Feedback, Framing, Personality and Risk Attitude

- Experiments on Factors Affecting Financial Optimism

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Abstract

This paper explores whether and how feedback, framing, personality, and risk attitude could affect financial optimism in an enclosed experimental environment. Evidence in this paper shows that feedback on investment performance affects financial optimism depending on whether people forecast returns in absolute values or in relative terms. Financial optimism is increased upon receiving negative feedback when participants forecast in absolute values, while receiving negative feedback reduces financial optimism when participants forecast in relative terms on portfolio return. We find framing of the experiments affects one's financial optimism level directly and forecasting in absolute terms is more likely to result in optimistic expectations. We also find financial optimism correlates with certain personality traits, such as extraversion, modesty and altruism. Financial optimism is also strongly positively associated with an attitude for risk tolerance.

Keywords: Financial optimism; Individual portfolio choice; Psychology and financial decision making; Asset allocation; Forecasting

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1. Introduction

Previous literature shows that both motivational and cognitive reasons affect optimism (Coelho, 2010). Motivational explanation for optimism implies people intentionally distort information in order to serve a given purpose (Coelho, 2010). Factors such as who made the forecast and the motivation of the forecasters are likely to affect the optimism level in forecasting. Research has found optimistic bias widely exists among financial analysts, professional forecasters, and normal individual investors when they make investment decisions or forecast future returns (Heaton J. B., 2002; Hackbarth, 2007; Barberis, Shleifer, & Vishny, 1998; Kacperczyk & Kominek, 2002; Butler & Lang, 1991; Batchelor, 2007).

Although there is much research which shows that optimism has its motivational roots and individuals can behave tough when encountered with difficulties and maintain positive images of themselves (Gollier, 2005; Weinstein & Lyon, 1999; Bénabou & Tirole, 2002), cognitive biases have effects on optimistic bias and cognitive explanations suggest people should be considered innocent victims of their thought processes (Hoorens, 1993; Coelho, 2010). Research find non-motivational reasons, such as the sense of power and illusion of control can also play an important role in making people optimistic (Klar, Medding, & Sarel, 1996; Chambers, Windschitl, & Suls, 2003; Anderson & Galinsky, 2006).

Other factors, such as feedback (Carroll, Sweeny, & Shepperd, 2006), framing (Lauver & Rubin, 1990), certain personality traits (Eroglu & Croxton, 2010), and risk tolerance (Puri & Robinson, 2007) are found to have influences on optimism. However, questions still remain on whether and how these factors affect financial optimism in particular.

By using an experimental approach, this paper explores the effect of a number of factors of

interest on financial optimism. We will try to answer questions such as "Can optimism be reinforced or reduced by historical investment performance or is it constant over time?", "Does financial optimism correlate with personality traits?", or "Is financial optimism in fact risk-taking?". The layout of this chapter is as follows.

We found evidence that feedback on previous portfolio returns affect financial optimism in different ways depending on whether people forecast returns in absolute values or in relative terms. When forecasting in absolute values, participants increase optimism when they receive negative feedback. When forecasting portfolio returns in relative terms, receiving negative feedback reduces financial optimism. Framing of the experiments has affected participants' financial optimism. We found that financial optimism is related to personality traits, such as extraversion, modesty and altruism. Financial optimism is also positively correlated with attitude on risk tolerance and risk-taking behaviour in financial decisions.

An important contribution to the existing literature is our domain specific definition for optimism. We find an individual investor's optimism level by asking them to make a number of investment decisions and forecasts, and comparing these domain specific financial measures. We used quantitative financial figures from the individual's historical investment performance and investment forecast data.

We do not measure financial optimism using potentially biased self-reported data such as asking questions to collect self-reported scoring of optimism as reported in previous experimental studies (Weinstein, 1980; Anderson & Galinsky, 2006). By conducting this research in the format of a controlled experimental environment, we were able to minimise the affect of extraneous factors on an investor's optimism of their investment performance. For example, we avoided the situation that measures of optimism can generate a signal even if the forecast is rational due to subjects' private information not revealed in surveys.

We believe findings in this chapter fill gaps in the literature on optimism studies. Previous literature studied determinants including anticipating feedback on general optimism, but there was little research on how financial optimism changes after receiving feedback. Comparing two forecasting scenarios on expectations within the same experiment design is rare (Glaser, Weber, Langer, & Reynders, 2007), and the study in this chapter is the first to look into how framing influences financial optimism. The effect of detailed personality facets on financial optimism also has never been researched before, and whether an attitude on risk tolerance in an investment decision is correlated with optimism in the same financial decision making domain was unclear.

2. Literature Review

The belief that we are better than average commonly exists among individuals and this leads to optimism over one's own ability of achieving desirable results or avoiding unfavourable events. Research found that optimism is not consistent over the time but can be enhanced or reduced via new activities or upon the arrival of new information (Korhonen, Mano, Stenfors, & Wallenius, 2008; Carroll, Sweeny, & Shepperd, 2006).

Research found that optimism is a "thinking style" that can be reinforced or suppressed through cognitive activities (Seligman, 1991; Korhonen, Mano, Stenfors, & Wallenius, 2008). Optimism driven by self-efficacy can be enhanced through processes on logical thinking based on available facts. In the stock market, previous capital gains encourage risk-taking behaviour while previous losses increase risk aversion through intensifying the fear of having further losses (Barberis, Huang, & Santos, 2001). The level of optimism can be manipulated in an experimental environment, an induced optimistic (pessimistic) outlook is likely to lead the decision maker to be more optimistic (pessimistic) and aim at higher (lower) levels of future achievement (Korhonen, Mano, Stenfors, & Wallenius, 2008). In the paper subjects' decision quality was observed in terms of allocating their resources (time) to a number of activities in computerised "biased" scenarios. In order to test the influence of induced optimism (pessimism) on the subsequent performance in decision making processes, Korhonen, et al (2008) provided some decision makers with a positive basis for their future choices and others a more pessimistic outlook for their choices. They found optimism leads to choices of higher levels of success and pessimism to lower levels. Optimistic models also significantly improved the decision makers' emotional states and their attitudes towards the decision model. However, Korhonen, et al's (2008) research is based on an artificially generated optimistic (pessimistic) outlook, therefore they do not study the effect on future decision making processes that is

caused by the reported success or failure of the subject's own historical decisions.

Some studies have focused on only a loss situation. Etchart-Vincent (2009) studied the sensitivity of probabilistic optimism to the payoff structure of a gambling situation in the loss domain. The study introduced three types of gambles: two homogeneous gambles (involving either small or large losses), and heterogeneous gambles involving both large and small losses. Etchart-Vincent (2009) found that compared to small-loss gambles, large-loss gambles can enhance probabilistic optimism while gambles offering both small losses and large losses seem to increase pessimism.

The above literature discussed the reasons that cause optimistic bias, but the story of optimism has yet another side. Recent research has studied why optimism declines when subjects anticipate self relevant feedback (Carroll, Sweeny, & Shepperd, 2006). Overly optimistic predictions can incur unfavourable effects on the pleasure of outcomes (McGraw, Mellers, & Ritov, 2004). They observed that an overwhelming majority of basketball players were overly optimistic reflected by their overconfident predictions of performance. They found optimistic beliefs can have negative effects on the pleasure of outcomes in a task of physical skill. For most players, accurate self assessments make the task more enjoyable. De-biased players also experience a reduction in displeasure caused by failures compared to overconfident players as they were better calibrated to the likelihood of success. McGraw et al's (2004) research is consistent with previous studies suggesting lowering one's expectations would decrease disappointment and minimize regret (Shepperd, Ouellette, & Fernandez, 1996; van Dijk, Zeelenberg, & van der Pligt, 2003; Kopalle & Lehman, 2000). Van Dijk et al (2003) also found that people may use lowering their expectation as a strategy to avoid future disappointments when self-relevant feedback about the outcome is anticipated in the immediate future.

People show a sharp decline in optimism when they anticipate self-relevant feedback in the near

future (Carroll, Sweeny, & Shepperd, 2006). Carroll et al (2006) suggested that there are mainly two categories of explanations for a shift in subjects' prediction downwards. The first category explains the reduction in optimism as a response to new information. This shift represents an intention to adjust predictions in the direction of greater accuracy. Reconsidering existing data, the arrival of new data, and the predictor's current mood can be sources of information for the prediction shift. The second category explains the decline in optimism to brace oneself for unfavourable outcomes. People adjust their predictions to avoid disappointment, to manage how they feel about the negative outcomes and to protect themselves against the psychological impact of an undesired outcome. Kirkebøen and Teigen (2010) argue that regret experienced in the pre-outcome period has an important function that post-outcome regret does not have. Pre-outcome regret can also motivate the decision maker to reconsider the ongoing decision process and reverse the initial prediction. In our experiment, we hope to quantify previous losses and gains and observe how feedback affects the level of optimism and decision making processes.

Positive or negative psychological affects might be a channel through which past experience on losses and gains could affect optimism. Nygren et al (1996) tested the influences of positive affect on thinking and decision making. They induced positive affect in their experiments by providing a gift (a bag of candy in their study) to participants and found that optimism among participants with positive affect significantly enhanced their estimates of the probabilities of winning relative to losing. However, such enhancement in estimation did not lead to subject actions, therefore such optimism led by positive affect does not seem to be dangerous in their study. Nygren et al (1996) suggest that the reason that positive affect can lead to "cautious optimism" may be two fold. When individuals are in positive mood, judgments are framed strictly on probability estimates and not actual choices. Positive mood is likely to lead to thoughts about positive material in memory (Isen, Shalker, Clark, & Karp, 1978). However, when it comes to choices, such bias in probability estimation might not be the determining

factor. Perceived negative value or utility of losses induces conservation and self-protection in choice situations (Isen & Patrick, 1983). The anticipated impact related to a real loss is greater for someone in a positive mood than in a neutral state as people who are feeling happy are more motivated to maintain their current felicity and avoid potential losses (Isen & Simmonds, 1978; Mischel, Ebbesen, & Zeiss, 1976).

Most of the above literature focused on the effect of anticipating feedback on the performance of an expectation or forecast. There are a number of studies on the interplays between feedback and behaviour after feedback is received, and most of these studies focus on how feedback could influence overconfidence[1]. The majority of research on probability judgment found that people's judgments tend to be overconfident and recent studies found that such phenomenon is resistant to the attempts at reducing overconfidence by providing feedback (Bolger & Onkal-Atay, 2004). Whether feedback works on changing confidence levels depends on a number of factors such as the difficulty of the tasks, differences among individuals or the types of feedback provided (Pulford & Colma, 1997; Eberlein, Ludwig, & Nafziger, 2010; Onkal & Muradoglu, 1995).

Pulford and Colma (1997) found evidence that feedback could improve calibration only when questions are constantly hard in their experiment. Such feedback may not be necessarily from the experimenter but could come from participants' own evaluation of how well they performed in the task. Social pressure might play an important role in reducing overconfidence upon feedback when the questions are hard. People lower their overconfidence during hard tasks to save face in case of failure. However, social pressure does not seem to increase confidence when tasks are easy for under-confident individuals, because it may be a way of boosting

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[1] Overconfidence indicates an interval for belief while optimism/pessimism is the direction of such belief. For example, an individual can be overconfidently pessimistic about certain events.

self-esteem in case of success if low confidence is expressed beforehand.

Feedback affects overconfidence in the decision-making of some individuals but not on all (Eberlein, Ludwig, & Nafziger, 2010). Some individuals take an advantage of feedback and improve their decision making process while others ignore feedback. Besides, some subjects appear to be confused by feedback and mistakes in decision-making can even be caused by the overreaction to feedback. Overall, overconfidence does not vanish completely over time. Contrary to Eberlein et al (2010), Bolger and Onkal-Atay (2004) found that forecasters learnt to evaluate information better and the initial overconfident forecasts were improved significantly after feedback.

Research also shows various types of feedback have different level of effectiveness on forecasting accuracy. Three types of feedback were given to subjects in Onkal and Muradoglu's (1995) experiment: (a) simple outcome feedback, (b) outcome feedback presented in the task format and (c) performance feedback in the form of an overall accuracy score in addition to detailed calibration information. They found that while all feedback groups improve calibration, only task-formatted outcome feedback and performance feedback improve forecasters' skill. Stone and Open (2000) provided subjects with either performance feedback (provides information about the accuracy of one's judgments) or environmental feedback (provides information about the task to be predicted) and they found that performance feedback reduces participants' overconfidence while environment feedback led to an increase in overconfidence.

There is very little research regarding how receiving feedback would affect optimism. When it comes to decision-making, people tend to fall into two biases (Dunning, Heath, & Suls, 2004). One is that the predictions they make are likely to be too optimistic and the other bias is that the confidence they place in the optimistic or pessimistic predictions is too high and the accuracy of

the forecasts is low. The neglect of the lessons of past experience is one of the main reasons contributing to such effects. People ignore previous experience because they often only consider the unique features of the current task, and focus on their abilities and resources to solve future problems but forget their own or other people's past experience of similar situations (Kahneman & Lovallo, 1993; Buehler, Griffin, & Ross, 2002; Dunning, Heath, & Suls, 2004).

In the domain of physical health, exposure to negative life events can reduce optimism about similar events that might take place in the future (Dunning, Heath, & Suls, 2004). When given computer-generated personalised risk feedback about getting certain diseases or encountering accidents, patients' optimism or pessimism levels on some diseases and accidents change upon receiving such feedback (Kreuter & Strecher, 1995). However, the effectiveness of feedback is inconsistent across events as individualised risk feedback did not alter patients' perception of their heart attack and motor vehicle crash risks.

The majority of research on feedback and optimism focus on the stage of before feedback is given, in other words, how anticipating feedback could affect optimism. As for the stage after feedback is received, the effect of receiving feedback on confidence in forecasting has been investigated in a number of studies. However, there is little literature on how receiving feedback could shift optimism levels. Compared to most of previous research which ask participants to make forecasts after being given a single piece of feedback such as Kreuter and Strecher (1995), our research studies feedback and financial optimism using experiments with several stages, and feedback about previous decision making performance is reported to subjects provide at each stage. This enabled us to conduct a detailed study of the iterative interplay between feedback and optimism. By giving individual more frequent feedback based on their historical performances we believe I've created a controlled experiment which is more similar to the situations where investors make financial decisions in reality. We also focus on domain specific financial optimism in our research instead of indicators of general optimism or optimism in

health.

Optimism could also have interactive effects with the framing of information (Lauver & Rubin, 1990). Positive and negative framed scenarios might induce different reactions from optimists and pessimists (Bier & Connell, 1994). Framing affects decision making and shifts preference when the same problem is framed in different ways (Tversky & Kahneman, 1981). According to Tversky and Kaheneman (1981), the dependence of preferences on how the decision problems are formulated is a concern for the theory of rational choice. Reversals of preference are found in choices of monetary outcomes and in questions regarding the loss of human lives although the preference reversals or other errors of choice are not necessarily irrational. They propose that the phenomena in decision making due to framing effects can be explained by prospect theory which based on the assumption that people weight losses more than equivalent gains. However, framing effects greatly diminish and even disappear when participants have access to credible advice on how to make decisions (Druckman, 2001).

Tversky and Kahneman (1981) use the term decision frame in a relatively broad sense and the frame is controlled partly by the formulation of the problem and partly by decision makers' characteristics (Kuhberger, 1998). The strict definition of framing relates to how the same problem is differently described, while the loose definition of the term refers to an event that can be induced from other contextual features of a problem and from individual characteristics (Kuhberger, 1998).

The existence of framing effects has been evidenced in medical and clinical decisions, perceptual judgments, consumer decisions, responses to social issues, etc (Levin, Schneider, & Gaeth, 1998). Schmitz and Ziebarth (2011) found that framing of price differences between health plans has a substantial impact on price competition and price sensitivity in the health insurance market. Various other studies also show price framing affects consumer decision

making and the perceived value of goods (Bertini & Wathieu, 2006; Chetty, Looney, & Kroft, 2009; Wallace & Huck, 2010).

In particular, studies show that giving statistics to participants in absolute or relative terms has an influence on subjects' choices. When patients faced with choosing between two treatments, the majority choose the treatment framed as a relative benefit rather than the one expressed as an absolute benefit. This result holds even when adequate information on the underlying risk of death was provided so that the relative benefit could be converted to absolute benefit (Malenka, Baron, Johansen, Wahrenberger, & Ross, 1993). According to Malenka et al (1993), their findings might be due to "pseudocertainty" effect which can occur when a decision requires conditional evaluation (Tversky & Kahneman, 1986). In Malenka et al's (1993) study, the benefit of the medication presented in relative terms is conditional on the underlying risk of dying and the underlying risk of death was eliminated from consideration, therefore the sense of certainty of making the choices is illusive. When making the decision, patients might simply compare the relative benefit with the absolute benefit.

Similar framing effects on decision-making are also found in research regarding consumer choices. Hastings and Tejeda-Ashton (2008) demonstrated expressing fees in pesos instead of annual percentage rates leads to more awareness of fees and choices of investment funds with lower average fees among the financially illiterate. By using individual-level panel data, Schmitz and Ziebarth (2011) find reforms by German federal regulation, requiring health insurance companies to express price differences between health plans in absolute values rather than percentage point payroll tax differences, led to a six-fold increase in individuals switching probability and a three-fold demand elasticity increase.

In studies analysing return and volatility expectation of financial markets, the majority of research found that there is a framing effect when investors form expectations (Glaser, Weber,

Langer, & Reynders, 2007). Some studies asking for future price levels find mean reverting expectations (De Bondt, 1991; O'Connor, Remus, & Griggs, 1997; Siebenmorgen & Weber, 2004), while other studies that ask for percentage return forecast find trend continuation (Shiller, 2000; Graham & Harvey, 2003). However, these studies do not ask the subjects to forecast future price levels and returns within the same experiment design to study the effect of how the questions were asked on expectations (Glaser, Weber, Langer, & Reynders, 2007). Glaser et al (2007) ask half of their subjects to make future forecasts in price levels and the other half to forecast in returns. They found return forecasts are significantly higher than price level forecasts in upward sloping time-series, but in down ward sloping time-series, return forecasts are significantly lower than price forecasts.

Existing literature showed framing of a problem or information affects decision making and the formation of expectation in various social domains. Therefore, we suspect by framing experiment situations differently, for example by asking subjects to forecast price levels versus forecast return percentages, subjects' optimism level would be different. To our knowledge, our research is the first study attempting to investigate how this type of framing affects financial optimism.

We learnt from the literature that optimism is not constant throughout the time and can be reinforced by environmental factors. However, the relationship between financial optimism and personality traits is still ambiguous. Eroglu and Croxton (2010) found some personality traits are related to optimism in forecasting. Personality is a set of traits that drive people's behaviour and is consistent across situations and time periods (Levy, Cober, & Norris-Watts, 2004). In Eroglu and Croxton (2010), they measure personality with the Big-Five Model which is the most widely accepted model of personality (Judge & Ilies, 2002). The Big-Five Model includes

five broad domains of personality and these five factors are conscientiousness, neuroticism, extraversion, agreeableness and openness to experience[1] (Goldberg, 1993). Eroglu and Croxton (2010) found personality traits are associated with optimistic bias in adjusting forecasts. Agreeableness decreases optimistic bias while openness to experience increases it. Other personality traits, such as extraversion and conscientiousness, do not significantly impact on optimism bias.

Personality can impact on people's judgment and decision-making behaviour through information processing cognitive style, and affect mood-states (Eroglu & Croxton, 2010). Two distinct information processing styles are presented when individuals make decisions (Epstein, 1994). One processing system is more rational, controlled and conscious, and is more likely to be used by individuals who are more conscientious, open to experience and emotionally stable (an absence of neuroticism) when making decisions. The other system is more experiential, intuitive and emotional, and tends to be preferred by individuals who are more subject to cognitive biases (Handley, Newstead, & Wright, 2000; Eroglu & Croxton, 2010). From a perspective of mood status, extraversion is related to positive affect while neuroticism is associated with negative affect. According to Bower (1981; 1991), positive (negative) moods produce more positive (negative) judgments.

Besides personalities, Eroglu and Croxton (2010) also found other individual differences such as age, gender, and education do not contribute significantly to effect forecasters' judgmental adjustments. However, prior experience of the current position and challenge seeking encourage forecasters to make judgmental adjustments. Greater variability in statistical forecast errors

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[1] The representative characteristics and the Big-five personality factors (Eroglu & Croxton, 2010): *Conscientiousness* is associated with being dependable, orderly, organized, responsible, practical, thorough, hardworking and thrifty; *Neuroticism* is related to being depressed, tense, nervous, angry, unstable, discontented, emotional, envious, worried and uneasy; *Extraversion* is represented by characteristics like being sociable, outgoing, energetic, talkative, bold, assertive, adventurous and gregarious; *Openness to experience* is connected with being creative, imaginative, inventive, intelligent, analytical, reflective, curious and sophisticated; *Agreeableness* is linked to being courteous, polite, trusting, nice, kind, gentle and pleasant.

decreases the level of optimism while age increases it. In our study, we hope to identify whether personality traits and demographics are contributing factors of financial optimism, or whether the level of financial optimism transforms over time and is more associated with other changing factors, such as feedback about historical performance.

In this paper, we will investigate whether personality has any correlations with optimism in the financial decision making domain. This has never been studied before. We also use the five big factors of the personality traits together with the thirty facets that compute the five big factors to examine whether financial optimism is affected by personality traits.

3. Research Hypotheses

Literature shows that optimism is not completely innate, so the question is raised on what and how external factors could alter one's financial optimism bias. Research showed anticipating feedback reduces optimism (Carroll, Sweeny, & Shepperd, 2006; Kirkebøen & Teigen, 2010), and feedback affects forecasting confidence for some individuals (Eberlein, Ludwig, & Nafziger, 2010). However, there is little research on how optimism is changed after receiving feedback. We suspect that once feedback is received, individuals will shift their optimism bias. Hypothesis 1 deals with whether subjects' financial optimism levels are correlated with feedback of the immediate historical performance of the subjects' investment.

Hypothesis 1: Feedback of the result of past investment decisions changes one's financial optimism.

If feedback does shift optimism levels, then what is the direction of such shift? In other words, whether positive feedback always leads to increased optimism and negative feedback reduces optimism. Our intuition is that the direction of change in optimism is somehow uncertain. It might depend on how information or feedback itself is presented in the experiment. Previously published literature showed framing of information or situations affects decision making, especially economic decision making (Tversky & Kahneman, 1981; Malenka, Baron, Johansen, Wahrenberger, & Ross, 1993; Schmitz & Ziebarth, 2011; Glaser, Weber, Langer, & Reynders, 2007). In particular, whether numerical information is given to participants in absolute or relative terms has different impacts on people's choices (Malenka, Baron, Johansen, Wahrenberger, & Ross, 1993). There is no existing research on whether financial optimism is affected by alternatively framed forecasting scenarios. So Hypothesis 2 is proposed as follows.

Hypothesis 2:   Framing of forecasting scenarios affects an investor's financial optimism.

Personality traits have been found to relate to general optimism in forecasting (Eroglu & Croxton, 2010), but no previous research has studied whether financial optimism is associated with certain personality traits as well. Hypothesis 3 investigates whether such individual differences in personality correlate with financial optimism.

Hypothesis 3: Financial optimism is correlated with certain personality traits.

We study optimism within the financial decision making domain, therefore it would be interesting to further investigate this issue. We suspect financial optimism cannot be replaced or explained by risk attitude towards investment, but the correlations might be stronger than Puri & Robinson (2007) found. We use a questionnaire to measure individuals' attitude on risk tolerance in this paper. Hypothesis 4 investigates the relationship of risk tolerance with financial optimism.

Hypothesis 4: Optimism is positively associated with risk tolerance.

4. Data and Methodology

The experiment contains three parts: the participants are required to fill up a questionnaire on general demographics, and then they need to take part in an eight step portfolio allocation task, followed by a 120 item personality test.

In the experiments, participants are asked to fill out a questionnaire which collects information on their demographics, including their risk attitude on investment. Demographic questions include asking participants of their age, gender, degree information, country which they feel belong the most, wealth level, expectation on future income and wealth, risk tolerance, finance literacy.

In our experiments, subjects are asked to make a number of decisions on investment allocation tasks (with 8 steps). The budget that is available to invest is dependent on the result of the previous steps. Participants were given a scenario that they have just won a prize of £1,000[1] and are seeking investment opportunities. They start with an initial virtual fund of £1,000 in Step 1. After each task, the balance from the previous task is carried on to the next task and the participants only have what they have left from the previous task to invest in the next one. If a participant loses all the virtual money at any step of the experiment, he will no longer be able to invest in sequent steps. Participants are not prohibited from using calculators and computers to help them make decisions.

The subjects are required to make a forecast on the return of the portfolio for each step. They

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[1] I provide a windfall income scenario to encourage investment as for example a saving scenario is more likely to bias people to keep money in cash (the non-risky option).

are asked to make decisions on how much they would like to invest in each asset of the portfolios. We designed two experiments in order to find out whether asking forecast portfolio return in different forms (absolute portfolio values versus portfolio return in percentages) would result in different findings. Feedback of investment performance is given in both absolute value and percentage forms in both experiments. The only difference between the two experiments is that Experiment 1 asks participants to forecast their new portfolio total in absolute values in the investment allocation tasks while Experiment 2 asks participants to forecast their portfolio return in percentages in the tasks.

We generated the assets' returns using MATLAB such that the sample properties are the same as the population properties so the presented historical observations are an accurate representation of the assets' probabilities of return. Besides, such returns from independent normally distributed assets do not imply trend. We generate the actual returns of the assets for each step using Monte Carlo simulation based on their means and standard deviations.

Studies have shown that providing a real financial reward to subjects causes them to be more careful when participating in experiments (Baltussen & Post, 2011). We provided financial incentives to motivate participants to try to do well in the investment allocation task. The top 5% best performers of the portfolio allocation task in the experiment are rewarded with £10 each. The utility of different reward structures will change the subjects risk/return preference in the experiment. By using this reward structure, we encourage subjects to work hard in order to get into the top 5% of highest earners while they need to be reasonably cautious not to be too risk taking and lose too much.

Compared to other tests on personalities, the significant advance of the five factor model of personality (FFM) was the establishment of a common taxonomy of personality traits in a previously unsystematic research field (Digman, 1990; Goldberg, 1993). The five factors were

defined and scrutinised by several independent researchers and the domain of personality traits could be adequately described by the five factors though there were different opinions regarding the interpretation of these constructs (Digman, 1990). According to Goldberg (1993), the five factors in the FFM are described as follows, "Factor I - Extraversion which contrasts such traits as talkativeness, assertiveness and activity level with traits such as silence, passivity and reserve. Factor II - Agreeableness that contrasts traits such as kindness, trust and warmth with such traits as hostility, selfishness and distrust. Factor III - Conscientiousness which contrasts such traits as organization, thoroughness and reliability with traits such as carelessness, negligence and unreliability. Factor IV - Neuroticism which includes such traits as nervousness, moodiness and temperamentality. Factor V - Openness to Experience that contrasts such traits as imagination, curiosity and creativity with traits such as shallowness and imperceptiveness". We use the short version of the IPIP – NEO (International Personality Item Pool Representation of the NEO PI-R™[1]) to measure the five factors of personality.

We use students as our experimental subjects. 200 students in total participated in the experiments. The participants include 165 students who are in their final year of education prior to college from the Shanghai Economic Management School, and 35 undergraduate students from the Psychology Department of City University London. Among the participants, 102 students participated in Experiment 1 and 98 students participated in Experiment 2. Among the 200 experiment participants, data from 172 participants are used in our analysis. Invalid data due to participants' misunderstanding the task has been deleted from the data set.

In our experiments, financial optimism is measured under the framework of *Financial expectation*, *A priori optimism*, and *A posteriori optimism* proposed in Balasuriya et al (2010a). We do not measure optimism by asking questions or obtain self reported optimism

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[1] NEO PI-R Represents for Neuroticism, Extraversion, Openness to Experience Personality Inventory - Revised

scores as in many previous experimental studies (Weinstein, 1980; Anderson & Galinsky, 2006), but we find individual's optimism level by asking them to complete a particular set of tasks. We measure optimism in a precise financial decision making domain. The details of financial optimism definitions in the experiments are presented in the following sections.

We ask participants to make a forecast on their portfolio return after they make allocations (A_i) to available assets. We use the direct answers of the forecast, denoted as $\mathbf{E}_i$, as our definition of *Financial expectation*.

In the context of our experiments, as all the information for participants to make investment decisions is encapsulated in the experiment and is known to us in theory, *A priori optimism* is defined as the difference between a subject's forecast (E_i) of her portfolio return and the rational expected return of the portfolio (C_i^-) calculated based on Modern Portfolio Theory (MPT)

The following formula is used to define *A priori optimism* (O_i^-) within each portfolio allocation (A_i), where E_i is the forecasted return that the participant expects after allocating A_i , and C_i^- is the rational expected returns for A_i . *i* indicates a single step of the portfolio allocation task.

$$\mathbf{O}_i^- = \mathbf{E}_i - \mathbf{C}_i^- \qquad \qquad \text{Equation 1}$$

Where C_i^- is calculated as follows. μ_f is the mean returns for asset$_f$ and A_i is the allocation that participants made in asset$_f$ in experiment step *i. n* is the number of assets within each step.

$$\mathbf{C}_i^- = \sum_{f=1}^{\mathbf{n}} \mu_f \mathbf{A}_{i,f} \qquad \qquad \text{Equation 2}$$

As all the relevant information needed for participants to make investment decisions is provided and encapsulated in the controlled experiment and is known to us, *A priori optimism* is considered as "irrational optimism" in theory. But we are cautious in labelling *A priori optimism* as irrational optimism because behaviour which may seem to be irrational behaviour or judgments in an artificial environment may be rational and well justified in a real life situation (Ayton & Wright, 1994). People are not suited to deal with uncertainty using single event probabilities, such as in completing experiment tasks, but can make right judgments on uncertainty with frequencies with events in reality (Gigerenzer, 1994). Besides, there might also be flaws that we are not aware of in designing the experiment preventing participants making rational judgments.

A posteriori optimism is defined as the difference between a subject's forecast (E_i) of her portfolio return and the realised returns of the portfolio.

We use the following formula to define *A posteriori optimism* (O_i^+) within each portfolio allocation (A_i), where E_i is the forecasted return that participants made after allocating A_i, and C_i^+ is the realised returns for A_i.

$$\mathbf{O}_i^+ = \mathbf{E}_i - \mathbf{C}_i^+ \hspace{3cm} \text{Equation 3}$$

Where C_i^+ is the actual return for an allocation A_i, and is generated using Monte Carlo simulation of the asset means and standard deviations. With *A posteriori optimism*, although we use realisation as approximation for the theoretical rational expected value, we are aware of that what happens in reality is often not rational. *A posteriori optimism* can be interpreted as errors in forecasting.

Return of a portfolio ($RPtf_i$) is defined as follows, where $VPtf_i$ is the portfolio total after investing budget (Bgt_i) that is available for an individual to invest at the beginning of an experiment step.

$$RPtf_i = VPtf_i / Bgt_i - 1 \qquad\qquad \text{Equation 4}$$

As the population correlations among assets are zero in our experiment, portfolio risk ($PtfRisk_i$) which is the standard deviation (or volatility) of the portfolio is defined as follows, where σ_f is the standard deviation for each asset in the allocation A_i.

$$PtfRisk_i = \sqrt{\sum\nolimits_{f=1}^{n} (\sigma_f \, A_{i,f})} \qquad\qquad \text{Equation 5}$$

We assume that the financial optimism and predictive factors are linearly correlated and use the OLS regression method. We estimate the following equations with data on relevant variables collected in the experiments.

First we analyse the following equations using Experiment 1 and Experiment 2 data respectively as these two experiments were framed differently.

$$Optimism_i = \beta_0(PtfRisk_i) + \beta_1(RPtf_{i-1}) + \sum\nolimits_{m=1}^{5} \beta_m \, Pers \, (Factor)_{i,m} +$$

$$\sum\nolimits_{j=1}^{7} \beta_j \, Demo_{i,j} \qquad\qquad \text{(Equation 6)}$$

Where $Optimism_i$ is replaced by E_i, O_i^-, and O_i^+ respectively in analysis. i represents an observation (portfolio allocation) in the panel. $PtfRisk_i$ is the risk of portfolio allocation A_i

contains. $RPtf_{i-1}$ is the subject's portfolio return from the previous step's allocation A_{i-1} and $Pers(Factor)_{i,m}$ refers to the five factors of personality traits (extraversion, agreeableness, conscientiousness, neuroticism, and openness). $Demo_{i,j}$ refers to gender, age, wealth, salary expectation, wealth expectation in 10 years, risk tolerance and knowledge of finance theory. These variables definitions are valid for the following equations as well.

Then instead of using five factors of the personality, in the following equation we replace $Pers(Factor)_{i,m}$ with $Pers(Facet)_{i,n}$ which contains the 30 facets of personality (friendliness, gregariousness, assertiveness, activity level, excitement-seeking, cheerfulness, trust, morality, altruism, cooperation, modesty, sympathy, self-efficacy, orderliness, dutifulness, achievement-striving, self-discipline, cautiousness, anxiety, anger, depression, self-consciousness, immoderation, vulnerability, imagination, artistic interests, emotionality, adventurousness, intellect and liberalism).

$$Optimism_i = \beta_0(RtfRisk_i) + \beta_1(RPtf_{i-1}) + \sum_{n=1}^{30}\beta_n\,Pers\,(Facet)_{i,n} + \sum_{j=1}^{7}\beta_j\,Demo_{i,j}$$

(Equation 7)

We combine data from Experiment 1 and Experiment 2, and add an independent variable ($Framing_i$) to indicate which experiment the data come from. This is to identify any effects of the framing of the experiments. The equations containing the ($Framing_i$) variable are as follows.

$$Optimism_i =$$
$$\beta_0(RtfRisk_i) + \beta_1(RPtf_{i-1}) + \beta_2(Framing_i) + \sum_{m=1}^{5}\beta_m\,Pers\,(Factor)_{i,m} +$$
$$\sum_{j=1}^{7}\beta_j\,Demo_{i,j}$$

(Equation 8)

$Optimism_i =$

$\beta_0(RtfRisk_i) + \beta_1(RPtf_{i-1}) + \beta_2(Framing_i) + \sum_{n=1}^{30} \beta_n \, Pers \, (Facet)_{i,n} +$

$\sum_{j=1}^{7} \beta_j \, Demo_{i,j}$

<div align="right">(Equation 9)</div>

For Equation 27 and Equation 29, a variable selection linear model is applied in the regression analysis to eliminate random correlations found among a large number of variables. Variable selection is an important part of regression analysis when there are multiple redundant or highly correlated independent variables in the data.

5. Analysis and Findings

In this section, data collected from the experiments are analysed. We first provide descriptive statistics on variables for both experiments to get a general outlook of variable values. Mean comparisons are then conduced to detect whether there are any significant differences in variables between the two experiments. Regression analysis is carried out to explore the correlations between financial optimism and a number of explanatory variables of interest including feedback, personality and risk attitude. The framing effect is also investigated at the end of the section.

Table 1 Descriptive statistics on variables in Experiment 1

This table reports the mean, standard deviations, minimum values, maximum values and the number of observations of the variables measured in Experiment 1. The variables are grouped into Financial optimism, Personal Characteristics, Personality and Portfolio allocation.

	All Individuals (Experiment 1)				
	Mean	**Sdv**	**Min**	**Max**	**N (obs)**
Financial optimism					
Financial expectation	26.71	96.91	-100	1384	704
A priori optimism	21.52	97.00	-105	1379	704
A posteriori optimism	20.46	98.07	-115	1371	704
Personal characteristics					
Male	0.57	0.50	0	1	704
Age	18.03	2.29	17	34	704
Wealth	4.13	0.92	2	6	672
Salary expectation (compared to peers)	4.03	0.85	1	6	704
Wealth expectation in 10 years (compared to peers)	4.66	0.84	3	7	704
Risk tolerance	3.05	0.81	1	5	704
Knowledge of finance theory	0.32	0.47	0	1	704
Personality (five factors)					
Extraversion	38.13	18.24	0	92	704
Agreeableness	43.98	21.28	2	95	704
Conscientiousness	47.31	21.34	8	99	704
Neuroticism	50.92	21.65	5	99	704
Openness	26.94	19.04	1	94	704
Portfolio allocation					
Return on portfolio	6.25	20.61	-69	140	704
Allocation in high risk high return choice (ptg)	0.30	0.27	0	1	704
Allocation in medium risk medium return choice (ptg)	0.31	0.25	0	1	704
Allocation in low risk low return choice (ptg)	0.30	0.23	0	1	704
Allocation in cash (ptg)	0.10	0.19	0	1	704
Portfolio risk	19.07	15.08	0	60	702

In Table 1the average scores for financial optimism, *A priori optimism*, and *A posteriori optimism* are 26.71, 21.52 and 20.46 respectively. This means on average participants forecast that their portfolio values increase by 26.71% (*Financial expectation*) after allocation. Participants forecast 21.52% (*A priori optimism*) more than the rational expected returns. Compared to realised returns after allocations, participants' forecast is 20.46% (*A posteriori optimism*) more on average.

57% participants in Experiment 1 are male and the average age is 18.03. The average answers for wealth and salary questions are between "Average" and "Above Average". In general, participants expect their wealth level to increase by about half of a scale (4.13 to 4.66). Not too surprisingly, participants on average are willing to take a medium level of risk for medium returns (3.05 for risk tolerance) when making investment decisions. About one-third of the participants have knowledge in finance theory. The average actual portfolio return is 6.25%. They allocate about 30% of the investment budget to each of the three available assets in the experiment while leaving 10% in cash. The average portfolio risk (standard deviation of the portfolio) is 19.07.

Table 2 Descriptive statistics on variables in Experiment 2

This table reports the mean, standard deviations, minimum values, maximum values and the number of observations of the variables measured in Experiment 2. The variables are grouped into Financial optimism, Personal Characteristics, Personality and Portfolio allocation.

	All Individuals (Experiment 2)				
	Mean	**Sdv**	**Min**	**Max**	**N (obs)**
Financial optimism					
Financial expectation	19.90	27.26	-25	500	672
A priori optimism	15.12	27.17	-31	491	672
A posteriori optimism	13.00	30.84	-75	415	672
Personal characteristics					
Male	0.27	0.45	0	1	672
Age	18.21	1.95	17	27	672
Wealth	4.11	0.82	2	7	672
Salary expectation (compared to peers)	4.29	0.96	2	7	672
Wealth expectation in 10 years (compared to peers)	4.95	0.99	2	7	672

Risk tolerance	3.12	0.88	1	5	672
Knowledge of finance theory	0.38	0.49	0	1	672
Personality (five factors)					
Extraversion	40.57	21.78	1	96	672
Agreeableness	40.57	22.04	0	99	672
Conscientiousness	48.73	25.96	0	99	672
Neuroticism	45.52	20.62	0	91	672
Openness	30.05	22.60	1	85	672
Portfolio allocation					
Return on portfolio	6.90	18.50	-69	85	672
Allocation in high risk high return choice (ptg)	0.31	0.23	0	1	672
Allocation in medium risk medium return choice (ptg)	0.28	0.20	0	1	672
Allocation in low risk low return choice (ptg)	0.29	0.22	0	1	672
Allocation in cash (ptg)	0.12	0.21	0	1	672
Portfolio risk	19.16	13.26	0	60	672

In Table 2 the average scores for financial optimism, *A priori optimism*, and *A posteriori optimism* are 19.90, 15.12, and 13.00 respectively. This means on average participants forecast their portfolio values increase by 19.9% (*Financial expectation*) after allocation. Participants forecast 15.12% (*A priori optimism*) more than their rational expected returns. Compared to the realised returns after allocations, participants' forecast is 13% (*A posteriori optimism*) more on average.

27% participants in Experiment 2 are male and the average age is 18.21. The average answers for wealth and salary questions are between "Average" and "Above Average". In general, participants expect their wealth level to increase by about three quarter of a scale (4.11 to 4.95). Participants on average are willing to take a just above average level of risk associated with a similar level of returns when making investment decisions. Half of the participants have knowledge of finance theory. The average actual portfolio return is 6.90%. They allocate 31% of their investment budget to the riskiest asset available in the experiment while leaving 12% in cash. The average portfolio risk (standard deviation of the portfolio) is 19.16.

Table 3 Comparisons between Experiment 1 & 2

This table reports the comparisons of means of variables in Experiment 1 and Experiment 2. The left column displays the variables including measures of financial optimism, personal characteristics, personality and portfolio allocation. The second column from left reports the mean of these variables in

Experiment 1 and the third column reports the mean of these variables in Experiment 2. The fourth column shows the level of significance (*p*-values) of the mean comparisons.

	Comparisons of Means		
	Experiment 1 (forecast values)	Experiment 2 (forecast returns)	*p*-Value
Financial optimism			
Financial expectation	26.71	19.90	0.04
A priori optimism	21.52	15.12	0.05
A posteriori optimism	20.46	13.00	0.03
Personal characteristics			
Male	0.57	0.27	0.00
Age	18.03	18.21	0.06
Wealth	4.13	4.11	0.31
Salary exp (to peers)	4.03	4.29	0.00
Wealth exp in 10 years (to peers)	4.66	4.95	0.00
Risk tolerance	3.05	3.12	0.05
Knowledge of finance theory	0.32	0.38	0.01
Personality (five factors)			
Extraversion	38.13	40.57	0.01
Agreeableness	43.98	40.57	0.00
Conscientiousness	47.31	48.73	0.13
Neuroticism	50.92	45.52	0.00
Openness	26.94	30.05	0.00
Portfolio allocation			
Return on portfolio	6.25	6.90	0.27
Allocation in high risk high return choice (ptg)	0.30	0.31	0.26
Allocation in medium risk medium return choice (ptg)	0.31	0.28	0.01
Allocation in low risk low return choice (ptg)	0.30	0.29	0.27
Allocation in cash (ptg)	0.10	0.12	0.01
Portfolio risk	19.07	19.16	0.46

The average values of financial optimism in Table 1 seem higher than in Table 2. Therefore we conducted a comparison of the key variables using student's *t*-test (Welch's *t*-test: unequal sample sizes and unequal variance). Results on the comparisons of financial optimism, individual differences and portfolio allocations between Experiment 1 (forecast values) and Experiment 2 (forecast returns) are displayed in Table 3. We found that participants have significantly higher levels of financial optimism when forecasting portfolio values compared to forecasting returns. For all three measures of financial optimism, participants forecast around 6% higher portfolio returns in Experiment 1 than in Experiment 2. The differences are highly significant. However, whether such differences in optimism result from the different framing of forecasting scenarios or sample differences is not clear. There are also differences in the demographics and personal characteristics between the two experiment groups. There are more

males in Experiment 1 than in Experiment 2. Participants in Experiment 2 are slightly but statistically significantly older than in Experiment 1. Participants in Experiment 2 have a higher expectation for future salary and wealth level than in Experiment 1. They are also more likely to have finance related knowledge. In terms of personality, participants in Experiment 1 are less extravert and open than in Experiment 2, but more likely to agree with people and feel stressed (Neuroticism). Participants in Experiment 2 do not prefer investing in the medium risk medium return assets, but leave more money in cash compared to participants in Experiment 1. The risk levels of the portfolios are not significantly different in Experiment 1 and Experiment 2.

Table 4 Optimism, feedback, personality (five factors) and risk attitude in Experiment 1

This table reports the regression results using Equation 26. Variables listed in the left column including demographics, risk attitude, five-factor personality and feedback are independent variables for the regression. Financial optimism in the first row is the dependent variable in the regression equation. Beta coefficients and the p-values associated with each coefficient are reported in the rest of the columns. Financial optimism is represented by *Financial expectation*, *A priori optimism* and *A posteriori optimism* respectively in the regression analysis. Coefficients and p-values reported respectively under each measure of financial optimism.

| | Financial Optimism (Experiment 1) | | | | | |
| | Financial expectation | | A Priori Optimism | | A Posteriori Optimism | |
	Beta	p-Value	Beta	p-Value	Beta	p-Value
Male	-0.033	0.451	-0.032	0.462	-0.038	0.384
Age	-0.056	0.184	-0.054	0.197	-0.053	0.203
Wealth	-0.207	0.000	-0.206	0.000	-0.211	0.000
Salary exp (to peers)	0.052	0.302	0.051	0.306	0.057	0.252
Wealth exp in 10 years (to peers)	0.002	0.973	0.003	0.954	0.005	0.931
Risk tolerance	0.084	0.063	0.084	0.062	0.085	0.058
Knowledge of finance theory	0.118	0.006	0.118	0.006	0.116	0.007
Extraversion	0.032	0.504	0.032	0.509	0.035	0.472
Agreeableness	-0.081	0.123	-0.079	0.136	-0.083	0.114
Conscientiousness	0.045	0.399	0.046	0.383	0.046	0.384
Neuroticism	-0.020	0.706	-0.019	0.721	-0.024	0.658
Openness	0.029	0.539	0.030	0.532	0.029	0.545
Portfolio return in last step	-0.195	0.000	-0.202	0.000	-0.216	0.000
Portfolio risk	0.009	0.828	-0.005	0.899	0.035	0.393
R Square	0.103		0.105		0.117	

Financial expectation represents an individual's general positive outlook without a benchmark. Although *Financial expectation* is a straightforward measure, it might be oversimplified and might not reflect "true" optimism and the full decision making environment a respondent is in. *A priori optimism* and *A posteriori* optimism, on the other hand, improve the accuracy of

measurement using a benchmark component compared to *Financial expectation*.

A priori optimism is calculated using information gathered before information about year *t* has been exposed and it measures an individual's optimism level by using historical data as the 'rational expected value'. Although it does not reveal new information that people have at the time of forecasting which might justify their positive expectation for future in real life scenario, *A priori optimism* is a much more suitable optimism measure in controlled experiment studies as the experimenter provides all the information a participant needs to make a rational forecast. There is no hidden relevant information for the financial decision making process. Therefore *A priori optimism* can be considered as irrational optimism in theory in an experimental environment.

A posteriori optimism uses actual returns as benchmark values hence measures the 'forecasting errors' individuals make. Although what happened in reality is not always rational, an advantage of this measure is that problem of not knowing private information related to individuals' decision making is somewhat reduced as the realised financial return captures this information. *A posteriori optimism* represents irrational optimism or the effect of unexpected information exposed in year *t* in real life situations.

Regression results in Table 4 shows consistency between financial optimism and the independent variables across all three measures of financial optimism, which indicates the correlations between the investigated variables and different aspects of optimism measured by *Financial expectation*, *A priori optimism*, *A posteriori optimism* respectively are robust. Financial optimism is negatively correlated with current wealth level but positively correlated with risk tolerance and having knowledge of finance theory. All our measures of financial optimism do not have significant correlation with the five factors of personality. When asked to forecast portfolio return in absolute values in Experiment 1, higher returns in the previous

investment step (positive feedback) results in a lower financial optimism level in the following

step. This finding is supported by some previous studies on framing and expectation which

found that asking for future price levels results in mean reverting expectations (De Bondt, 1991;

O'Connor, Remus, & Griggs, 1997; Siebenmorgen & Weber, 2004).

Table 5Optimism, feedback, personality (30 facets) and risk attitude in Experiment 1

This table reports the regression results using Equation 27. Variables listed in the left column including demographics, risk attitude, 30-facet personality and feedback are independent variables for the regression. Financial optimism in the first row is the dependent variable in the regression equation. Beta coefficients and the p-values associated with each coefficient are reported in the rest of the columns. Financial optimism is represented by *Financial expectation*, *A priori optimism* and *A posteriori optimism* respectively in the regression analysis. Coefficients and p-values reported respectively under each measure of financial optimism.

	Financial Optimism (Experiment 1)					
	Financial expectation		A Priori Optimism		A Posteriori Optimism	
	Beta	p-Value	Beta	p-Value	Beta	p-Value
Male	0.118	0.076	0.119	0.072	0.108	0.102
Age	-0.003	0.953	-0.002	0.979	-0.004	0.938
Wealth	-0.282	0.000	-0.281	0.000	-0.286	0.000
Salary exp (to peers)	0.103	0.113	0.104	0.108	0.116	0.071
Wealth exp in 10 years (to peers)	-0.016	0.809	-0.016	0.802	-0.018	0.780
Risk tolerance	0.096	0.062	0.096	0.060	0.093	0.069
Knowledge of finance theory	0.093	0.068	0.095	0.065	0.095	0.064
Friendliness	0.053	0.464	0.056	0.443	0.045	0.540
Gregariousness	-0.147	0.046	-0.151	0.040	-0.149	0.042
Assertiveness	0.203	0.006	0.205	0.006	0.204	0.006
Activity Level	-0.110	0.060	-0.108	0.064	-0.099	0.091
Excitement-Seeking	0.130	0.115	0.134	0.104	0.134	0.102
Cheerfulness	-0.120	0.126	-0.122	0.120	-0.116	0.137
Trust	0.049	0.443	0.048	0.444	0.052	0.411
Morality	0.052	0.594	0.058	0.553	0.063	0.515
Altruism	0.160	0.171	0.164	0.162	0.155	0.182
Cooperation	0.214	0.022	0.220	0.019	0.210	0.024
Modesty	-0.271	0.001	-0.272	0.001	-0.274	0.001
Sympathy	-0.006	0.923	-0.008	0.900	-0.004	0.949
Self-Efficacy	-0.223	0.010	-0.220	0.011	-0.219	0.011
Orderliness	-0.165	0.004	-0.165	0.004	-0.152	0.008
Dutifulness	0.012	0.883	0.015	0.860	0.007	0.931
Achievement-Striving	-0.062	0.411	-0.064	0.396	-0.063	0.401
Self-Discipline	0.022	0.764	0.022	0.766	0.029	0.689
Cautiousness	0.055	0.492	0.051	0.523	0.059	0.463
Anxiety	-0.089	0.261	-0.090	0.257	-0.099	0.212
Anger	0.102	0.136	0.102	0.138	0.097	0.153
Depression	0.057	0.397	0.055	0.411	0.062	0.352
Self-Consciousness	-0.063	0.414	-0.064	0.407	-0.073	0.342
Immoderation	-0.041	0.554	-0.040	0.566	-0.029	0.673
Vulnerability	0.066	0.463	0.072	0.425	0.068	0.450
Imagination	0.029	0.719	0.027	0.738	0.026	0.748
Artistic Interests	0.169	0.028	0.172	0.025	0.164	0.032
Emotionality	-0.132	0.139	-0.134	0.133	-0.133	0.134
Adventurousness	-0.151	0.027	-0.152	0.027	-0.159	0.020
Intellect	0.000	0.996	0.000	0.997	0.011	0.871
Liberalism	-0.184	0.001	-0.184	0.001	-0.180	0.001
Portfolio return in last step	-0.208	0.000	-0.216	0.000	-0.229	0.000

	Beta	p-Value	Beta	p-Value	Beta	p-Value
Portfolio risk	0.009	0.829	-0.004	0.920	0.036	0.394
R Square	0.201		0.202		0.209	

Regression equations used in Table 5 replace the five factors by the 30 facets as independent variables for personality measures. We found that although financial optimism does not correlate with the five factors of personality, it is significantly correlated with some of the facets. Financial optimism is negatively correlated with gregariousness, activity level, modesty, self-efficacy, orderliness, adventurousness and liberalism, but positively correlated with assertiveness, cooperation and artistic interests. Again, we found that financial optimism is negative correlated with current wealth level and the level of previous portfolio return but positively correlated with risk tolerance and having knowledge of finance theory.

Table 6 Optimism, feedback, personality (30 facets) and risk attitude in Experiment 1 (stepwise)

This table reports the regression results using Equation 27. Variables listed in the left column are independent variables selected by the "stepwise" procedure in SPSS for the regression. The importance of the independent variables in terms of their effects on the dependent variables is ranked from high to low in the left column. Financial optimism in the first row is the dependent variable in the regression equation. Beta coefficients and the *p*-values associated with each coefficient are reported in the rest of the columns. Financial optimism is represented by *Financial expectation*, *A priori optimism* and *A posteriori optimism* respectively in the regression analysis. Coefficients and *p*-values reported respectively under each measure of financial optimism.

	Financial Optimism (Experiment 1)					
	Financial expectation		A Priori Optimism		A Posteriori Optimism	
	Beta	*p*-Value	Beta	*p*-Value	Beta	*p*-Value
Portfolio return in last step	-0.204	0.000	-0.212	0.000	-0.226	0.000
Wealth	-0.181	0.000	-0.177	0.000	-0.187	0.000
Modesty	-0.145	0.001	-0.145	0.001	-0.146	0.001
Knowledge of finance theory	0.108	0.006	0.106	0.007	0.110	0.005
Cooperation	0.170	0.000	0.173	0.000	0.166	0.000
Morality	-0.116	0.012	-0.114	0.013	-0.110	0.016
Liberalism	-0.087	0.027	-0.087	0.027	-0.088	0.024
R Square	0.129		0.131		0.139	

Regression analysis for Table 6 also used 30 facets instead of the five factors as independent variables for personality measures. A large number of variables are analysed in Table 5 which may result in random correlations among variables, in Table 6 we used a variable selection linear model to avoid finding such random correlations among variables (see details in section **Error! Reference source not found.**). We found that although financial optimism is not

correlated with the five factors of personality, it is significantly correlated with some of the facets. Financial optimism is negatively correlated with modesty, morality and liberalism, but is positively correlated with cooperation. Financial optimism is also negative correlated with current wealth level but positively correlated with having knowledge of finance theory. Gain in the previous portfolio return is the biggest contributing factor for reduced financial optimism among the variables we investigated.

Table 7Optimism, feedback, personality (five factors) and risk attitude in Experiment 2

This table reports the regression results using Equation 26. Variables listed in the left column including demographics, risk attitude, five-factor personality and feedback are independent variables for the regression. Financial optimism in the first row is the dependent variable in the regression equation. Beta coefficients and the *p*-values associated with each coefficient are reported in the rest of the columns. Financial optimism is represented by *Financial expectation*, *A priori optimism* and *A posteriori optimism* respectively in the regression analysis. Coefficients and *p*-values reported respectively under each measure of financial optimism.

	Financial Optimism (Experiment 2)					
	Financial expectation		A Priori Optimism		A Posteriori Optimism	
	Beta	*p*-Value	Beta	*p*-Value	Beta	*p*-Value
Male	0.079	0.055	0.077	0.061	0.066	0.116
Age	-0.036	0.390	-0.035	0.415	-0.032	0.462
Wealth	0.108	0.017	0.106	0.019	0.094	0.041
Salary exp (to peers)	0.062	0.214	0.066	0.183	0.046	0.363
Wealth exp in 10 years (to peers)	-0.129	0.012	-0.132	0.011	-0.118	0.025
Risk tolerance	0.074	0.090	0.079	0.073	0.065	0.147
Knowledge of finance theory	-0.101	0.020	-0.107	0.015	-0.092	0.039
Extraversion	-0.102	0.031	-0.112	0.019	-0.083	0.086
Agreeableness	-0.047	0.275	-0.045	0.299	-0.046	0.296
Conscientiousness	0.002	0.972	0.004	0.940	-0.008	0.866
Neuroticism	0.009	0.839	0.009	0.843	-0.002	0.972
Openness	-0.043	0.379	-0.045	0.357	-0.024	0.627
Portfolio return in last step	0.081	0.032	0.080	0.034	-0.068	0.079
Portfolio risk	0.142	0.000	0.086	0.029	-0.026	0.512
R Square	0.084		0.072		0.043	

We found in Table 7 that financial optimism is positively correlated with being male and having higher wealth levels, but is negatively correlated with wealth expectation in ten years' time and having knowledge of finance theory. Higher levels of risk tolerance lead to higher levels of financial optimism. Among personality traits, extraverts are less likely to be financially optimistic. Compared to results in Experiment 1, when asked to forecast portfolio returns in relative terms in Experiment 2, participants' optimism levels are increased with higher gains in

previous steps (positive feedback). This finding is supported by previous research on framing and expectation which found that asking for percentage return forecasts leads to trend continuation (Shiller, 2000; Graham & Harvey, 2003). Optimists are also more likely to invest in riskier portfolios

Table 8Optimism, feedback, personality (30 facets) and risk attitude in Experiment 2

This table reports the regression results using Equation 27. Variables listed in the left column including demographics, risk attitude, 30-facet personality and feedback are independent variables for the regression. Financial optimism in the first row is the dependent variable in the regression equation. Beta coefficients and the *p*-values associated with each coefficient are reported in the rest of the columns. Financial optimism is represented by *Financial expectation*, *A priori optimism* and *A posteriori optimism* respectively in the regression analysis. Coefficients and *p*-values reported respectively under each measure of financial optimism.

	Financial Optimism (Experiment 2)					
	Financial expectation		A Priori Optimism		A Posteriori Optimism	
	Beta	*p*-Value	Beta	*p*-Value	Beta	*p*-Value
Male	0.181	0.003	0.178	0.004	0.139	0.028
Age	-0.055	0.384	-0.051	0.430	-0.040	0.543
Wealth	0.134	0.011	0.133	0.012	0.111	0.042
Salary exp (to peers)	0.093	0.194	0.100	0.161	0.066	0.369
Wealth exp in 10 years (to peers)	-0.173	0.010	-0.178	0.009	-0.153	0.027
Risk tolerance	0.073	0.162	0.078	0.138	0.069	0.196
Knowledge of finance theory	-0.090	0.100	-0.097	0.079	-0.087	0.124
Friendliness	-0.144	0.050	-0.147	0.046	-0.126	0.095
Gregariousness	-0.016	0.838	-0.020	0.798	-0.011	0.890
Assertiveness	-0.140	0.059	-0.148	0.048	-0.119	0.120
Activity Level	-0.052	0.460	-0.053	0.452	-0.045	0.532
Excitement-Seeking	0.066	0.437	0.058	0.494	0.042	0.632
Cheerfulness	0.155	0.111	0.165	0.092	0.135	0.177
Trust	0.033	0.580	0.034	0.572	0.047	0.442
Morality	0.051	0.411	0.057	0.362	0.041	0.526
Altruism	-0.180	0.030	-0.187	0.025	-0.185	0.031
Cooperation	-0.044	0.530	-0.047	0.503	-0.013	0.853
Modesty	0.074	0.378	0.085	0.316	0.042	0.627
Sympathy	-0.092	0.173	-0.101	0.138	-0.064	0.356
Self-Efficacy	0.045	0.676	0.049	0.647	0.067	0.542
Orderliness	-0.053	0.544	-0.047	0.592	-0.034	0.707
Dutifulness	0.082	0.203	0.083	0.198	0.053	0.424
Achievement-Striving	0.118	0.265	0.114	0.285	0.113	0.299
Self-Discipline	-0.022	0.803	-0.011	0.895	-0.038	0.671
Cautiousness	0.027	0.747	0.020	0.818	0.012	0.893
Anxiety	-0.040	0.540	-0.041	0.532	-0.032	0.629
Anger	0.076	0.292	0.075	0.299	0.066	0.374
Depression	0.132	0.060	0.134	0.058	0.103	0.156
Self-Consciousness	0.028	0.685	0.031	0.656	0.021	0.764
Immoderation	0.019	0.800	0.022	0.762	0.015	0.838
Vulnerability	-0.156	0.072	-0.158	0.070	-0.131	0.143
Imagination	-0.088	0.234	-0.094	0.209	-0.066	0.386
Artistic Interests	0.050	0.422	0.056	0.370	0.053	0.410
Emotionality	-0.006	0.926	-0.006	0.931	-0.018	0.800
Adventurousness	-0.113	0.060	-0.116	0.055	-0.072	0.246
Intellect	-0.014	0.841	-0.017	0.797	-0.039	0.575
Liberalism	0.023	0.708	0.029	0.646	0.034	0.589
Portfolio return in last step	0.083	0.027	0.083	0.028	-0.063	0.105

	Beta	p-Value	Beta	p-Value	Beta	p-Value
Portfolio risk	0.153	0.000	0.097	0.017	-0.023	0.586
R Square	0.131		0.122		0.080	

The five factors of personality in the regression equations used in Table 7 were replaced by the 30 facets as independent variables for personality measures in Table 8. We found that males are more likely to be financially optimistic. Wealth level is positively correlated with optimism while wealth expectation in ten years' time is negatively correlated with financial optimism. When we look into the relationship between financial optimism and personality facets, we found that optimism is negatively correlated with friendliness, altruism, vulnerability and adventurousness. When asked to forecast portfolio returns in relative terms in Experiment 2, a high portfolio return in the past results in increased levels of financial optimism. Financial optimism is also positively correlated with the riskiness of the portfolio.

Table 9 Optimism, feedback, personality (30 facets) and risk attitude in Experiment 2 (stepwise)

This table reports the regression results using Equation 27. Variables listed in the left column are independent variables selected by the "stepwise" procedure in SPSS for the regression. The importance of the independent variables in terms of their effects on the dependent variables is ranked from high to low in the left column. Financial optimism in the first row is the dependent variable in the regression equation. Beta coefficients and the p-values associated with each coefficient are reported in the rest of the columns. Financial optimism is represented by *Financial expectation*, *A priori optimism* and *A posteriori optimism* respectively in the regression analysis. Coefficients and p-values are reported respectively under each measure of financial optimism.

	Financial Optimism (Experiment 2)					
	Financial expectation		A Priori Optimism		A Posteriori Optimism	
	Beta	**p-Value**	**Beta**	**p-Value**	**Beta**	**p-Value**
Altruism	-0.098	0.024	-0.099	0.023	-0.128	0.002
Wealth	0.144	0.000	0.145	0.000	0.117	0.005
Wealth exp in 10 years (to peers)	-0.102	0.016	-0.103	0.015	-0.084	0.050
Portfolio risk	0.128	0.001	0.070	0.069		
Male	0.099	0.009	0.099	0.010		
Portfolio return in last step	0.085	0.023	0.085	0.025		
Friendliness	-0.091	0.029	-0.096	0.023		
R Square	0.084		0.071		0.030	

Again in

Table 9 we used a variable selection linear model to avoid the occurrence of random correlations among a large number of variables. We found that being male or wealthy increased financial optimism, but higher wealth expectation is related to lower financial optimism. When

we look into the relationship between financial optimism and personality facets, we found that financial optimism is negatively correlated with altruism and friendliness. Optimism is also positively associated with the riskiness of the portfolio. Higher previous gain is associated with higher optimism levels.

Table 10Financial optimism and framing effect(personality: five factors)

This table reports the regression results using Equation 28. Variables listed in the left column including the identifier of the experiment, demographics, risk attitude, five-factor personality and feedback are independent variables for the regression. Financial optimism in the first row is the dependent variable in the regression equation. Beta coefficients and the p-values associated with each coefficient are reported in the rest of the columns. Financial optimism is represented by *Financial expectation*, *A priori optimism*, and *A posteriori optimism* respectively in the regression analysis. Coefficients and p-values reported respectively under each measure of financial optimism.

	Financial Optimism (Experiment 1 vs. 2)					
	Financial expectation		A Priori Optimism		A Posteriori Optimism	
	Beta	*p*-Value	Beta	*p*-Value	Beta	*p*-Value
Forecast values	0.042	0.163	0.039	0.194	0.068	0.022
Male	0.007	0.827	0.007	0.815	0.002	0.956
Age	-0.036	0.221	-0.035	0.238	-0.034	0.241
Wealth	-0.123	0.000	-0.123	0.000	-0.131	0.000
Salary exp (to peers)	0.063	0.073	0.063	0.073	0.064	0.065
Wealth exp in 10 years (to peers)	-0.034	0.341	-0.033	0.348	-0.026	0.452
Risk tolerance	0.040	0.188	0.040	0.185	0.037	0.212
Knowledge of finance theory	0.049	0.100	0.049	0.101	0.049	0.096
Extraversion	-0.012	0.713	-0.014	0.681	-0.009	0.778
Agreeableness	-0.040	0.223	-0.038	0.254	-0.042	0.197
Conscientiousness	0.030	0.401	0.031	0.386	0.027	0.455
Neuroticism	-0.023	0.493	-0.022	0.507	-0.029	0.373
Openness	-0.005	0.873	-0.006	0.855	-0.005	0.876
Portfolio return in last step	-0.118	0.000	-0.123	0.000	-0.162	0.000
Portfolio risk	0.059	0.041	0.038	0.185	0.043	0.130
R Square	0.042		0.040		0.056	

When we look at the comparisons of average values of financial optimism between Experiment 1 and Experiment 2 in Table 3, there was a significant difference between financial optimism in the two experiments. However, it is not clear from the results in Table 3 whether such difference in optimism is due to the framing of the two forecast situations or sample differences. Therefore, we combined the data from Experiment 1 and Experiment 2 and added a "framing" factor (Forecast values versus Forecast returns) as an independent variable to investigate whether framing of the experiments affects financial optimism. We found in Table 10that framing does not affect *Financial expectation* and *A priori optimism*, but forecasting in values increases *A*

posteriori optimism. This indicates that when making forecasts in values, participants are more likely to make forecasting errors than when they forecast in relative terms. In the combined data, wealth level is negatively correlated with financial optimism, but salary expectation in ten years compared to peers is positively related to financial optimism. Positive feedback reduces financial optimism.

Table 11Financial optimism and framing effect(personality: 30 facets)

This table reports the regression results using Equation 29. Variables listed in the left column including the identifier of the experiment, demographics, risk attitude, 30-facet personality and feedback are independent variables for the regression. Financial optimism in the first row is the dependent variable in the regression equation. Beta coefficients and the *p*-values associated with each coefficient are reported in the rest of the columns. Financial optimism is represented by *Financial expectation*, *A priori optimism*, and *A posteriorioptimism* respectively in the regression analysis. Coefficients and *p*-values reported respectively under each measure of financial optimism.

	Financial Optimism (Experiment 1 vs. 2)					
	Financial expectation		A Priori Optimism		A Posteriori Optimism	
	Beta	*p*-Value	Beta	*p*-Value	Beta	*p*-Value
Forecast values	0.028	0.376	0.024	0.435	0.055	0.076
Male	0.065	0.087	0.065	0.087	0.056	0.142
Age	-0.015	0.674	-0.014	0.703	-0.016	0.657
Wealth	-0.125	0.000	-0.124	0.001	-0.134	0.000
Salary exp (to peers)	0.055	0.144	0.055	0.146	0.056	0.136
Wealth exp in 10 years (to peers)	-0.037	0.331	-0.037	0.331	-0.029	0.446
Risk tolerance	0.064	0.045	0.064	0.044	0.062	0.048
Knowledge of finance theory	0.045	0.170	0.045	0.165	0.045	0.163
Friendliness	0.033	0.475	0.034	0.462	0.028	0.536
Gregariousness	-0.056	0.210	-0.059	0.191	-0.047	0.288
Assertiveness	0.078	0.073	0.078	0.074	0.081	0.062
Activity Level	-0.063	0.080	-0.063	0.082	-0.058	0.107
Excitement-Seeking	0.052	0.233	0.052	0.229	0.050	0.245
Cheerfulness	0.001	0.979	0.002	0.976	0.007	0.892
Trust	-0.003	0.929	-0.003	0.939	0.002	0.962
Morality	-0.070	0.120	-0.067	0.136	-0.064	0.153
Altruism	0.023	0.700	0.022	0.715	0.013	0.825
Cooperation	0.168	0.000	0.167	0.000	0.162	0.000
Modesty	-0.137	0.002	-0.136	0.002	-0.132	0.002
Sympathy	0.011	0.766	0.012	0.753	0.016	0.664
Self-Efficacy	-0.122	0.020	-0.123	0.020	-0.116	0.027
Orderliness	-0.130	0.001	-0.130	0.001	-0.117	0.004
Dutifulness	0.059	0.190	0.060	0.183	0.050	0.261
Achievement-Striving	0.095	0.060	0.096	0.057	0.083	0.098
Self-Discipline	-0.083	0.066	-0.083	0.067	-0.084	0.059
Cautiousness	0.122	0.008	0.122	0.009	0.123	0.007
Anxiety	-0.067	0.105	-0.066	0.107	-0.071	0.083
Anger	0.087	0.047	0.085	0.053	0.081	0.063
Depression	0.088	0.043	0.087	0.044	0.085	0.049
Self-Consciousness	-0.014	0.714	-0.015	0.711	-0.013	0.747
Immoderation	-0.033	0.389	-0.033	0.390	-0.036	0.335
Vulnerability	0.007	0.884	0.010	0.847	0.008	0.879
Imagination	0.019	0.685	0.018	0.690	0.025	0.590
Artistic Interests	0.044	0.290	0.045	0.281	0.047	0.255
Emotionality	-0.055	0.229	-0.055	0.234	-0.056	0.225
Adventurousness	-0.071	0.058	-0.071	0.056	-0.068	0.065

	-0.031	0.425	-0.032	0.419	-0.035	0.368
Intellect	-0.031	0.425	-0.032	0.419	-0.035	0.368
Liberalism	-0.074	0.030	-0.074	0.031	-0.076	0.026
Portfolio return in last step	-0.121	0.000	-0.127	0.000	-0.165	0.000
Portfolio risk	0.055	0.056	0.035	0.227	0.039	0.173
R Square	0.090		0.089		0.101	

When we use 30 facets for personality traits instead of five factors as independent variables in Table 11, we still found that framing is significantly correlated with *A posteriori optimism*. This means participants are significantly more optimistic when they forecast portfolio returns in absolute values rather than in percentages. Forecasting in values again seems to increase forecasting errors. Among personality facets, financial optimism is positively correlated with assertiveness, cooperation, achievement thriving, cautiousness, anger and depression, but is negatively associated with activity level, modesty, self-efficacy, orderliness, self-discipline, adventurousness and liberalism. Positively feedback reduces financial optimism.

Table 12Financial optimism and framing effect(personality: 30 facets; stepwise)

This table reports the regression results using Equation 27. Variables listed in the left column are independent variables selected by the "stepwise" procedure in SPSS for the regression. The importance of the independent variables in terms of their effects on the dependent variables is ranked from high to low in the left column. Financial optimism in the first row is the dependent variable in the regression equation. Beta coefficients and the *p*-values associated with each coefficient are reported in the rest of the columns. Financial optimism is represented by *Financial expectation*, *A priori optimism* and *A posteriori optimism* respectively in the regression analysis. Coefficients and *p*-values reported respectively under each measure of financial optimism.

	Financial Optimism (Experiment 1 vs. 2)					
	Financial expectation		A Priori Optimism		A Posteriori Optimism	
	Beta	*p*-Value	Beta	*p*-Value	Beta	*p*-Value
Portfolio return in last step	-0.120	0.000	-0.125	0.000	-0.162	0.000
Wealth	-0.123	0.000	-0.121	0.000	-0.128	0.000
Know finance theory	0.058	0.039	0.056	0.046	0.059	0.033
Modesty	-0.081	0.007	-0.080	0.008	-0.085	0.005
Cooperation	0.120	0.000	0.120	0.000	0.116	0.000
Morality	-0.085	0.007	-0.083	0.008	-0.080	0.010
Forecast values					0.061	0.027
R Square	0.045		0.046		0.062	

In Table 12, we found framing affects on *A posteriori optimism* which is consistent with our findings on financial optimism and framing effect in Table 10 and Table 11. When we use a variable selection model, framing is the sixth largest influencer for *A posteriori optimism*.

Feedback has the strongest effect on financial optimism. Modesty and morality is negatively associated with financial optimism while cooperation promotes optimism.

Overall we found that financial optimism is positively correlated with risk tolerance for all the regression analysis in both experiments. In Experiment 1, positive feedback on previous portfolio returns significantly reduces financial optimism while it increases financial optimism in Experiment 2. When looking into the relationship between financial optimism and personality traits, we found that in Experiment 1 financial optimism is negatively correlated with modesty, morality and liberalism, but is positively correlated with cooperation. In Experiment 2, financial optimism is negatively correlated with extraversion, friendliness and altruism. We find framing affects financial optimism directly. Forecasting values instead of returns significantly increases the *A posteriori optimism* measure. This indicates that participants are more likely to make forecasting errors when they forecast in absolute values rather than in relative terms.

6. Conclusion

This paper investigates whether and how feedback on investment performance, framing of situations, personality, and risk attitude influence financial optimism via controlled experiments. The overall finding is that financial optimism is associated with these factors. We used *Financial expectation*, *A priori optimism* and *A posteriori optimism* as the measures of financial optimism. Findings are discussed and conclusions reached in the following paragraphs of this section.

When exploring the relationship between financial optimism and feedback, we found people react to feedback of previous investment performance significantly differently in alternatively framed forecasting scenarios. Our results show how people react to the previous portfolio returns depends on whether they are forecasting portfolio returns in absolute values or relative terms. In other words, by asking participants to answer questions differently (forecast portfolio return in absolute values versus forecast portfolio return in percentage terms), the effect of feedback on financial optimism varies.

In Experiment 1, within which participants forecast portfolio return in absolute values, positive feedback on previous portfolio returns reduces financial optimism while it increases financial optimism in Experiment 2, where participants forecast portfolio returns in relative terms. This confirms our belief that different experiment settings would lead people to make decisions on forecasting differently. We suspect the underlying reason for such differences is that when people consider their investment in absolute terms in Experiment 1, achieving a positive return makes them feel satisfied with the achieved absolute figures and such satisfaction with the previous return make them less "aggressive" in forecasting future returns to avoid potential disappointment. When the portfolio return is low in absolute values, people are not willing to

adjust their expectation downwards accordingly as we found with our trial data. In Experiment 2 where people consider their investment in percentages, such effect of satisfaction or dissatisfaction with absolute investment values fades away and people are more aware of how well they actually did in the previous investment task. Therefore, they adjust their expectation accordingly with previous investment performance. A high return might be perceived as good performance or investment skill by the participants and such belief might increase their future optimism level. Subjects seem to have responded to feedback on previous portfolio returns in a more objective way in Experiment 2.

By combining data from Experiment 1 and Experiment 2 and adding a "framing" factor to the regression equations, we found that framing affects financial optimism directly. Forecasting values instead of returns significantly increases *A posteriori optimism* which is one of our financial optimism measures. This indicates forecasting values are more likely to lead to larger forecasting errors. Our findings on financial optimism and framing is consistent with previous studies where asking for future price levels results in mean reverting expectations (De Bondt, 1991; O'Connor, Remus, & Griggs, 1997; Siebenmorgen & Weber, 2004), but asking for percentage return forecasts causes trend continuation (Shiller, 2000; Graham & Harvey, 2003).

We then look into whether financial optimism is related to certain personality traits. Results show that financial optimism does not correlate with a subject's five factors of personality in Experiment 1, but is significantly negatively correlated with Extraversion in Experiment 2. Among personality facets, financial optimism is negatively correlated with gregariousness, activity level, modesty, self-efficacy, orderliness, adventurousness and liberalism, but is positively correlated with assertiveness, cooperation and artistic interests in Experiment 1. When we used a variable selection model, financial optimism is negatively correlated with modesty, morality and liberalism, and is positively correlated with cooperation. In Experiment 2, financial optimism is negatively correlated with friendliness, altruism, vulnerability and

adventurousness. Among these facets, altruism and friendliness have the largest correlations with financial optimism.

The reason why certain dimensions of personality are correlated with financial optimism is beyond the scope of this thesis. The detailed reasons behind these correlations are not investigated further. Our speculation is that different forecasting scenarios might affect the way subjects think and bring out various aspects of their personalities when they make financial decisions. Previous literature shows personality can affect people's decision making via their information processing style and mood-states (Eroglu & Croxton, 2010). Future work could investigate whether the relationship we found between personalities and optimism is robust by using a much larger sample size and samples that are more representative of the whole population, such as subjects from different age groups and occupations. Researchers can also select people of certain a personality, such as Extraverts, using a personality test and investigate whether these subjects are constantly making more/less optimistic forecasts in their investment compared to a control group.

Regarding the relationship between financial optimism and risk attitude, we found that financial optimism is positively correlated with an attitude on risk tolerance for all the regression analysis in both experiments. In Experiment 2, financial optimism is also significantly correlated with the risk-taking behaviour in making portfolio allocation decisions. The regression results in Experiment 2 show that financial optimism increases riskiness in the portfolios. Although we found financial optimism is associated with attitude towards risks in Experiment 1, we did not find a significant relationship between optimism and the level of risk in portfolios in Experiment 1. This slight uncertainty in the relationship between optimism and risk-taking behaviour could be due to a statistically significant lower number of participants (32%) having knowledge of finance theory in Experiment 1 compared with 38% in Experiment 2. It is possible that fewer participants have the ability or financial knowledge to mediate between risk

and returns, or they might not be able to identify the level of risk of each investment choice in Experiment 1.

We believe findings in this paper fill a longstanding void in the literature. Optimism within the financial decision making domain has never been studied in such a depth before. There was little research showing how financial optimism is altered after receiving feedback. There is very limited prior research comparing two forecasting scenarios within the same experiment design (Glaser, Weber, Langer, & Reynders, 2007). To our knowledge, research in this paper is the first sturdy to investigate how framing affects financial optimism. Whether financial optimism is correlated with personalities including a detailed list of personality facets has never been studied before, and whether risk tolerance in investment is correlated with optimism in the same domain was unspecified.

The uniqueness of our definitions of optimism in the experiments is that we study optimism in a specific financial decision making domain, and we measure financial optimism by using observed data instead of self reported data. In this paper, we do not measure optimism by asking questions to collect self-reported scores on optimism as in many previous experimental studies (Weinstein, 1980; Anderson & Galinsky, 2006), but we find individual's optimism level by asking them to make a number of investment decisions and forecast. By not using the self-reported data, we could avoid the situation where optimism measures can generate a score when the forecast is in fact not irrational due to participants' private information.

Using an controlled experiment approach also provided a remedy to the shortcomings of testing optimism with field data. However, we are also aware that an artificial experiment setting sometimes affects the applicability of research results and conclusions to real life investing behaviour as the observed participants' behaviour or judgments in experiments might not happen the same way in reality. What may look like irrational or "wrong" behaviour might be

perfectly justified in a real world situation. Although we have tried our best to consider all the factors that might affect results in designing our experiment, we have to face the truth that experiments are often more or less flawed as there could always be neglected factors. However we believe that even given their limitations, controlled experiments have revealed a great deal about the factors affecting optimism in financial decision making. When conducting these controlled experimented we had to fund the experiments myself which means very limited financial incentives could be provided to the participants to simulate real investment behaviour. Future improvements of this experiment should aim at encouraging participants to make financial decisions that are more close to what they would do in reality.

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