has been vigorously tested, and its construct reliability is well established in previous research. Taken together, I have had confidence in using them in the current study.

4.5.4 Habitual emotion regulations

In Chapter Three, Subsection 3.5.5 described how the reappraisal manipulation and the manipulation check question were devised. As for the habitual emotion regulations, they were measured by the Cognitive Emotion Regulation Questionnaire (the CERQ; Garnefski and Kraaij, 2007). Two subscales from the CERQ, Positive Reappraisal and Catastrophising, were selected because they are typically used to measure individuals’ cognitive coping abilities for adverse events. In assessing the correlations between the various subscales of the CERQ and the functional subscales of the Coping Inventory for Stressful Situation (CISS, Endler and Parker, 1990), Garnefski and colleagues (2002) find
a significant, positive association between Positive Reappraisal and the CISS task-oriented coping subscale, whereas Catastrophising is positively and significantly related to the CISS emotion-oriented coping subscale.

The pattern of correlations between the 18-item CERQ-short scale (Garnefski and Kraaij, 2006) and the Positive and Negative Affect Scales (the PANAS; Watson, Clark, and Tellegen, 1988), a multifaceted measure of emotions, reveals marginally weaker associations than the correlations between the latter and the entire measurement of the CERQ. Hence, the Positive Reappraisal and Catastrophising subscales in complete length were used in the present research. This application is also in line with the apparatus used in the Mindful Coping Model (Garland et al., 2011). Positive Reappraisal asks participants to attach a positive meaning to the event, and Catastrophising highlights the negative aspect of experiences by assuming the worst would happen. The following items from the two subscales were set up as Q119 to Q126 in the survey:

**Positive Reappraisal**

Generally speaking, you think you can learn something from the situation you have experienced (words in italics are added to increase clarity).

You think that you can become a stronger person as a result of what has happened.

You think that the situation you have experienced also has its positive sides.

In general, you look for the positive sides to the situation you have experienced (words in italics are added to increase clarity).

**Catastrophising**

You think that what you have experienced is the worst that can happen to a person.

You keep thinking about how terrible it is what you have experienced.

You continually think how horrible the situation has been.
You think that what you have experienced is much worse than what others have experienced.

As participants were asked about their psychological reactions to lived experiences in general, I adopted the original measures which use the present perfect tense to describe individuals’ experiences for the trait psychometrics. Each item in the two subscales was scored on a five-point Likert scale ranging from 1 (almost never) to 5 (almost always).

4.5.5 Pre-trading and post-trading positive and negative emotions

In Subsection 3.7.8, I discussed how I adapted the Evaluative Space Grid (the ESG; Larsen et al., 2009) to measure the valence and magnitude of participants’ positive and negative emotions before and after trading. There are three reasons to use the one-item measure of the ESG rather than Watson et al.’s (1988) popular measure of the PANAS, which is a multiple-item scale encompassing various attributes of positive and negative affect. First, the ESG can be administered quickly which is especially useful when there is the need to keep the questionnaire within a reasonable size because of repeated self-reporting of emotions as initially required for the study of mixed emotions (cf. Seo et al., 2010; a longitudinal study using emotions as antecedents). Second, the scores from each component of the PANAS need to be amalgamated to obtain a final score for either positive emotion or negative emotion, so it is cumbersome for participants and may impact compliance and attrition. A parsimonious application of measurement, as always, helps reduce dropouts. Third, it is easier and more practicable for participants to just report a single assessment of their emotion in terms of valence and intensity at a time, without differentiating which particular emotion they have just experienced because participants may only respond with their emotional reactions to relative changes in their situations instead of the absolute outcomes of their decisions (Loewenstein and Lerner, 2003), and the experience of emotion is elusive as its effect can disappear once people are made aware of it (Schwarz and Clore, 2003).
Q25 (see Appendix-4) exhibits the question for pre-trading emotions as follows:

Before going on for the investment simulation, kindly consider your emotions at the present moment. It is possible to have both positive emotion (pleasant feeling) and negative emotion (unpleasant feeling) at the same time.

Please select a point from each of the two rows for positive emotion and negative emotion you feel now:

<table>
<thead>
<tr>
<th>Levels of emotion</th>
<th>Not at all (1)</th>
<th>Slightly (2)</th>
<th>Moderately (3)</th>
<th>Quite a bit (4)</th>
<th>Very much (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive emotion (1)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Negative emotion (2)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

Responses for positive and negative emotions were scored on a five-anchor Likert, ranging from 1 (not at all) to 5 (very much). Likewise, Q78 enquires about participants’ post-trading emotions using the same measure as Q25.

4.5.6 Demographic variables

Previous research findings suggest important control variables or covariates are required to study the disposition effect, despite some contrasting results, such as gender differences (cf. Shu et al., 2005; Da Costa Jr, Mineto, and Da Silva, 2008). After administering the trait psychometrics, participants’ demographics were collected. Among them, age, gender, and financial sophistication (measured by participants’ years of investment experience) are of interest for the current research. Investment horizon, the time that an investor holds an asset, was not studied. Such a time frame reflects how much
risk people want to take but is different from that allowed by an experiment; the current research constrains investment behaviour to a relatively short period of time.

Controlling covariates is important in cross-sectional analysis with trait variables and the disposition effect. For the experimental analysis, randomly allocating participants to experimental conditions has balanced demographic variables across groups and reduced the potential for unmeasured confounding variables. Whether adequate randomisation has been achieved is tested in a separate analysis, discussed in Section 5.3.

### 4.6 Preparing the data for analysis

#### 4.6.1 Scrutinising for straightlining

Possibly, some participants did not report their feelings or thoughts seriously but mechanically gave the same response for every question, forming a straight line when the responses are plotted as a line (e.g., a participant always selected a score of 1 or 5 for every question). This non-differentiation in ratings is called straightlining, which ‘happens when respondents lose their motivation to engage with a survey because they’re bored, don’t have the mental energy, or they find the survey too complex and demanding’ (Vannette, 2018). Undoubtedly, this measurement error jeopardises data quality.

Straightlining is found when there are no differences among the scores reported by a participant. Statistically, the variance for a straightliner’s responses is zero. To preclude the error before analysing the data, I used the SPSS programme to run variance analysis for response items that constitute the state mindfulness measure, Perceived Responsibility, the trait measures of mindfulness, Positive Reappraisal, and Catastrophising, age, investment experience, pre-trading and post-trading positive and negative emotions (this last group of variables was used to test the effects of manipulations before and after trading, see Subsection 6.2.2). I did not find a pattern of mechanical responses forming a straight line.
across data in any of these cases as the lowest variance score was 0.07. Hence, no case was removed.

4.6.2 Construct reliability of psychometric scales

The construct reliability of a scale is a test of internal consistency of the scale formed by consolidating the scores in a set of test items (Easterby-Smith et al., 2015). Each test item is assumed to measure the same latent trait on the same scale, and they are collectively measured by Cronbach’s alpha coefficient (Cronbach, 1951). Acceptable values of Cronbach’s alpha coefficient range from 0.70 to 0.95. A value lower than the acceptable range indicates the test length is too short or heterogeneous constructs exist. In contrast, a value within the acceptable range suggests the test items are sufficiently correlated or homogeneous (Tavakol and Dennick, 2011).

I tested the construct reliability of the following scales based on the sample of 820 (which excludes one participant who bought and sold up all funds in the first round of trading without subsequent trading, see Subsection 5.2.1).

Having reviewed the survey questionnaire after the Qualtrics Pilot, I streamlined the use of each subscale of the TMS further by reducing it to two items with the highest factor loadings within the subscale as recorded by its developers (Lau et al., 2006). The scale used in the Main Study consisted of two subscales (i.e., Decentring and Curiosity) which were reduced to two items each (see Subsection 4.5.3). I should test its construct reliability. Cronbach’s alpha coefficient for the TMS scale is within the acceptable range (α = .811). Additionally, arithmetic mean scores of Curiosity (2.53) and Decentring (3.16) under the mindfulness manipulation (N = 421) are slightly lower than those obtained in the researcher-attended Student Pilot (N = 18, discussed in Subsection 3.5.4), but the difference in effect cannot be compared because of different sample sizes. I have confidence in using the scale as its reliability is established. The reduction in scale length
from 6 to 4 items is justified due to economical reasons to save time and costs, and the mitigation of potential priming.

Cronbach's alpha coefficient for trait mindfulness is at the low end of the acceptable range ($\alpha = .712$).

Cronbach's alpha coefficient for trait positive reappraisal is at the middle-to-high end of the acceptable range ($\alpha = .828$).

Cronbach's alpha coefficient for trait catastrophising is at the high end of the acceptable range ($\alpha = .871$).

4.6.3 Descriptive and correlation statistics for variables to be tested

Variables of interest for the current research are those related to the manipulations, independent and dependent variables, covariates, and pre-trading and post-trading emotions. A set of descriptive statistics summarising the variables’ characteristics (or references where their characteristics are discussed), mean scores, standard deviations, and Cronbach’s alpha values (where applicable) is set out below in Table 4-3.

Generally, data of these variables are not widely spread from their respective mean values as their standard deviations are around 1 or below. Both gender and the two manipulated variables have a standard deviation of 0.50 as they are dichotomous variables obtained from a uniform quota and randomised even allocations, respectively.

Before conducting analysis to test hypotheses, relationships among these variables are examined. Table 4-4 below exhibits Spearman's $\rho$ correlation analysis for the variables. Spearman's $\rho$ is a rank-order correlation measuring the direction and magnitude of association between ranked bivariates, which is the nonparametric analogue of the Pearson product-moment correlation (for two variables in which at least one has an
interval scale) (Howell, 2007). One-tailed correlations were obtained as there lacked evidence for bidirectional influences among the variables.

Table 4-3 Descriptive statistics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Data characteristic/reference</th>
<th>Mean</th>
<th>Median</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Standard Deviation</th>
<th>Cronbach’s alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>1 = F, 2 = M</td>
<td>1.524</td>
<td>2.000</td>
<td>1.000</td>
<td>2.000</td>
<td>0.500</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>Subsection 5.2.2</td>
<td>3.804</td>
<td>4.000</td>
<td>1.000</td>
<td>5.000</td>
<td>1.194</td>
<td></td>
</tr>
<tr>
<td>Investment experience</td>
<td>Subsection 5.3.2</td>
<td>2.020</td>
<td>1.000</td>
<td>1.000</td>
<td>4.000</td>
<td>1.281</td>
<td></td>
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<tr>
<td>Mindfulness manipulation</td>
<td>Dichotomous</td>
<td>0.513</td>
<td>1.000</td>
<td>0.000</td>
<td>1.000</td>
<td>0.500</td>
<td></td>
</tr>
<tr>
<td>Reappraisal manipulation</td>
<td>Dichotomous</td>
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<td>0.000</td>
<td>0.000</td>
<td>1.000</td>
<td>0.500</td>
<td></td>
</tr>
<tr>
<td>The TMS</td>
<td>Subsection 5.5.1</td>
<td>2.683</td>
<td>2.750</td>
<td>1.000</td>
<td>5.000</td>
<td>0.967</td>
<td>0.811</td>
</tr>
<tr>
<td>Perceived Responsibility</td>
<td>Subsection 5.5.1</td>
<td>3.654</td>
<td>4.000</td>
<td>1.000</td>
<td>5.000</td>
<td>1.149</td>
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</tr>
<tr>
<td>Pre-trading positive affect</td>
<td>Subsection 4.5.5</td>
<td>3.091</td>
<td>3.000</td>
<td>1.000</td>
<td>5.000</td>
<td>1.052</td>
<td></td>
</tr>
<tr>
<td>Pre-trading negative affect</td>
<td>Subsection 4.5.5</td>
<td>2.261</td>
<td>2.000</td>
<td>1.000</td>
<td>5.000</td>
<td>1.086</td>
<td></td>
</tr>
<tr>
<td>Post-trading positive affect</td>
<td>Subsection 4.5.5</td>
<td>2.511</td>
<td>3.000</td>
<td>1.000</td>
<td>5.000</td>
<td>1.099</td>
<td></td>
</tr>
<tr>
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<td>Subsection 4.5.5</td>
<td>2.702</td>
<td>3.000</td>
<td>1.000</td>
<td>5.000</td>
<td>1.161</td>
<td></td>
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<tr>
<td>Trait mindfulness measure</td>
<td>Subsection 4.5.3</td>
<td>3.429</td>
<td>3.400</td>
<td>1.400</td>
<td>5.000</td>
<td>0.564</td>
<td>0.712</td>
</tr>
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<td>Trait Positive Reappraisal</td>
<td>Subsection 4.5.4</td>
<td>3.637</td>
<td>3.750</td>
<td>1.000</td>
<td>5.000</td>
<td>0.771</td>
<td>0.828</td>
</tr>
<tr>
<td>Trait Catastrophising</td>
<td>Subsection 4.5.4</td>
<td>2.090</td>
<td>2.000</td>
<td>1.000</td>
<td>5.000</td>
<td>0.884</td>
<td>0.871</td>
</tr>
<tr>
<td>PGR</td>
<td>Subsection 4.5.2</td>
<td>0.172</td>
<td>0.110</td>
<td>0.000</td>
<td>1.000</td>
<td>0.190</td>
<td></td>
</tr>
<tr>
<td>PLR</td>
<td>Subsection 4.5.2</td>
<td>0.245</td>
<td>0.210</td>
<td>0.000</td>
<td>1.000</td>
<td>0.199</td>
<td></td>
</tr>
<tr>
<td>The disposition effect</td>
<td>Subsection 4.5.2</td>
<td>-0.073</td>
<td>-0.056</td>
<td>-1.000</td>
<td>1.000</td>
<td>0.248</td>
<td></td>
</tr>
</tbody>
</table>

N = 820

The initial check for the manipulations finds that the TMS correlated with the mindfulness manipulation (Spearman’s rho = .18, p < .001) but Perceived Responsibility did not relate to the reappraisal manipulation, suggesting the failure of the latter. Only the mindfulness manipulation was associated with the dependent variables – it correlated inversely with PGR (Spearman’s rho = -.14, p < .001) and PLR (Spearman’s rho = -.09, p = .005). Both manipulations did not have correlations with the disposition effect, which is contrary to what was hypothesised. I discuss these observations further in Chapter Five.

Covariates should be related to both dependent and independent variables when they are included in hypothesis-testing. Gender correlated positively with PGR (Spearman’s rho = .06, p = .046) and negatively with trait catastrophising (Spearman’s rho = -.06, p =
Age correlated positively with the mindfulness manipulation (Spearman's rho = .11, p = .001) and trait mindfulness (Spearman's rho = .28, p < .001) and negatively with trait catastrophising (Spearman's rho = -.32, p < .001), PGR (Spearman's rho = -.19, p < .001), and the disposition effect (Spearman's rho = -.12, p < .001). Although investment experience only had rank-order correlations with pre-trading positive and negative emotions and post-trading positive emotion (see Subsection 6.2.2 for the relationships among investment experience, the two manipulations, and pre-trading emotions), the variable had a negative Pearson product-moment correlation with PLR (r = -.06, p = .048) which warrants attention. Taken together, the three covariates should be included to test the hypotheses involving trait psychometrics (i.e., Hypothesis sets H3 to H5).

Overall, the inter-correlations among dependent and independent variables, covariates, and pre-trading and post-trading emotions are weak to modest. Bivariate Spearman's rho correlations higher than .50 are not found among independent variables, suggesting that multicollinearity among them seems not to be a substantial problem. When conducting statistical inferences (e.g., regression analysis), multicollinearity is a cause for concern because it may result in less reliable analysis, which is attributed to higher standard errors in predicting the dependent variable.

Given that trait mindfulness, trait positive reappraisal, and trait catastrophising are related attributes as posited by the Mindful Coping Model (Garland et al., 2009), it is unsurprising that their correlation coefficients are close to .50: Spearman's rho for trait mindfulness and trait catastrophising is -.48, p < .001; Spearman's rho for trait mindfulness and trait positive reappraisal is .44, p < .001. To rule out the possible compromise on dependent variable prediction, I carry out a further test to ensure that multicollinearity is not present in inferential analysis for the disposition effect and its behavioural components when regression analysis is run for the manipulations, trait psychometrics, and covariates in Subsection 6.1.5 (of note, multicollinearity is precluded by the VIF analysis).

The dependent and independent variables and covariates are now ready for inferential analysis. Testing for the first two sets of hypotheses is analysed in Chapter Five. Testing for the Hypothesis sets of H3 to H5 is discussed in Chapter Six.
### Table 4-4 Spearman’s rho correlation analysis

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Gender</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Age</td>
<td>.143*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>3 Investment experience</td>
<td>.230**</td>
<td>.164**</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Mindfulness manipulation</td>
<td>-0.023</td>
<td>.108**</td>
<td>0.019</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>5 Reappraisal manipulation</td>
<td>0.027</td>
<td>-0.055</td>
<td>-0.019</td>
<td>-0.058*</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>6 The TMS</td>
<td>-0.055</td>
<td>-.103**</td>
<td>0.040</td>
<td>.177**</td>
<td>-0.023</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>7 Perceived Responsibility</td>
<td>0.022</td>
<td>-.063*</td>
<td>0.044</td>
<td>0.019</td>
<td>0.048</td>
<td>.211**</td>
<td></td>
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<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>8 Pre-trading positive affect</td>
<td>0.005</td>
<td>-.126**</td>
<td>-.155**</td>
<td>0.022</td>
<td>-.061*</td>
<td>.335**</td>
<td>.164**</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 Pre-trading negative affect</td>
<td>-.086**</td>
<td>-.053</td>
<td>-.107**</td>
<td>.062*</td>
<td>.064*</td>
<td>.065*</td>
<td>-.025</td>
<td>-.328**</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 Post-trading positive affect</td>
<td>-0.006</td>
<td>-.127**</td>
<td>.062*</td>
<td>-0.025</td>
<td>-0.031</td>
<td>.176**</td>
<td>0.012</td>
<td>.421**</td>
<td>-0.059*</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 Post-trading negative affect</td>
<td>-0.020</td>
<td>-.066*</td>
<td>-.002</td>
<td>0.052</td>
<td>0.035</td>
<td>.156**</td>
<td>.109**</td>
<td>0.017</td>
<td>.328**</td>
<td>-.302**</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>12 Trait mindfulness measure</td>
<td>0.020</td>
<td>.278**</td>
<td>0.001</td>
<td>-.005</td>
<td>-.066*</td>
<td>-.001</td>
<td>-.046</td>
<td>.138**</td>
<td>-.258**</td>
<td>.085**</td>
<td>-.246**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13 Trait Positive Reappraisal</td>
<td>-0.020</td>
<td>.054</td>
<td>.037</td>
<td>.035</td>
<td>-.039</td>
<td>.251**</td>
<td>.092**</td>
<td>.317**</td>
<td>-.157**</td>
<td>.215**</td>
<td>-.098**</td>
<td>.436**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14 Trait Catastrophising</td>
<td>-.063*</td>
<td>-.322**</td>
<td>-.021</td>
<td>-.086**</td>
<td>-.013</td>
<td>.137**</td>
<td>.086**</td>
<td>0.012</td>
<td>.190**</td>
<td>0.057</td>
<td>.163**</td>
<td>-.482**</td>
<td>-.289**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 PGR</td>
<td>.059*</td>
<td>-.186**</td>
<td>-.014</td>
<td>-.139**</td>
<td>0.030</td>
<td>0.053</td>
<td>-.025</td>
<td>.083**</td>
<td>0.021</td>
<td>-0.009</td>
<td>.093**</td>
<td>-.052</td>
<td>-0.012</td>
<td>.127**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16 PLR</td>
<td>-0.042</td>
<td>-.054</td>
<td>-.056</td>
<td>-.089**</td>
<td>-.014</td>
<td>0.013</td>
<td>-.034</td>
<td>-.025</td>
<td>.084**</td>
<td>-.121**</td>
<td>-.031</td>
<td>-.045</td>
<td>.164**</td>
<td>.102**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17 The disposition effect</td>
<td>0.053</td>
<td>-.115**</td>
<td>0.035</td>
<td>-0.043</td>
<td>0.040</td>
<td>0.014</td>
<td>-.015</td>
<td>.059*</td>
<td>-.010</td>
<td>-.087**</td>
<td>.080*</td>
<td>-0.016</td>
<td>0.006</td>
<td>-0.007</td>
<td>.634**</td>
<td>-.625**</td>
<td></td>
</tr>
</tbody>
</table>

** Correlation is significant at the 0.01 level (1-tailed).
* Correlation is significant at the 0.05 level (1-tailed).

N = 820
The previous chapter discussed how online data were collected for the Main Study. It included, among others, a detailed description of how the dependent variables and antecedents were measured. The dependent variables are the disposition effect and its behavioural components (i.e., the PGR and the PLR). The efficacy of the mindfulness and the reappraisal manipulations were measured by the Toronto Mindfulness Scale (the TMS; Lau et al., 2006) and Perceived Responsibility, respectively.

This chapter discusses how these variables are used to test whether the hypotheses are supported or should be rejected. It begins with a review of the sample data. A demographic analysis is used to investigate the effectiveness of randomisation by checking for a disproportionate distribution of demographic characteristics between randomised groups in the online experiment. They are controlled for in the rest of the analysis. From there, the effectiveness of the reappraisal and the mindfulness manipulations is examined. The analysis focuses on the disposition effect measured in the two different costing conventions, and whether the manipulations affected financial behaviour, including the realisation of gains and losses. The chapter finishes with a summary of the findings from the analyses.

In this chapter, I investigate the effects of the mindfulness and the reappraisal manipulations as a dual antecedent to test the following hypotheses, which were developed at the start of the present research as discussed in Chapter Two:
H1a. State mindfulness affects the disposition effect such that the higher the state mindfulness, the lower the disposition effect.

H1b. State mindfulness affects the realisation of gains such that the higher the state mindfulness, the lower the realisation of gains.

H1c. State mindfulness affects the disposal of losses such that the higher the state mindfulness, the higher the disposal of losses.

H2a. Situational reappraisal affects the disposition effect such that the stronger the influence of the situational reappraisal, the lower the disposition effect.

H2b. Situational reappraisal affects the realisation of gains such that the stronger the influence of the situational reappraisal, the lower the realisation of gains.

H2c. Situational reappraisal affects the disposal of losses such that the stronger the influence of the situational reappraisal, the higher the disposal of losses.

5.1 Factorial design of the experimental study

The online experiment deployed two manipulations, the mindfulness intervention and the situational reappraisal intervention, in a randomised control experiment with a 2 × 2 factorial design. This design had four different treatment conditions which were categorised as the control (mindfulness = 0, reappraisal = 0), the reappraisal-only (mindfulness = 0, reappraisal = 1), the mindfulness-only (mindfulness = 1, reappraisal = 0), and the mindfulness-reappraisal (mindfulness = 1, reappraisal = 1) conditions. To test the hypotheses, I focused on the effects of the two manipulations on the financial behaviour of selling investment funds. The manipulations had been deployed before participants proceeded to a Free Trading Simulation. Participants chose the amounts of money they wished to invest and divest for each of four investment funds in eight rounds of simulated
trading. Data were captured on purchases and sales of assets and converted into measures relevant to the study. These measurements included the realisation of gains and the disposal of losses, which collectively constituted the measurement for the disposition effect. Trait psychometrics and demographics were measured by self-reporting soon after participants had finished the trading simulation.

5.2 The sample data

5.2.1 Reviewing trading activities and removal of non-traders

The Main Study started in mid-October 2019. A total of 821 participants completed the study, which ended on 19th December 2019. The online trading simulation and survey allowed participants to undergo eight rounds of trades with the same four investment funds in each round of trade. A preliminary screening of the complete data found that some participants just made the initial purchase of the four funds and did not trade in subsequent rounds, although some of them sold part of their portfolio in the last round of trading. The research did not force people to trade, but a trading activity pattern without conscientious effort might create bias in the analysis. The acceptance of such trading data for analytical purposes depends on whether participants had opportunities to trade in the rounds of reviews from which data were taken.

Perhaps certain participants may need some time to familiarise themselves with the mechanics of the investment simulation. They might not be ready to buy and sell any investments seriously in the first round of trade. It was natural for participants to wait for one more turn to sell their assets after buying them at the outset. On the other hand, excluding the last round (i.e., the eighth round) sale seemed prudent, as some participants chose to sell all the investments because they had been told this was the last chance of selling. After considering the above scenarios, I decided to exclude the observations of
divestments in the first and last rounds of trading from the measurement of the selling behaviour.

Having applied the rule to preclude any boundary effect, I found that 15 participants did not trade in the second to seventh rounds of trades. A closer look at their trading pattern revealed that one participant bought funds and sold them up in the first round without trading or holding any investments in the subsequent rounds. The other 14 participants traded in the first round and had assets in their portfolios but did not trade in the subsequent rounds despite having opportunities to do so. Then, I resorted to Odean’s (1998) rationale for participant selection. He excluded non-traders as he did not know when and at what prices they bought their initial portfolios, given that he studied an enormous set of trade data from retail investors in a prescribed time. In contrast, I had full data on trading positions and prices from the first round. Hence, I should remove the first participant who did not hold any positions for divestment purposes. The 14 non-active investors may have had various reasons for not trading in the subsequent rounds. For example, they might adopt a buy-and-hold strategy as discussed in Subsection 4.5.2. Further, when considering the realisation of gains and the disposal of losses separately and the focus is on the tendency to realise gains or cut losses, those who did not realise gains or losses are of particular interest. Throughout the analysis, I excluded the non-trader who sold all assets in the first round and retained the 14 participants who had assets but performed no trading after the first round.

5.2.2 General characteristics of the sample

Only UK graduates or qualified professionals were recruited for the Main Study. Out of the 820 participants admitted for the Main Study analysis, 390 were female, and 430 were male. Thirty participants were in the 20 to 29 age group. One hundred and ten were between 30 to 39, and 170 were in the 40 to 49 group. The remaining majority (62%
of the entire sample) were senior people: 191 were in the 50 to 59 age range and 319 were 60 or older. **Table 5-1** shows the distribution of age between genders.

### Table 5-1 Distribution of age between genders

<table>
<thead>
<tr>
<th>Age</th>
<th>Female</th>
<th>% on gender</th>
<th>Male</th>
<th>% on gender</th>
<th>Total</th>
<th>% on total</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-29 years</td>
<td>20</td>
<td>5%</td>
<td>10</td>
<td>2%</td>
<td>30</td>
<td>4%</td>
</tr>
<tr>
<td>30-39 years</td>
<td>75</td>
<td>19%</td>
<td>35</td>
<td>8%</td>
<td>110</td>
<td>13%</td>
</tr>
<tr>
<td>40-49 years</td>
<td>71</td>
<td>18%</td>
<td>99</td>
<td>23%</td>
<td>170</td>
<td>21%</td>
</tr>
<tr>
<td>50-59 years</td>
<td>94</td>
<td>24%</td>
<td>97</td>
<td>23%</td>
<td>191</td>
<td>23%</td>
</tr>
<tr>
<td>60 and over</td>
<td>130</td>
<td>33%</td>
<td>189</td>
<td>44%</td>
<td>319</td>
<td>39%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>390</td>
<td>100%</td>
<td>430</td>
<td>100%</td>
<td>820</td>
<td>100%</td>
</tr>
</tbody>
</table>

### 5.3 Demographic differences

In a randomised treatment allocation, such as the current research setting, the treatment effects of interventions on the outcome variable (*i.e.*, the disposition effect) assume no confounding with covariates, such as demographic differences. The elimination of systematic bias is an intended benefit of randomisation (Levin, 1998). However, randomisation can produce, at random, some significant differences in confounding variables between groups. The experiment did not use uniform quotas for different age groups and levels of financial sophistication (measured by years of investment experience), potentially leading to different numbers in treatment groups. So, I tested that the randomised experiment did not have significant demographic differences among groups due to different numbers in treatments and potential epiphenomenal associations that were not due to manipulations.

The evidence reviewed in **Chapter Four** suggests that age and financial sophistication influence investment behaviour (*e.g.*, Feng and Seasholes, 2005; also see
Subsection 4.5.1 for another reason to control for financial sophistication). Gender has different effects on the disposition effect as advised by previous research (cf. Shu et al., 2005; Da Costa Jr et al., 2008).

For the current sample, gender, age, and investment experience had significant correlations with the dependent and independent variables (see Subsection 4.6.3). The effects of randomised allocation to treatment groups on these control variables are now tested in the following subsections.

5.3.1 Gender distribution in the four experimental conditions

In addition to the randomised allocation of participants to the manipulations, the online experiment applied a uniform quota for gender. Having filled the gender quota, participants were led to the mindfulness and the reappraisal manipulations. As discussed in Section 4.3, the attrition in the mindfulness and mind-wandering interventions led to uneven allocations to the four different experimental conditions, which also resulted in unequal numbers in gender, the mindfulness/mind-wandering groups, and participants under the two different reappraisals. Consequently, male participants outnumbered females by 40, or 5% of the total sample. A Chi-square test was applied to test if a significant difference existed in gender under the three treatments and the control groups.

Table 5-2 below shows a crosstabulation of observed and expected counts of gender distribution across the four treatment conditions. Pearson Chi-square is non-significant [$\chi^2(3) = 1.04$, asymptotic significance (2-tailed) = .791], suggesting that the randomised allocation balanced gender distribution across the four experimental conditions. Hence, gender does not need to be controlled for in hypothesis-testing involving the two manipulations.
Table 5-2 Gender crosstabulation under the four experimental conditions

<table>
<thead>
<tr>
<th>3 interventions and control</th>
<th>Gender</th>
<th></th>
<th></th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>Count</td>
<td>91</td>
<td>98</td>
<td>189</td>
</tr>
<tr>
<td></td>
<td>Expected Count</td>
<td>90</td>
<td>99</td>
<td>189</td>
</tr>
<tr>
<td>Reappraisal</td>
<td>Count</td>
<td>94</td>
<td>116</td>
<td>210</td>
</tr>
<tr>
<td></td>
<td>Expected Count</td>
<td>100</td>
<td>110</td>
<td>210</td>
</tr>
<tr>
<td>Mindfulness-Reappraisal</td>
<td>Count</td>
<td>94</td>
<td>103</td>
<td>197</td>
</tr>
<tr>
<td></td>
<td>Expected Count</td>
<td>94</td>
<td>103</td>
<td>197</td>
</tr>
<tr>
<td>Mindfulness</td>
<td>Count</td>
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<td>113</td>
<td>224</td>
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<td></td>
<td>Expected Count</td>
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<tr>
<td>Total</td>
<td>Count</td>
<td>390</td>
<td>430</td>
<td>820</td>
</tr>
<tr>
<td></td>
<td>Expected Count</td>
<td>390</td>
<td>430</td>
<td>820</td>
</tr>
</tbody>
</table>

5.3.2 Testing age and investment experience under manipulations

Age and investment experience are covariates that were not manipulated. As discussed in Subsection 5.2.2, age is a categorical variable with five consecutive ranges of ten years each except the final category (60+, see Table 5-1). Investment experience is categorised into four groups: i) have no experience at all (N = 463), ii) have solely relied on financial advisors to handle investments (N = 79), iii) have had less than three years of experience (N = 77), and iv) have had three or more years of experience (N = 201).

A two-way analysis of variance (ANOVA) is a parametric test typically used to estimate how the mean of a dependent variable changes in different levels of two categorical manipulated variables in a factorial design (Levin, 1998). It is analogous to multiple two-sample t-tests\(^\text{10}\) and results in fewer Type I errors (i.e., the false rejection of a true null hypothesis; Howell, 2007). It includes F-tests of hypotheses about each manipulated variable, unconfounded by levels of the other manipulated variable and the interaction between them (Levin, 1998). Table 5-3 below shows the between-subjects

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\(^\text{10}\) A t-test is a parametric test for comparing two independent groups subjected to different experimental conditions (Howell, 2007).
effects for age and investment experience in a two-way ANOVA. Type III Sums of Squares was used due to the need to test the interaction of the manipulations. Small but significant differences were found in the allocation of age groups to the mindfulness and the mind-wandering conditions as the $F$-score is significant [$F (1, 816) = 8.37, p = .004$]. The analysis indicates the homogeneity of variances condition as Levene’s test for equality of error variances is not significant [$F (3, 816) = 2.35, p = .071$]. Age varied inversely with the mindfulness manipulation, and the difference was about three years because the parameter estimate shows that the coefficient for mindfulness is -0.31 [standard error = .118, 95% CI (-0.54 to -0.08), $p = .009$] as each age band spans ten years in the first four categories. The fifth category is composed of people 60 or older.

Table 5-3 Two-way ANOVA test for age and investment experience

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>16.544</td>
<td>3</td>
<td>5.515</td>
<td>3.910</td>
<td>0.009</td>
<td>5.140</td>
<td>3</td>
<td>1.713</td>
<td>1.044</td>
<td>0.372</td>
</tr>
<tr>
<td>Intercept</td>
<td>11803.847</td>
<td>1</td>
<td>11803.847</td>
<td>8369.449</td>
<td>0.000</td>
<td>3313.993</td>
<td>1</td>
<td>3313.993</td>
<td>2020.263</td>
<td>0.000</td>
</tr>
<tr>
<td>Mindfulness</td>
<td>11.798</td>
<td>1</td>
<td>11.798</td>
<td>8.366</td>
<td>0.004</td>
<td>0.329</td>
<td>1</td>
<td>0.329</td>
<td>0.200</td>
<td>0.654</td>
</tr>
<tr>
<td>Reappraisal</td>
<td>3.179</td>
<td>1</td>
<td>3.179</td>
<td>2.254</td>
<td>0.134</td>
<td>0.215</td>
<td>1</td>
<td>0.215</td>
<td>0.131</td>
<td>0.717</td>
</tr>
<tr>
<td>Mindfulness * Reappraisal</td>
<td>0.924</td>
<td>1</td>
<td>0.924</td>
<td>0.655</td>
<td>0.418</td>
<td>4.493</td>
<td>1</td>
<td>4.493</td>
<td>2.739</td>
<td>0.098</td>
</tr>
<tr>
<td>Error</td>
<td>1150.845</td>
<td>816</td>
<td>1.410</td>
<td></td>
<td></td>
<td>1338.548</td>
<td>816</td>
<td>1.640</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>13031.000</td>
<td>820</td>
<td>1.410</td>
<td></td>
<td></td>
<td>4688.000</td>
<td>820</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>1167.389</td>
<td>819</td>
<td>1.410</td>
<td></td>
<td></td>
<td>1343.688</td>
<td>819</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. R Squared = .014 (Adjusted R Squared = .011)
b. R Squared = .004 (Adjusted R Squared = .000)

In parallel, I found from a $t$-test a small but significant difference in mean category labels of ages between the mindfulness group (N = 421, mean category label = 3.92) and the mind-wandering group (N = 399, mean category label = 3.67). The mean difference of 0.25 is significantly different from zero [$t (1, 818) = 2.98, 95\% \text{CI (0.08 to 0.41), } p = .002$ (one-tailed)] under the condition of variance homogeneity as Levene’s test is non-significant [$F (1, 818) = 2.87, p = .090$]. The result suggests that those allocated at random to the mindfulness condition were on average slightly older by about three years than those who experienced the mind-wandering condition. On average, both groups were positioned
at the higher end of the age bracket 40 – 49 (category label 3). These observations are consistent with the overall age distribution, where 510 participants (62%) were 50 or over. Owing to this disproportionate participation, I controlled for age as a covariate in hypothesis-testing involving the two manipulations.

Turning to investment experience, the mean score is 2.02. Only 34% (N = 278, the sum of categories iii and iv) of the total sample had ever made investment decisions before taking part in the trading simulation, indicating that most participants had not traded before. Conceivably, the disproportionate participation could be due to the selective attrition of the financially sophisticated who dropped out at the start of the mindfulness/mind-wandering induction as discussed in Subsection 4.4.2. Perhaps, this demographic feature may reflect the reality of the UK individual investors as the finding of a recent research study on 2,000 UK adults shows that 74% of participants did not have any investments (Alois, 2019).

Nevertheless, the two-way ANOVA test of between-subjects effects for investment experience in Table 5-3 above shows that investment experience was not significantly associated with the allocation to manipulation groups, with no significant differences across the four experimental conditions [F (3, 816) = 1.04, p = .372], under the condition of heteroscedasticity as Levene’s test is significant [F (3, 816) = 3.16, p = .024]. The result suggests that randomisation seemed to work for investment experience. Hence, investment experience did not need to be controlled for in testing the manipulation hypotheses.

5.4 The disposition effect measurement

Chapter Four (Subsection 4.5.2) discussed how I adapted Odean’s (1998) formula to calculate the disposition effect, the difference between the PGR and the PLR.

\[
PGR = \frac{\text{realised gains}}{\text{realised gains} + \text{unrealised gains}}
\]

\[
PLR = \frac{\text{realised losses}}{\text{realised losses} + \text{unrealised losses}}
\]
The disposition effect = PGR - PLR

Odean ascertained the numbers of gains and losses sold using the values of stocks involved in every trade as the basis of calculation. He was able to secure statistically significant results readily due to the high power of an enormous data population. Since I have not had as vast a sample as he did, I modified his method from using the values of trades sold to the numbers of fund units sold as the basis of calculation. As discussed in Subsection 4.5.2, in the eight rounds of trades, 537,168 units were sold as either gains or losses when measuring the disposition effect at the last period pricing. Among these divestments, 9,041 sales transactions were made in the second to the seventh rounds of trades, which the current research used as data for calculating realised gains and losses. The dataset was considered large enough to produce meaningful results when using fund units transacted as the basis of measurement.

I aggregated the total number of fund units in gain in the six rounds (from the second to the seventh) as the denominator and the total number of units of gains sold as the numerator to arrive at the PGR. Similarly, the total number of fund units for losses sold in the six rounds was divided by the number of total fund units at loss to obtain the PLR fraction. The disposition effect measurement was the difference between the PGR and the PLR (PGR - PLR), which was continuous from -1 to +1. Two measurements were calculated using two costing methods: the prior period pricing and the weighted average costing. How they were calculated was shown in Subsection 4.5.2.

This research uses the prior period price as the reference point for current sales to calculate gains and losses. It then considers results using a weighted average price method to calculate the disposition effect as a robustness check. As discussed, the average purchase price was also applied by Odean (1998). In real-life situations, retail investors are shown the weighted average cost of assets in their portfolios (calculated from various purchase prices when they bought the assets, see Subsection 4.5.2).

In contrast, fund houses advise clients of the performances of their portfolios through periodic reviews, which compare the performances of investments from the last period to the current one with reference to the previous review’s market pricing. The last
period pricing seems to provide a reasonable reference point in the present research as participants may not be able to remember at what price they purchased a certain investment in prior periods, or they may buy the same fund in different tranches at different prices. Comparing the current price with that of the last period was likely to be more salient for them. Using the prior period price as the reference point for selling assets was particularly relevant to the research setting. Participants were free to adapt themselves to multiple reference points during trading (see Weber and Camerer, 1998) rather than using multiple previous purchase prices that they might not remember.

5.4.1 Distribution of measurement at prior period pricing

I tested the skewness of the distribution of the disposition effect measured at prior period pricing and found that it is mildly left-skewed or negatively skewed, but the skewness is not significant as the Z-value is lower than 1.96, the critical Z-value at the 95% level.\(^{11}\) The distribution appears to be leptokurtic, with scores shifting from the shoulders to the centre and the tails (see the histogram shown in Figure 5-1 below). Kurtosis analysis shows that the Z-value is higher than the critical Z-value,\(^{12}\) confirming a significant leptokurtic distribution. It has extreme values lying at the tails and a tall centre concentrated with close-to-zero cases.

The third test on the distribution is normality. Results of the Kolmogorov-Smirnov test (.065, \(p < .001\)) and the Shapiro-Wilk test (.976, \(p < .001\)) are all significant, indicating that the disposition effect measurement is not normally distributed. Any major violation of the normality assumption can suggest that distribution-free or nonparametric methods should be used to study the disposition effect. However, given a reasonably large

\(^{11}\) Z-value = skewness-score / standard error of skewness, i.e., -112/.085 = -1.32, which is less than 1.96.

\(^{12}\) Z-value = kurtosis-score / standard error of kurtosis, i.e., 1.815/.171 = 10.61, which is higher than 1.96.
sample, ANOVA and regression tests are robust to modest departures from normality (Howell, 2007), as in the case of the current study.

Figure 5-1 Distribution of the disposition effect measured at prior period pricing

5.4.2 Distribution of measurement at weighted average costing

As discussed in Subsection 4.5.2, a sale deemed to be a realisation of gain under the last period pricing can be reckoned as a loss disposal in average costing, or *vice versa* (see Table 4-1 for a reconciliation of gains and losses sold under the two measurements for case identifier 15). The disposition effect measured at weighted average costing, which serves as a robustness check, is analysed with the same tests I applied to the last period pricing. I expected that the analysis results of the two measurements would mostly be consistent.
Figure 5-2 displays a histogram of the frequency distribution for the disposition effect measured at weighted average cost. Both results of the Kolmogorov-Smirnov test (.079, \( p < .001 \)) and the Shapiro-Wilk test (.960, \( p < .001 \)) are significant, supporting the non-normality of the alternative disposition effect measurement. Then, I tested the skewness of the distribution and found that it is slightly left-skewed, but the skewness is not significant because the Z-value is lower than 1.96.\(^{13}\) The distribution appears to be more leptokurtic\(^ {14} \) than that of the counterpart measurement at the last period pricing. Yet, it does not affect its nonparametric property. So, I applied similar tests for measurement at the last period pricing to the alternative measurement.

**Figure 5-2 Distribution of the disposition effect measured at weighted average cost**

\(^{13}\) Z-value = skewness-score / standard error of skewness, \( i.e., -.174/.085 = -2.05 \), which is less than 1.96.

\(^{14}\) Z-value = kurtosis-score / standard error of kurtosis, \( i.e., 2.519/.171 = 14.73 \), which is higher than 1.96.
Parametric tests chiefly analyse data based on the mean scores of variables (e.g., a t-test). The mean scores for the prior period pricing and the weighted average costing measurement are -0.07 and -0.06. Parametric tests are usually preferred to their nonparametric counterparts because of power considerations. These tests are recommended even if the distribution assumptions are moderately violated (Howell, 2007). F-test (ANOVA) and regression analysis are robust to modest departures from normality. An F-test is robust to slight, moderate, and severe departures from normality, with various sample sizes (equal or unequal sample size) and with the same or different shapes in the groups (Blanca et al., 2017). The relatively low-power nonparametric tests should be used for testing non-normal distributions, especially for a small sample size in which minor deviations from normality are significant. The disposition effect distributions for both costing methods are only modestly non-normal. Given a reasonably large sample (N = 820), I used nonparametric tests as the primary analyses and parametric tests of regression and F-test (ANOVA) when nonparametric tests did not provide adequate interpretations.

In the next section, I assess the effectiveness of manipulations before testing their effects on the disposition effect.

5.5 Did manipulations work?

I tested the effectiveness of the manipulations by two measures. The psychometric measure related to the situational reappraisal manipulation is the Perceived Responsibility for the investment decisions made during the trading simulation. The measure for the mindfulness-based manipulation is the TMS (Lau et al., 2006), a state measure of mindfulness. The former is a single item measure reported by participants after they had finished the trading simulation — you felt that you were responsible for the gain or loss when you were making trading decisions for the investment portfolio (Q97, refer to details of reappraisal instructions and the measure to Section 3.5.5). The latter, the TMS, is a streamlined scale used to measure the state of mindfulness (see Subsection 4.5.3)
immediately after the mindfulness or mind-wandering induction but before trading. The measure encompasses two subscales, Decentring and Curiosity, and the construct reliability of the measure has been justified as discussed in Subsection 4.6.2. The Perceived Responsibility measurement is ordinal (at ordered intervals), while the TMS is a quasi-continuous variable.

5.5.1 Distributions of the TMS and Perceived Responsibility

Before investigating the effectiveness of manipulations, a normality test was carried out for the TMS and Perceived Responsibility. Results for the TMS are significant in the two tests: the Kolmogorov-Smirnov test (.069, \( p < .001 \)) and the Shapiro-Wilk test (.976, \( p < .001 \)). The results for Perceived Responsibility are significant: the Kolmogorov-Smirnov test (.248, \( p < .001 \)) and the Shapiro-Wilk test (.870, \( p < .001 \)). Measurements of both manipulation test variables are not normally distributed.

The mean and median scores for the TMS are 2.68 and 2.75, whereas those for Perceived Responsibility are 3.65 and 4.00, respectively. A five-point Likert scale measures both the TMS and Perceived Responsibility. The TMS is closer to the central score than Perceived Responsibility. When the median is greater than the mean, as for the TMS and Perceived Responsibility, it implies that the distribution tends to be negatively skewed to the left.

**Figure 5-3** below displays the histograms for the TMS and Perceived Responsibility. The TMS histogram shows a relatively smooth bell curve except for a spike at score 1, the lowest point on the scale. Since I ruled out the possibility of the straightlining bias in the psychometric data (as discussed in Subsection 4.6.1), I was not concerned about the spike at score 1. On the other hand, the distribution for Perceived Responsibility is visually normal with some right censoring (probably some participants would have chosen an even higher scale level if one was available). This distribution
slightly reduces the power of any test but would not be a problem for conducting parametric tests for the variable. Although nonparametric tests should be used to test non-normal distributions, a reasonably large sample such as the current research would not render minor deviations from normality significant. Hence, I have used nonparametric tests as primary analyses to investigate manipulations and explored discrepancies by applying the more versatile parametric tests.

**Figure 5-3 Distribution of the TMS and Perceived Responsibility**

i) The TMS, a state mindfulness measure  

ii) Perceived Responsibility

5.5.2 Testing effectiveness of manipulations

The mean scores for state mindfulness between the group under the mindfulness manipulation (N = 421) and those under the mind-wandering instruction (N = 399) are 2.84 and 2.51, indicating the former group is 0.33 higher in mean score than the latter group. The mean scores for the group subjected to reappraisal manipulation (N = 407) and
those without the Perspective-taking as an advisor instruction (N = 413) are respectively 3.74 and 3.57, resulting in a difference of 0.17 in Perceived Responsibility.

The mean differences found in the two manipulations do not indicate whether they are statistically significant. I used the nonparametric analogue for a two independent samples t-test, a Mann-Whitney U test (Howell, 2007), to examine the efficacy of manipulations. Table 5-4 below exhibits the Mann-Whitney U statistics with Monte Carlo significance. Monte Carlo significance is derived from Monte Carlo simulation for resampling of asymmetric distributions based on theoretical distributions. Using the SPSS programme, I selected resampling 10,000 times (with seeding references specified in Table 5-4) to run Monte Carlo significance at α level of .05 and pertinent confidence intervals (Buckland, 1984). Monte Carlo methods are suitable for samples of relatively large sizes. When testing asymmetric samples, I used asymptotic methods when the sample size was assumed to be adequate. I counted on the Monte Carlo significance rather than the asymptotic significance because the current research has a reasonably large sample. The hypotheses for the mindfulness and the reappraisal manipulations are unidirectional, so I used one-tailed tests instead of the relatively low-power two-tailed tests (Levin, 1998). The mindfulness manipulation has a significant effect (Z = -5.06, p < .001) on participants, whereas the reappraisal manipulation does not have a significant effect (Z = -1.36, p = .089). The two-tailed test results are shown in the table to demonstrate that the asymptotic and the Monte Carlo significance are consistent.

The mindfulness-based intervention worked as its effectiveness is significant. The effect of reappraisal manipulation is not significant, suggesting that participants did not feel more (or less) responsible for the trading outcome when instructed to think as financial advisors than when they took the perspective that the investments were their own. This finding is not congruent with the hypothesised prediction that participants instructed to act as financial advisors would distance themselves from the outcomes of their trading decisions so that they would feel less uncomfortable about underperforming assets. Given a reasonably large sample and a close to a bell-shaped distribution for Perceived Responsibility, I explore the discrepancy by a parametric t-test in the next subsection.
5.5.3 Investigating Perceived Responsibility in the reappraisal manipulation

$T$-statistics comparing the means between the groups with and without undergoing Perspective-taking for the Perceived Responsibility measure show that the mean difference of 0.17 is significantly different from zero [$t(1, 801.37) = 2.07, 95\% \text{ CI} (0.01 \text{ to } 0.32), p = .020 \text{ (one-tailed)}$] under the condition of variance heterogeneity as Levene’s test is significant [$F(1, 818) = 19.06, p < .001$]. The statistics suggest that participants felt more responsible for the trading outcome when they took the perspective of thinking as financial advisors than when they were instructed that the assets were their own. Yet, the result should be accepted with caution as a lower $p$-value of .025 is required at an $\alpha$ level of 5\% to support significant findings since heterogeneity of variances prevails. The Perspective-taking as an advisor intervention increased Perceived Responsibility instead of reducing it. It requires a two-tailed (rather than one-tailed) $p$-value, .039, which is higher than .025. More importantly, the conclusion to be drawn from the test is that I cannot reject the null hypothesis because the effect is in the opposite direction to that hypothesised.

### Table 5-4 Mann-Whitney U statistics for the two manipulations

<table>
<thead>
<tr>
<th></th>
<th>TMS</th>
<th>Perceived Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mann-Whitney U</td>
<td>66877.500</td>
<td>79611.500</td>
</tr>
<tr>
<td>Z</td>
<td>-5.064</td>
<td>-1.363</td>
</tr>
<tr>
<td>Asymptotic Significance (2-tailed)</td>
<td>0.000</td>
<td>0.173</td>
</tr>
<tr>
<td>Monte Carlo Sig. (2-tailed) Significance</td>
<td>.000\textsuperscript{a}</td>
<td>.175\textsuperscript{b}</td>
</tr>
<tr>
<td>95% Confidence Interval</td>
<td>Lower Bound</td>
<td>0.000 \text{ to } 0.168</td>
</tr>
<tr>
<td></td>
<td>Upper Bound</td>
<td>0.000 \text{ to } 0.183</td>
</tr>
<tr>
<td>Monte Carlo Sig. (1-tailed) Significance</td>
<td>.000\textsuperscript{a}</td>
<td>.089\textsuperscript{b}</td>
</tr>
<tr>
<td>95% Confidence Interval</td>
<td>Lower Bound</td>
<td>0.000 \text{ to } 0.083</td>
</tr>
<tr>
<td></td>
<td>Upper Bound</td>
<td>0.000 \text{ to } 0.094</td>
</tr>
</tbody>
</table>

**TMS: Mindfulness manipulation**

**Perceived Responsibility: Reappraisal manipulation**

a. Based on 10000 sampled tables with starting seed 6512604.

b. Based on 10000 sampled tables with starting seed 2087511987.
Why might the manipulation effect be opposite to what was intended? At first sight, participants instructed to act as financial advisors may think about “responsibility” in the context of a principal-agent relationship, that is, responsibility towards clients rather than for their decisions. When participants read ‘you felt that you were responsible for the gain or loss when you were making trading decisions for the investment portfolio’ (Item 97 of the questionnaire), they may interpret it as “you felt you were held responsible for.” Being held responsible (or accountable) is probably felt by people who invest money on someone else’s behalf. Two different feelings toward taking responsibility were likely. Some participants appeared to adopt the principal-agent context to assume accountability for their decisions and felt relatively high responsibility. I cite two examples from the numerous comments that held this opinion. Case identifier 445 wrote, ‘I was making the decisions the investor had put their trust in me’ as the reason for feeling responsible for the profit or loss of trading decisions (answer to Q99) when instructed to act as a financial advisor. Case identifier 595 responded, ‘because if I made a bad decision, my client would have lost money’ for the same question. In contrast, those who felt less responsible might choose to distance themselves from the decisions they made. Yet, this explanation was not conclusive. So, I sought after reasons that affected participants’ Perceived Responsibility.

It may be that the sense of responsibility felt by people depends on their characteristics, such as financial sophistication. Grayson (2017) argues that the think-as-a-trader intervention effectively affects financially naïve people who are not familiar with investment trading. People with no trading experience might reduce their Perceived Responsibility for portfolio trading, whereas those having experience would feel more responsibility because they know how complicated trading can be.

As shown in Table 5-5 below, a Mann-Whitney U test was used to examine this proposition. I targeted a one-tailed Monte Carlo significance at a 95% confidence level for the reappraisal manipulation. On average, participants seemed to feel higher responsibility for their decisions. The mean differences between Perspective-taking as a financial advisor and trading for oneself are positive for both the experienced group (0.29) and the inexperienced group (0.10). The reappraisal manipulation had a significant effect on Perceived Responsibility for participants who had trading experience (Z = -1.90, p = .027)
but not on those who had no trading experience ($Z = -0.34, p = .372$). Among participants who had trading experience ($N = 278$), those instructed to think as an advisor tended to take in the accountability approach as an agent entrusted with responsibility for delivering performance and felt higher responsibility than others who assumed responsibility for their decisions in the rest of the group. This attitude aligns with Chang and colleagues’ (2016) findings that delegation of trading transactions to fund managers allows business student participants to blame the professionals for trading mistakes.

### Table 5-5 Mann-Whitney U statistics for Perceived Responsibility

<table>
<thead>
<tr>
<th>Trading experience</th>
<th>Reappraisal manipulation 1</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>136</td>
<td>142</td>
</tr>
<tr>
<td>No</td>
<td>271</td>
<td>271</td>
</tr>
<tr>
<td>Mean</td>
<td>3.838</td>
<td>3.549</td>
</tr>
<tr>
<td></td>
<td>3.686</td>
<td>3.583</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test of Perceived Responsibility under different trading experiences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mann-Whitney U</td>
</tr>
<tr>
<td>$8439.000$</td>
</tr>
<tr>
<td>$36127.500$</td>
</tr>
<tr>
<td>$Z$</td>
</tr>
<tr>
<td>$-1.899$</td>
</tr>
<tr>
<td>$-0.338$</td>
</tr>
<tr>
<td>Monte Carlo Significance (1-tailed) Significance</td>
</tr>
<tr>
<td>$0.027^*$</td>
</tr>
<tr>
<td>$0.372^*$</td>
</tr>
<tr>
<td>$95%$ Confidence Interval Lower Bound</td>
</tr>
<tr>
<td>$0.024$</td>
</tr>
<tr>
<td>$0.363$</td>
</tr>
<tr>
<td>$95%$ Confidence Interval Upper Bound</td>
</tr>
<tr>
<td>$0.030$</td>
</tr>
<tr>
<td>$0.382$</td>
</tr>
</tbody>
</table>

^a. Based on 10000 sampled tables with starting seed 785789061.

In contrast, people have to admit trading mistakes when they trade their assets. In the current research, those who had no trading experience ($N = 542$) had diverse feelings or thoughts towards their felt responsibility, probably due to their lack of knowledge about investment and its complexity, resulting in a negligible finding for inter-personal variations in Perceived Responsibility. People tend to assess an incident according to their prior knowledge and experience of the subject. Consequently, they have different affective reactions if different situated meanings are ascribed to the incident (see the discussion of the relationships between the manipulations and pre-trading emotions in Subsection 6.2.2).
The effect of Perspective-taking as a financial professional differs from previous research. The inconsistency can be explained by different perceptions attached to the role of a financial advisor between those who had no trading experience and experienced investors. Contrary to an indeterminant result from testing the entire sample (i.e., undifferentiated by experience), the above analysis confirms a positive association between Perspective-taking as an advisor and Perceived Responsibility, despite the positive relationship being confined to the financially experienced subsample. I argue that the inconsistency is a justified exception to prior studies, which used experimenter-administered experiments or participants with some investment experience because it was due to the different meanings ascribed to Perceived Responsibility by people of different investment experiences. Participants who invested before may adopt the accountability approach to responsibility for their decisions, leading to a positive relationship between knowledge and felt responsibility. Notably, as a cognitive reappraisal strategy, the Perspective-taking to think as an advisor intervention is found to be contextual. People tend to assign different situated meanings to a subject matter according to their respective appraisals.

Although the Perspective-taking strategy more effectively promoted Perceived Responsibility in those with investment experience relative to those who had no experience, I cannot treat the reappraisal manipulation as an adequate antecedent because its effect was precisely opposite to the hypothesised effect. I should only rely on the mindfulness manipulation to test the hypotheses. However, the failure of this manipulation is not fatal to the current research since the primary novel contribution concerns the effects of mindfulness on asset selling behaviour. In subsequent analysis, the reappraisal manipulation is included in analyses as this is important to control for but not treated as an effective test for the related hypotheses.
5.6  Hypothesis-testing for effects of manipulations on the disposition effect

5.6.1  Summary of tests used for effects of manipulations

I used a $t$-test to investigate the effectiveness of manipulations on the exhibition of the disposition effect. The equivalent nonparametric test, a Mann-Whitney U test, was not needed for a robustness check because the relatively high-power parametric test showed non-significant results for the effectiveness of both manipulations, discussed as follows. On the one hand, the mindfulness manipulation had no significant effect on the exhibition of the disposition effect. On the other hand, the results for the reappraisal manipulation are not interpretable since the manipulation did not work as expected. It is essential to control for the reappraisal manipulation and the mindfulness-reappraisal interaction in examining the mindfulness manipulation. A two-way ANOVA was used to test between-subjects effects of manipulations and their interaction for the disposition effect. As discussed below, mindfulness, reappraisal, and their interaction did not significantly affect the disposition effect. Then, I used the same set of analyses to test the disposition effect measured at weighted average cost as a robustness check for the alternative measurement.

5.6.2  Effect of the mindfulness manipulation on the disposition effect

I used a one-tailed $t$-test as the hypothesised effect of the mindfulness manipulation is unidirectional. $T$-statistics comparing the means between the group under the mindfulness manipulation (mindfulness = 1: mean for the disposition effect = -0.08) and those under mind-wandering instruction (mindfulness = 0: mean for the disposition effect = -0.06) show that the difference in means is not significantly different from zero [mean difference = -0.02, $t$ (1, 818) = -1.29, 95% CI (-0.06 to 0.01), $p = .099$ (one-tailed)] under the homogeneity of variances condition as Levene’s test is not significant [$F$ (1, 818) =
1.97, \( p = .161 \]. The test result suggests that the mindfulness manipulation had no significant effect on participants’ exhibition of the disposition effect. The negative mean difference indicates that participants had a slightly lower disposition effect when subjected to the mindfulness manipulation than when they were not, but this difference is negligible.

5.6.3 Reappraisal manipulation and the disposition effect

Again, a one-tailed test was applied to the reappraisal manipulation as the effect was unidirectional as hypothesised. I bore in mind that the manipulation did not affect Perceived Responsibility in the way I expected, meaning a high likelihood of bidirectional influence of Perceived Responsibility on the disposition effect. \( T \)-statistics comparing the means between the group under the reappraisal manipulation to think like a financial advisor (reappraisal = 1: mean = -0.07) and those under their own investment scenario (reappraisal = 0: mean = -0.08) for the disposition effect show that the mean difference is not significantly different from zero \([\text{mean difference} = 0.01, t (1, 818) = 0.65, 95\% \text{ CI (-0.02 to 0.05), } p = .257 \text{ (one-tailed)}]\) under the condition of homoscedasticity as Levene’s test is not significant \([F (1, 818) = 1.39, p = .119]\). The test result suggests that the reappraisal manipulation had no significant effect on participants’ exhibition of the disposition effect, irrespective of whether the effect is unidirectional or bidirectional. A positive mean difference denotes that people sold more gains than losses when they took the perspective of financial advisors than when they were instructed that the assets were their own. Again, this difference is not significant.

5.6.4 Testing effects of both manipulations on the disposition effect

A two-way ANOVA was used to test the between-subjects effects of both manipulations and their interaction on the disposition effect. Owing to the disproportionate
participation of older people in the Main Study (see Section 5.3), age was controlled for, but it had no significant effect on participants’ exhibition of the disposition effect \([F (1, 815) = 2.82, p = .094]\). As expected from the prior test, the \(F\)-score for the mindfulness manipulation is not significant on the disposition effect \([F (1, 815) = 1.16, p = .282]\). The disposition effect is neither significant for the reappraisal manipulation \([F (1, 815) = 0.21, p = .645]\) nor for the joint mindfulness and reappraisal interaction \([F (1, 815) = 1.42, p = .234]\). Table 5-6 exhibits a two-way ANOVA test of between-subjects effects for the disposition effect. Results for between-subjects effects are similar when age is not controlled for in the two-way ANOVA test as a robustness check.

Table 5-6 Two-way ANOVA for manipulations on the disposition effect

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>(F)</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>.375(^a)</td>
<td>4</td>
<td>0.094</td>
<td>1.533</td>
<td>0.191</td>
</tr>
<tr>
<td>Intercept</td>
<td>0.046</td>
<td>1</td>
<td>0.046</td>
<td>0.751</td>
<td>0.386</td>
</tr>
<tr>
<td>Age</td>
<td>0.173</td>
<td>1</td>
<td>0.173</td>
<td>2.817</td>
<td>0.094</td>
</tr>
<tr>
<td>Mindfulness</td>
<td>0.071</td>
<td>1</td>
<td>0.071</td>
<td>1.158</td>
<td>0.282</td>
</tr>
<tr>
<td>Reappraisal</td>
<td>0.013</td>
<td>1</td>
<td>0.013</td>
<td>0.213</td>
<td>0.645</td>
</tr>
<tr>
<td>Mindfulness * Reappraisal</td>
<td>0.087</td>
<td>1</td>
<td>0.087</td>
<td>1.416</td>
<td>0.234</td>
</tr>
<tr>
<td>Error</td>
<td>49.918</td>
<td>815</td>
<td>0.061</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>54.620</td>
<td>820</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>50.293</td>
<td>819</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. R Squared = .007 (Adjusted R Squared = .003)

5.6.5 Effects of both manipulations on the alternative measurement

A two-way ANOVA was used to test between-subjects effects of manipulations and their interaction on the disposition effect measured at weighted average cost (WAC). Age was controlled for, but it had no significant effect on participants’ exhibition of the disposition effect (WAC) \([F (1, 815) = 0.86, p = .354]\). Like the measurement at the last period pricing, the effects of manipulations on the disposition effect (WAC) were negligible. The \(F\)-score for the mindfulness manipulation is not significant for the
disposition effect (WAC) \( F(1, 815) = 0.37, p = .541 \). Negligible effects are found in the reappraisal group \( F(1, 815) = 2.28, p = .131 \) and in the joint mindfulness and reappraisal intervention \( F(1, 815) = 0.83, p = .363 \). Table 5-7 exhibits the two-way ANOVA test of between-subjects effects on the disposition effect (WAC).

Table 5-7 Two-way ANOVA for the disposition effect (WAC)

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>.283*</td>
<td>4</td>
<td>0.071</td>
<td>1.202</td>
<td>0.309</td>
</tr>
<tr>
<td>Intercept</td>
<td>0.072</td>
<td>1</td>
<td>0.072</td>
<td>1.226</td>
<td>0.269</td>
</tr>
<tr>
<td>Age</td>
<td>0.051</td>
<td>1</td>
<td>0.051</td>
<td>0.861</td>
<td>0.354</td>
</tr>
<tr>
<td>Mindfulness</td>
<td>0.022</td>
<td>1</td>
<td>0.022</td>
<td>0.374</td>
<td>0.541</td>
</tr>
<tr>
<td>Reappraisal</td>
<td>0.135</td>
<td>1</td>
<td>0.135</td>
<td>2.283</td>
<td>0.131</td>
</tr>
<tr>
<td>Mindfulness * Reappraisal</td>
<td>0.049</td>
<td>1</td>
<td>0.049</td>
<td>0.829</td>
<td>0.363</td>
</tr>
<tr>
<td>Error</td>
<td>48.059</td>
<td>815</td>
<td>0.059</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>51.056</td>
<td>820</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>48.343</td>
<td>819</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. R Squared = .006 (Adjusted R Squared = .001)

Overall, based on the preceding analyses, Hypothesis 1a is disconfirmed, and H2a cannot be tested adequately as the reappraisal manipulation failed to perform as intended. I analyse the effect of the manipulations on the behavioural components of the disposition effect, namely, the realisation of gains and the disposal of losses. These behaviours are measured in terms of the PGR and the PLR, the tendencies to sell gains and losses. Prior research shows that the PGR and the PLR may have different antecedents (Weber and Welfens, 2008; Richards, 2013; Grayson, 2017), which explains why auxiliary hypotheses are required to examine the PGR and the PLR.
5.7 Effects of manipulations on the PGR and the PLR

5.7.1 Distributions of the PGR and the PLR

Both the PGR and the PLR distributions are highly non-normal (as is often the case with proportions). The normality test confirms non-normality for the PGR (Kolmogorov-Smirnov: .183, $p < .001$; Shapiro-Wilk: .828, $p < .001$) and the PLR (Kolmogorov-Smirnov: .109, $p < .001$; Shapiro-Wilk: .914, $p < .001$). The PGR/PLR pair is not only significantly skewed ($Z$-values for the PGR and the PLR are 19.14 and 13.51, respectively) but is also substantially platykurtic as scores move from the centre and tails to the shoulders ($Z$-values for the PGR and the PLR are 18.43 and 9.03, respectively). Figure 5-4 displays the histograms of the frequency distributions of the PGR and the PLR.

Figure 5-4 Frequency distributions of the PGR and the PLR

i) PGR

ii) PLR
To satisfy the general linear model assumption on normality, of which ANOVA is an example, I needed to ensure that residuals in the dependent variable analysis were normally distributed, although normality of the dependent variable was not required. As both the PGR and the PLR distributions are not normal, I ran normal quantile-quantile (Q-Q) plots to determine whether the residuals are normally distributed and found that they are not. Figure 5-5 displays the normal Q-Q plots of the PGR and the PLR.

**Figure 5-5 Normal Q-Q plots of the PGR and the PLR**

![i) Normal Q-Q plot of PGR](image1)

![ii) Normal Q-Q plot of PLR](image2)

To assess whether parametric tests could be used by transforming the PGR and the PLR measurements, I added a constant, +1 (as the minimum score is zero and dependent variable values must be strictly positive), to their measurements and took the logarithm (log10) of the scores. The purpose was to make the distributions closer to normal, rendering their measurements amenable to parametric tests. Yet, the resulting distributions were not normal, so I used the original distributions for further analysis. I then used the nonparametric Mann-Whitney U test for the effects of manipulations on the PGR and the PLR, discussed later in Subsection 5.7.3.
Figure 5-4 above shows that the PGR and the PLR distributions are positively skewed with a spike at the lowest scores (ranging from 0.00 to 0.03). A parametric test such as two-way ANOVA relying on the normality assumption for hypothesis-testing is not suitable to test these highly non-normal distributions. I used the Generalized Linear Models (GzLMs) protocol in the SPSS programme because this protocol fits distributions in the exponential family, such as the Gamma distribution, which has error distribution models that deviate from normality (Ng and Cribbie, 2017). The Gamma distribution is often a suitable model for continuous distributions with a mode at the lowest scale point (e.g., the PGR and the PLR). Additionally, such distributions cannot be transformed into a normal distribution. The effects of both experimental manipulations on the PGR and the PLR are discussed in Subsection 5.7.4.

5.7.2 Descriptive statistics for the PGR and the PLR

As found, only the mindfulness manipulation influenced the selling behaviours, so descriptive statistics for the realisation of gains and the disposal of losses are reported under the mindfulness and the mind-wandering conditions as shown in Table 5-8. Mean scores for both the PGR and the PLR are higher in the mind-wandering than in the mindfulness condition. In general, mean scores of gain realisation are lower than those of loss disposal, but this observation does not necessarily indicate a reverse disposition effect.

Table 5-8 Descriptives of the PGR and the PLR under manipulated conditions

<table>
<thead>
<tr>
<th>Experimental condition</th>
<th>N</th>
<th>PGR</th>
<th></th>
<th>PLR</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Minimum</td>
<td>Maximum</td>
<td>Mean</td>
<td>Std. Deviation</td>
</tr>
<tr>
<td>Mindfulness</td>
<td>421</td>
<td>0.000</td>
<td>0.950</td>
<td>0.148</td>
<td>0.174</td>
</tr>
<tr>
<td>Mind-wandering</td>
<td>399</td>
<td>0.000</td>
<td>1.000</td>
<td>0.199</td>
<td>0.204</td>
</tr>
<tr>
<td>Overall</td>
<td>820</td>
<td>0.000</td>
<td>1.000</td>
<td>0.172</td>
<td>0.190</td>
</tr>
</tbody>
</table>
5.7.3 Effect of either manipulation on the PGR and the PLR

Given the high non-normality of the divesting behaviours, I used a Mann-Whitney U test to investigate the effects of manipulations on PGR and PLR. The mindfulness manipulation had a significant effect, but the reappraisal manipulation did not significantly affect the pair. Table 5-9 shows the Mann-Whitney U statistics.

Table 5-9 Mann-Whitney U statistics for effects of manipulations on PGR and PLR

<table>
<thead>
<tr>
<th>Manipulation</th>
<th>PGR</th>
<th>PLR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mindfulness manipulation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mann-Whitney U</td>
<td>70501.000</td>
<td>75365.500</td>
</tr>
<tr>
<td>Z</td>
<td>-3.987</td>
<td>-2.544</td>
</tr>
<tr>
<td>Asymptotic Significance (2-tailed)</td>
<td>0.000</td>
<td>0.011</td>
</tr>
<tr>
<td>Monte Carlo Sig. (2-tailed) Significance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>95% Confidence Interval Lower Bound</td>
<td>0.000</td>
<td>0.008</td>
</tr>
<tr>
<td>Upper Bound</td>
<td>0.000</td>
<td>0.012</td>
</tr>
<tr>
<td>Monte Carlo Sig. (1-tailed) Significance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>95% Confidence Interval Lower Bound</td>
<td>0.000</td>
<td>0.003</td>
</tr>
<tr>
<td>Upper Bound</td>
<td>0.000</td>
<td>0.006</td>
</tr>
</tbody>
</table>

| **Reappraisal manipulation** |        |        |
| Mann-Whitney U              | 81134.000 | 82711.500 |
| Z                          | -0.860 | -0.393 |
| Asymptotic Significance (2-tailed) | 0.390 | 0.694 |
| Monte Carlo Sig. (2-tailed) Significance |        |        |
| 95% Confidence Interval Lower Bound | 0.372 | 0.677 |
| Upper Bound                | 0.391 | 0.695 |
| Monte Carlo Sig. (1-tailed) Significance |        |        |
| 95% Confidence Interval Lower Bound | 0.186 | 0.330 |
| Upper Bound                | 0.201 | 0.348 |

a. Based on 10000 sampled tables with starting seed 2000000.

b. Based on 10000 sampled tables with starting seed 926214481.

I adopted a one-tailed Monte Carlo significance test for the unidirectional mindfulness manipulation and a two-tailed significance test for the bidirectional
reappraisal manipulation. The mindfulness manipulation had a significant effect on participants’ exhibition of the PGR ($Z = -3.99, p < .001$) and the PLR ($Z = -2.54, p = .005$), reducing both. The reappraisal manipulation had no significant effect on participants’ exhibition of the PGR ($Z = -0.86, p = .381$) and the PLR ($Z = -0.39, p = .686$).

It seems that investigating the realisation of gains and the disposal of losses provides complementary evidence that is not available when only studying the difference between the two divesting activities. This approach is appropriate as the disposition effect involves two kinds of divestments, the selling of gains and losses, and justifies the testing of auxiliary hypotheses H1b, H1c, H2b, and H2c.

5.7.4 Manipulation effects on the PGR and the PLR as Gamma distributions

The Gamma Generalized Linear Model in the SPSS programme allows for Gamma distributed response variables through a link function. The magnitude of the variance of measurement is a function of its predicted value. The Q-Q plots displayed in Figure 5-5 above justify a test for the PGR and the PLR distributions using the Gamma GzLM. Before testing the PGR/PLR pair, I added one to each of the scores in these distributions to transform their scores into natural logarithmic values to fit in the Gamma GzLM analysis.

The transformed distribution of the PGR was selected as the dependent variable, while predictors were classified as factors (i.e., the manipulated variables of reappraisal and mindfulness) and relevant covariates (i.e., age). Table 5-10 below displays a parameter analysis for the realisation of gains. Hypothesis-testing for the significance of parameters is based on their logarithmic values converted back to their respective exponents [Exp(B)]. The $p$-values for hypothesis-testing come from Wald Chi-square tests, which are non-directional. Taking age as an example, Exp(B) value of 0.98 ($p <
.001) is the reverse of natural logarithm for B (-0.02). The meaning of the parameter is that the effect of a one-unit increase in age (chiefly ten years per category unit) is to change the value of the PGR by multiplying the PGR by the Exp(B) parameter value. A one-unit increase in age (i.e., ten years) reduced the PGR by 2% \([\text{Exp}(B) - 1 = 0.98 - 1 = -0.02]\) and is significant \((p < .001)\). The reappraisal manipulation did not predict the PGR as the \(\text{Exp}(B) - 1\) value is non-significant \((0.002, p = .821)\). The mindfulness manipulation significantly affected the realisation of gains since it reduced the latter by 4% \([\text{Exp}(B) - 1 = -0.04, p < .001]\).

Table 5-10 Parameter analysis of the PGR in Gamma distribution

<table>
<thead>
<tr>
<th>Parameter</th>
<th>B</th>
<th>Std. Error</th>
<th>Sig.</th>
<th>Hypothesis Test</th>
<th>Exp(B)</th>
<th>Exp(B) - 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>0.254</td>
<td>0.019</td>
<td>0.000</td>
<td>1.289</td>
<td>0.289</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>-0.020</td>
<td>0.004</td>
<td>0.000</td>
<td>0.980</td>
<td>-0.020</td>
<td></td>
</tr>
<tr>
<td>[Reappraisal manipulation=1]</td>
<td>0.002</td>
<td>0.010</td>
<td>0.821</td>
<td>1.002</td>
<td>0.002</td>
<td></td>
</tr>
<tr>
<td>[Reappraisal manipulation=0]</td>
<td>0(^a)</td>
<td></td>
<td>0</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>[Mindfulness manipulation=1]</td>
<td>-0.038</td>
<td>0.010</td>
<td>0.000</td>
<td>0.963</td>
<td>-0.037</td>
<td></td>
</tr>
<tr>
<td>[Mindfulness manipulation=0]</td>
<td>0(^b)</td>
<td></td>
<td>0</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>(Scale)</td>
<td>.022(^b)</td>
<td>0.001</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Dependent Variable: PGR

a. Set to zero because this parameter is redundant.

b. Maximum likelihood estimate.

Table 5-11 below shows analysis results for the PLR or loss disposal in the Generalized Linear Model of Gamma distribution. The \(\text{Exp}(B) - 1\) value for age is -0.01 \((p = .033)\), indicating that a unit increase in age reduced loss disposal by 1%. Neither manipulation exerted significant influence on the disposal of loss because the value of \(\text{Exp}(B) - 1\) for the reappraisal manipulation is -0.01 \((p = .645)\), and the corresponding value for the mindfulness manipulation is -0.02 \((p = .052)\). Of note, the \(p\)-value for the effect of the mindfulness manipulation on loss disposal is marginally non-significant.
When age is not controlled for, as illustrated in Table 5-12, the mindfulness manipulation is found to reduce loss disposal by 2% as the $\text{Exp}(B) - 1$ value changes to -0.02 ($p = .029$). These different mindfulness effects echo earlier findings that older people carried on with the mindfulness instruction while younger people dropped out at the beginning stage of the survey.

Table 5-11 Parameter analysis of the PLR in Gamma distribution

<table>
<thead>
<tr>
<th>Parameter</th>
<th>$B$</th>
<th>Std. Error</th>
<th>Hypothesis Test</th>
<th>Exp($B$)</th>
<th>Exp($B$) - 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>0.269</td>
<td>0.019</td>
<td>0.000</td>
<td>1.308</td>
<td>0.308</td>
</tr>
<tr>
<td>Age</td>
<td>-0.010</td>
<td>0.004</td>
<td>0.033</td>
<td>0.991</td>
<td>-0.009</td>
</tr>
<tr>
<td>[Reappraisal manipulation=1]</td>
<td>-0.005</td>
<td>0.011</td>
<td>0.645</td>
<td>0.995</td>
<td>-0.005</td>
</tr>
<tr>
<td>[Reappraisal manipulation=0]</td>
<td>0$^a$</td>
<td></td>
<td></td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>[Mindfulness manipulation=1]</td>
<td>-0.021</td>
<td>0.011</td>
<td>0.052</td>
<td>0.979</td>
<td>-0.021</td>
</tr>
<tr>
<td>[Mindfulness manipulation=0]</td>
<td>0$^a$</td>
<td></td>
<td></td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>(Scale)</td>
<td>.023$^b$</td>
<td>0.001</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Dependent Variable: PLR
a. Set to zero because this parameter is redundant.
b. Maximum likelihood estimate.

Table 5-12 Gamma parameter analysis of the PLR (without controlling for age)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>$B$</th>
<th>Std. Error</th>
<th>Hypothesis Test</th>
<th>Exp($B$)</th>
<th>Exp($B$) - 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>0.233</td>
<td>0.010</td>
<td>0.000</td>
<td>1.262</td>
<td>0.262</td>
</tr>
<tr>
<td>[Reappraisal manipulation=1]</td>
<td>-0.004</td>
<td>0.011</td>
<td>0.739</td>
<td>0.996</td>
<td>-0.004</td>
</tr>
<tr>
<td>[Reappraisal manipulation=0]</td>
<td>0$^a$</td>
<td></td>
<td></td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>[Mindfulness manipulation=1]</td>
<td>-0.023</td>
<td>0.011</td>
<td>0.029</td>
<td>0.977</td>
<td>-0.023</td>
</tr>
<tr>
<td>[Mindfulness manipulation=0]</td>
<td>0$^a$</td>
<td></td>
<td></td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>(Scale)</td>
<td>.023$^b$</td>
<td>0.001</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Dependent Variable: PLR
a. Set to zero because this parameter is redundant.
b. Maximum likelihood estimate.
5.7.5 Distributions of the PGRWAC and the PLRWAC

Like the last period pricing measurement, both the PGR and the PLR measured at weighted average cost (the PGRWAC and the PLRWAC) are not normally distributed. Normality test confirms non-normality for the PGRWAC (Kolmogorov-Smirnov: .167, \( p < .001 \); Shapiro-Wilk: .834, \( p < .001 \)) and the PLRWAC (Kolmogorov-Smirnov: .121, \( p < .001 \); Shapiro-Wilk: .886, \( p < .001 \)). The alternative PGR/PLR pair is significantly skewed (Z-values for the PGRWAC and the PLRWAC are 19.89 and 15.93, respectively) and significantly platykurtic (Z-values for the PGRWAC and the PLRWAC are respectively 20.28 and 11.53). In line with the mean scores of the last period pricing measurements, the mean scores under the mindfulness condition for the PGRWAC and the PLRWAC are 0.16 and 0.22, and those under the mind-wandering condition are 0.21 and 0.26, respectively. As shown in Figure 5-6, the PGRWAC and the PLRWAC distributions resemble those of the primary measurements.

Figure 5-6 Histograms of the PGRWAC and the PLRWAC distributions

![Histograms of the PGRWAC and the PLRWAC distributions](image-url)
Additionally, the residuals of the PGR and the PLR distributions at the alternative measurement are not normally distributed as found from their Q-Q plots. Figure 5-7 shows normal Q-Q plots of the PGRWAC and the PLRWAC. The transformation protocols also failed to change the distributions closer to normal. Hence, the original distributions were used for further analysis.

**Figure 5-7 Normal Q-Q plots of the PGRWAC and the PLRWAC**

i) Normal Q-Q plot of PGRWAC  
ii) Normal Q-Q plot of PLRWAC

5.7.6 Effect of either manipulation on the PGRWAC and the PLRWAC

Like testing the PGR and the PLR measured at the last period pricing, I conducted a Mann-Whitney U test for the effects of manipulations on the PGRWAC and the PLRWAC as shown in Table 5-13 below. I adopted a one-tailed Monte Carlo significance for the mindfulness manipulation and a two-tailed significance for the reappraisal manipulation. The mindfulness manipulation had significant effect on participants’ exhibition of the PGRWAC ($Z = -4.02, p < .001$) and the PLRWAC ($Z = -3.19, p = .001$).
The reappraisal manipulation had no significant effect on participants’ exhibition of the PGRWAC \((Z = -1.66, p = .093)\) and the PLRWAC \((Z = -1.26, p = .201)\).

Table 5-13 Mann-Whitney U statistics for the PGRWAC and the PLRWAC

<table>
<thead>
<tr>
<th></th>
<th>I Mindfulness Manipulation</th>
<th>II Reappraisal Manipulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mann-Whitney U</td>
<td>70360.000</td>
<td>78437.000</td>
</tr>
<tr>
<td>Z</td>
<td>-4.023</td>
<td>-1.655</td>
</tr>
<tr>
<td>Asymp. Sig. (2-tailed)</td>
<td>0.000</td>
<td>0.098</td>
</tr>
<tr>
<td>Monte Carlo Sig. (2-tailed)</td>
<td>Sig.</td>
<td>Sig.</td>
</tr>
<tr>
<td>95% Confidence Interval</td>
<td>Lower Bound</td>
<td>Lower Bound</td>
</tr>
<tr>
<td></td>
<td>0.000</td>
<td>0.088</td>
</tr>
<tr>
<td></td>
<td>0.000</td>
<td>0.099</td>
</tr>
<tr>
<td>Monte Carlo Sig. (1-tailed)</td>
<td>Sig.</td>
<td>Sig.</td>
</tr>
<tr>
<td>95% Confidence Interval</td>
<td>Lower Bound</td>
<td>Lower Bound</td>
</tr>
<tr>
<td></td>
<td>0.000</td>
<td>0.043</td>
</tr>
<tr>
<td></td>
<td>0.000</td>
<td>0.051</td>
</tr>
</tbody>
</table>

5.7.7 Effects of both manipulations on the PGRWAC and the PLRWAC

Same as the last period pricing counterparts, the manipulation effects on the PGRWAC and the PLRWAC were tested as Gamma distributions by the Generalized Linear Model protocol. Table 5-14 below displays a parameter analysis of the realisation of gains measured at weighted average costing (the PGRWAC) in Gamma distribution. The value of Exp(B) - 1 for age is -0.02 and significant \((p < .001)\), indicating that an age
increase of ten years reduced the realisation of gains at weighted average cost by 2%. The reappraisal manipulation did not predict the PGRWAC as the \( \text{Exp}(B) - 1 \) value is 0.01 and is not significant (\( p = .466 \)). The mindfulness manipulation significantly affected the alternative measurement of realisation of gains as it reduced the latter by 4% (\( p < .001 \)).

Table 5-14 Gamma parameter analysis of the PGRWAC

<table>
<thead>
<tr>
<th>Parameter</th>
<th>B</th>
<th>Std. Error</th>
<th>Hypothesis Test</th>
<th>Exp(B)</th>
<th>Exp(B) - 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>0.257</td>
<td>0.019</td>
<td>0.000</td>
<td>1.293</td>
<td>0.293</td>
</tr>
<tr>
<td>[Mindfulness manipulation=1]</td>
<td>-0.040</td>
<td>0.010</td>
<td>0.000</td>
<td>0.961</td>
<td>-0.039</td>
</tr>
<tr>
<td>[Mindfulness manipulation=0]</td>
<td>0(^a)</td>
<td></td>
<td></td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>[Reappraisal manipulation=1]</td>
<td>0.008</td>
<td>0.010</td>
<td>0.466</td>
<td>1.008</td>
<td>0.008</td>
</tr>
<tr>
<td>[Reappraisal manipulation=0]</td>
<td>0(^a)</td>
<td></td>
<td></td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Age</td>
<td>-0.019</td>
<td>0.004</td>
<td>0.000</td>
<td>0.982</td>
<td>-0.018</td>
</tr>
<tr>
<td>(Scale)</td>
<td>0.022(^b)</td>
<td>0.001</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Dependent Variable: PGR, measured at weighted average cost

a. Set to zero because this parameter is redundant.
b. Maximum likelihood estimate.

Table 5-15 Gamma parameter analysis of the PLRWAC

<table>
<thead>
<tr>
<th>Parameter</th>
<th>B</th>
<th>Std. Error</th>
<th>Hypothesis Test</th>
<th>Exp(B)</th>
<th>Exp(B) - 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>0.287</td>
<td>0.020</td>
<td>0.000</td>
<td>1.333</td>
<td>0.333</td>
</tr>
<tr>
<td>[Mindfulness manipulation=1]</td>
<td>-0.030</td>
<td>0.011</td>
<td>0.007</td>
<td>0.971</td>
<td>-0.029</td>
</tr>
<tr>
<td>[Mindfulness manipulation=0]</td>
<td>0(^a)</td>
<td></td>
<td></td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>[Reappraisal manipulation=1]</td>
<td>-0.014</td>
<td>0.011</td>
<td>0.194</td>
<td>0.986</td>
<td>-0.014</td>
</tr>
<tr>
<td>[Reappraisal manipulation=0]</td>
<td>0(^a)</td>
<td></td>
<td></td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Age</td>
<td>-0.013</td>
<td>0.005</td>
<td>0.006</td>
<td>0.988</td>
<td>-0.012</td>
</tr>
<tr>
<td>(Scale)</td>
<td>0.024(^b)</td>
<td>0.001</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Dependent Variable: PLR, measured at weighted average cost

a. Set to zero because this parameter is redundant.
b. Maximum likelihood estimate.
**Table 5-15** above shows a parameter analysis of loss disposal measured at the weighted average cost (the PLRWAC) in Gamma distribution. The value of Exp(B) - 1 for age is -0.01 ($p = .006$), indicating that an age increase of ten years reduced the disposal of losses measured at weighted average cost by 1%. The reappraisal manipulation did not predict the PLRWAC since the Exp(B) - 1 value is negligible (-0.01, $p = .194$). The mindfulness manipulation significantly affected the disposal of losses measured at weighted average cost, reducing the latter by 3% ($p = .007$). A similar test without controlling for age is not needed because the mindfulness manipulation shows a significant effect in Table 5-15, as it does in Table 5-12.

The foregoing analysis results are consistent with those of their equivalents measured at the last period pricing – the mindfulness manipulation reduced the exhibition of the realisation of gains and the disposal of losses, but the reappraisal manipulation did not have any effect on either divesting behaviour. The influence of the mindfulness manipulation in reducing the realisation of gains and losses was in the same direction for both divesting behaviours. Hence, it is helpful to examine a variable that combines the PGR and the PLR, the proportion of funds realised (PFR). The ensuing section carries on investigating the effects of manipulations on the PFR.

### 5.8 Effects of manipulations on the proportion of funds realised

Since the effect of the mindfulness manipulation seemed to reduce the selling of assets held regardless of whether they are winners or losers, I conducted further exploratory analysis by looking at the overall level of selling. The total divestments, or the PFR, is a conceptual measurement for a different form of financial behaviour featuring the propensity to sell rather than hold assets, irrespective of whether they are at a gain or a loss relative to a reference point. Its measurement is a combination of divestment of gains and losses, expressed in the following equation:
PFR = (realised gains + realised losses) / (realised gains + realised losses + unrealised gains + unrealised losses)

5.8.1 Distribution and descriptive statistics of the PFR

Figure 5-8 Histogram showing the frequency distribution of the PFR

Figure 5-8 above displays a histogram showing the frequency distribution of the PFR. Contrary to the disposition effect distribution, the skewness test on the distribution of the PFR reveals that it is right-skewed or positively skewed, and the skewness is significant as the Z-value is greater than 1.96.\(^{15}\) The shape of the distribution shows half of a typical

---

\(^{15}\) Z-value = skewness-score / standard error of skewness (i.e., 1.622/0.085 = 19.08) is higher than 1.96.
leptokurtic distribution. Kurtosis analysis indicates that the Z-value is higher than the critical Z-value, confirming a significant semi-leptokurtic distribution. Normality tests of the distribution are significant (Kolmogorov-Smirnov test: .101, \( p < .001 \); Shapiro-Wilk test: .880, \( p < .001 \)), advising that the PFR is not normally distributed. I checked whether the residuals are normally distributed from the normal Q-Q plot and found that they are not. A transformed distribution (by taking log after adding 1) has still shown non-normality, so I continued to use the original distribution for further tests.

**Table 5-16** below shows the descriptive statistics for the PFR under the mindfulness and the mind-wandering conditions. The mean score for the PFR is higher in the mind-wandering condition relative to the mindfulness manipulation, which is consistent with the findings for the PGR and the PLR since the effect of the mindfulness manipulation on the pair acted in the same direction.

<table>
<thead>
<tr>
<th>Experimental condition</th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mindfulness</td>
<td>421</td>
<td>0.000</td>
<td>0.913</td>
<td>0.176</td>
<td>0.139</td>
</tr>
<tr>
<td>Mind-wandering</td>
<td>399</td>
<td>0.000</td>
<td>0.991</td>
<td>0.220</td>
<td>0.156</td>
</tr>
<tr>
<td>Overall</td>
<td>820</td>
<td>0.000</td>
<td>0.991</td>
<td>0.198</td>
<td>0.149</td>
</tr>
</tbody>
</table>

5.8.2 Effect of either manipulation on total divestments

I ran a Mann-Whitney U test for the effectiveness of manipulations on the PFR. **Table 5-17** below exhibits the Mann-Whitney U statistics. As expected, the mindfulness manipulation had a significant effect on participants’ exhibition of the PFR \([Z = -4.77, p < .001 \) (one-tailed)], such that the mindfulness condition was associated with lower divesting

---

16 \( Z \)-value = kurtosis-score / standard error of kurtosis, \( i.e., 3.975/0.171 = 23.25 \), which is higher than 1.96.
activities — mindful participants “churned” their portfolios less. The reappraisal manipulation had no significant effect on participants’ exhibition of the PFR \([Z = -0.19, p = .845 \text{ (two-tailed)}]\). A two-tailed \(p\)-value was used because it was uncertain whether the effect of the reappraisal manipulation on the PFR was unidirectional. Still, the result shows the same for a one-tailed test.

### Table 5-17 Statistics for the effectiveness of manipulations on the PFR

<table>
<thead>
<tr>
<th></th>
<th>Mindfulness</th>
<th>Reappraisal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mann-Whitney U</td>
<td>67815.000</td>
<td>83391.000</td>
</tr>
<tr>
<td>(Z)</td>
<td>-4.771</td>
<td>-0.193</td>
</tr>
<tr>
<td>Asymptotic Significance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2-tailed)</td>
<td>0.000</td>
<td>0.847</td>
</tr>
<tr>
<td>Monte Carlo Sig.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2-tailed)</td>
<td>0.000(^a)</td>
<td>(0.845)^b</td>
</tr>
<tr>
<td>95% Confidence Interval</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower Bound</td>
<td>0.000</td>
<td>0.838</td>
</tr>
<tr>
<td>Upper Bound</td>
<td>0.000</td>
<td>0.852</td>
</tr>
<tr>
<td>Monte Carlo Sig.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1-tailed)</td>
<td>0.000(^a)</td>
<td>(0.419)^b</td>
</tr>
<tr>
<td>95% Confidence Interval</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower Bound</td>
<td>0.000</td>
<td>0.409</td>
</tr>
<tr>
<td>Upper Bound</td>
<td>0.000</td>
<td>0.428</td>
</tr>
</tbody>
</table>

\(a\). Based on 10000 sampled tables with starting seed 334431365.  
\(b\). Based on 10000 sampled tables with starting seed 624387341.

#### 5.8.3 Effects of both manipulations on the PFR

A two-way ANOVA was used to test between-subjects effects of manipulations and their interaction on the PFR (see Table 5-18 below). Age was controlled for, and it had a significant effect on participants’ exhibition of the PFR \([F (1, 815) = 19.21, p < .001]\). The \(F\)-score for the mindfulness manipulation is significant \([F (1, 815) = 14.83, p < .001]\). No significant effect from the reappraisal manipulation is found \([F (1, 815) = 0.00, p = .994]\), but the mindfulness-reappraisal interaction shows a significant effect \([F (1, 815) = 4.95, p = .026]\). These results align with those from the Mann-Whitney U test shown in Table 5-17 above.
As a robustness check, I tested between-subjects effects in the two-way ANOVA without controlling for age. Table 5-19 exhibits the related two-way ANOVA statistics. The findings for the effects of both manipulations are comparable to those in Table 5-18 above, which preclude collinearity between age and mindfulness driving the results.

### Table 5-18 Two-way ANOVA for manipulation effects on the PFR

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>.919^a</td>
<td>4</td>
<td>0.230</td>
<td>10.855</td>
<td>0.000</td>
</tr>
<tr>
<td>Intercept</td>
<td>5.248</td>
<td>1</td>
<td>5.248</td>
<td>247.937</td>
<td>0.000</td>
</tr>
<tr>
<td>Age</td>
<td>0.407</td>
<td>1</td>
<td>0.407</td>
<td>19.206</td>
<td>0.000</td>
</tr>
<tr>
<td>Mindfulness</td>
<td>0.314</td>
<td>1</td>
<td>0.314</td>
<td>14.826</td>
<td>0.000</td>
</tr>
<tr>
<td>Reappraisal</td>
<td>0.000</td>
<td>1</td>
<td>0.000</td>
<td>0.000</td>
<td>0.994</td>
</tr>
<tr>
<td>Mindfulness * Reappraisal</td>
<td>0.105</td>
<td>1</td>
<td>0.105</td>
<td>4.949</td>
<td>0.026</td>
</tr>
<tr>
<td>Error</td>
<td>17.251</td>
<td>815</td>
<td>0.021</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>50.193</td>
<td>820</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>18.171</td>
<td>819</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. R Squared = .051 (Adjusted R Squared = .046)

### Table 5-19 Two-way ANOVA test for the PFR (without controlling for age)

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>.513^a</td>
<td>3</td>
<td>0.171</td>
<td>7.896</td>
<td>0.000</td>
</tr>
<tr>
<td>Intercept</td>
<td>31.856</td>
<td>1</td>
<td>31.856</td>
<td>1472.122</td>
<td>0.000</td>
</tr>
<tr>
<td>Mindfulness</td>
<td>0.394</td>
<td>1</td>
<td>0.394</td>
<td>18.203</td>
<td>0.000</td>
</tr>
<tr>
<td>Reappraisal</td>
<td>0.001</td>
<td>1</td>
<td>0.001</td>
<td>0.049</td>
<td>0.826</td>
</tr>
<tr>
<td>Mindfulness * Reappraisal</td>
<td>0.117</td>
<td>1</td>
<td>0.117</td>
<td>5.400</td>
<td>0.020</td>
</tr>
<tr>
<td>Error</td>
<td>17.658</td>
<td>816</td>
<td>0.022</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>50.193</td>
<td>820</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>18.171</td>
<td>819</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. R Squared = .028 (Adjusted R Squared = .025)
5.8.4 Manipulation effects on the PFR measured at weighted average cost

The PFR analysis is supplemental to hypothesis-testing, so the robustness check on its alternative measurement, the PFR measured at weighted average costing (PFRWAC), is briefly discussed. Like the distribution measured at prior period pricing, the distribution of the PFRWAC is non-normal, right-skewed, and semi-leptokurtic. The mean scores of the PFRWAC under the mindfulness and the mind-wandering conditions are 0.38 and 0.47, respectively. Like the mean scores of the PGWAC and the PLWAC, the PFRWAC mean scores under the two conditions are marginally higher than their counterparts in the measurement at prior period pricing.

As expected, results of the Mann-Whitney U test for the effectiveness of manipulations on the PFRWAC show that the mindfulness manipulation had a significant effect on participants’ exhibition of PFRWAC \([Z = -4.75, p < .001 \text{ (one-tailed)}]\), whereas the reappraisal manipulation had no significant effect on the PFRWAC \([Z = -0.40, p = .343 \text{ (one-tailed)} \text{ or } .688 \text{ (two-tailed)}]\). The results indicate that mindfulness reduced divesting activities, irrespective of gains or losses, while the reappraisal manipulation did not affect the PFRWAC.

A two-way ANOVA was used to test the between-subjects effects of manipulations and their interaction with the PFRWAC (see Table 5-20 below). Like the findings for the last period pricing measurement, the \(F\)-score for the mindfulness manipulation is significant for the PFRWAC \([F (1, 815) = 14.95, p < .001]\). No significant effect was found from the reappraisal manipulation in PFRWAC \([F (1, 815) = 0.08, p = .774]\). Age had significant effect on the PFRWAC \([F (1, 815) = 16.76, p < .001]\). The joint intervention had significant effect on the PFRWAC \([F (1, 815) = 3.95, p = .047]\). Like the prior period pricing measurement, the joint intervention had a less significant effect than the mindfulness manipulation to reduce the PFRWAC.
All in all, the effects of manipulations on various divestment activities measured at weighted average costing are consistent with those for the last period pricing measurements. I am satisfied with the robustness of the alternative measurement. The weighted average price approach to calculating the disposition effect also shows no significant effect of the experimental manipulations between randomised groups.

5.9 Summary of findings and evaluation of hypotheses

The mindfulness-based manipulation worked as intended. Those who underwent the mindfulness induction had a significantly higher level of state mindfulness than participants subjected to the mind-wandering instruction. People who underwent the mindfulness manipulation divested, regardless of gains or losses, less than those who took the mind-wandering instruction. Since the mindfulness manipulation exerted its influence unidirectionally on both divesting behaviours, it is logical that it did not cause interpersonal differences in the disposition effect, which is the difference between the divesting behaviours, among the two groups.
The intended effect of the situational reappraisal manipulation, the Perspective-taking as a financial advisor, was to distance participants’ Perceived Responsibility relative to those instructed to trade their assets. The current research has found a different effect of the thinking-as-an-advisor reappraisal. On the one hand, among participants who had trading experience, those instructed to think as an advisor tended to take in the accountability approach (as an agent entrusted with responsibility for delivering performance) and felt higher responsibility than others who assumed responsibility for trading their own assets. On the other hand, those who had no investment experience had diverse feelings or meanings towards their responsibility for trading decisions, probably due to their lack of knowledge about investment and its complexity, resulting in a negligible finding for inter-personal differences in Perceived Responsibility. People tend to appraise an incident according to their prior knowledge and experience of the subject matter. Consequently, they have different perceptions if different situated meanings are ascribed to the incident. The finding that the reappraisal manipulation worked only in the experienced investors (but in the direction opposite to that intended) may explain the insignificant overall result. Even so, it does not explain the unexpected positive association between felt responsibility and Perspective-taking as an advisor, which is opposite to that expected from the literature. Hence, no substantive conclusions can be drawn about the hypothesised effects of the situational reappraisal.

The disposition effect is measured at the last period pricing as the primary measurement for testing hypotheses. An alternative measurement at weighted average costing serves as a robustness check. No significant effect was found from either manipulation or their interaction on both measurements of the disposition effect. Thus, H1a, that state mindfulness affects the disposition effect such that the higher the state mindfulness, the lower the disposition effect, is disconfirmed. H2a, that situational reappraisal affects the disposition effect such that the stronger the influence of the situational reappraisal, the lower the disposition effect, cannot be adequately tested since the manipulation did not work as expected.

H1b, that state mindfulness affects the realisation of gains such that the higher the state mindfulness, the lower the realisation of gains, is supported. H1c, that state
mindfulness affects the disposal of losses such that the higher the state mindfulness, the higher the disposal of losses, is not supported because the mindfulness manipulation reduced, rather than increased, the disposal of losses.

Hypotheses for the reappraisal manipulation (i.e., the H2 series of hypotheses) cannot be adequately tested since the reappraisal manipulation was not effective.

The mindfulness manipulation affected behavioural selling of gains and losses in a way inconsistent with the disposition effect. Higher mindfulness was hypothesised to decrease the realisation of gains and increase the disposal of losses. Yet, further exploration into the total divestment behaviour shows that an elevated state of mindfulness was associated with a lower tendency to sell both gains and losses. Whilst mindfulness may not reduce the disposition effect, it may have another significant and beneficial effect, that is, to reduce investors' tendency to churn their portfolios. Portfolio churning is recognised as an important cause of lower investor returns. I discuss this behaviour further in Section 7.2 after analysing test results from trait psychometrics.

In the next chapter, I move on to further tests for the hypotheses drawn on psychometric trait measures of mindfulness and emotion regulations under the influence of the experimental manipulations.
6 TRAIT MEASURES AND TRADING BEHAVIOUR

In Chapter Five, I discussed how I used two-way, factorial ANOVAs and the Gamma Generalized Linear Model analysis to investigate whether the dual emotion-regulatory antecedent using the mindfulness and the reappraisal manipulations had any main and interactive effects on the disposition effect and its constituent selling activities of gains and losses. The manipulations were randomly induced on a sample of 820 in a $2 \times 2$ factorial design. The experimentally induced mindfulness state reduced the realisation of both gains and losses. Since the effect was in the same direction, the mindfulness manipulation did not influence the exhibition of the disposition effect. In parallel, the reappraisal manipulation did not work as intended, so no conclusive effect is drawn on the divesting behaviours.

In this chapter, the hypotheses (H1 and H2 sets) are revisited by examining the relationship between the disposition effect and psychometric trait measures of mindfulness and cognitive emotion regulations under both manipulations, together with related selling behaviours. Correlation analysis discussed in Chapter Four (Subsection 4.6.3) found examples of their associations: trait mindfulness and trait catastrophising correlated to the dependent variables (the PGR and the PLR) and the manipulated variables. Such associations are investigated further by testing whether dispositional psychometrics had any predictive power on the divesting behaviours. The hypotheses below are operationalised in terms of the trait psychometric measures:
H3a. Trait mindfulness affects the disposition effect such that the higher the trait mindfulness, the lower the disposition effect.

H3b. Trait mindfulness affects the realisation of gains such that the higher the trait mindfulness, the lower the realisation of gains.

H3c. Trait mindfulness affects the disposal of losses such that the higher the trait mindfulness, the higher the disposal of losses.

H4a. Trait positive reappraisal affects the disposition effect such that the higher the use of trait positive reappraisal, the lower the disposition effect.

H4b. Trait positive reappraisal affects the realisation of gains such that the higher the use of trait positive reappraisal, the lower the realisation of gains.

H4c. Trait positive reappraisal affects the disposal of losses such that the higher the use of trait positive reappraisal, the higher the disposal of losses.

H5a. Trait catastrophising affects the disposition effect such that the higher the use of trait catastrophising, the higher the disposition effect.

H5b. Trait catastrophising affects the realisation of gains such that the higher the use of trait catastrophising, the higher the realisation of gains.

H5c. Trait catastrophising affects the disposal of losses such that the higher the use of trait catastrophising, the lower the disposal of losses.

After testing these hypotheses, the chapter evaluates findings and reviews Perceived Responsibility and divesting activities under the dual antecedent of the two manipulations. A preliminary review of the cognitive processes of reification and de-reification is discussed along with an evaluation of the influences exerted by the two manipulations and the habitual emotion regulation of catastrophising on divesting activities.
6.1 The cognitive emotion-regulatory mechanism and psychometrics

6.1.1 Dispositional psychometrics under the manipulations

To ascertain whether the trait-level cognitive emotion-regulatory mechanism influences the occurrence of the disposition effect under the dual antecedent of both manipulations, I tested psychometric measures, trait mindfulness, and two habitual emotion regulation processes, trait positive reappraisal and trait catastrophising. The composition of these measures and a reliability test of the scale variables were discussed in Chapter Four (Subsections 4.5.3, 4.5.4, and 4.6.2). These trait psychometric measures may exert influence on divesting activities. Additional inferential analyses are needed to test the effects of these trait psychometrics on the selling behaviours under both manipulations.

In the prior analysis, any unmodelled variance was controlled for through randomisation. However, as I look at the effects of non-manipulated variables, it is important to control for other recognised influences on the disposition effect. Demographic characteristics of age, gender, and investment experience are regarded as control variables. They may play a role in explaining inter-personal differences in exhibiting the disposition effect as advised by previous research: age (e.g., Feng and Seasholes, 2005), gender (cf. Shu et al., 2005; Da Costa Jr et al., 2008), and investment experience (e.g., Feng and Seasholes, 2005).

The extant literature provides evidence for inter-correlations among the three demographic characteristics, trait mindfulness, and habitual emotion regulations. Some of these associations are consistent with the results of the correlation analysis discussed in Subsection 4.6.3 (see Table 4-4). Older people have a higher level of trait mindfulness (Shook et al., 2017) and achieve successful habitual emotion regulation (Suri and Gross, 2012). The evidence corresponds to age’s positive correlation with trait mindfulness (Spearman’s rho = .28, p < .001) and negative association with trait catastrophising
(Spearman’s rho = -0.32, p < .001). Women use maladaptive emotion regulation strategies more than men do (Nolen-Hoeksema and Aldao, 2011). This is consistent with the association between gender and trait catastrophising (Spearman’s rho = -0.06, p = .037).

As a caveat, the bivariate correlation alone may not be sufficient to support significant effects when other variables are involved. For example, although ageing had an inverse correlation with the disposition effect (Spearman’s rho = -0.12, p < .001; see Table 4-4), the two-way ANOVA found that ageing did not have any significant effect on the behaviour when the manipulated variables were tested together, suggesting that the correlation was due to the disproportionate participation of older people in the research (see Subsection 5.6.4). Taken together, the three demographics are required to be controlled as covariates in the following inferential analyses.

6.1.2 Distributions of dispositional psychometrics

Figure 6-1 Histograms of three dispositional psychometrics

i) Positive Reappraisal  ii) Catastrophising  iii) The FFMQ, a trait mindfulness measure
Displayed above in Figure 6-1 are histograms showing frequency distributions for the three dispositional variables. They exhibit two different patterns of frequency distributions: i) visually normal as shown in trait positive reappraisal and the trait mindfulness scale of the FFMQ (comprising Observing, Describing, Acting with Awareness, Nonjudging, and Nonreactivity; Baer et al., 2006); and ii) showing a right-skewed curve with a spike at score 1 (i.e., trait catastrophising), which suggests a left-censored normal distribution. These asymmetric distributions may slightly reduce the power of any statistical test. Given a reasonably large sample size such as the current research, it should not be a problem for conducting parametric tests, such as regression analysis for the variables.

6.1.3 Hierarchical regression analysis adapted for the current research

I used hierarchical regression analysis\(^{17}\) to ascertain how much variance from the demographics and dispositional psychometrics contribute to predicting the disposition effect. In a hierarchical regression, variables were entered into the regression analysis stepwise in different groups of interest to test whether a statistically significant amount of variance was explained for the divesting behaviour concerned. Demographic factors were entered as the first step, followed by the trait measures, to assess the predictive power of these psychometrics above and beyond the demographics. Moreover, to check additional explanatory power beyond the manipulations, I added them to the final step of the hierarchical regression as control variables (i.e., controlling for the effects of manipulations). This last step served as a robustness check on the tests for H1a and H2a.

Regression analysis does not assume the shape of the distribution for the dependent variable (Hayes, 2018), although normality of residuals is assumed. The validity of statistical inferences from regression analysis is jeopardised only if the moderately non-

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17 Hierarchical regression analysis, in which blocks of variables are entered sequentially in a regression to examine additional variance explained, is different from hierarchical models. The latter is a kind of multilevel model wherein the data are grouped in hierarchical or nested levels.
normal sample is small (Hayes, 2018). The current sample is considered sufficiently large to provide valid results. However, a large sample does not help ease the violation of variance homogeneity. Heteroscedasticity influences statistical inference by affecting the standard errors of regression coefficients (Hayes, 2018). Blanca et al. (2017) argue that variance heterogeneity influences $F$-test robustness more than non-normality does. The hierarchical regression operative in the SPSS (version 24) software I used did not provide heteroscedasticity-consistent standard error estimates that could overcome the problem. To accommodate the issue, I turned to the PROCESS macro (Hayes, 2018).

6.1.4 Stepwise regression adapted for heteroscedasticity consistency

As one of the crucial assumptions in Ordinary Least Square (OLS) regression, the homogeneity of variances or homoskedasticity condition requires that the variance of errors is unrelated to any independent variables or any linear combination of them. When this assumption is violated, a condition known as heteroskedasticity, the estimator of the covariance matrix of the parameter estimates would be biased and inconsistent, rendering significance tests and confidence intervals unreliable (Hayes and Cai, 2007). Research methodologists Hayes and Cai (2007) examined a group of heteroscedasticity consistency standard error (HCSE) estimators for OLS regression. They introduced the use of four HCSE estimators for heteroskedasticity-consistent inference to the current version of the PROCESS macro (Hayes, 2018). The heteroskedasticity-consistent inference estimator 3 (i.e., HC3, derived from Davidson and MacKinnon, 1993; cited in Hayes and Cai, 2007) was used in the current research because it can keep the test size at the nominal level irrespective of the status for heteroskedasticity, although a slight loss of power occurs when homoskedasticity prevails (Long and Ervin 2000). Given the high likelihood of heteroskedasticity for the variables involved in the regression analysis, whose normal distribution would thus be doubtful, I applied standard errors estimated by heteroskedasticity-consistent inference estimator 3 (SE[HC3]) to the statistical procedures in running the SPSS (version 24) programme incorporated with the PROCESS macro.
Krishnamoorthy, Lu, and Mathew (2007) advise that using parametric bootstrap performs statistical inference satisfactorily in controlling the Type I error rate due to heteroscedasticity in the F-test for ANOVA. Insofar as Type I error is contained, bootstrapping is a useful statistical tool for inference purposes, that is, to determine whether an association is not negligible when a regression coefficient is barely significant. The PROCESS macro provides bootstrap sampling, which may overcome issues of the asymmetric distribution of the regression variables. Without necessitating the fulfilment of presumptions about the shape of the sampling distribution, percentile bootstrap confidence intervals (resampled 5,000 times, at α level of .05) were used to assess whether an effect falls in intervals that do not straddle zero (Hayes, 2018). Bootstrapping neither changes the values of the coefficients concerned, nor the F-scores of regressions. Parameter details of the constant are not relevant to the hypotheses under test, so they are not shown.

As a robustness check on testing Hypothesis 1a and Hypothesis 2a, I examined the relationships between trait measures of mindfulness, Positive Reappraisal, and Catastrophising, and their impacts, if any, on the disposition effect and its related divesting activities under the dual antecedent of both manipulations. This was a critical check since trait measures were conducted after the manipulations and may have been affected. These analyses were also used to test Hypothesis sets H3 to H5. Hierarchical regression analysis was run stepwise in three successive models. Model 1 covered demographic variables. Model 2 consisted of the block of Model 1 variables, trait mindfulness, and the two habitual emotion regulations. The block of Model 2 variables combined with the two manipulations (that serve as control variables) to form the Model 3 variables. The application of Hayes’s (2018) PROCESS macro regression tool complements the SPSS programme (version 24) for data analysis, which is helpful given the heteroscedastic property of selling behaviours.

6.1.5 Manipulations and psychometrics regressed on the disposition effect

Table 6-1 below exhibits hierarchical regression statistics for the disposition effect. The initial F-score for Model 1 is not significant \([F (3, 816) = 2.58, p = .053]\) with a small
$r$ square (0.9%) because only age was inversely related to the exhibition of the behaviour. The $F$-change for Model 2 is negligible [$F_{change}$ (3, 813) = 1.54, $p = .204$] and $r$ square changes (0.6%) to 1.5% as neither trait mindfulness nor the habitual emotion-regulatory processes had a significant effect on the disposition effect. The $r$ square change gives the change in variance explained when a new block of variables is added to the model. Adding variables tends to increase the $r$ square value but this may not explain additional variance in the disposition effect. The $F$-change value is used to calculate the significance of the change in variance explained, so the initial $F$-score and subsequent $F$-change values are examined successively in blocks to investigate whether the additional variables predict the disposition effect beyond the previous models. A significant $F$-change, if found, indicates that the variables added in that model explain significant variance in the disposition effect.

Table 6-1 Hierarchical regression statistics for the disposition effect

<table>
<thead>
<tr>
<th>Unstandardised coefficients:</th>
<th>Model 1</th>
<th></th>
<th></th>
<th></th>
<th>Model 2</th>
<th></th>
<th></th>
<th></th>
<th>Model 3</th>
<th></th>
<th></th>
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<tbody>
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<td>Age</td>
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<td>0.007</td>
<td>0.027</td>
<td></td>
<td>-0.022</td>
<td>0.008</td>
<td>0.007</td>
<td></td>
<td>-0.021</td>
<td>0.008</td>
<td>0.010</td>
</tr>
<tr>
<td>Gender</td>
<td>0.027</td>
<td>0.019</td>
<td>0.143</td>
<td></td>
<td>0.026</td>
<td>0.019</td>
<td>0.156</td>
<td></td>
<td>0.025</td>
<td>0.019</td>
<td>0.176</td>
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<tr>
<td>Investment experience</td>
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<td>0.007</td>
<td>0.246</td>
<td></td>
<td>0.008</td>
<td>0.007</td>
<td>0.218</td>
<td></td>
<td>0.008</td>
<td>0.007</td>
<td>0.212</td>
</tr>
<tr>
<td>Trait positive reappraisal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.001</td>
<td>0.012</td>
<td>0.966</td>
<td></td>
<td>0.001</td>
<td>0.012</td>
<td>0.915</td>
</tr>
<tr>
<td>Trait catastrophising</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-0.018</td>
<td>0.012</td>
<td>0.127</td>
<td></td>
<td>-0.019</td>
<td>0.012</td>
<td>0.114</td>
</tr>
<tr>
<td>Trait Mindfulness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.010</td>
<td>0.019</td>
<td>0.580</td>
<td></td>
<td>0.009</td>
<td>0.019</td>
<td>0.640</td>
</tr>
<tr>
<td>Mindfulness manipulation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-0.020</td>
<td>0.018</td>
<td>0.268</td>
</tr>
<tr>
<td>Reappraisal manipulation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-0.007</td>
<td>0.018</td>
<td>0.688</td>
</tr>
</tbody>
</table>

$F$-statistics:

<table>
<thead>
<tr>
<th>df</th>
<th>3, 816</th>
<th></th>
<th></th>
<th></th>
<th>3, 813</th>
<th></th>
<th></th>
<th></th>
<th>2, 811</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>$F$-score</td>
<td>2.575</td>
<td>0.053</td>
<td></td>
<td></td>
<td>1.535</td>
<td>0.204</td>
<td></td>
<td></td>
<td>0.741</td>
<td>0.477</td>
<td></td>
</tr>
<tr>
<td>$F$-change</td>
<td>0.009</td>
<td></td>
<td></td>
<td></td>
<td>0.015</td>
<td></td>
<td></td>
<td></td>
<td>0.017</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R square</td>
<td>0.006</td>
<td></td>
<td></td>
<td></td>
<td>0.006</td>
<td></td>
<td></td>
<td></td>
<td>0.002</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For Model 3, the $F$-change is non-significant [$F_{change}$ (2, 811) = 0.74, $p = .477$] with a minuscule $r$ square change (0.2%) and non-significant coefficient values for the
manipulations. The purpose of including the manipulations in the analysis was to check whether the trait variables influenced the disposition effect along with the manipulations.

In Subsection 4.6.3, I assessed inter-correlations among the predictors and covariates. I needed to preclude multicollinearity that may inflate the variance among these variables, which reduces their statistical significance. When running the hierarchical multiple regression, I obtained the variance inflation factor (VIF) for each of these variables. The VIF is a measurement of collinearity between a predictor variable with the remaining ones, such that the higher the factor value, the higher the correlation and collinearity. Whereas a VIF value of 1 means orthogonal (zero) correlation with the remaining predictors, a VIF value of 10 or above renders the variable no longer reliable for inferential analysis (Belsley, Kuh, and Welsch, 1980). For the current sample, the lowest VIF value, 1.02, belongs to the reappraisal manipulation, while the trait mindfulness measure has the highest VIF score (1.57). Hence, I can rely on the hierarchical multiple regression analysis as multicollinearity among the predictors and covariates is not a problem.

Overall, results show that all these variables had no significant effect. Hence, these findings do not support Hypotheses 3a, 4a, and 5a.

6.1.6 Effects of manipulations and psychometrics on the PGR as GGzLM

For the same reason as I used the Gamma Generalized Linear Model analysis for the realisation of gains in Subsection 5.7.4, I ran the same analysis by adding the predictors and covariates for testing the effects of trait psychometrics on the PGR as shown in Table 6-2 below. This analysis approach treats the manipulations as main factors (without including their interaction) and demographics and dispositional psychometrics as covariates. I compare the results with those obtained without including trait psychometrics and demographics (i.e., age, gender, and investment experience) in the Gamma GzLM analysis conducted for the manipulations and age in Chapter Five (see Table 5-10).
Consistent with the findings discussed in Subsection 5.7.4 about the effects of manipulations on the PGR, the mindfulness manipulation is found to affect the realisation of gains because it lessened the latter by 4% (Exp(B) - 1 = -0.04, p < .001). Similarly, the reappraisal manipulation did not predict the PGR as the value of Exp(B) - 1 is negligible (0.004, p = .713). A unit increase in age (10 years per category unit) decreased the value of the PGR by 2% as the value of Exp(B) - 1 is significant (-0.02, p < .001). The inclusion of trait psychometrics did not change the effects of the mindfulness manipulation and age on the realisation of gains. A unit increase in trait catastrophising is found to increase the PGR by 2% [Exp(B) - 1 = 0.02, p = .007]. Trait mindfulness and positive reappraisal did not influence the PGR as the p-values of their respective Exp(B) - 1 values are negligible. Trait catastrophising thus had a significant positive association with the realisation of gains, offering support for H5b.
6.1.7 Effects of manipulations and psychometrics on the PLR as GzLM

Table 6-3 displays the Gamma GzLM analysis for the proportion of losses realised. I compare the results with those obtained without including trait psychometrics, gender, and investment experience (see Table 5-12 in Subsection 5.7.4). The Gamma GzLM analysis finds that the mindfulness manipulation did not predict the PLR as the value $Exp(B) - 1 = -0.02$ ($p = .087$) is not significant. This result is contrary to those shown in Table 5-12, where the mindfulness manipulation was found to reduce the PLR by 2% ($p = .029$) when no covariates were involved. The difference in the findings indicates that older people were more mindful, and they were the majority in the sample. Relatedly, the mindfulness manipulation negatively correlated with trait catastrophising (Spearman’s $rho = -.09, p = .007$), suggesting the former may reduce the latter (see Table 4-4). After controlling for other variables, a unit increase in trait catastrophising increased the PLR by 3% since the value of $Exp(B) - 1$ is significant ($0.03, p < .001$).

Table 6-3 Gamma Generalized Linear Model analysis for the PLR

<table>
<thead>
<tr>
<th>Parameter</th>
<th>B</th>
<th>Std. Error</th>
<th>Hypothesis Test</th>
<th>Exp(B)</th>
<th>Exp(B) - 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>0.160</td>
<td>0.0543</td>
<td>0.003</td>
<td>1.173</td>
<td>0.173</td>
</tr>
<tr>
<td>[Mindfulness manipulation=1]</td>
<td>-0.018</td>
<td>0.0106</td>
<td>0.087</td>
<td>0.982</td>
<td>-0.018</td>
</tr>
<tr>
<td>[Mindfulness manipulation=0]</td>
<td>0a</td>
<td>1</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>[Reappraisal manipulation=1]</td>
<td>-0.003</td>
<td>0.0105</td>
<td>0.797</td>
<td>0.997</td>
<td>-0.003</td>
</tr>
<tr>
<td>[Reappraisal manipulation=0]</td>
<td>0a</td>
<td>1</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>0.000</td>
<td>0.0048</td>
<td>0.957</td>
<td>1.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Gender</td>
<td>-0.003</td>
<td>0.0109</td>
<td>0.814</td>
<td>0.997</td>
<td>-0.003</td>
</tr>
<tr>
<td>Investment experience</td>
<td>-0.007</td>
<td>0.0042</td>
<td>0.104</td>
<td>0.993</td>
<td>-0.007</td>
</tr>
<tr>
<td>Trait-mindfulness</td>
<td>-0.002</td>
<td>0.0117</td>
<td>0.888</td>
<td>0.998</td>
<td>-0.002</td>
</tr>
<tr>
<td>Positive Reappraisal</td>
<td>0.007</td>
<td>0.0076</td>
<td>0.353</td>
<td>1.007</td>
<td>0.007</td>
</tr>
<tr>
<td>Catastrophising</td>
<td>0.033</td>
<td>0.0070</td>
<td>0.000</td>
<td>1.033</td>
<td>0.033</td>
</tr>
<tr>
<td>(Scale)</td>
<td>.022b</td>
<td>0.0011</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. Set to zero because this parameter is redundant.
b. Maximum likelihood estimate.
The inclusion of trait psychometrics changes the effect of ageing on the disposal of losses. Contrary to the analysis in Subsection 5.7.4, age is found not to affect the PLR as the value of $\text{Exp}(B) - 1$ is 0.00 ($p = .957$). Trait mindfulness and trait positive reappraisal did not influence the PLR because the $p$-values of their respective $\text{Exp}(B) - 1$ values are negligible. Like the analysis discussed in Subsection 5.7.4, the reappraisal manipulation did not predict the PLR as the value $\text{Exp}(B) - 1 = -0.003$ ($p = .797$) is negligible.

6.1.8 Manipulations and psychometrics regressed on the PFR

Table 6-4 below exhibits hierarchical regression statistics for total divestments, including gains and losses (i.e., the PFR). The $F$-score for Model 1 is significant [$F (3, 816) = 7.89, p < .001$] and $r$ square is moderate (3%) as older people divested less ($B = -0.02, p < .001$). The $F$-change for Model 2 is significant [$F_{\text{change}} (3, 813) = 8.72, p < .001$], and $r$ square changes (3%) to 6% as trait catastrophising increased total divestments ($B = 0.03, p < .001$), suggesting that trait catastrophising predicts PFR above and beyond the covariates, in particular, age.

The $F$-change for Model 3A (controlling for the two manipulations) is significant [$F_{\text{change}} (2, 811) = 6.23, p = .002$], but the $r$ square change is low (1%). Like findings from the two-way ANOVA as discussed in Subsection 5.8.3, the mindfulness manipulation reduced total divestments ($B = -0.04, p < .001$), while the reappraisal manipulation did not exert an effect on the PFR. Likewise, the $F$-change for Model 3B (controlling for the three treatment conditions) is significant [$F_{\text{change}} (3, 810) = 6.11, p < .001$] and the $r$ square change from Model 2 (2%) is marginally higher than that of Model 3A. The difference between Models 3A and 3B is that the joint intervention reduces the PFR ($B = -0.03, p = .011$), and the mindfulness-only treatment effect becomes negligible when the three treatments are differentiated from the two manipulations. Perhaps, the reductive effect was mainly attributed to the mindfulness-reappraisal interaction.
The effects of both manipulations on PFR were broadly consistent with the results obtained from just testing manipulations without including the trait measures (see Subsection 5.8.3). I discuss the impacts of manipulations on trading activities in Subsection 7.2.2, which may explain the interaction effect as aforementioned.

6.1.9 Trait catastrophising and the Mindful Coping Model

Since trait catastrophising correlated with the PGR, the PLR, and the PFR, I examined its relationships with its adaptive counterpart (i.e., trait positive reappraisal), trait mindfulness, the two manipulations, and the covariates. In Subsection 4.6.3, I ran a correlation analysis for these variables, which found that trait catastrophising was used more by female participants (Spearman’s rho = -.06, p = .037) and decreased with age (Spearman’s rho = -.32, p < .001), as discussed in Subsection 6.1.1. Older people are found to use less trait catastrophising, which is consistent with the finding of Suri and Gross (2012) that older people attain successful habitual emotion regulation.

Table 6-4 Hierarchical regression statistics for the PFR

<table>
<thead>
<tr>
<th>Unstandardised coefficients:</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3A</th>
<th>Model 3B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>-0.021</td>
<td>-0.014</td>
<td>-0.012</td>
<td>-0.012</td>
</tr>
<tr>
<td>Gender</td>
<td>0.007</td>
<td>0.008</td>
<td>0.007</td>
<td>0.007</td>
</tr>
<tr>
<td>Investment experience</td>
<td>-0.002</td>
<td>-0.003</td>
<td>-0.003</td>
<td>-0.003</td>
</tr>
<tr>
<td>Trait positive reappraisal</td>
<td>0.007</td>
<td>0.009</td>
<td>0.009</td>
<td>0.009</td>
</tr>
<tr>
<td>Trait catastrophising</td>
<td>0.033</td>
<td>0.031</td>
<td>0.003</td>
<td>0.003</td>
</tr>
<tr>
<td>Trait Mindfulness</td>
<td>0.006</td>
<td>0.003</td>
<td>0.003</td>
<td>0.003</td>
</tr>
<tr>
<td>Mindfulness manipulation</td>
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<td>-0.036</td>
<td>-0.010</td>
<td>0.002</td>
</tr>
<tr>
<td>Reappraisal manipulation</td>
<td>0.002</td>
<td>0.002</td>
<td>0.010</td>
<td>0.868</td>
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<tr>
<td>Mindfulness only intervention</td>
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<td>0.014</td>
<td>0.015</td>
<td>0.013</td>
</tr>
<tr>
<td>Reappraisal only intervention</td>
<td>0.027</td>
<td>0.015</td>
<td>0.079</td>
<td>0.011</td>
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<td>Mindfulness-reappraisal inter</td>
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<td>0.013</td>
<td>0.011</td>
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<table>
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</thead>
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<td>3,813</td>
<td>2,811</td>
<td>3,810</td>
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<tr>
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<td>7.894</td>
<td>0.000</td>
<td>8.723</td>
<td>6.232</td>
</tr>
<tr>
<td>F-change</td>
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<td>0.000</td>
<td>6.232</td>
<td>6.113</td>
</tr>
<tr>
<td>R square</td>
<td>0.028</td>
<td>0.058</td>
<td>0.072</td>
<td>0.079</td>
</tr>
<tr>
<td>R square change</td>
<td>0.030</td>
<td>0.014</td>
<td>0.014</td>
<td>0.021</td>
</tr>
</tbody>
</table>
A decrease in trait catastrophising was associated with increased trait mindfulness (Spearman’s rho = -.48, p < .001) and increased trait positive reappraisal (Spearman’s rho = -.29, p < .001). The cross-sectional inter-correlations among the three trait psychometrics lend support to the functioning of the Mindful Coping Model (see Subsection 2.6.1 for a detailed review).

Trait catastrophising, a dysfunctional form of emotion regulation, amplifies the experience of negative emotion, which is typical in a laborious task of portfolio trading such as the current research setting. Trait catastrophising elevates the tendency to churn investment portfolios as it was associated with the increase in the realisation of gains and the disposal of losses. Since the disposition effect is influenced by the intensity of emotion and potentially its reactivity, post-trading emotions would influence the disposition effect. As expected, trait catastrophising was found to be positively associated with post-trading negative affect (Spearman’s rho = .16, p < .001). However, the current research should treat this as a marginal effect on the pre-existing trait measure instead of underrating the influence of the counterproductive emotion-regulatory strategy on financial behaviour and post-trading emotions based on sound theoretical underpinnings.

The trait psychometric variables were measured after the manipulations and trading. Similarly, some previous literature used trait psychometric measures after trading to study the effects of emotion regulation on the disposition effect (e.g., Richards, 2013). Although post-trading negative affect correlated with trait catastrophising in the current research, their association should be a cross-sectional result. Therefore, I cannot use it to claim the direction of causality. They are just limitations to be identified and discussed.

In retrospect, I had the same dilemma as do other researchers who measure trait psychometrics. Measuring trait psychometric variables after trading may result in correlations between psychometrics, manipulations, and post-decision emotions. In contrast, measuring these psychometrics before trading may prime participants to be more aware of the underlying emotions purported to be regulated, which would change their affective conditions. The measurement should occur at the precise time of trading, but this would add cognitive load to participants, compromising their performances.
When controlling the two manipulations in the hierarchical regression analysis as exhibited in Table 6-4 above, trait catastrophising was still a significant predictor of the PFR. The cross-sectional analysis has not ruled out the experience of greater negative affect in the mind-wandering condition, as the measure of trait catastrophising seemed to be influenced by the mindfulness manipulation. In parallel, the effect of trait catastrophising on divesting behaviours was found to be remarkably similar to the influence of mindfulness on the same divesting behaviours despite acting in opposite directions. I evaluate these observations in Subsection 6.3.1 and discuss their inter-connectedness in Chapter Seven. Before then, I revisit the effectiveness of the two manipulations.

6.2 Revisiting the reappraisal and mindfulness manipulations

6.2.1 Evaluating why the reappraisal manipulation did not work as intended

As discussed in Section 5.5, the mindfulness manipulation successfully increased state mindfulness as measured by the TMS (Lau et al., 2006). However, the reappraisal manipulation failed the manipulation check. In this subsection, I evaluate the reasons and thoughts on why the reappraisal manipulation did not work as hypothesised.

First, the work of Sokol-Hessner and colleagues (2009) did not check the reappraisal manipulation, so its research users do not know whether felt responsibility at different levels, or the specific level intended by the original study, exists.

Second, the wording for the “Perspective-taking as advisors” instruction was not identical to those used by the originators. This might cast doubt on whether the effect of the reappraisal manipulation applied in the current research resembled that intended in the original study if it ever existed.

Third, there are two findings for the manipulations in the present research. The first finding is that the mindfulness manipulation worked in the entire sample. A significant difference in state mindfulness was found between mindfulness and mind-wandering
conditions. The second finding is that the reappraisal manipulation worked in the opposite direction as hypothesised for the financially experienced subsample. Felt responsibility was significantly different between those instructed to think as an advisor and those trading for themselves in the subsample. It seems that the functioning of the reappraisal manipulation could be altered by people’s cognitive appraisals of their capability (i.e., financial sophistication), and mindfulness may play a role in changing the situated meaning ascribed to by the people concerned.

Fourth, since the Perspective-taking as an advisor and trading for oneself interventions may shape different perceptions while increased state mindfulness might cause a fundamental change of perception and related apperception on the Perspective-taking instruction from that intended by the original context, an interaction effect of the joint intervention on the exhibition of behaviour would exist. In a heightened attention deployment such as state mindfulness, people may evaluatively highlight selected aspects of reality from their world and behave according to such appraisal of the situational meaning (Dreyfus, 2011; Garland et al., 2015a).

In contrast with the work of Sokol-Hessner and colleagues (2009), I checked the reappraisal manipulation for the entire sample but did not find different levels of felt responsibility as the manipulation did not work as hypothesised. In the current sample, the reappraisal manipulation worked in the opposite direction as intended for the financially experienced subsample. For those instructed to think as an advisor, their perceived responsibility was significantly higher than those who traded for themselves. As for the wording of the reappraisal instruction, applying a similar but not identical instruction to those used by the originators was due to the need to streamline the instruction to adapt to the reappraisal manipulation. Even if the reappraisal manipulation used in the current research did not achieve what was intended by Sokol-Hessner and colleagues (2009), it still served the specific purpose of changing participants’ emotions that should be identified. To this end, I explore the relationships between the pre-trading emotions and the manipulations.

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18 Apperception refers to one's mental process wherein a perception is assimilated in their inner world (Depraz et al., 2000; cited in Brown and Ryan, 2004).
together with the cognitive emotion-regulatory mechanism as evidence for participants’ primary and secondary appraisals in the next subsection.

On balance, the last two arguments outlined in the preceding discussions – that the functioning of the reappraisal manipulation could be altered by people’s cognitive appraisal of their financial sophistication, and mindfulness may change the perceptions and related apperceptions (situated meaning ascribed to by the people concerned) for the two reappraisal instructions from those intended by the original contexts – help clarify the queries arising from the foregoing thoughts. Further, the financially experienced perceived different levels of responsibility in different experimental conditions (see Subsection 6.2.3). The findings discussed in the same subsection support the interaction effect of the two manipulations among this subsample. As discussed further in Subsection 6.2.4, this interaction may be caused by a change in the situated meaning of the trading task ascribed to by people under the two scenarios prescribed by the reappraisal manipulation.

6.2.2 Primary and secondary appraisals immediately before trading

Pre-trading emotions were positive and negative affectivity measured immediately after the two manipulations but before the trading exercise. They were the immediate emotions that reflected the affective states in the wake of the two manipulations and changes due to their effects. I conducted an exploratory analysis of the bivariate correlations between the manipulations and pre-trading emotions for the entire sample (see Subsection 4.6.3 for more detail). The reappraisal manipulation was found to reduce pre-trading positive affect (Spearman’s \( \rho = -0.06, p = 0.040 \)) and increase pre-trading negative affect (Spearman’s \( \rho = 0.06, p = 0.033 \)), whereas the mindfulness manipulation was found to increase pre-trading negative affect (Spearman’s \( \rho = 0.06, p = 0.039 \)). The findings suggest that positive affect was suppressed while negative affect was elevated immediately after the manipulations, plausibly due to the imminent requirement to undergo a laborious task of portfolio trading in the prescribed capacity of a financial advisor.
The check on the reappraisal manipulation using Perceived Responsibility showed a significant difference in the levels of felt responsibility in the financially experienced subsample (N = 278) but not in those who had no investment experience (N = 542). I ran the same correlation analysis set for pre-trading emotions and the two subsamples. Only the mindfulness manipulation had modest correlations with pre-trading emotions. For the financially experienced subsample, the mindfulness manipulation upregulated pre-trading positive affect (Spearman’s rho = .11, p = .036), indicating that mindful people in this subsample were comfortable to undertake the trading exercise. For those who had not traded before, the mindfulness manipulation increased pre-trading negative affect (Spearman’s rho = .09, p = .015), suggesting that this group of mindful people experienced a moderately disturbed emotion when they were required to do a task they had never done before. Since those who had no investment experience outnumbered the financially experienced twofold, mindfulness’s positive correlation with pre-trading negative affect prevailed in the corresponding set of correlations for the entire sample. Even so, these findings imply that an elevated state of mindfulness plays a crucial role in facilitating people’s affective reactions towards the performance of the task through their respective appraisals of the underlying process. People who had more experience felt more pleasant (Spearman’s rho = .16, p < .001) and less unpleasant (Spearman’s rho = -.11, p < .001) before trading, suggesting their appraisals may reduce maladaptive emotions.

To rule out the possible flawed measurement of pre-trading emotions that might compromise the preceding correlations, I investigated any substantial contaminations in these measurements for the entire sample by checking their correlations with trait mindfulness and habitual emotion regulations. Pre-trading positive affect positively correlated with trait mindfulness (Spearman’s rho = .14, p < .001) and trait positive reappraisal (Spearman’s rho = .32, p < .001). Pre-trading negative affect correlated positively with trait catastrophising (Spearman’s rho = .19, p < .001), and negatively with trait mindfulness (Spearman’s rho = -.26, p < .001) and trait positive reappraisal (Spearman’s rho = -.16, p < .001). These results are plausible and not counter-intuitive to prevailing emotion theory, suggesting no substantial contamination to the measurements of the pre-trading emotions. The results also help justify the way these trait psychometrics were measured (i.e., after the manipulations and the trading task, see Subsection 6.1.9).
The findings of the preceding correlation analysis lend support to the current research design which studied how emotions were managed using cognitive-affective functioning processes instead of emotion per se, and the underlying emotions were endogenously elicited during portfolio trading.

Moreover, findings from the foregoing analyses on pre-trading emotions and manipulations are congruent with Lazarus’s (1991a, 1991b) appraisal theory – appraisal precedes cognitive computation which triggers the emotion. The primary appraisal assesses whether there is something of relevance to the decision-maker (i.e., by figuring out the situated meaning of the trading task under the two scenarios – trading as an advisor or for oneself). In parallel, the secondary appraisal appears to align the decision-maker’s pre-existing coping mechanism from their habitual emotion-regulatory resources. The two instructions of the reappraisal manipulation had specific situated meanings to their respective recipients, and the latter appeared to apperceive their coping facilities accordingly (see Subsection 2.3.6 for the appraisal theory).

6.2.3 Perceived Responsibility among the financially experienced

In the entire sample, the think-as-an-advisor perspective-taking increased felt responsibility (not decreased as intended) when compared with the trading own assets group (see Subsection 5.5.3). This result was contrary to the intended effect of the Perspective-taking to act as a financial advisor, which was to lessen participants’ Perceived Responsibility relative to those instructed to trade their assets. Among participants who had trading experience, those instructed to think as an advisor tended to take in the accountability approach (as an agent entrusted with responsibility for delivering performance) and felt higher responsibility than others who assumed responsibility for their own decisions. On the other hand, those without trading experience had diverse feelings or meanings towards their responsibility for trading decisions. This was probably
due to their lack of trading experience and knowledge of its complexity, resulting in a negligible finding for inter-personal differences in Perceived Responsibility.

Disparities may exist between people undergoing different experimental conditions (e.g., the reappraisal-only group vs the mindfulness-reappraisal group) among the financially experienced people. To assess intergroup differences, I compared the mean differences among participants’ Perceived Responsibility for the financially experienced people under different experimental conditions. I used a one-way ANOVA as an exploratory test to investigate this proposition. The test aims to ascertain the different effects of a predictor variable by comparing the differences between mean scores in different conditions (Levin, 1998). In the present research, the four experimental conditions are the control, the reappraisal-only, the mindfulness-only, and the mindfulness-reappraisal interventions. A Bonferroni adjustment for multiple comparisons is normally used to avoid familywise error rate, the probability of rejecting at least a true null hypothesis, subject to certain conditions. One of them, the orthogonal assumption, is violated as three of the four experimental conditions are interdependent, suggesting that using a Bonferroni adjustment may overcorrect for Type I error (Armstrong, 2014). To mitigate the exposure to Type II error, I did not apply a Bonferroni adjustment.

Exhibited below in Table 6-5 is the set of post hoc comparisons from a one-way ANOVA for Perceived Responsibility among the financially experienced subsample. The omnibus test is significant \( F(3, 274) = 4.14, p = .007 \), indicating significant differences among treatment conditions. Levene’s test is significant \( F(3, 274) = 5.04, p = .002 \), suggesting the presence of heteroscedasticity. As homoscedasticity was not assumed, I used a Games-Howell test for post hoc comparisons. The mean differences in Perceived Responsibility between the mindfulness-reappraisal group and each of the different experimental conditions are found to be significant: the control condition [mean difference = 0.51, \( p = .042 \), 95% CI (0.01 to 1.01)], the reappraisal condition [mean difference = 0.52, \( p = .014 \), 95% CI (0.08 to 0.97)], and the mindfulness condition [mean difference = 0.64, \( p = .003 \), 95% CI (0.17 to 1.12)]. The results indicate that the interaction between the reappraisal and the mindfulness manipulations raised the Perceived Responsibility of the financially experienced people, compared to all other experimental conditions.
A Kruskal-Wallis test, the nonparametric equivalent to a one-way ANOVA, was applied as a robustness check. This is a rank-based test that assesses whether a significant difference exists in two or more subsamples (Howell, 2007). The Kruskal-Wallis test does not advise which differences between subsamples are significant but serves aptly as a confirmatory test to support findings from a one-way ANOVA for variables having nonparametric properties. The test result shows that Chi-square is significant \( \chi^2(3) = 12.23 \), asymptotic significance = .007, supporting the results of the one-way ANOVA as significant inter-personal differences appear in the levels of Perceived Responsibility across the four experimental conditions for the financially experienced people.

Next, I unfold possible explanations for the foregoing observations as discussed.

### 6.2.4 Cognitive de-reification process

In Subsection 6.2.1, I proposed that the effect of mindfulness could be better understood by using a different approach – the influence of mindfulness on people's...
apperceptions of different scenarios. People felt negative emotions after being instructed to trade like an advisor, probably due to their appraisal of the requirement for the laborious task (see Subsection 6.2.2). Those who had undergone the mindfulness manipulation showed different emotions: the financially experienced felt positive as they knew what to do, whereas negative feelings remained in those who had no investment experience because they had to do a task they had never done before. It is likely that the mindfully reappraised people allowed psychological distancing from self-referential cognition (e.g., financial sophistication) by taking a relatively broad perspective to generate insight into the cause of the incident. Among the mindful people, those instructed to trade like an advisor might be more vigilant to the prescribed role and attempt to deconstruct the relatively far-fetched, conditioned identity than those who assumed they were trading for themselves. The mindfully reappraised people (mindfulness = 1, reappraisal = 1) in the financially experienced subsample knew the complexity of trading investments, so they tended to be more cautious and assumed the highest responsibility for their trading performance. They may be sceptical about the instruction to ‘take risks with money every day, and [...] are on top of it’ (Item 24 of the questionnaire) and seemed not to take in the prescribed role of a financial advisor to trade profusely by treating each trading transaction as one of ‘a series of decisions that they make with clients’ money’ (Item 24).

In an elevated state of mindfulness, people may evaluatively take in selected aspects of reality from their world and behave according to the situational meaning they ascribe (Garland et al., 2015a). These evaluative apperceptions relate to cognitive processes of de-reification. Cognitive de-reification is a deconstructive process that aims to undo ‘cognitive patterns by exploring the dynamics of perception, emotion and cognition, and generating insights into one’s internal models of the self, others, and the world’ (Dahl, Lutz, and Davidson, 2015: 519). The cognitive process also comes with the conditioned responses that naturally follow. In the current research, the conditioned role to be deconstructed was being financially sophisticated as an advisor. Building on these deconstructive or de-reified stances, they appeared to sell assets cautiously or responsibly. The mindfully reappraised participants divested the least, compared to other experimental groups, as evidenced by the significant reductive effect of the joint intervention on PFR
discussed in Subsection 6.1.8 (despite a lack of differentiation between the financially experienced and those who had no investment experience).

The efficacy of this cognitive process appears to rely on mindful decentring, which disidentifies inner experiences that may separate their sense of self, reducing the attachment to ego (Jinpa, 2002; Lutz et al., 2015). The conceptual framework of cognitive de-reification is drawn on the Buddhist doctrine of the reified self, whereas the context of the Mindfulness-to-Meaning Theory reviewed in Subsection 2.6.2 outlines how the cognitive process might work. In practice, cognitive de-reification is effectually caused by changing the way of thinking due to the new appraisals to achieve effective goal pursuit (Dahl et al., 2015; Garland et al., 2015b). For example, the mindful participants seemed to be cautious and prudent to tackle the laborious trading exercise when the relevant emotion derived from the appraisal of the situated meaning was experienced. The mindfully reappraised people seemed to be sceptical about the role as a financial advisor or being financially sophisticated, resulting in suppressed positive affect and increased negative affect immediately after the Perspective-taking as advisors intervention (refer to discussions in Subsection 6.2.2). They tended to devote more attention to the information in a cognitive context than their less mindful counterparts (Haddock et al., 2017). This observation was more pronounced in those who had prior trading experience. Mindfulness seemed to provide a buffer from automatic reactivity, facilitating a psychological space for increased cognitive set-shifting, thus new and evaluative appraisals (Garland et al., 2015a). The evaluative scepticism on the financial advisory role or the related sophistication (i.e., awareness of one’s inadequacy in trading skills) may explain why the mindfully reappraised people did not behave according to the underlying meanings of the instruction for the Perspective-taking as an advisor intervention as described above.

It is likely that a cognitive de-reification process depends on the corresponding reification process as the former mirrors the features contrary to those intended by the latter. Cognitive reification refers to ‘the experience of thoughts, emotions, and perceptions as being accurate depictions of reality and, in particular, the implicit belief that the self and objects of consciousness are inherently enduring, unitary, and independent of their surrounding conditions and circumstances’ (Dahl et al., 2015: 515). In the current
research, the mindfully reappraised people having presumably undergone the cognitive process exhibited behaviour opposite to what was intended by the Perspective-taking as advisors (the reappraisal-only intervention). The latter intervention was meant to reify the prescribed role, although the effect was inconclusive.

As a caveat, the preceding argument of the cognitive de-reification process is a speculative explanation that should not take the research question further but offers a line for future research. Its underpinnings are found in the interaction of the two manipulations, which are incidental to the testing of hypotheses and may not establish contributions. Hence, it is discussed briefly without much emphasis to avoid distraction from the major findings.

6.3 Evaluation of findings

6.3.1 Findings for the trait emotion-regulatory mechanism

I conducted the analyses discussed in Section 6.1 to revisit Hypothesis sets 1 and 2. Further, I tested Hypothesis sets 3 to 5 using psychometric trait measures of mindfulness and two habitual emotion regulations, trait positive reappraisal and trait catastrophising. These psychometrics were measured after the experimentally induced treatments of mindfulness and reappraisal and could be influenced by them. Hence, the manipulated variables were controlled for when testing the dispositional psychometrics.

As found from the preceding analyses (see Tables 6-1, 6-2, and 6-4), older people exhibited a lower disposition effect, the realisation of gains, and total divestments. These findings are consistent with those of the extant literature on the disposition effect, which argues that older people are less susceptible to the disposition effect in general (Feng and Seasholes, 2005) and specifically older male investors (Talpsepp, 2010).
The combined measure of five commonly studied mindfulness traits, the FFMQ (Baer et al., 2006), which includes Observing, Describing, Acting with Awareness, and Nonjudging and Nonreactivity to inner experiences, had a negligible association with the disposition effect and any of the constituent divesting behaviours. The study of trait mindfulness and habitual emotion regulations was motivated by the theoretical background laid down by the Mindful Coping Model (Garland et al., 2009; Garland et al., 2011). The model posits that trait mindfulness and Positive Reappraisal, while controlling for Catastrophising, serially and reciprocally reinforce each other in a longitudinal study. In the current research, neither trait positive reappraisal affected the disposition effect and related divesting behaviours, nor did the combination of the selected mindfulness traits.

However, a unit increase in trait catastrophising was associated with a 2% increase in the realisation of gains and a 3% increase in the disposal of losses. The mindfulness manipulation may reduce trait catastrophising, which increased with an increase in each of the divesting behaviours.

Evidence from the current research suggests that the more affect-related coping strategy of habitual or trait catastrophising outweighs the more task-related coping strategy of trait positive reappraisal as the former increases with elevated levels of the realisation of gains, the disposal of losses, and total divestments, whereas the latter does not have any significant effect on the divesting behaviour. This is consistent with Aldao and colleagues’ (2010: 233) argument that effective emotion regulation strategies can ‘flexibly move between coping strategies depending on the context of a situation.’ In parallel, the intercorrelations among the three trait psychometrics are significant – trait catastrophising was inversely correlated with trait mindfulness and its adaptive counterpart, trait positive reappraisal (see Subsection 6.1.9). These cross-sectional associations support the Mindful Coping Model in that trait mindfulness and habitual use of positive reappraisal appear to reduce the tendency to catastrophise.

All in all, the interpretations of results in this subsection uphold the findings from various analyses conducted in Chapter Five, discussed in Subsection 6.3.2.
6.3.2 Evaluation of findings for hypotheses

The Hypothesis set H3 for the effect of trait mindfulness on a) the disposition effect, b) the realisation of gains, and c) the disposal of losses is not supported.

The Hypothesis set H4 for the effect of trait positive reappraisal on a) the disposition effect, b) the realisation of gains, and c) the disposal of losses is not supported.

H5a, that trait catastrophising affects the disposition effect such that the higher the use of trait catastrophising, the higher the disposition effect, is disconfirmed.

H5b, that trait catastrophising affects the realisation of gains such that the higher the use of trait catastrophising, the higher the realisation of gains, is broadly supported with a minor reservation as trait catastrophising may have been primed by post-trading emotions, which were in turn influenced by sales of gains.

H5c, that trait catastrophising affects the disposal of losses such that the higher the use of trait catastrophising, the lower the disposal of losses, is not supported. The observation is that trait catastrophising was associated with both the realisation of gains and the realisation of losses. Just as higher state mindfulness seems to reduce the selling of both gains and losses, higher trait catastrophising tends to be associated with greater selling of both gains and losses. Encountering a financial loss during portfolio trading is inevitable adversity that investors must face. As a counterproductive emotion regulation, trait catastrophising may treat the laborious trading task as a taxing experience in general and cause more unpleasantness with the dealing of losses in particular. I discuss further how trait catastrophising may cope with portfolio trading and financial losses in Chapter Seven (Subsection 7.2.3).

Contrary to the conventional assumption that personality dispositions are stable in the short term, the measure of trait catastrophising could be lessened by the mindfulness manipulation in the cognitive emotion-regulatory mechanism (the Mindful Coping Model, see Subsection 6.1.9). Alternatively, trait catastrophising may be capturing aspects of state
catastrophising during the trading, and this may mediate the reductive effect of the mindfulness manipulation on the selling of gains and losses. There would be no mediation effect passing through trait catastrophising if mindfulness directly reduced the latter. In either event, trait catastrophising is not considered an immutable trait but merely a habitual pattern of emotional responses that can be modified by emotion-regulatory processes such as meditation practice (Dreyfus, 2011).

However, to claim that a heightened mindfulness state reduced trait catastrophising in the present research is controversial as a habitual emotion regulation was not likely to be affected by just undergoing a one-off, ten-minute meditation. Accordingly, it is more probable that the mindfulness manipulation affected the state measure of catastrophising that was not measured in the current study. I treat it as a limitation and an implication for future research interest, discussed further in Chapter Seven.

A possible explanation for the association is that trait catastrophising was primed by pre-trading and post-trading emotions. The priming would involve shaping up its measurement to vary with pre-trading and post-trading emotions in line with the different levels of investment experience under the influence of the mindfulness manipulation (Subsection 6.2.2). Nevertheless, this is a speculative explanation because this situation requires relatively small fluctuations between pre-trading and post-trading emotions to achieve the priming of a single variable.

I close this chapter with a summary of the findings. Whilst the unsuccessful reappraisal manipulation rendered the interpretations of its effects inconclusive, the successful mindfulness manipulation was found to cause a reduction in the selling of gains (as hypothesised) and losses (contrary to what was intended). Hypotheses related to the disposition effect were disconfirmed. Effects of trait mindfulness and trait positive reappraisal were not successful, whereas increased trait catastrophising was associated with increased levels in the divestment of gains (as hypothesised) and losses (opposite to the hypothesis). In Chapter Seven, I further discuss the novelty findings for the effects of state mindfulness and trait catastrophising on divesting behaviours as theoretical implications and review the limitations of the current study and implications for future research.
In this concluding chapter, I start with reviewing the research question, the hypotheses, and their findings. Investors’ trading activities and their coping with the trading task and financial losses are discussed from their affective and cognitive aspects under the influences of the mindfulness intervention. Then, the thesis evaluates the viability of the reductive effect of state mindfulness on the habitual tendency to catastrophise, along with the divesting behaviours. Having discussed these arguments as implications for theory, the chapter reviews the current research’s limitations, methodological and practical implications for future research, and presents a summary of original contributions. A conclusion closes the thesis.

7.1 Review of the research question and hypotheses

7.1.1 The research question and hypotheses

As developed in Chapter Two of the thesis, I proposed a research question concerning a behavioural tendency, the disposition effect, among retail investors:
Do mindfulness and cognitive emotion regulation reduce the disposition effect and its behavioural components exhibited by individual investors, and what does each of them contribute to changing individual investors’ susceptibility to the disposition effect?

The research question has been examined in two complementary ways: i) whether the mindfulness and the reappraisal manipulations lessen the exhibition of the disposition effect and its underlying components, the realisation of gains and the disposal of losses; and ii) whether trait mindfulness and habitual cognitive emotion regulations are associated with the disposition effect and its behavioural components. Both approaches are complementary because the effects of the manipulations on the divesting behaviours should be studied on two levels. First, I manipulated mindfulness and cognitive reappraisal (on responsibility felt for trading decisions) at the state level. Second, I investigated inter-personal differences under the influence of trait mindfulness and habitual emotion regulations (trait positive reappraisal and trait catastrophising) at the trait level. The research question led to five sets of hypotheses tested through an online, randomised control experiment with a trading simulation for 820 participants. The hypotheses are reiterated as follows:

H1a. State mindfulness affects the disposition effect such that the higher the state mindfulness, the lower the disposition effect.

H1b. State mindfulness affects the realisation of gains such that the higher the state mindfulness, the lower the realisation of gains.

H1c. State mindfulness affects the disposal of losses such that the higher the state mindfulness, the higher the disposal of losses.

H2a. Situational reappraisal affects the disposition effect such that the stronger the influence of the situational reappraisal, the lower the disposition effect.

H2b. Situational reappraisal affects the realisation of gains such that the stronger the influence of the situational reappraisal, the lower the realisation of gains.

H2c. Situational reappraisal affects the disposal of losses such that the stronger the influence of the situational reappraisal, the higher the disposal of losses.
H3a. Trait mindfulness affects the disposition effect such that the higher the trait mindfulness, the lower the disposition effect.

H3b. Trait mindfulness affects the realisation of gains such that the higher the trait mindfulness, the lower the realisation of gains.

H3c. Trait mindfulness affects the disposal of losses such that the higher the trait mindfulness, the higher the disposal of losses.

H4a. Trait positive reappraisal affects the disposition effect such that the higher the use of trait positive reappraisal, the lower the disposition effect.

H4b. Trait positive reappraisal affects the realisation of gains such that the higher the use of trait positive reappraisal, the lower the realisation of gains.

H4c. Trait positive reappraisal affects the disposal of losses such that the higher the use of trait positive reappraisal, the higher the disposal of losses.

H5a. Trait catastrophising affects the disposition effect such that the higher the use of trait catastrophising, the higher the disposition effect.

H5b. Trait catastrophising affects the realisation of gains such that the higher the use of trait catastrophising, the higher the realisation of gains.

H5c. Trait catastrophising affects the disposal of losses such that the higher the use of trait catastrophising, the lower the disposal of losses.

7.1.2 Key findings and their significance for theory

In this thesis, I have addressed the effects of the reappraisal and the mindfulness manipulations on predicting the disposition effect, using a randomised experimental
survey design through the internet. Both manipulations were hypothesised to influence participants’ psychological cognitive-affective states and their impacts on the selling of gains and losses. Analyses based on a comparison of the impact of each manipulated variable in the online experiment suggest no significant differences in the exhibition of the disposition effect among participants under the two manipulations. Similarly, after examining the cognitive emotion-regulatory processes of trait mindfulness, trait positive reappraisal, and trait catastrophising, I found that these traits did not significantly affect the disposition effect. Thus, none of the hypotheses related to the disposition effect (i.e., hypotheses suffixed by an “a”) is supported. Given the large sample size, this null finding is important and suggests that any undetected effect must be minimal if it even exists.

For the divestment of gains, H1b is supported as the mindfulness manipulation reduced gain realisation. The reappraisal manipulation, trait mindfulness, and trait positive reappraisal did not affect sales of gains; therefore, H2b, H3b, and H4b are not supported. H5b is confirmed as trait catastrophising increased with an increase in the selling of gains.

Regarding the disposal of losses, H1c is not supported as the mindfulness manipulation lessened, rather than increased, loss disposals. H2c, H3c, and H4c are disconfirmed because the situational reappraisal, trait mindfulness, and trait positive reappraisal did not affect the disposal of losses. H5c is not supported as an increase in trait catastrophising was found to associate with an increase in the disposal of losses.

The average score of the disposition effect found in the Main Study sample is lower than in many other studies. Probably, this was due to the high average age of participants, as some studies show the disposition effect declines with age (e.g., Feng and Seasholes, 2005). The small difference in average scores of selling of gains and losses did not indicate a significant difference between the two behaviours. Hence, no disposition effect was observed.

The reappraisal manipulation did not work as intended as the manipulation check found that participants felt higher, rather than lower, responsibility for trading decisions. I cannot rely on the test results of the reappraisal manipulation so I disconfirm the related hypotheses. State mindfulness did not reduce the disposition effect, contrary to the
hypothesis, but it reduced individual divesting behaviours for both gains and losses. State mindfulness was manipulated in the current research, so there is support for the direction of causality from mindfulness to the divesting behaviours. This finding is novel and important both for practice and further research. A modest mindfulness intervention can reduce selling activities and thus portfolio churning, which may benefit investors as excessive portfolio churning is a common cause of suboptimal investment returns (Norden, 2010). The primary objective of studying the disposition effect was to seek its mitigation, through investigating inter-individual variations in the exhibition of the behaviour under the two manipulations, to minimise probable inferior returns. Then, the inclination to refrain from overtrading may, to a certain extent, complement this objective.

Turning to habitual emotion regulations, as with the experimental manipulations, none of the mindfulness or emotion regulation measures has significant associations with the disposition effect. This is contrary to previous evidence that shows habitual cognitive reappraisal is associated with a less intense experience of negative emotion, which may lessen the disposition effect. Trait mindfulness and trait positive reappraisal did not exert any influence on selling behaviours. They constitute the Mindful Coping Model (see Subsection 2.6.1) with trait catastrophising but results of the current research show that the latter was related to the selling of both gains and losses. I discuss possible reasons why trait catastrophising was associated with a tendency to increase the divesting behaviours in Subsection 7.2.3.

It is worth noting that the effect of state mindfulness on reducing the realisation of gains and losses, and the effect of trait catastrophising on increasing the sales of gains and losses acted unidirectionally across the divesting behaviours. The two cognitive-affective functioning processes synchronously exerted their influences in opposite directions. A causal relationship may exist between the mindfulness manipulation and the trait catastrophising measure, although associations between trait catastrophising and the sales of both gains and losses are considered cross-sectional. The results may suggest a potential mediating relationship in which mindfulness reduced selling behaviour via a lessened tendency to catastrophise, although a state measure of catastrophising would be needed to test this properly. I discuss the theoretical implications of the potential effect of the
mindfulness manipulation on trait catastrophising along with people’s coping with portfolio trading and financial losses in Subsection 7.2.3. Before then, based on the results from the current research and recent literature, I attempt to interpret the novelty finding of state mindfulness’s reductive effects on selling activities broadly from an affective aspect in Subsection 7.2.1 and a cognitive perspective in Subsection 7.2.2. Together, these three subsections constitute the implications for theory section, discoursed as follows.

7.2 Implications for theory

In this research, I have hypothesised that state mindfulness would reduce the disposition effect, by reducing automatic reactions to emotions such as regret and elation. In other words, it would reduce the selling of gains (by reducing the need to savour realised gains) and increase the selling of losses by decreasing the emotional reactivity to the anticipated regret of crystalising a loss. Yet, the data suggest that, for people in a heightened state of mindfulness, selling gains decreases whilst selling losses also decreases. The mindful people reduce the selling of gains, perhaps, by reducing the need to savour realised gains, but the result for loss disposals contradicted the hypothesis.

Nevertheless, the finding that the mindful individuals’ inclination to trade cautiously (i.e., reduced portfolio churning) serendipitously serves as an example of a good trading practice that mitigates inferior returns – the reason that this research was motivated. Portfolio churning or overtrading is regarded as a poor investment practice since the frequency of trades is counterproductive to investors’ interests, suggesting they are trading on noise instead of relevant information, which leads to excessive transaction costs incurred and potentially poor performance.

As mindfulness is practised by many traders to improve performance (Peterson, 2014), there may be literature that links mindfulness to a reduction in trading activity. In the following subsection, I revisit mindfulness research to propose theoretical explanations for this important finding.
7.2.1 Overtrading lessened by containing emotional reactivity

Dayton (2014) highlights that mindfulness practice helps traders cope with the day-to-day emotional challenges, which come with risk and uncertainty, in a number of ways. Among them is the cultivation of decentering from mindfulness practice, which facilitates traders to detach themselves from their thoughts and feelings so that they see these internal experiences as passing events instead of something that requires a response. Another benefit that comes with mindfulness practice is that mindful traders are more able to notice their mental roaming, which brings them back to holding onto key trading strategies.

The first attribute that mindfulness benefits investors (*i.e.*, a decentered mindset) is that they may become more tolerant to uncertainty (*e.g.*, Kraemer, O’Bryan, and McLeish, 2016). More mindful people may perceive their internal experiences as less threatening, thereby enhancing their ability to tolerate uncertainty and reducing the need to worry. Perhaps, the overriding effect is that mindfulness induced participants of the current research to be more tolerant of not knowing. All investors face uncertainty, and it is an uncomfortable aversive state (Fenton-O’Creevy and Tuckett, 2021). It may be that the more mindful participants, being more tolerant of uncertainty, were more able to accept uncertainty in a spirit of openness and curiosity and took the view that a price change was not a trend so they waited and saw what would go on. They were less likely to pass immediate and impulsive judgements on information by responding automatically to their thoughts and feelings (Dayton, 2014).

The second attribute mindfulness brings about which may benefit investors is that they become more planful and act with meta-awareness as they are not easily swayed away by maladaptive emotions. This is a vital mental quality that can enhance trading performance, provided the investors have the proper skill. This argument is echoed by recent evidence from Asian scholars Charoensukmongkol and Pandey (2021), who showed that more mindful salespersons were more planful to engage in more sales planning than others in response to challenging sales contexts. This evidence supports the role of mindfulness in reducing automatic reactivity to immediate thoughts and emotions.
More importantly, Charoensukmongkol and Aumeboonsuke (2018) found that the intensity of investors’ meditation practice was inversely related to panic selling due to a comparatively high trading discipline and low reactivity (e.g., reduced over-reaction to news) resulting from the practice. Panic selling is investors’ tendency to sell assets because of their fear, which overrides the motivation to evaluate fundamentals in deciding their divestments. Mindfulness reduces panic selling as it promotes mental clarity and maintains emotional stability (Charoensukmongkol and Aumeboonsuke, 2018). Like panic selling, overtrading may be driven by maladaptive emotions. Attaining emotional stability seems to be an antidote to ease off emotional reactivity so that people can have a cool mind to decide what is best for them.

Of note, Charoensukmongkol and Aumeboonsuke (2018), as did other researchers of the preceding studies mentioned in the subsection, did not manipulate state mindfulness in the people they studied. They reckoned the length of habitual practice to correlate with people’s dispositional mindfulness or used trait measure of mindfulness to gauge people’s mindfulness capacity. Research on the effect of mindfulness on task performance (e.g., portfolio trading) has been mostly restricted to limited comparisons of task-performers’ dispositions rather than their behaviour under manipulations (e.g., operationalisation of the state mindfulness hypothesis in the current research). The key issue of relying on these previous studies is that their findings are cross-sectional and cannot be used to explain cause-and-effect relationships between behaviour and mindfulness at momentary states.

The two attributes brought about by mindfulness in affecting traders’ performance (Dayton, 2014) seem to hinge on the control of emotional reactivity. Lutz and colleagues (2008) advocate the role of mindfulness in lessening emotional reactivity in the emotional state and trait continuum. They found that an elevated state of mindfulness developed in a focused attention meditation correlated with a significant reduction in emotional reactivity as people appeared to exhibit a reduction in the habitual pattern of responding to a psychological test, which lends support to mindfulness’s effect to cause ‘partial “de-automatisation” of the mental processes that shape and interpret perceptual stimuli’ (p. 165). As the pervasiveness of emotional reactivity appears to depend on emotional stability, learning how the latter arises is conducive to interpreting the lessened activities.
Khenchen\(^{19}\) Thrangu (1993) explains emotional stability attained in mindfulness meditation. The tranquillity that emerged from meditation, or Samatha, ‘is the basis of all the meditative states in which the mind is resting one-pointedly on something and remains completely focused on that object’ (p. 12). The mindfulness induction seemed to direct participants’ attention to breathing as the object for them to settle their minds. Such effect might last until participants finished the trading task and attained temporary emotional stability as they were not easily distracted by emotions attributed to gains and losses they ever encountered. In this mindfulness state, both positive and negative thoughts recede so the mind becomes *stable* and *unwavering* (Thrangu, 1993). When ‘the mind is stable and becomes unaffected by thoughts, then one is able to have a clear understanding of things’ (pp. 56-57). This mental state differs from that of the mind-wandering condition, an unregulated mental state representing one’s normal consciousness, which is unstable and reactive to things one likes or dislikes (Dreyfus, 2011; Garland, Hanley *et al*., 2015).

It is likely that in a tranquil state of mindfulness, emotional reactivity is lower as compared to the mind-wandering condition. The present-focused characteristic of mindfulness is meant to free one’s mind by confining the focus of one’s attention to the present and uncoupling it from the habitual propensity to conceptualise one’s experiences in terms of what one likes or dislikes (Dreyfus, 2011), such as gains and losses in portfolio trading. A heightened state mindfulness also allows observing mental states without labelling them, facilitating an individual’s acceptance of phenomena *observed as they are*, which ultimately liberates the individual from their compulsions and persistent patterns of emotional reactivity (Dreyfus, 2011). In the current study, the mindful minds may just focus on the present moment and nonjudgementally accept whatever transpired in the outcomes of their decisions. Despite the uncertainty they faced in portfolio trading, they tended not to think about any projections, whether favourable or unfavourable, for the trading results. These minds appeared to be emotionally stable and calm, which might alter their emotional responses to experiences by refraining from impulsive judgements and actions.

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\(^{19}\) In Tibetan Buddhism, Khenchen is a title given to chosen Khenpos who have great quality in their scholarship and dedication to their activities for the belief and practice of Buddhist doctrines. Khenpos are ordained scholars who complete a nine-year course in Buddhist philosophy.
Plausibly, this is the mental state that Charoensukmongkol and Aumeboonsuke (2018) refer to – the more mindful individuals attain mental clarity and emotional stability. Because of these characteristics, these minds may experience lower emotional reactivity, regardless of positivity or negativity, and sold fewer assets than the less mindful people in the current study. The rationale behind the reduced trading activities is consistent with the argument I put forth for the state-mindfulness hypothesis – mindful decentering promotes awareness of affective and cognitive processes as transient mental events without intrinsic reality, thus equipping the mindful minds with cognitive flexibility to respond to the taxing trading task (i.e., figuring out a “less for more” strategy). Whilst their reduced selling of gains may also be attributed to the decreased need to savour realised gains as hypothesised (which is consistent with reduced emotional reactivity as discussed), the mindful minds sold fewer losses, contrary to the hypothesis, probably because of reduced reactivity to the impact of losses. There may not be a compulsion for them to defer the experiential regret for loss disposals, as would a disposition investor do.

### 7.2.2 Reduced divesting activities and coping with losses

In this subsection, I discuss whether the difference in trading activity levels between the mindfulness and mind-wandering groups depends on the cognitive processes of reification and de-reification (also see Subsection 6.2.4). Despite the failure of the reappraisal manipulation since its effect acted opposite to the hypothesised direction, I argue that the effect of the reappraisal manipulation should be considered independently. The original intention of the manipulation was meant to concretise the belief in a constructed role (i.e., to act as an advisor) by enhancing the ‘awareness of the interpretive thinking that ordinarily contributes to the subjective unquestioning sense’ (Lutz et al., 2015: 649). The effect on the reappraised was to regard the intended meaning of the Perspective-taking intervention as a reality, but it turned out to work in different ways. For example, the instruction “you take risks with money every day, and you are on top of it” (Item 24 of the questionnaire) might lead the reappraised-only participants to believe that
they were financially sophisticated, rather than treating the trading task “business as usual” and not be obsessed with the outcomes. They appeared to trade overconfidently, manifesting this belief in an excess portfolio rebalancing (Barber and Odean, 2000, 2001; Norden, 2010). The reappraised-only group divested most among others. They seemed to take in the belief of having a higher capability to deliver trading performance, which amounts to the desire to create the image of providing a valuable service as performing financial professionals (Dow and Gorton, 1997), leading to their assumption of greater responsibility than those who traded for their own. On balance, the failure of the reappraisal manipulation is not detrimental to the mindfulness results because of randomisation, I can reasonably ignore the reappraisal manipulation and focus on the main effects of the mindfulness manipulation.

Refraining from overtrading turned out to be a prudent practice adopted by the mindful investors, who traded less than the mind-wandering participants. An elevated state of mindfulness was likely to enable them to recognise fleetingly that the roles prescribed in the situational reappraisals (i.e., trading one’s investments vs acting as a financial advisor) were illusion-like. Hence, they did not aspire to or find any selfsameness in these roles. People who had undergone the mindfulness induction tended to deconstruct the sophistication levels prescribed by their respective reappraisal instructions, particularly the Perspective-taking as an advisor intervention. Consequently, they demonstrated behaviour different from what the instruction intended (i.e., distancing felt responsibility for trading decisions) or implied (reduced excess trading instead of reduced disposition effect).

The mindful investors received two different instructions on gains and losses anticipated in the trading exercise. The mindfulness-only group was asked to reflect on ‘how you would feel if you had some gains and how you would feel should you have some losses’ (Item 22 of the questionnaire). The mindfully reappraised people were instructed that ‘you should not be obsessed with the outcomes of individual trading decisions you have made – you win some and you lose some’ (Item 24). The former was advisory on the prospect of profit and loss, whereas the latter implied the potential severity of trading outcomes, specifically, a financial loss. In anticipating the adversity of a disadvantageous outcome, the latter group had less motivation to trade keenly than the former. The
mindfully reappraised participants felt the highest responsibility for their decisions, and those decisions led to gains and losses, the last of which they tried to avoid or mitigate. They seemed not to take in the instruction ‘you take risks with money every day, and you are on top of it’ (Item 24) since reification of the role of a sophisticated financial advisor appeared to be unsuccessful in them. Consequently, they divested significantly fewer assets than the reappraised-only group, who received the same Perspective-taking instruction but without having undergone the mindfulness intervention (see Subsection 6.1.8).

In parallel, people with shallow experience, who were the majority of the sample, might feel maladaptive emotions before trading due to the imminent requirement to do a task they had little knowledge about (see Subsection 6.2.2). A heightened state of mindfulness might facilitate adaptive appraisals and cognitive changes to achieve an effective goal – one of the arguments I used to formulate the related hypotheses – by trading cautiously. A de-reified mindset that is clear of scepticism and affliction (i.e., being asked to trade in either of the two different roles) is probably comparable to the mental condition of increased emotional stability discussed in Subsection 7.2.1. In either situation, emotional reactivity is reduced and the reliance on habitual responses to gains or losses (that one likes or dislikes) may be weakened, rendering a clear mind to ascertain and choose from different alternatives. Again, this de-automatisation of habitual emotional responses is another argument based on which I developed the mindfulness hypotheses.

It is worth noting that the arguments I put forth to explain the reductive effect of mindfulness on overtrading in these two subsections are mainly built on the Buddhist psychology of Samatha and Vipassana, respectively the fundamental practice for emotional stability and mental clarity in Buddhist doctrines.

Nevertheless, in the absence of empirical evidence that cognitive de-reification was the pathway by which effects occurred, the preceding argument for de-reification remains speculative, albeit an interesting conjecture to test in future research.
7.2.3 Coping with portfolio trading and financial losses by trait catastrophising

In this subsection, I explain why trait catastrophising increases the selling of gains and losses in the same direction from cognitive and affective aspects. There are two lines of argument. First, trait catastrophising may directly influence selling behaviours. Second, state mindfulness may cause a change (i.e., reduction) in the habitual emotion regulation so that the latter acts concurrently, but in the opposite direction, on the selling behaviours.

As for the first argument, I reviewed that trait catastrophising correlated with pre-trading and post-trading negative affect and argued that I should not underrate the influence of the maladaptive emotion-regulatory strategy on divesting behaviour (see Subsection 6.1.9). Prior research and theory suggest that the primary effect of catastrophising is to amplify negative emotions and hence their behavioural impacts (e.g., Keefe et al., 1989; Turner and Aaron, 2001). That is why the Catastrophising scale is used to measure people’s propensity to emphasise the hardship of their experiences (Garnefski et al., 2002). Building on this line of thought, two pathways may explain the effect. First, trait catastrophising may increase the likelihood of panic selling of underperforming investments. Second, by increasing the experience of negative emotion, trait catastrophising may increase the need for emotion repair, prompting the realisation of gains to allow savouring of those gains. I discuss the theoretical bases of these two putative pathways below.

In the current research, trait catastrophising enhanced displeasure more prominently than did trait positive reappraisal uplift pleasure as the effect of the latter was negligible. Plausibly, ‘the displeasure of getting the worse of two outcomes is typically greater in magnitude than the pleasure of receiving the better outcome’ (Mellers and McGraw, 2001: 211). This theory helps explain that, on average, a higher level of selling activities for losses than gains correlates to trait catastrophising, and the negligible effect of trait positive reappraisal on selling behaviour, even though the Mindful Coping Model (Garland et al., 2009; Garland et al., 2011) is found to be operative as discussed in Subsection 6.1.9. The theory supports the increased likelihood of heavy disposal of losses
under the influence of trait catastrophising, contrary to the effect of loss aversion on lessening the realisation of underperforming assets as predicted by Prospect Theory.

In parallel, investors might treat the behaviour of realising gains as a heuristic to cope with their emotional reactivity arising from cognitive dissonance (Festinger, 1957; see Subsection 2.2.6) experienced because of underperforming assets they had bought. They tended to sell gains to comfort the losses they had desired to hold but subsequently sold. Allowing savouring of those gains to repair the negative emotion due to unwilling sales of the losses may facilitate the maintenance of hedonic balance. This may explain why an increase in trait catastrophising increased the sales of both gains and losses.

The theoretical argument of the first pathway is not consistent with the theories I used to develop the related hypotheses. The argument for increased emotional reactivity due to cognitive dissonance (i.e., the second pathway) is more plausible despite that increased trait catastrophising promotes the disposal of losses (which is contrary to the effect of loss aversion on lessening the disposal of losses as predicted by Prospect Theory).

As for the second argument, that state mindfulness may cause a reduction in trait catastrophising and decreased selling behaviours, branches out two putative pathways. First, the emotional stability attained in a heightened state of mindfulness may facilitate the reduction of the maladaptive effect of trait catastrophising. Second, some of the effects of the two manipulations may be mediated by a reduced tendency to catastrophise.

I refer to the discussions in the previous subsection for the first pathway. Emotional stability is probably attained in an elevated state of mindfulness, which may, in turn, affect the habitual responses to emotional reactivity. This proposition is critical as it implies that the “trait measure” was influenced by the mindfulness manipulation. Recent evidence suggests that emotional states can be predicted by trait measures of emotion regulations. Maxwell and colleagues (2019) found that habitual emotion-regulatory strategies correlated to the differences in the state or momentary emotions reported by participants. They argue that the measure of a trait emotion regulation, when the strategy is deployed, should predict individual differences in emotional states related to the habitual
use of the strategy. This argument is congruent with Lazarus’s (1991b) emotion state and trait theory. When differentiating an emotion trait from an emotion state, he takes the perspective from their relative stability. Like the functioning of emotion traits, a trait emotion regulation has some dispositional characteristic that generates the emotional state. Moreover, emotional traits and states are closely related in a continuum: ‘when stability is high, the focus is on trait and state recedes in importance; when instability is high, the focus is on state and trait recedes in importance’ (Lazarus, 1991b: 47).

Garland (2007) argues that mindfulness affects the primary appraisal (e.g., encountering the task of portfolio trading), which alters their experiences of emotional responses by reducing catastrophising, state or habitual. This in turn influences the secondary appraisal. In the current study, the decreased tendency to catastrophise may lead to reduced efforts in i) savouring of gains by realising them to uplift positive emotion, and ii) disposing of losses so that the experience of negative emotion was lessened. The apperception of catastrophising’s impact appeared to be reduced, leading to the reporting of lower average scores for the trait measure. This is consistent with Lutz and colleagues’ (2008) argument of partial de-automatisation of mental processes (see Subsection 7.2.1).

As for the second pathway, that some of the effects of the two manipulations may be mediated by trait catastrophising, implies that the trait measure is causally influenced by state mindfulness or situational reappraisal. Since the reappraisal manipulation failed, I cannot use it as a causal antecedent. The tendency to catastrophise may act as an intermediary through which the manipulated effects of mindfulness pass. The mediation requires a state measure of catastrophising as the mediator. I consider this limitation (of not using a state measure) an opportunity for future research (see Subsection 7.4.1). As a caveat, since catastrophising was not experimentally manipulated, the associations could be due to trading experiences making recall of catastrophising habits more salient, which suggests that the trading experience affected participants’ reporting of trait catastrophising. Self-reporting trait measurement is subjected to errors and can be contextual (e.g., questions may make the measure more salient; recent events may affect the measurement). Moreover, the measurement of trait catastrophising could be influenced by the momentary experience of state catastrophising that was not measured.
In the current research, emotional stability might be attained in a heightened state of mindfulness. Perhaps, an accelerated process of the Mindful Coping Model (see Subsection 2.6.1 for a review of the theory and Subsection 6.1.9 for a discussion of its occurrence), fuelled by an elevated state of mindfulness (i.e., trait catastrophising reduced by emotional stability, the first pathway of the second line of argument), has occurred to alleviate catastrophising. Mindfulness properties accumulate from meditation practice and develop into trait mindfulness (Kiken et al., 2015), which explains that the length of meditation practice can be used as an indicator of one’s mindfulness attainment (e.g., Charoensukmongkol and Aumeboonsuke, 2018). In the current research, it is possible that the mindfulness capacity in those subjected to the mindfulness manipulation may have been elevated to a level that expedited the Model. Yet, I should be cautious to admit the reductive effects of state mindfulness on trait catastrophising as it implies that the mindfulness manipulation affects the trait measure of catastrophising, which treats the latter as a malleable orientation to emotional responses.

To summarise, a more stable mind in an elevated state of mindfulness tends to alleviate the self-report trait measure of catastrophising. The emotional stability notion is also consistent with Dreyfus’s (2011) de-automatisation of habitual patterns of emotional reactivity by mindfulness, the core argument I applied to formulate the trait-level hypothesis. However, in the absence of empirical underpinning to support the pathway (i.e., the first pathway of the second argument), this explanation of state mindfulness’s reductive effect on trait catastrophising remains speculative. Thus, the increased emotional reactivity argument for the effect of trait catastrophising (i.e., the second pathway of the first argument) is the more plausible between the two.

7.3 Limitations of the current research

As do all studies, the current research has several limitations. First, participant engagement in mass recruitment and attrition management is a challenge to research studies of this kind. The high dropout rate indicates that people interested in investment trading
may not like to use even just ten minutes of their time for a focused breathing or mind-wandering induction. On the other hand, it is not surprising that more than 62% of the participants were 50 or older. Older people are likely to have the patience and time to undergo an audio induction. The disproportionate participation of older people may threaten the generalisability of the findings. However, the effect of age has been controlled for in the analysis, mitigating this concern somewhat. When manipulating mindfulness, future researchers need to be vigilant about attrition, especially from younger participants.

The second limitation relates to the failure of the reappraisal manipulation. Besides noting the absence of a manipulation check for this form of manipulation in prior research, this thesis identifies the problems with the reappraisal manipulation. The instruction for Perspective-taking as an advisor intervention might conceptually prime participants to perceive a higher level of responsibility than was intended. There are two possible reasons to account for the discrepancy. First, participants might appraise the reappraisal texts differently as I did not use the exact wording written by Sokol-Hessner and colleagues (2009). Second, the sample (UK residents) I recruited may reckon a more prestigious position as a financial advisor than a trader as perceived by the US participants used in Sokol-Hessner and colleagues’ (2009) research. The manipulation was intended to prime a particular perspective to induce reduced felt responsibility, but the reappraised group of the current research tended to assume greater responsibility for delivering performance. These people were primed in an unintended way and in the opposite direction. Future researchers should be cautious in relying on the findings of previous studies using this intervention and in manipulating cognitive reappraisal of emotion by seeking to manipulate felt responsibility in this way in future research. A manipulation check on cognitive reappraisal is highly recommended for future researchers to determine how much reliance they can place on the manipulated effect.

The third limitation is the constraint on the trait catastrophising measure due to the research design. The inter-correlations between trait catastrophising and selling behaviours are cross-sectional and should not establish causation (see Subsection 7.2.3 for the proposed explanation for an exception). I cannot know whether trait catastrophising had a causal influence on selling behaviours, whether the trading experience influenced self-
report of trait catastrophising, or whether a third unmeasured variable influenced both. The salience of the tendency to catastrophise may be primed by post-trading emotions associated with selling behaviours, thus affecting the self-report measure. The arguments on the more salient effect of trait catastrophising in divesting losses and gains, as discussed in Subsection 7.2.3, are speculations based on evidence from the extant literature. Though they are informed speculations, I need to be cautious about spurious effects arising from measurement errors, which are typical in self-report measures. For example, an upsetting event in the last couple of days may contaminate the trait catastrophising measure – a carryover effect (see Subsection 2.3.2 for the relationship between immediate emotion and carryover effect). Explicit enquiry on participants’ state catastrophising, which was not measured in the current research (as discussed in Subsection 6.3.2), might have provided the opportunity to explore the interesting question of whether the effects of state mindfulness on selling behaviour could have been mediated by state catastrophising, given the mindfulness intervention might reduce the propensity to catastrophise which in turn reduces selling behaviour. Similarly, future research manipulating state catastrophising could help establish causality, or not. Studying state catastrophising is a worthwhile option for future researchers that is further discussed in the next section.

The fourth limitation concerns the financial incentive. Portfolio trading is a laborious task that requires highly involved engagement from participants. Therefore, graduates or qualified professionals were recruited to perform the trading simulation as part of an online survey and experiment that manipulated state mindfulness and situational reappraisal. The requirement to attend a ten-minute induction before trading, along with the taxing trading exercise, warranted some incentives to encourage participant engagement. To this end, I set up a financial award of £100 to reward each of the two top performers. This remuneration structure of just paying performers but not penalising losers (a detrimental ethical issue) was devised to avoid any possible harm to participants. Yet, this unbalanced compensation structure may encourage risk-taking behaviour as participants have no downside risk of losing money. The absence of real and serious financial loss might compromise the psychological realism and the replicability of results to other research settings wherein actual monetary loss can take place (Seo et al., 2010). Nevertheless, while the field of behavioural economics places great emphasis on structured
financial incentives, many psychology researchers are less concerned with financial incentives since experience suggests that most research participants are intrinsically motivated to do as well as they can on tasks they are set.

The fifth limitation concerns the practical significance of the findings. Low absolute values are observed in the direct effect of the mindfulness manipulation on the realisation of gains and the disposal of losses, and the associations of trait catastrophising with the two divesting behaviours. I have dealt with trait catastrophising as the third limitation of the current research. As for the mindfulness manipulation, a ten-minute audio induction can reasonably be expected to yield a modest effect. More substantive mindfulness training might well have a substantially greater impact on trading behaviour. Again, this is an opportunity for future research, but I bring forward its discussion here to show that the severity of the limitation has been considered and how it might be mitigated. I had initially intended to conduct a second study using postgraduate students who studied a mindfulness course, to be matched with a sample from a different discipline of study to examine their differential behaviour in the online experiment. Unfortunately, I had to curtail the proposed second study because the outbreak of Covid-19 disrupted it, making it impractical in the time available for the current research. That said, this proposed design may lead to a worthwhile study for future research.

7.4 Implications for future research

7.4.1 Implications for methods

It is not always clear whether the mindfulness measures used track what is taught during practice (van Dam et al., 2018) and the degree of proficiency. Research that encompasses the study of veterans and novices of meditation practice can be revealing because i) understanding and construction of the meaning of an attribute may differ among different levels of meditation practitioners, ii) efficacy of the effects on cognitive de-
reification (disidentifying self from fixed beliefs, identities, and feelings) may differ from level to level of mindfulness attainments, and iii) different mindfulness attainments may have different levels of emotional stability. Qualitative methods using interviewing could be a suitable approach to investigate the inter-personal differences between groups. Interviewees would be invited to speak out about how they think and feel during the simulated trading so that intergroup comparisons can be made and analysed.

Using web-based experimentation such as the current research may affect the quality of manipulations, especially the mindfulness induction, due to the inability of the researcher to monitor participants. Two effective solutions were built into the current setting. First, a script used by a renowned mindfulness researcher as the instruction and breath counting added to the instruction rendered the instruction highly adaptable to a self-administered experiment. Second, the timing protocol served as a tool to monitor compliance with the mindfulness instruction, which led to a large number of non-compliants being filtered out from the research. To learn from these experiences, I advise practitioners to include various standardised protocols when disseminating web-based experimentation or training and address inter-personal differences using very large-N studies (Davidson and Dahl, 2017).

It is plausible that some of the effects of the mindfulness intervention may be mediated by a reduced tendency to catastrophise, where the latter acts as an intermediary through which the manipulated effects pass. A state rather than trait measure of catastrophising is required to investigate the proposed mediation. As a caveat, emotions experienced in portfolio trading may increase the salience of catastrophising and prime the response to a trait measure that follows trading. Relatedly, self-report measures collected before trading may have a priming effect on the behaviour being studied. Future researchers could ascertain and control emotions induced during trading or separate the data collection in time from trait measures. All these proposed measures are not just implications for methods; they serve as implications for future research into theory as a significant finding for the mediating role of state catastrophising may establish the cause and effect relationship between the cognitive-affective processes of mindfulness and catastrophising at the state level.
Moreover, emotion should be measured at the precise moment it arises \((i.e.,\) when the trading decision is made\), which entails repeat measures of emotions. To avoid potential cognitive load when measuring emotions in this manner, I recommend that a smaller number than eight trading occasions be used.

7.4.2 Implications for practice

Findings from the current research indicate that mindfulness practice and approaches to reducing catastrophising \((e.g.,\) cognitive behavioural therapy\) may be valuable training tools for investors and traders if current findings that they reduce overtrading are confirmed. I argue that the trading experiment adapted with mindfulness and therapeutic techniques, such as mindfulness-based cognitive behavioural therapy, to lessen catastrophising is suitable for training for both long-term purposes and short-term trading. When the timeframe of the research setting is compressed, it resembles the conditions where trading is performed in an instantly volatile market such as the currency market. Adaptive trading strategies to avoid overtrading can be developed by using the modified setting as a training programme. This setting would be valuable for recruitment programmes for traders \((e.g.,\) aptitude tests\) and their periodic assessments.

The recent prevalence of improved financial technology sees a growing number of people trading leveraged financial products online. These people may be motivated to trade profusely in high-risk financial products, such as currency and commodities, by their “coaches” who typically appeal a lavish lifestyle to their audience and tell their success stories in trading these products. This is an example of indoctrinating vainglorious aspirations in people, who, if follow suit, largely end up in precarious situations rather than the success that these coaches propagate. The deployment of a mindfulness meditation before any attempt to trade commodities online can be beneficial to these novice traders. They may rein in their activities and become more cautious in placing their bets due to, perhaps, mindfulness properties in reducing people’s emotional reactivity or
enlightening the cognition of their actual capability. Mindfulness may bring about both psychological and financial well-being for these traders.

This research manipulated two emotion-functioning processes: mindfulness and cognitive reappraisal. Specifically, perspective-taking was used as a situational reappraisal intervention. Other cognitive reappraisal strategies have not been explored for the disposition effect, for example, reappraising emotional response. Accordingly, the apparent inadequacy seems more of a research opportunity than a limitation. Aspirations for future research on the emotional aspects of the disposition effect include reinvesting behaviour for gains and losses, and the co-occurrence of momentum and contrarian trading in the disposition effect (Oehler et al., 2003).

7.5 Summary of contributions

Decades of research has provided abundant evidence of the disposition effect studied in both field and laboratory settings. The current research differs from previous research by using an online experiment that secures performance data from a trading simulation to measure the disposition effect, paralleled by manipulating mindfulness and cognitive reappraisal to investigate inter-personal differences. Two of the major quality indicators for experimental studies are the reliable measurement of observable phenomena and the stable exhibition of inter-personal differences in the behaviour being studied under different antecedents. The current research does not find manipulated effects on the disposition effect outright but demonstrates that a modest manipulation of state mindfulness influences divesting behaviours. The divestment of gains and losses can be reliably measured as a state behaviour of dynamic decision-making under uncertainty since the trading simulation fulfilled the criteria of dynamic decision-making under uncertainty (see Subsection 3.7.4) rather than just static decision-making under risk based on probabilities of expected outcomes. More importantly, studying the disposition effect using the joint antecedent of state mindfulness and situational reappraisal is novel. Results suggest that
susceptibility to the predisposition should be dealt with separately for its constituent behaviours, the realisation of gains and the disposal of losses.

This research makes two novel contributions to the literature. First, investors are influenced by habitual emotion regulation of catastrophising that causes greater emotional effects in the same direction for selling gains and losses. Save for the less likely priming of trait catastrophising by post-trading emotions that may shape its measurement, investors tend to treat both sales of gains and losses as undesirable behaviours, which are performed against the backdrop of a laborious task of portfolio trading. People are likely to sell gains to cope with their emotional reactivity arising from cognitive dissonance experienced because of the underperforming assets they bought. Another implication from the findings is that the conventional theories for explaining the disposition effect (e.g., Prospect Theory) may not be all-encompassing as the increased tendency to catastrophise promotes the disposal of losses, contrary to the effect of loss aversion on lessening the realisation of underperforming assets. Second, the mindfulness manipulation causes the reduction of both divestments of gains and losses, compared to the mind-wandering condition. A heightened state of mindfulness may facilitate emotional stability and lessen emotional reactivity. The reliance on habitual responses to gains and losses that one likes and dislikes may be reduced, rendering a clear mind to assess and decide the best solution from different patterns of trading. The mindful people refrain from overtrading of investments, which is a suboptimal practice leading to lower returns. A potential implication is that overtrading could be alleviated by training that focuses on increasing state mindfulness and decreasing the tendency to catastrophise.

Owing to the recent improvements in financial technology, a growing number of people are making their own investment decisions rather than relying on financial professionals, who are normally deemed to be more informed and disciplined in making trading decisions. Investors inevitably experience stress and even adversity in investment activities. Retail investors are more affected than professional traders as outcomes and emotions reciprocally impact on each other more in the former because trading gains and losses directly change their wealth positions. To enable effective adaption to the precarious experiences of market volatility and emotional reactivity, I recommend mindfulness
meditation practice to these retail investors as an adaptive tool because it may help lower the inclination to overtrade, which improves investment performance in the long run.

7.6 Conclusion

This thesis takes a step towards bridging behavioural finance and cognitive psychology in studying the influence of state mindfulness and situational reappraisal on the disposition effect and its behavioural components. Given a reasonably large sample, it is rather unexpected to find no effects of the manipulated antecedents on people’s tendency to sell gains more than losses. However, a vital role of mindfulness in disidentifying people’s internal experiences and thoughts from the external world was found to be pivotal in the current research. Desirable and undesirable outcomes represented by gains and losses in portfolio trading are the relevant experiences targeted by the current study in investigating people’s apperceptions and reactions to their decision-making. Rather than reducing the realisation of gains and promoting the disposal of losses as hypothesised, findings from the current research suggest that an elevated state of mindfulness decreases the sales of both (i.e., lessened portfolio churning) and offer some support for investigating routes to reducing the tendency to catastrophise as another way to mitigate overtrading.

In an ever-changing world, people need adaptation to external inconsistencies and unexpected apprehensions that emerge from their inner world. Mindfulness practice appears to offer a hands-on solution. A ten-minute focused breathing exercise might change the way of thinking so that people can use a more adaptive approach to cope with usual irregularities or unpredictable circumstances. For example, for mindful individuals, figuring out a “less for more” approach might have been unintentional, but it paradoxically turned out to be advantageous. After all, mindfulness practice has been found to bring its practitioners desirable qualities such as promoting psychological well-being and enrichment of eudaemonic meaning when facing adversity, which frees up people’s potential to meet the unabating demands of life.
REFERENCES


APPENDICES

Appendix-1 The “thinking like a trader” reappraisal instruction

When you see “Reappraise” before a block of trials, think of each of the following monetary decisions in the context of all of the previous and following choices during Reappraise trials. That is, treat it as one of many monetary decisions, which will constitute a “portfolio.” Remind yourself that you are making many of these similar decisions. Do not keep a running total—simply approach these gambles keeping in mind their context.

Imagine you are considering one of the monetary decisions in this task right now.

One way to think of this instruction is to imagine yourself a trader. You take risks with money every day, for a living. Imagine that this is your job and that the money at stake is not yours—it is someone else’s. Of course, you still want to do well (your job depends on it). You have done this for a long time, though, and will continue to. All that matters is that you come out on top in the end—a loss here or there will not matter in terms of your overall portfolio. In other words, you win some and you lose some.

It is important that you focus on these monetary decisions in the context of all of the other monetary decisions you will be making today during the Reappraise trials.

Source: Supporting Information to Sokol-Hessner and colleagues (2009: 3).
Appendix-2 Mind-wandering instruction (Question item 3)

When you’re ready, you can start by allowing your mind to roam; there is no need to focus on anything in particular,

Just let your mind wander

Openly let your thoughts flow

Continue to let yourself think freely about whatever you want, just let your mind wander

Think about whatever comes to mind

Allow your mind to roam; there is no need to focus on anything in particular,

Just let your mind wander

Openly let your thoughts flow

Continue to let yourself think freely about whatever you want, just let your mind wander

Think about whatever comes to mind

Just allow your mind to roam

There is no need to focus on anything in particular,

Just let your mind wander

Openly let your thoughts flow

Continue to let yourself think freely about whatever you want,

Just let your mind wander

Think about whatever comes to mind

Just allow your mind to roam

There is no need to focus on anything in particular,

Just let your mind wander

...Continued on next page
Openly let your thoughts flow
Continue to let yourself think freely about whatever you want,
Just let your mind wander
Think about whatever comes to mind
Just allow your mind to roam
There is no need to focus on anything in particular,
Just let your mind wander
Openly let your thoughts flow
Continue to let yourself think freely about whatever you want,
Just let your mind wander
Think about whatever comes to mind
Just allow your mind to roam
There is no need to focus on anything in particular,
Just let your mind wander
Openly let your thoughts flow
Continue to let yourself think freely about whatever you want,
Just let your mind wander
Think about whatever comes to mind
Just allow your mind to roam
There is no need to focus on anything in particular,
Just let your mind wander
Openly let your thoughts flow
...Continued on next page
Continue to let yourself think freely about whatever you want,

Just let your mind wander

Think about whatever comes to mind

Just allow your mind to roam

There is no need to focus on anything in particular,

Just let your mind wander

Openly let your thoughts flow

Continue to let yourself think freely about whatever you want,

Just let your mind wander

Think about whatever comes to mind

Just allow your mind to roam

There is no need to focus on anything in particular,

Just let your mind wander

Openly let your thoughts flow

Continue to let yourself think freely about whatever you want,

Just let your mind wander

Think about whatever comes to mind.
Appendix-3 Mindfulness instruction (Question item 5)

When you’re ready, you can get your body into a comfortable yet alert posture

Sitting with your back supported, almost as if you are a king or a queen on your throne

With your feet planted firmly on the floor

And your spine is straight but not stiff

Your head held high, but not straining

And when you’re ready, you can begin to come aware of the state of the body at this moment

Noticing, is the body tired or full of energy, right now

Is it relaxed or tense, and it really doesn’t matter, just noticing the state of the body at this moment

And in a moment, noticing the state of the mind at this moment.

Is it full of thoughts, or mostly empty of thoughts

Are the thoughts moving fast, or are they moving slowly

And again, it really doesn’t matter

Whatever the state of the mind is at this moment, it’s OK, just noticing the state of the mind at this moment

And when you’re ready, you can shift the focus of your attention to the sensation of the breathing

Now you are going to take three deep, slow breaths

Noticing the sensation of the breath as it flows into the nostrils when you inhale and the warmth or the coolness of that air as you breathe, exhale slowly

In the second breath, notice the movements of the tiny muscles in the nostrils as you inhale and soon following the breath even more deeply into the body, breathe out slowly

...Continued on next page
In the third breath, notice the sensation of the breath filling the lungs, filling the belly with each passing breath and each passing moment, exhale slowly

Now you will do slow breathing. Follow the slow breathing rhythm without force.......

From this moment, start to count your breaths with your mind focusing on breathing. I will ask you to record the number of breaths after this audio induction.......

And soon, you may begin to notice that the mind begins to wander, to thoughts, feelings, sensations in the body, images, or memories

And when you notice that the mind has wandered, that’s OK, because that’s what minds do; they wander

You can just notice where the mind has wandered off to, accepting and acknowledging those thoughts and feelings

And then gently, but firmly, return the focus of your attention back to the breathing, back to the sensation of the breath flowing into the nostrils

Back to the sensation of the breath filling the lungs

That’s right

And each time that the mind wanders, you can just notice where the mind has wandered off, accepting and acknowledging those thoughts or feelings

And then letting them go, to return the focus of your attention back to the breathing

And soon, you may begin to notice that your thoughts and feelings, images and memories, come and go

Come and go, like clouds passing in a clear blue sky

And like clouds, your thoughts come out of nowhere, change shape and fade into the distance all on their own

And there is no need to hold on to those thoughts or to push them away

You can just let them go, all on their own

And a part of the mind is like those thoughts or feelings, like clouds passing

But there is a deeper part of the mind that is more like the space in which the clouds pass

...Continued on next page
An observing awareness

And you can focus your mind on that, or you can continue to focus your mind on the sensation of the breath flowing into the nostrils

Or the sensation of the breath moving deep in the lungs

(SILENCE FOR 330 SECONDS)

And when you’re ready, you can open your eyes.

(Note: Words in *italics* are added to instruct deep, slow breathing and breath counting)
Appendix-4 The complete questionnaire used in the Main Study

This survey is part of a research study on emotion and its relationships with financial decision-making. Your participation in this survey will provide data for the study. In addition to an investment simulation, there are questions about your risk attitudes and how you feel in some day-to-day activities. As there are no right or wrong answers to the questions, please give responses that best describe your preferences and feelings. You are assured that participation in the survey will not change your risk attitudes towards investment. Some general questions on emotions and experiences will be asked, but there are no personally sensitive questions to answer.

The survey will take around 25 minutes, so please make yourself available in the coming half an hour to complete it. **Please make sure you are able to complete this survey in one sitting as you will not be able to return to the survey to complete it at a later time.**

You will be led to a ten-minute audio induction and asked to follow the instructions carefully as practising the induction will prepare you for the conditions to do some financial decision exercises that come next. So, please make sure that you can carry out the survey in a quiet, comfortable, and well-lit place and that you are not distracted by other activities.

You can withdraw from the survey at any point- just leave the webpage for withdrawal from the survey, and the data collected will be discarded automatically. When you are happy to go on, please complete the survey.

By proceeding with the survey, you acknowledge that:
1) the purpose and possible effects of participating in this research have been explained to your satisfaction.
2) you understand that you are free to withdraw from the survey without explanation or prejudice until the survey has been completed and submitted.
3) you understand that the confidentiality of the information you provide will be safeguarded subject to the General Data Protection Regulation.
4) you understand that with your consent, the data generated will be stored by the Open University UK in anonymised form and will be destroyed after a maximum of ten years.

5) you understand that anonymised research data may be made available to other members of the research community subject to the rules of the Open University UK for a period of ten years.

The highlight of this survey is to practise financial decision-making and there are eight rounds of trading decisions in the investment simulation. There is an award of £100 for each of the top two performers in the financial decision exercise. You may be able to get £100 as an INCENTIVE for your engaging participation.

Kindly note that there will be attention check questions, so please read through the questions before you answer.

Thank you for your participation in this survey. Please click the forward arrow to get started!

This project has been reviewed by, and received a favourable opinion from, The Open University Human Research Ethics Committee, reference HREC/3087/Wong.

Start of Block: GeoIP

Where do you live?

☐ In the UK (1)

☐ Not in the UK (2)

Skip To: End of Block If Where do you live? = Not in the UK

End of Block: GeoIP

Start of Block: Quota

Q1 What is your gender?

☐ Female (1)

☐ Male (2)
Q2 Please choose from the following which best describes your qualification.

- I am neither a graduate nor a qualified professional (1)
- I am not a graduate but I am a qualified professional (2)
- I am a graduate (3)
- I am a graduate and I am doing/ have completed a postgraduate study (4)

Q3
The audio player file below will play a ten-minute audio clip. When you click on the file, the clip will open in a separate tab, and you should close it once you have listened to the whole clip to return to the survey page.

Please follow the instructions carefully to complete it. When you have finished, a forward arrow will appear at the bottom for you to click on. Then go on to answer the next four questions to reflect on the feelings you have experienced during the induction.

[Mindwandering.MP3](Mindwandering.MP3)

Q4 Timing
First Click (1)
Last Click (2)
Page Submit (3)
Click Count (4)

[Display This Question:
If Mindfulness = 1](#)
Q5

The audio player file below will play a ten-minute audio clip, which will take you through a brief mindfulness induction. When you click on the file, the clip will open in a separate tab, and you should close it once you have listened to the whole clip to return to the survey page. You will be asked to follow the instructions carefully as practising the induction will prepare you for the conditions to do some financial decision exercises that come next.

So, please make sure that you can carry out the mindfulness induction in a quiet, comfortable, and warm place and that you are not distracted by other activities.

Kindly follow the instructions carefully to complete it. Note that you will be asked to provide the number of breath (one inhalation and one exhalation as one breath) counts you have practised between the time you are asked to start breath counting and the end of the induction. Also, follow the pace of the deep breathing that the induction advises you and practise breathing in the same manner.

When you have finished, a forward arrow will appear at the bottom for you to click on. Then go on to answer the breath count question.

Mindfulness.MP3

Q6  Timing

First Click  (1)
Last Click  (2)
Page Submit  (3)
Click Count  (4)

Skip To: End of Block If Timing [ Last Click]  >= 600

Display This Question:

If Timing [ Page Submit ]  >= 780

Q7

You have not attended closely to the mindfulness induction. Please press the forward arrow to exit the survey.
Q8 Timing

First Click (1)
Last Click (2)
Page Submit (3)
Click Count (4)

End of Block: Audios

Start of Block: Breath count

Display This Question:

If The audio player file below will play a ten-minute audio clip, which will take you through a brie... Is Displayed
And Timing [ Page Submit ] Is Not Empty

Q9

During the mindfulness induction, the instructor asked you to count the number of breaths after three deep breaths. The number of breaths you counted is:

_______________________________________________________________

End of Block: Breath count

Start of Block: State mindfulness

Q10

During the induction, you were curious about your reactions to things.

- Not at all (1)
- A little (2)
- Moderately (3)
- Quite a bit (4)
- Very much (5)
Q11
During the induction, you were curious to see what your mind was up to from moment to moment.

- Not at all (1)
- A little (2)
- Moderately (3)
- Quite a bit (4)
- Very much (5)

Q12
During the induction, you were more concerned with being open to your experiences than controlling or changing them.

- Not at all (1)
- A little (2)
- Moderately (3)
- Quite a bit (4)
- Very much (5)

Q13
During the induction, you were more invested in just watching your experiences as they arose than in figuring out what they could mean.

- Not at all (1)
- A little (2)
- Moderately (3)
- Quite a bit (4)
- Very much (5)
Q22

After attending an investment seminar, you opened an investment account in order to maximise investment returns from investment fund trading. At the start of period 1, you have £60,000 to invest, and you decide to build an investment portfolio from four newly launched funds.

You should recognise that the market price of a fund reflects its current value. Trading results are evaluated at the market values of the funds and advise you how much they are worth should you sell them. In the next section, you will be asked to make trading decisions in order to maximise the overall value of the investment portfolio (including cash) from the price movements of the funds.

To evaluate results, you will carry out reviews on the first day of each of the following eight periods. Profit or loss arising from fund price movements at these intervals will be evaluated with reference to the money you have invested in the funds concerned. You will be given figures on the current value of each fund and the overall profit or loss of the portfolio when the outcome of each trading decision you have just made is known. You can ignore any capital gains or losses, dividends, and transaction costs for holding and trading funds.

To maximise the scores of this financial decision exercise, you should focus on the gains and losses of individual funds. As your goal is to make as much money as possible, you should have a sense of responsibility for decision-making in every trading transaction. Any one of the transactions may be
the one that you get paid for, so do approach each trading decision seriously and treat each of them in isolation from others. Ask yourself how you would feel if you had some gains and how you would feel should you have some losses. Think also about the incentive that you would get if you got your decisions right. There are only eight rounds of trading so try your best in making the decisions. Remember, the INCENTIVE of £100 is out there for you!

Q23 Timing

First Click (1)
Last Click (2)
Page Submit (3)
Click Count (4)

Display This Question:
If Reappraisal = 1

Q24

Imagine that you are a financial advisor who invests money on behalf of a large number of different clients. For example, you have just opened an investment account for a client at the start of period 1, and now consider to invest £60,000 for the client. There are four newly launched investment funds that you would like to build a portfolio for this client.

In the next section, you will be asked to make trading decisions in order to maximise the overall value of the investment portfolio (including cash) from the price movements of the funds. To evaluate results, you will carry out reviews on the first day of each of the following eight periods.

Profit or loss arising from fund price movements at these intervals will be evaluated with the money you have invested in the funds concerned. You will be given figures on the current value of each fund and the overall profit or loss of the portfolio when the outcome of each trading decision you have made is known.

You should recognise that the market price of a fund reflects its current value. Trading results are evaluated at the market values of the funds and advise you how much they are worth should you sell them. To maximise the scores of this exercise, you should only count on the gains and losses of individual funds. You can ignore any capital gains or losses, dividends, and transaction costs for holding and trading funds.
As your goal is to make as much money as possible, you should adopt the strategy of a financial advisor who treats each trading transaction as one of a series of decisions that they make with clients’ money. You should not be obsessed with the outcomes of individual trading decisions you have made – you win some, and you lose some. Anyhow, you take risks with money every day, and you are on top of it. So don’t keep a running total but simply approach the following eight rounds of trading as a very small part of many monetary decisions you make regularly.

Q25

Before going on for the investment simulation, kindly consider your emotions at the present moment. It is possible to have both positive emotion (pleasant feeling) and negative emotion (unpleasant feeling) at the same time.

Please select a point from each of the two rows for positive emotion and negative emotion you feel now:

<table>
<thead>
<tr>
<th>Levels of emotion</th>
<th>Not at all (1)</th>
<th>Slightly (2)</th>
<th>Moderately (3)</th>
<th>Quite a bit (4)</th>
<th>Very much (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive emotion (1)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Negative emotion (2)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

Q26 Timing

First Click (1)
Last Click (2)
Page Submit (3)
Click Count (4)

End of Block: Reappraisals

Start of Block: Period 1

Display This Question:

If the audio player file below will play a ten-minute audio clip, which will take you through a brie... Is Displayed
Q28
You are going to take part in an investment simulation. You will start with a choice of 4 investment funds to invest the £60,000 available to you. The simulation will play out over eight periods. After the end of each period, you will learn the new value of each fund and have the opportunity to sell the funds you hold and buy other funds. You may also choose to leave some of your investment as cash. You will gain no interest, but the value of cash will remain the same.

You will recall that in the audio induction, as thoughts and feelings came into your mind, you allowed yourself to notice them and let them go. When you make investment decisions and consider the outcomes of your investments, allow yourself to notice your feelings about gains or losses and let them pass without getting caught up in them.

Q29
You are going to take part in an investment simulation. You will start with a choice of 4 investment funds to invest the £60,000 available to you. The simulation will play out over eight periods. After the end of each period, you will learn the new value of each fund and have the opportunity to sell the funds you hold and buy other funds. You may also choose to leave some of your investment as cash. You will gain no interest, but the value of cash will remain the same.

Remember, your task is to invest your money so as to achieve the highest possible value of your investment by the end of the simulation.

Q30 Timing
First Click (1)
Last Click (2)
Page Submit (3)
Click Count (4)
Q31
Making your first investment

The four investment Funds A, B, C, and D have underlying assets in the finance, biotech, energy, and construction sectors, respectively. At the start of period 1 (now), each fund is priced at £100 per unit. This price may rise or fall over time, although you have confidence in the performance of the fund managers who have launched the funds. You can distribute your money as you choose between all four funds. Please use the sliders below to show what percentage of your available funds you will invest in each fund and what proportion (if any) you will leave as cash.

_______ Fund A (1)
_______ Fund B (2)
_______ Fund C (3)
_______ Fund D (4)
_______ Cash (5)

End of Block: Period 1

Start of Block: Period1 investment display

Display This Question:
If Timing [ Page Submit ] Is Empty

Q32
Your investment position at the start of period 1

At the start of period 1 (P1) you have invested your total funds of £${e://Field/TotalInvest1}$ as follows:

<table>
<thead>
<tr>
<th>Fund</th>
<th>% of investments</th>
<th>Current value</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>${e://Field/FundA1percent}%</td>
<td>£${e{round(e://Field/FundA1Value , 0)}}</td>
</tr>
<tr>
<td>B</td>
<td>${e://Field/FundB1percent}%</td>
<td>£${e{round(e://Field/FundB1Value , 0)}}</td>
</tr>
<tr>
<td>C</td>
<td>${e://Field/FundC1percent}%</td>
<td>£${e{round(e://Field/FundC1Value , 0)}}</td>
</tr>
<tr>
<td>D</td>
<td>${e://Field/FundD1percent}%</td>
<td>£${e{round(e://Field/FundD1Value , 0)}}</td>
</tr>
<tr>
<td>Cash</td>
<td>${e://Field/Cash1percent}%</td>
<td>£${e{round(e://Field/Cash1Value , 0)}}</td>
</tr>
</tbody>
</table>

On the next page, you will learn how the values of your investments have changed by the end of period 1 (start of period 2).

End of Block: Period1 investment display
The table below shows how your investments have performed over period 1 (P1). Compare the values of funds at the start of the period with their current values.

<table>
<thead>
<tr>
<th>Fund</th>
<th>% of investments</th>
<th>Value at start of period 1</th>
<th>Current value</th>
<th>Gain / - loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>${e://Field/FundB1percentx, 1)%}</td>
<td>£${e://Field/FundB1Value}</td>
<td>£${e://Field/FundB1Valuex}</td>
<td>£${e://Field/FundB1Valuex - e://Field/FundB1Value}</td>
</tr>
<tr>
<td>C</td>
<td>${e://Field/FundC1percentx, 1)%}</td>
<td>£${e://Field/FundC1Value}</td>
<td>£${e://Field/FundC1Valuex}</td>
<td>£${e://Field/FundC1Valuex - e://Field/FundC1Value}</td>
</tr>
<tr>
<td>D</td>
<td>${e://Field/FundD1percentx, 1)%}</td>
<td>£${e://Field/FundD1Value}</td>
<td>£${e://Field/FundD1Valuex}</td>
<td>£${e://Field/FundD1Valuex - e://Field/FundD1Value}</td>
</tr>
<tr>
<td>Cash</td>
<td>${e://Field/Cash1percentx, 1)%}</td>
<td>£${e://Field/Cash1Value}</td>
<td>£${e://Field/Cash1Valuex}</td>
<td>£${e://Field/Cash1Valuex - e://Field/Cash1Value}</td>
</tr>
</tbody>
</table>

Your total investments (including any cash) are now worth £${e://Field/TotalInvest1x}. Compared with the initial capital you have an overall gain / loss of $e{round(e://Field/FundA1Valuex + e://Field/FundB1Valuex + e://Field/FundC1Valuex + e://Field/FundD1Valuex + e://Field/Cash1Valuex, 0) - 60000}$ in Pounds, where a negative value (if it appears to be) denotes a loss.
Q34

Below are the charts for the 4 funds showing the price movements during the previous period (P1). Now at the start of period 2, the unit prices of Funds A, B, C, and D are £105.50, £99.79, £105.28, and £97.00, respectively.

You can sell the funds you currently hold by using the sliders below to set the proportion of your investment in a fund you want to sell. You will then have an opportunity to re-invest the cash you have released.

<table>
<thead>
<tr>
<th>Percentage to sell</th>
</tr>
</thead>
<tbody>
<tr>
<td>0     10    20    30    40    50    60    70    80    90    100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fund A ()</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Slider" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fund B ()</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image2" alt="Slider" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fund C ()</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image3" alt="Slider" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fund D ()</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image4" alt="Slider" /></td>
</tr>
</tbody>
</table>
Q35 Timing

First Click (1)
Last Click (2)
Page Submit (3)
Click Count (4)

End of Block: Period 2 starting decisions - sales

Start of Block: Period 2 starting decisions - purchases

Q36

You now have cash of £$e\{\text{round}(e://\text{Field/Cash1postsalesvalue}, 0)\}$ and the following investments: £$e\{e://\text{Field/FundA1postsalesvalue}\}$ in Fund A; £$e\{e://\text{Field/FundB1postsalesvalue}\}$ in Fund B; £$e\{e://\text{Field/FundC1postsalesvalue}\}$ in Fund C; and £$e\{e://\text{Field/FundD1postsalesvalue}\}$ in Fund D.

Below are the price charts for the 4 funds during the previous period:

The current prices of Funds A, B, C, and D are £105.50, £99.79, £105.28, and £97.00 respectively.

Please use the sliders below to show what percentage of your cash you will invest in each fund and what proportion (if any) you will leave as cash.
If you don't have cash to buy any fund because you have bought funds without selling them in the previous round, please pull the cash slider to the right end to continue.

_______ Fund A (1)
_______ Fund B (2)
_______ Fund C (3)
_______ Fund D (4)
_______ Cash (5)

Q37  Timing

First Click (1)
Last Click (2)
Page Submit (3)
Click Count (4)

---

End of Block: Period 2 starting decisions - purchases

Start of Block: Period 2 investment display

Display This Question:
If Timing [ Page Submit ] Is Empty

Q39

At the start of period 2, you have invested your total funds of £$\{e://Field/TotalInvest1x\}$ as follows:

On the next page, you will learn how the values of your investments have changed by the end of period 2.

<table>
<thead>
<tr>
<th>Fund</th>
<th>% of investments</th>
<th>Current value</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>${e://Field/FundA2percent}$ %</td>
<td>£${e://Field/FundA2Value}$</td>
</tr>
<tr>
<td>B</td>
<td>${e://Field/FundB2percent}$ %</td>
<td>£${e://Field/FundB2Value}$</td>
</tr>
<tr>
<td>C</td>
<td>${e://Field/FundC2percent}$ %</td>
<td>£${e://Field/FundC2Value}$</td>
</tr>
<tr>
<td>D</td>
<td>${e://Field/FundD2percent}$ %</td>
<td>£${e://Field/FundD2Value}$</td>
</tr>
<tr>
<td>Cash</td>
<td>${e://Field/Cash2percent}$ %</td>
<td>£${e://Field/Cash2Value}$</td>
</tr>
</tbody>
</table>

End of Block: Period 2 investment display

Start of Block: Period 3 sales
Q40

The table below shows how your investments have performed over period 2:

<table>
<thead>
<tr>
<th>Fund</th>
<th>% of investments</th>
<th>Value at start of period 2</th>
<th>Current value</th>
<th>Gain / - loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>${\text{round(e://Field/FundA2percentx , 1)}}%$</td>
<td>$$\text{e://Field/FundA2Value}$</td>
<td>$$\text{e://Field/FundA2Valuex}$</td>
<td>$$\text{e://Field/FundA2Valuex - e://Field/FundA2Value}$</td>
</tr>
<tr>
<td>B</td>
<td>${\text{round(e://Field/FundB2percentx , 1)}}%$</td>
<td>$$\text{e://Field/FundB2Value}$</td>
<td>$$\text{e://Field/FundB2Valuex}$</td>
<td>$$\text{e://Field/FundB2Valuex - e://Field/FundB2Value}$</td>
</tr>
<tr>
<td>C</td>
<td>${\text{round(e://Field/FundC2percentx , 1)}}%$</td>
<td>$$\text{e://Field/FundC2Value}$</td>
<td>$$\text{e://Field/FundC2Valuex}$</td>
<td>$$\text{e://Field/FundC2Valuex - e://Field/FundC2Value}$</td>
</tr>
<tr>
<td>D</td>
<td>${\text{round(e://Field/FundD2percentx , 1)}}%$</td>
<td>$$\text{e://Field/FundD2Value}$</td>
<td>$$\text{e://Field/FundD2Valuex}$</td>
<td>$$\text{e://Field/FundD2Valuex - e://Field/FundD2Value}$</td>
</tr>
<tr>
<td>Cash</td>
<td>${\text{round(e://Field/Cash2percentx , 1)}}%$</td>
<td>$$\text{e://Field/Cash2Value}$</td>
<td>$$\text{e://Field/Cash2Valuex}$</td>
<td>$$\text{e://Field/Cash2Valuex - e://Field/Cash2Value}$</td>
</tr>
</tbody>
</table>

Your total investments (including any cash) are now worth \$\text{e://Field/TotalInvest2x}$. You have an overall gain /loss of \$\text{e://Field/TotalInvest2x - 60000}$ in Pounds, where a negative value (if it appears to be) denotes a loss.

Below are the price charts for the 4 funds from the start of period 1 to the end of period 2:

The current prices of Funds A, B, C, and D are £101.24, £113.00, £97.43, and £110.66, respectively.

You can sell investments you currently hold by using the sliders below to set the proportion of your investment in a fund you want to sell. You will then have an opportunity to re-invest the cash you have released.

Display This Choice:

If FundA2percent > 0

_______ Fund A (1)
<table>
<thead>
<tr>
<th>Display This Choice:</th>
<th>If FundB2percent &gt; 0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>_______ Fund B (2)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Display This Choice:</th>
<th>If FundC2percent &gt; 0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>_______ Fund C (3)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Display This Choice:</th>
<th>If FundD2percent &gt; 0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>_______ Fund D (4)</td>
</tr>
</tbody>
</table>

---

**Q41 Timing**

First Click (1)
Last Click (2)
Page Submit (3)
Click Count (4)

---

**End of Block: Period 3 sales**

---

**Start of Block: Period 3 purchases**

---
You now have cash of £$\{\text{round(e://Field/Cash2postsalesvalue}, 0)\}$ and the following investments: £$\{\text{Field/FundA2postsalesvalue}\}$ in Fund A; £$\{\text{Field/FundB2postsalesvalue}\}$ in Fund B; £$\{\text{Field/FundC2postsalesvalue}\}$ in Fund C; and £$\{\text{Field/FundD2postsalesvalue}\}$ in Fund D.

Below are the price charts for the 4 funds from the start of period 1 to the end of period 2:

The current prices of Funds A, B, C, and D are £101.24, £113.00, £97.43, and £110.66, respectively.

Please use the sliders below to show what percentage of your cash you will invest in each fund and what proportion (if any) you will leave as cash.

If you don't have cash to buy any fund because you have bought funds without selling them in the previous round, please pull the cash slider to the right end to continue.

_______ Fund A (1)
_______ Fund B (2)
_______ Fund C (3)
_______ Fund D (4)
_______ Cash (5)
Q43  Timing
First Click  (1)
Last Click  (2)
Page Submit  (3)
Click Count   (4)

End of Block: Period 3 purchases

Start of Block: Period 3 investment display

Display This Question:
If Timing [ Page Submit ] Is Empty

Q45
At the start of period 3, you have invested your total funds of £\{e://Field/TotalInvest2x\} as follows:

On the next page, you will learn how the values of your investments have changed by the end of period 3.

<table>
<thead>
<tr>
<th>Fund</th>
<th>% of investments</th>
<th>Current value</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>${e://Field/FundA3percent}%</td>
<td>£${e://Field/FundA3Value}</td>
</tr>
<tr>
<td>B</td>
<td>${e://Field/FundB3percent}%</td>
<td>£${e://Field/FundB3Value}</td>
</tr>
<tr>
<td>C</td>
<td>${e://Field/FundC3percent}%</td>
<td>£${e://Field/FundC3Value}</td>
</tr>
<tr>
<td>D</td>
<td>${e://Field/FundD3percent}%</td>
<td>£${e://Field/FundD3Value}</td>
</tr>
<tr>
<td>Cash</td>
<td>${e://Field/Cash3percent}%</td>
<td>£${e://Field/Cash3Value}</td>
</tr>
</tbody>
</table>

End of Block: Period 3 investment display

Start of Block: Period 4 sales
The table below shows how your investments have performed over period 3:

<table>
<thead>
<tr>
<th>Fund</th>
<th>% of investments</th>
<th>Value at start of period 3</th>
<th>Current value</th>
<th>Gain / loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>${e://Field/FundA3percentx ,1)%}</td>
<td>£${e://Field/FundA3Value}</td>
<td>£${e://Field/FundA3Valuex}</td>
<td>£${e://Field/FundA3Valuex - e://Field/FundA3Value}</td>
</tr>
<tr>
<td>B</td>
<td>${e://Field/FundB3percentx ,1)%}</td>
<td>£${e://Field/FundB3Value}</td>
<td>£${e://Field/FundB3Valuex}</td>
<td>£${e://Field/FundB3Valuex - e://Field/FundB3Value}</td>
</tr>
<tr>
<td>C</td>
<td>${e://Field/FundC3percentx ,1)%}</td>
<td>£${e://Field/FundC3Value}</td>
<td>£${e://Field/FundC3Valuex}</td>
<td>£${e://Field/FundC3Valuex - e://Field/FundC3Value}</td>
</tr>
<tr>
<td>D</td>
<td>${e://Field/FundD3percentx ,1)%}</td>
<td>£${e://Field/FundD3Value}</td>
<td>£${e://Field/FundD3Valuex}</td>
<td>£${e://Field/FundD3Valuex - e://Field/FundD3Value}</td>
</tr>
<tr>
<td>Cash</td>
<td>${e://Field/Cash3percentx ,1)%}</td>
<td>£${e://Field/Cash3Value}</td>
<td>£${e://Field/Cash3Valuex}</td>
<td>£${e://Field/Cash3Valuex - e://Field/Cash3Value}</td>
</tr>
</tbody>
</table>

Your total investments (including any cash) are now worth £${e://Field/TotalInvest3x}. You have an overall gain /loss of £${e://Field/TotalInvest3x - 60000} in Pounds, where a negative value (if it appears to be) denotes a loss.

Below are the price charts for the 4 funds from the start of period 1 to the end of period 3:

The current prices of Funds A, B, C, and D are 95.00, 107.90, 102.36 and 128.47, respectively.

You can sell investments you currently hold by using the sliders below to set the proportion of your investment in a fund you want to sell. You will then have an opportunity to re-invest the cash you have released.
Display This Choice:
  If FundA3percent > 0
  _______ Fund A (1)

Display This Choice:
  If FundB3percent > 0
  _______ Fund B (2)

Display This Choice:
  If FundC3percent > 0
  _______ Fund C (3)

Display This Choice:
  If FundD3percent > 0
  _______ Fund D (4)

Q47 Timing
First Click (1)
Last Click (2)
Page Submit (3)
Click Count (4)

End of Block: Period 4 sales

Start of Block: Period 4 purchases

289
You now have cash of £$e\{\text{round}(e://\text{Field}/\text{Cash3postsalesvalue} , 0)\}$ and the following investments: £$e\{\text{Field}/\text{FundA3postsalesvalue}\}$ in Fund A; £$e\{\text{Field}/\text{FundB3postsalesvalue}\}$ in Fund B; £$e\{\text{Field}/\text{FundC3postsalesvalue}\}$ in Fund C; and £$e\{\text{Field}/\text{FundD3postsalesvalue}\}$ in Fund D.

Below are the price charts for the 4 funds from the start of period 1 to the end of period 3:

The current prices of Funds A, B, C, and D are £95.00, £107.90, £102.36, and £128.47, respectively.

Please use the sliders below to show what percentage of your cash you will invest in each fund and what proportion (if any) you will leave as cash.

If you don't have cash to buy any fund because you have bought funds without selling them in the previous round, please pull the cash slider to the right end to continue.

_______ Fund A (1)
_______ Fund B (2)
_______ Fund C (3)
_______ Fund D (4)
_______ Cash (5)
Q49  Timing
First Click  (1)
Last Click  (2)
Page Submit  (3)
Click Count  (4)

End of Block: Period 4 purchases

Start of Block: Period 4 investment display

Display This Question:

If Timing [ Page Submit ] Is Empty

Q51

At the start of period 4, you have invested your total funds of £$e://Field/TotalInvest3x$ as follows:

On the next page, you will learn how the values of your investments have changed by the end of period 4.

<table>
<thead>
<tr>
<th>Fund</th>
<th>% of investments</th>
<th>Current value</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>$e://Field/FundA4percent%</td>
<td>£$e://Field/FundA4Value$</td>
</tr>
<tr>
<td>B</td>
<td>$e://Field/FundB4percent%</td>
<td>£$e://Field/FundB4Value$</td>
</tr>
<tr>
<td>C</td>
<td>$e://Field/FundC4percent%</td>
<td>£$e://Field/FundC4Value$</td>
</tr>
<tr>
<td>D</td>
<td>$e://Field/FundD4percent%</td>
<td>£$e://Field/FundD4Value$</td>
</tr>
<tr>
<td>Cash</td>
<td>$e://Field/Cash4percent%</td>
<td>£$e://Field/Cash4Value$</td>
</tr>
</tbody>
</table>

End of Block: Period 4 investment display

Start of Block: Period 5 sales
The table below shows how your investments have performed over period 4:

<table>
<thead>
<tr>
<th>Fund</th>
<th>% of investments</th>
<th>Value at start of period 4</th>
<th>Current value</th>
<th>Gain / - loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>$e{\text{Field/FundA4percent}}%</td>
<td>$e{\text{Field/FundA4Value}}</td>
<td>$e{\text{Field/FundA4Valuex}}</td>
<td>$e{\text{Field/FundA4Valuex - Field/FundA4Value}}</td>
</tr>
<tr>
<td>B</td>
<td>$e{\text{Field/FundB4percent}}%</td>
<td>$e{\text{Field/FundB4Value}}</td>
<td>$e{\text{Field/FundB4Valuex}}</td>
<td>$e{\text{Field/FundB4Valuex - Field/FundB4Value}}</td>
</tr>
<tr>
<td>C</td>
<td>$e{\text{Field/FundC4percent}}%</td>
<td>$e{\text{Field/FundC4Value}}</td>
<td>$e{\text{Field/FundC4Valuex}}</td>
<td>$e{\text{Field/FundC4Valuex - Field/FundC4Value}}</td>
</tr>
<tr>
<td>D</td>
<td>$e{\text{Field/FundD4percent}}%</td>
<td>$e{\text{Field/FundD4Value}}</td>
<td>$e{\text{Field/FundD4Valuex}}</td>
<td>$e{\text{Field/FundD4Valuex - Field/FundD4Value}}</td>
</tr>
<tr>
<td>Cash</td>
<td>$e{\text{Field/Cash4percent}}%</td>
<td>$e{\text{Field/Cash4Value}}</td>
<td>$e{\text{Field/Cash4Valuex}}</td>
<td>$e{\text{Field/Cash4Valuex - Field/Cash4Value}}</td>
</tr>
</tbody>
</table>

Your total investments (including any cash) are now worth £\$e{\text{Field/TotalInvest4x}}\$. You have an overall gain /loss of \$e{\text{Field/TotalInvest4x - 60000}}\$ in Pounds, where a negative value (if it appears to be) denotes a loss.

Below are the price charts for the 4 funds from the start of period 1 to the end of period 4:

The current prices of Funds A, B, C, and D are £99.50, £110.81, £95.79, and £136.80, respectively.

You can sell investments you currently hold by using the sliders below to set the proportion of your investment in a fund you want to sell. You will then have an opportunity to re-invest the cash you have released.
Display This Choice:
If FundA4percent > 0
_______ Fund A (1)

Display This Choice:
If FundB4percent > 0
_______ Fund B (2)

Display This Choice:
If FundC4percent > 0
_______ Fund C (3)

Display This Choice:
If FundD4percent > 0
_______ Fund D (4)

Q53  Timing
First Click  (1)
Last Click  (2)
Page Submit  (3)
Click Count  (4)

End of Block: Period 5 sales

Start of Block: Period 5 purchases

Q54

You now have cash of £€\{round(e://Field/Cash4postsalesvalue , 0)\} and the following investments: £€\{e://Field/FundA4postsalesvalue\} in Fund A; £€\{e://Field/FundB4postsalesvalue\} in Fund B; £€\{e://Field/FundC4postsalesvalue\} in Fund C; and £€\{e://Field/FundD4postsalesvalue\} in Fund D.
Below are the price charts for the 4 funds from the start of period 1 to the end of period 4:

The current prices of Funds A, B, C, and D are £99.50, £110.81, £95.79, and £136.80, respectively.

Please use the sliders below to show what percentage of your cash you will invest in each fund and what proportion (if any) you will leave as cash.

If you don't have cash to buy any fund because you have bought funds without selling them in the previous round, please pull the cash slider to the right end to continue.

_______ Fund A (1)
_______ Fund B (2)
_______ Fund C (3)
_______ Fund D (4)
_______ Cash (5)

Q55 Timing
First Click (1)
Last Click (2)
Page Submit (3)
Click Count (4)

End of Block: Period 5 purchases

Start of Block: Period 5 investment display
Q57

At the start of period 5, you have invested your total funds of £$\{e://Field/TotalInvest4x\}$ as follows:

On the next page, you will learn how the values of your investments have changed by the end of period 5.

<table>
<thead>
<tr>
<th>Fund</th>
<th>% of investments</th>
<th>Current value</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>${e://Field/FundA5percent}%</td>
<td>£${e://Field/FundA5Value}$</td>
</tr>
<tr>
<td>B</td>
<td>${e://Field/FundB5percent}%</td>
<td>£${e://Field/FundB5Value}$</td>
</tr>
<tr>
<td>C</td>
<td>${e://Field/FundC5percent}%</td>
<td>£${e://Field/FundC5Value}$</td>
</tr>
<tr>
<td>D</td>
<td>${e://Field/FundD5percent}%</td>
<td>£${e://Field/FundD5Value}$</td>
</tr>
<tr>
<td>Cash</td>
<td>${e://Field/Cash5percent}%</td>
<td>£${e://Field/Cash5Value}$</td>
</tr>
</tbody>
</table>

Your total investments (including any cash) are now worth £$\{e://Field/TotalInvest5x\}$. You have an overall gain /loss of $\{e://Field/TotalInvest5x - 60000\}$ in Pounds, where a negative value (if it appears to be) denotes a loss.
Below are the price charts for the 4 funds from the start of period 1 to the end of period 5:

The current prices of Funds A, B, C, and D are £100.39, £106.32, £89.68, and £145.51, respectively.

You can sell investments you currently hold by using the sliders below to set the proportion of your investment in a fund you want to sell. You will then have an opportunity to re-invest the cash you have released.

Display This Choice:
If FundA5percent > 0
______ Fund A (1)

Display This Choice:
If FundB5percent > 0
______ Fund B (2)

Display This Choice:
If FundC5percent > 0
______ Fund C (3)

Display This Choice:
If FundD5percent > 0
______ Fund D (4)
Q59 Timing

First Click (1)
Last Click (2)
Page Submit (3)
Click Count (4)

End of Block: Period 6 sales

Start of Block: Period 6 purchases
You now have cash of £\$e{\text{round} (\text{Field/Cash5postsalesvalue}, 0)}\$ and the following investments: £\$e{\text{Field/FundA5postsalesvalue}}\$ in Fund A; £\$e{\text{Field/FundB5postsalesvalue}}\$ in Fund B; £\$e{\text{Field/FundC5postsalesvalue}}\$ in Fund C; and £\$e{\text{Field/FundD5postsalesvalue}}\$ in Fund D.

Below are the price charts for the 4 funds from the start of period 1 to the end of period 5: 

--- Fund A (1)
--- Fund B (2)
--- Fund C (3)
--- Fund D (4)
--- Cash (5)
Q61 Timing
First Click (1)
Last Click (2)
Page Submit (3)
Click Count (4)

End of Block: Period 6 purchases

Start of Block: Period 6 investment display

Display This Question:

If Timing [Page Submit] Is Empty

Q63
At the start of period 6, you have invested your total funds of £$\{e://Field/TotalInvest5x\}$ as follows:

<table>
<thead>
<tr>
<th>Fund</th>
<th>% of investments</th>
<th>Current value</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>${e://Field/FundA6percent}$%</td>
<td>£${e://Field/FundA6Value}$</td>
</tr>
<tr>
<td>B</td>
<td>${e://Field/FundB6percent}$%</td>
<td>£${e://Field/FundB6Value}$</td>
</tr>
<tr>
<td>C</td>
<td>${e://Field/FundC6percent}$%</td>
<td>£${e://Field/FundC6Value}$</td>
</tr>
<tr>
<td>D</td>
<td>${e://Field/FundD6percent}$%</td>
<td>£${e://Field/FundD6Value}$</td>
</tr>
<tr>
<td>Cash</td>
<td>${e://Field/Cash6percent}$%</td>
<td>£${e://Field/Cash6Value}$</td>
</tr>
</tbody>
</table>

On the next page, you will learn how the values of your investments have changed by the end of period 6.

End of Block: Period 6 investment display

Start of Block: Period 7 sales
The table below shows how your investments have performed over period 6:

<table>
<thead>
<tr>
<th>Fund</th>
<th>% of investments</th>
<th>Value at start of period 6</th>
<th>Current value</th>
<th>Gain / - loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>$e{\text{round(e://Field/FundA6percent, 1)}}%$</td>
<td>£${e://Field/FundA6Value}$</td>
<td>£${e://Field/FundA6Valuex}$</td>
<td>£$e{e://Field/FundA6Valuex - e://Field/FundA6Value}$</td>
</tr>
<tr>
<td>B</td>
<td>$e{\text{round(e://Field/FundB6percent, 1)}}%$</td>
<td>£${e://Field/FundB6Value}$</td>
<td>£${e://Field/FundB6Valuex}$</td>
<td>£$e{e://Field/FundB6Valuex - e://Field/FundB6Value}$</td>
</tr>
<tr>
<td>C</td>
<td>$e{\text{round(e://Field/FundC6percent, 1)}}%$</td>
<td>£${e://Field/FundC6Value}$</td>
<td>£${e://Field/FundC6Valuex}$</td>
<td>£$e{e://Field/FundC6Valuex - e://Field/FundC6Value}$</td>
</tr>
<tr>
<td>D</td>
<td>$e{\text{round(e://Field/FundD6percent, 1)}}%$</td>
<td>£${e://Field/FundD6Value}$</td>
<td>£${e://Field/FundD6Valuex}$</td>
<td>£$e{e://Field/FundD6Valuex - e://Field/FundD6Value}$</td>
</tr>
<tr>
<td>Cash</td>
<td>$e{\text{round(e://Field/Cash6percent, 1)}}%$</td>
<td>£${e://Field/Cash6Value}$</td>
<td>£${e://Field/Cash6Valuex}$</td>
<td>£$e{e://Field/Cash6Valuex - e://Field/Cash6Value}$</td>
</tr>
</tbody>
</table>

Your total investments (including any cash) are now worth £$e{e://Field/TotalInvest6x}$. You have an overall gain /loss of $e{e://Field/TotalInvest6x - 60000}$ in Pounds, where a negative value (if it appears to be) denotes a loss.

Below are the price charts for the 4 funds from the start of period 1 to the end of period 6:

The current prices of Funds A, B, C, and D are £101.30, £95.00, £81.00, and £156.06, respectively.

You can sell investments you currently hold by using the sliders below to set the proportion of your investment in a fund you want to sell. You will then have an opportunity to re-invest the cash you have released.

Display This Choice:

If FundA6percent > 0

______ Fund A (1)
Display This Choice:
    If FundB6percent > 0
    _______ Fund B (2)

Display This Choice:
    If FundC6percent > 0
    _______ Fund C (3)

Display This Choice:
    If FundD6percent > 0
    _______ Fund D (4)

Q65  Timing

First Click  (1)
Last Click  (2)
Page Submit  (3)
Click Count  (4)

End of Block: Period 7 sales

Start of Block: Period 7 purchases

Q66

You now have cash of £$e{round(e://Field/Cash6postsalesvalue , 0)} and the following
investments: £$e{e://Field/FundA6postsalesvalue} in Fund A; £$e{e://Field/FundB6postsalesvalue}
in Fund B; $e{e://Field/FundC6postsalesvalue} in Fund C; and £$e{e://Field/FundD6postsalesvalue}
in Fund D.
Below are the price charts for the 4 funds from the start of period 1 to the end of period 6:

The current prices of Funds A, B, C, and D are £101.30, £95.00, £81.00, and £156.06, respectively.

Please use the sliders below to show what percentage of your cash you will invest in each fund and what proportion (if any) you will leave as cash.

If you don't have cash to buy any fund because you have bought funds without selling them in the previous round, please pull the cash slider to the right end to continue.

_______ Fund A (1)
_______ Fund B (2)
_______ Fund C (3)
_______ Fund D (4)
_______ Cash (5)

Q67 Timing
First Click (1)
Last Click (2)
Page Submit (3)
Click Count (4)

End of Block: Period 7 purchases
At the start of period 7, you have invested your total funds of £$\{e://Field/TotalInvest6x\}$ as follows:

On the next page, you will learn how the values of your investments have changed by the end of period 7.

<table>
<thead>
<tr>
<th>Fund</th>
<th>% of investments</th>
<th>Current value</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>${e://Field/FundA7percent}$%</td>
<td>£${e://Field/FundA7Value}$</td>
</tr>
<tr>
<td>B</td>
<td>${e://Field/FundB7percent}$%</td>
<td>£${e://Field/FundB7Value}$</td>
</tr>
<tr>
<td>C</td>
<td>${e://Field/FundC7percent}$%</td>
<td>£${e://Field/FundC7Value}$</td>
</tr>
<tr>
<td>D</td>
<td>${e://Field/FundD7percent}$%</td>
<td>£${e://Field/FundD7Value}$</td>
</tr>
<tr>
<td>Cash</td>
<td>${e://Field/Cash7percent}$%</td>
<td>£${e://Field/Cash7Value}$</td>
</tr>
</tbody>
</table>
Q70

The table below shows how your investments have performed over period 7:

<table>
<thead>
<tr>
<th>Fund</th>
<th>% of investments</th>
<th>Value at start of period 7</th>
<th>Current value</th>
<th>Gain / - loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>$e{round(e://Field/FundA7percentx , 1)}%</td>
<td>$e://Field/FundA7Value</td>
<td>$e://Field/FundA7Valuex</td>
<td>$e{e://Field/FundA7Valuex - e://Field/FundA7Value}</td>
</tr>
<tr>
<td>B</td>
<td>$e{round(e://Field/FundB7percentx , 1)}%</td>
<td>$e://Field/FundB7Value</td>
<td>$e://Field/FundB7Valuex</td>
<td>$e{e://Field/FundB7Valuex - e://Field/FundB7Value}</td>
</tr>
<tr>
<td>C</td>
<td>$e{round(e://Field/FundC7percentx , 1)}%</td>
<td>$e://Field/FundC7Value</td>
<td>$e://Field/FundC7Valuex</td>
<td>$e{e://Field/FundC7Valuex - e://Field/FundC7Value}</td>
</tr>
<tr>
<td>D</td>
<td>$e{round(e://Field/FundD7percentx , 1)}%</td>
<td>$e://Field/FundD7Value</td>
<td>$e://Field/FundD7Valuex</td>
<td>$e{e://Field/FundD7Valuex - e://Field/FundD7Value}</td>
</tr>
<tr>
<td>Cash</td>
<td>$e{round(e://Field/Cash7percentx , 1)}%</td>
<td>$e://Field/Cash7Value</td>
<td>$e://Field/Cash7Valuex</td>
<td>$e{e://Field/Cash7Valuex - e://Field/Cash7Value}</td>
</tr>
</tbody>
</table>

Your total investments (including any cash) are now worth £${e://Field/TotalInvest7x}. You have an overall gain /loss of $e{e://Field/TotalInvest7x - 60000} in Pounds, where a negative value (if it appears to be) denotes a loss.

Below are the price charts for the 4 funds from the start of period 1 to the end of period 7:

![Performance of Fund A](image1)
![Performance of Fund B](image2)
![Performance of Fund C](image3)
![Performance of Fund D](image4)

The current prices of Funds A, B, C, and D are £109.00, £97.98, £79.16, and £158.43 respectively.

You can sell investments you currently hold by using the sliders below to set the proportion of your investment in a fund you want to sell. You will then have an opportunity to re-invest the cash you have released.

**Display This Choice:**

If FundA7percent > 0

_________ Fund A (1)
Display This Choice:
If FundB7percent > 0
_______ Fund B (2)

Display This Choice:
If FundC7percent > 0
_______ Fund C (3)

Display This Choice:
If FundD7percent > 0
_______ Fund D (4)

Q71 Timing
First Click (1)
Last Click (2)
Page Submit (3)
Click Count (4)

End of Block: Period 8 sales

Start of Block: Period 8 purchases
You now have cash of £\$\text{round(e://Field/Cash7postsalesvalue}, 0)\$ and the following investments: £\$e://Field/FundA7postsalesvalue\$ in Fund A; £\$e://Field/FundB7postsalesvalue\$ in Fund B; £\$e://Field/FundC7postsalesvalue\$ in Fund C; and £\$e://Field/FundD7postsalesvalue\$ in Fund D.

Below are the price charts for the 4 funds from the start of period 1 to the end of period 7:

The current prices of Funds A, B, C, and D are £109.00, £97.98, £79.16, and £158.43, respectively.

Please use the sliders below to show what percentage of your cash you will invest in each fund and what proportion (if any) you will leave as cash.

If you don't have cash to buy any fund because you have bought funds without selling them in the previous round, please pull the cash slider to the right end to continue.

_______ Fund A (1)
_______ Fund B (2)
_______ Fund C (3)
_______ Fund D (4)
_______ Cash (5)
Q73 Timing

First Click (1)
Last Click (2)
Page Submit (3)
Click Count (4)

End of Block: Period 8 purchases

Start of Block: Period 8 investment display

*Display This Question:*

*If Timing [ Page Submit ] Is Empty*

Q75

At the start of period 8 you have invested your total funds of £\(e://Field/TotalInvest7x\) as follows:

<table>
<thead>
<tr>
<th>Fund</th>
<th>% of investments</th>
<th>Current value</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>(e://Field/FundA8percent)%</td>
<td>£(e://Field/FundA8Value)</td>
</tr>
<tr>
<td>B</td>
<td>(e://Field/FundB8percent)%</td>
<td>£(e://Field/FundB8Value)</td>
</tr>
<tr>
<td>C</td>
<td>(e://Field/FundC8percent)%</td>
<td>£(e://Field/FundC8Value)</td>
</tr>
<tr>
<td>D</td>
<td>(e://Field/FundD8percent)%</td>
<td>£(e://Field/FundD8Value)</td>
</tr>
<tr>
<td>Cash</td>
<td>(e://Field/Cash8percent)%</td>
<td>£(e://Field/Cash8Value)</td>
</tr>
</tbody>
</table>

On the next page, you will learn how the values of your investments have changed by the end of period 8.

End of Block: Period 8 investment display

Start of Block: Period 9 sales
At the end of period 8, unit prices of Funds A, B, C, and D are £98.67, £96.51, £73.80, and £149.48, respectively.

Below are the price charts for the 4 funds from the start of period 1 to the end of period 8:

The table below shows how your investments have performed over period 8:

<table>
<thead>
<tr>
<th>Fund</th>
<th>% of investments</th>
<th>Value at start of period £</th>
<th>Current value £</th>
<th>Gain / - loss £</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>round(e://Field/FundB8percentx , 1)%</td>
<td>e://Field/FundB8Value</td>
<td>e://Field/FundB8Valuex</td>
<td>e://Field/FundB8Valuex - e://Field/FundB8Value</td>
</tr>
<tr>
<td>C</td>
<td>round(e://Field/FundC8percentx , 1)%</td>
<td>e://Field/FundC8Value</td>
<td>e://Field/FundC8Valuex</td>
<td>e://Field/FundC8Valuex - e://Field/FundC8Value</td>
</tr>
<tr>
<td>D</td>
<td>round(e://Field/FundD8percentx , 1)%</td>
<td>e://Field/FundD8Value</td>
<td>e://Field/FundD8Valuex</td>
<td>e://Field/FundD8Valuex - e://Field/FundD8Value</td>
</tr>
<tr>
<td>Cash</td>
<td>round(e://Field/Cash8percentx , 1)%</td>
<td>e://Field/Cash8Value</td>
<td>e://Field/Cash8Valuex</td>
<td>e://Field/Cash8Valuex - e://Field/Cash8Value</td>
</tr>
</tbody>
</table>

Your total investments (including any cash) are now worth £e://Field/TotalInvest8x. You have an overall gain /loss of £e://Field/TotalInvest8x - 60000 in Pounds, where a negative value (if it appears to be) denotes a loss.

You now have the final chance to sell any portions of the funds you hold by using the sliders below. Then you will assess the overall performance of the portfolio.
Q65 Timing

First Click (1)
Last Click (2)
Page Submit (3)
Click Count (4)

End of Block: Period 9 sales

Start of Block: Period 9 outcome
An evaluation of your investment performance

Below are the price charts for the 4 funds from the start of period 1 to the start of period 9:

Your total investments (including any cash) are now worth £$\text{Field/TotalInvest8x}$. As a final assessment, you have an overall gain /loss of $\text{Field/TotalInvest8x - 60000}$ in Pounds, where a negative value (if it appears to be) denotes a loss. The table below shows the composition of your current portfolio:

<table>
<thead>
<tr>
<th>Fund</th>
<th>% of investments</th>
<th>Current value</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>$\text{Field/FundApostsalesvalue / Field/TotalInvest8x , 1)}%$</td>
<td>$\text{Field/FundApostsalesvalue}$</td>
</tr>
<tr>
<td>B</td>
<td>$\text{Field/FundBpostsalesvalue / Field/TotalInvest8x , 1)}%$</td>
<td>$\text{Field/FundBpostsalesvalue}$</td>
</tr>
<tr>
<td>C</td>
<td>$\text{Field/FundCpostsalesvalue / Field/TotalInvest8x , 1)}%$</td>
<td>$\text{Field/FundCpostsalesvalue}$</td>
</tr>
<tr>
<td>D</td>
<td>$\text{Field/FundDpostsalesvalue / Field/TotalInvest8x , 1)}%$</td>
<td>$\text{Field/FundDpostsalesvalue}$</td>
</tr>
<tr>
<td>Cash</td>
<td>$\text{Field/Cashpostsalesvalue / Field/TotalInvest8x , 1)}%$</td>
<td>$\text{Field/Cashpostsalesvalue}$</td>
</tr>
</tbody>
</table>
Q78

Please select a point from each of the two rows for positive emotion and negative emotion you feel now:

<table>
<thead>
<tr>
<th>Levels of emotion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Not at all (1)</td>
</tr>
<tr>
<td>Slightly (2)</td>
</tr>
<tr>
<td>Moderately (3)</td>
</tr>
<tr>
<td>Quite a bit (4)</td>
</tr>
<tr>
<td>Very much (5)</td>
</tr>
</tbody>
</table>

Positive emotion (1)

Negative emotion (2)

---

Q79  Timing

First Click (1)
Last Click (2)
Page Submit (3)
Click Count (4)

End of Block: Period 9 outcome

Start of Block: Risk attitudes

Q89

When reviewing the performance of the funds at the end of each period, you used an amount as a reference to arrive at the potential gain or loss of a fund you wanted to buy in the current round.

Please select from the following which amount you used:

- £100 (1)
- The purchase price (2)
- The price at the previous round (3)
- The current price (5)
- None of the above (4)
Q90

In just one phrase, how would you describe the amount you used as the reference to arrive at the potential gain or loss when you wanted to buy a fund:

________________________________________________________________

Q91 Timing

First Click (1)
Last Click (2)
Page Submit (3)
Click Count (4)

Q92

When reviewing the performance of the funds at the end of each period, you used an amount as a reference to arrive at the potential gain or loss of a fund you wanted to sell for the current round. Please select from the following which amount you used:

- £100 (1)
- The purchase price (2)
- The price at the previous round (3)
- The current price (5)
- None of the above (4)
Q93
In just one phrase, how would you describe the amount you used as the reference to arrive at the potential gain or loss when you wanted to sell a fund:

Q94 Timing
First Click (1)
Last Click (2)
Page Submit (3)
Click Count (4)

Q95
You kept holding a fund when its current value was lower than that in the previous period because you wanted to avoid the regret that the price of this fund would rise later.

- Strongly disagree (1)
- Somewhat disagree (2)
- Neither agree nor disagree (3)
- Somewhat agree (4)
- Strongly agree (5)
Q96
You sold a fund when its current value was higher than that in the previous period because you wanted to avoid the regret that the price of this fund would fall later.

- Strongly disagree (1)
- Somewhat disagree (2)
- Neither agree nor disagree (3)
- Somewhat agree (4)
- Strongly agree (5)

Q97
You felt that you were responsible for the gain or loss when you were making trading decisions for the investment portfolio.

- Strongly disagree (1)
- Somewhat disagree (2)
- Neither agree nor disagree (3)
- Somewhat agree (4)
- Strongly agree (5)

Display This Question:
If You felt that you were responsible for the gain or loss when you were making trading decisions for... = Strongly disagree
Or You felt that you were responsible for the gain or loss when you were making trading decisions for... = Somewhat disagree
And After attending an investment seminar, you opened an investment account in order to maximise inve... Is Displayed
Q98
In just one phrase, explain why you felt that you were not responsible for the gain or loss of your trading decisions:

________________________________________________________________

Display This Question:
If You felt that you were responsible for the gain or loss when you were making trading decisions for...
= Strongly agree
Or You felt that you were responsible for the gain or loss when you were making trading decisions for...
= Somewhat agree
And Imagine that you are a financial advisor who invests money on behalf of a large number of differe...
Is Displayed

Q99
In just one phrase, explain why you felt that you were responsible for the gain or loss of your trading decisions:

________________________________________________________________

Display This Question:
If After attending an investment seminar, you opened an investment account in order to maximise inve...
Is Displayed

Q103
Having had a loss in some of the funds in the portfolio, you wanted to sell gain in other funds (if any) in order to comfort the loss.

○ Strongly disagree (1)

○ Somewhat disagree (2)

○ Neither agree nor disagree (3)

○ Somewhat agree (4)

○ Strongly agree (5)
Q104
As a financial advisor, you wanted to sell gain in funds (if any) after you had a loss from other funds in the portfolio, in order to comfort the loss for your client.

○ Strongly disagree (1)
○ Somewhat disagree (2)
○ Neither agree nor disagree (3)
○ Somewhat agree (4)
○ Strongly agree (5)

Q105
Having had a gain in the portfolio, you wanted to take more risk than if you had a loss.

○ Strongly disagree (1)
○ Somewhat disagree (2)
○ Neither agree nor disagree (3)
○ Somewhat agree (4)
○ Strongly agree (5)
Q106
Having had a loss in the portfolio, you wanted to take more risk than if you had a gain.

- Strongly disagree (1)
- Somewhat disagree (2)
- Neither agree nor disagree (3)
- Somewhat agree (4)
- Strongly agree (5)

Display This Question:
If Having had a gain in the portfolio, you wanted to take more risk than if you had a loss. = Strongly agree
Or Having had a gain in the portfolio, you wanted to take more risk than if you had a loss. = Somewhat agree
And Having had a loss in the portfolio, you wanted to take more risk than if you had a gain. = Strongly agree
Or Having had a loss in the portfolio, you wanted to take more risk than if you had a gain. = Somewhat agree

Q107
In one phrase, explain why you wanted to take more risk when you had either a gain or a loss:

_________________________________________________________________________________

_________________________________________________________________________________
Q108

The answer to this question must contain fourteen – you will exit the survey if you choose otherwise.

- There are eleven players in a team (1)
- There are twelve players in a team (2)
- There are thirteen players in a team (3)
- There are fourteen players in a team (4)
- There are fifteen players in a team (5)

Skip To: End of Block If The answer to this question must contain fourteen- you will exit the survey if you choose otherwise. ! There are fourteen players in a team

End of Block: Risk attitudes

Start of Block: Psychometrics

Q109

From now onward, you will be asked questions about your feelings or thinking about lived experiences in general.

You pay attention to physical experiences, such as the wind in your hair or the sun on your face.

- Almost never (1)
- Infrequently (2)
- About half of the time (3)
- Frequently (4)
- Almost always (5)
Q110
You notice visual elements in art or nature, such as colours, shapes, textures, or patterns of light and shadow.

- Almost never (1)
- Infrequently (2)
- About half of the time (3)
- Frequently (4)
- Almost always (5)

Q111
You are good at finding the words to describe your feelings.

- Almost never (1)
- Infrequently (2)
- About half of the time (3)
- Frequently (4)
- Almost always (5)
Q112
It’s hard for you to find the words to describe what you’re thinking.

- Almost never (1)
- Infrequently (2)
- About half of the time (3)
- Frequently (4)
- Almost always (5)

Q113
You do jobs or tasks automatically without being aware of what you’re doing.

- Almost never (1)
- Infrequently (2)
- About half of the time (3)
- Frequently (4)
- Almost always (5)

Q114
You find yourself doing things without paying attention.

- Almost never (1)
- Infrequently (2)
- About half of the time (3)
- Frequently (4)
- Almost always (5)
Q115
You tell yourself you shouldn’t be thinking the way you’re thinking.

- Almost never (1)
- Infrequently (2)
- About half of the time (3)
- Frequently (4)
- Almost always (5)

Q116
You think some of your emotions are bad or inappropriate, and you shouldn’t feel them.

- Almost never (1)
- Infrequently (2)
- About half of the time (3)
- Frequently (4)
- Almost always (5)

Q117
When you have distressing thoughts or images, you don’t let yourself be carried away by them.

- Strongly disagree (1)
- Somewhat disagree (2)
- Neither agree nor disagree (3)
- Somewhat agree (4)
- Strongly agree (5)
Q118
When you have distressing thoughts or images, you just notice them and let them go.

- Strongly disagree (1)
- Somewhat disagree (2)
- Neither agree nor disagree (3)
- Somewhat agree (4)
- Strongly agree (5)

Q119
Generally speaking, you think you can learn something from the situation you have experienced.

- Almost never (1)
- Infrequently (2)
- About half of the time (3)
- Frequently (4)
- Almost always (5)

Q120
You think that you can become a stronger person as a result of what has happened.

- Almost never (1)
- Infrequently (2)
- About half of the time (3)
- Frequently (4)
- Almost always (5)
Q121
You think that the situation you have experienced also has its positive sides.

- Almost never (1)
- Infrequently (2)
- About half of the time (3)
- Frequently (4)
- Almost always (5)

Q122
In general, you look for the positive sides to the situation you have experienced.

- Almost never (1)
- Infrequently (2)
- About half of the time (3)
- Frequently (4)
- Almost always (5)

Q123
You think that what you have experienced is the worst that can happen to a person.

- Almost never (1)
- Infrequently (2)
- About half of the time (3)
- Frequently (4)
- Almost always (5)
Q124
You keep thinking about how terrible it is what you have experienced.

- Almost never (1)
- Infrequently (2)
- About half of the time (3)
- Frequently (4)
- Almost always (5)

Q125
You continually think how horrible the situation has been.

- Almost never (1)
- Infrequently (2)
- About half of the time (3)
- Frequently (4)
- Almost always (5)

Q126
You think that what you have experienced is much worse than what others have experienced.

- Almost never (1)
- Infrequently (2)
- About half of the time (3)
- Frequently (4)
- Almost always (5)
Q131
You have high self-esteem.

- Strongly disagree (1)
- Somewhat disagree (2)
- Neither agree nor disagree (3)
- Somewhat agree (4)
- Strongly agree (5)

Q132
How old are you?

- 20-29 years (1)
- 30-39 years (2)
- 40-49 years (3)
- 50-59 years (4)
- 60 and over (5)

Q133
What best describes your qualification or discipline of study?

- Neither business nor finance-related (1)
- Business related but not finance-related (2)
- Finance related (3)
Q134
Which of the following best describes your experience in buying and selling financial investments?

- Have no experience at all (1)
- Have had less than three years' experience but poor investment returns (2)
- Have had three or more years' experience but poor returns overall (3)
- Have had less than three years' experience and satisfactory investment returns (4)
- Have had three or more years' experience and satisfactory returns overall (5)
- Have solely relied on financial advisors to handle investments (6)

Q135
What was your personal income last year?

- £0-14,999 (1)
- £15,000-29,999 (2)
- £30,000-59,999 (3)
- £60,000+ (4)
- Don't know (5)
Q136
How long have you ever practised mindfulness meditation regularly?

- Never or had practised but soon discontinued (1)
- Less than three months (2)
- Three months but less than a year (3)
- A year but less than three years (4)
- Three years or more (5)

Congratulations! You have gone through the whole survey.

Please be advised that this survey is set up in this manner in order to study the role of emotion regulation in connection with correcting some decision biases in investment.

As advised at the beginning of the survey, you may withdraw from this survey at any point, and withdrawal is possible even after you have submitted your data. Any request for data withdrawal should be made within one month from the date of submission of the survey. Please make a copy of the following email address so that in the unlikely event that you wish to withdraw from participation in the study, you write to me quoting the IP address of the computer equipment you have used to carry out the survey as reference:

ernest.wong@open.ac.uk

Now, if you are happy with your answers please click the forward arrow to submit, otherwise just screen out.

End of Block: Psychometrics