The importance of staying positive: the impact of emotions on attitude to risk

Article

Accepted Version

The Importance of Staying Positive: The Impact of Emotions on Attitude to Risk

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March 2021

Abstract
In this paper, we examine the impact of emotions towards financial investments and emotions towards life in general on attitudes to financial risk using questionnaire data from 970 UK-based retail investors. We show that risk tolerance monotonically increases with positive emotions towards investments and life, and decreases with negative emotions. We incorporate a broader range of relevant emotions than in comparable existing studies, and we show, perhaps surprisingly, that positive emotions have a more substantial impact on risk tolerance than negative emotions. We find that emotions towards investments have a considerably greater explanatory power for the cross-section of risk aversion than gender, age, income, investment experience and investment knowledge. Our research sheds light on the different impacts that integral and background emotions have on retail investor financial decision-making. We suggest several implications for regulators and financial advisors, and we emphasise the importance for financial educators to support investors in developing emotional resilience.

Keywords: retail investors, risk tolerance, risk aversion, attitude to risk, emotions.
J.E.L. Classifications: G11, G20, J14, C25

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Acknowledgements: We are grateful to the ESRC for funding this research under grant number ES/P000657/1.

1. Introduction

Contributions from behavioural scientists are changing the way that economists model decision-making under uncertainty. The traditional view of economic theorists was that when making choices between assets with differing characteristics, agents will select between them optimally, trading off risk and expected returns to maximise the utility of their end of period wealth. However, assuming that agents will make decisions based purely on von Neumann-Morgenstern expected utility maximisation is now a somewhat dated and unrealistic approach as psychologists have increasingly come to emphasise the role of 'affect' (experiencing an emotion) on how choices are made. In particular, the financial environment seems so complex for the majority of individual retail investors that their lack of information, expertise and time means that they make boundedly rather than entirely rational decisions and this allows considerable scope for emotions to play a role (Sahi, 2017). Emotions have more potent effects in situations where reliable information is limited and therefore making a purely logical decision is more challenging (Forgas, 1995), which is arguably the context in financial decision-making.

Evidence on the link between psychology and financial decision-making is advancing rapidly – see, for instance, the recent study by Khan and Mubarik (2020) on the role of neurotransmitters (chemical signals in the brain). The fact that emotions influence financial decisions is now accepted as incontrovertible and has the scope to explain many instances of apparently puzzling retail investor behaviour. For example, emotions can, to some extent, explain framing effects and different outcomes when choices are presented emphasising losses or emphasising gains (Miu and Crisan, 2011). Emotional traits also affect not only willingness to take risks but also preferred investment horizons. For example, angry people tend to be willing to invest over the medium/long term and are more inclined to hold out before selling either at a loss or gain, while those who are anxious prefer short-term savings accounts and selling any risky assets held as quickly as possible. In the latter case, people are willing to lock in a loss in order to remove the uncertainty involved in risky investments, thus obtaining a sense of relief and control (Gambetti and Giusberti, 2012).

Emotional factors can make real differences in financial decision-making compared to the situation where choices are made purely according to logic. Andersson et al. (2016) show that people take more significant financial risks when making decisions for others than when doing so regarding their own investments, which is consistent with their hypothesis that loss aversion is caused by emotions when investing for oneself but not for others where the losses feel somehow less real. They find no support for the alternative explanation that people simply worry less when the risks are to be borne by someone else. Moreover, the tendency to 'let the heart rule the head' when making financial decisions is not limited to retail investors: even professional traders have been observed to experience heightened emotional responses leading to faster pulse rates and greater skin conductance around times of market volatility (Lo and Repin, 2002).

In reality, investment choices always involve the interplay of two factors arising from processes in different parts of the brain. The first is the cognitive aspect where decisions are made rationally ('cold logic') based on

an objective assessment of the risks involved and the expected returns; the second consists of the overlay onto this framework of the effect of emotions. Traditionally, psychology viewed the two parts as entirely separate: the brain is considered as a computer with feelings being altogether separate from cognition (Fenton-O'Creevy et al., 2011, p.1045). However, this perception of decision-making processes is now considered by many to be fundamentally flawed. More recently, the class of so-called dual-process models has been developed by psychologists to explain how the two aspects may operate together (e.g., Loewenstein and O'Donoghue, 2004; Rustichini, 2008). It is believed that the two factors impact upon each other: cognitive thought processes lead to particular feelings, and emotions influence cognitive analyses.[1] Yet this view is still contested. Further research, suggests, however, that 'emotions constitute a relatively autonomous channel of influence on decision-making, operating in conjunction with, but largely independent of, more strictly cognitive processes' (Fessler et al., 2004, p.118).

A conventional view among those who acknowledge the role of emotions in decision-making was that they lead to sub-optional choices and if only agents could clear their minds of such distractions and focus purely on 'the facts', then they would make better judgements. There is evidence to support this perspective – for example, fear may encourage investors to steer clear of profitable risky investments which would have generated significantly higher average returns in the longer run. Extreme aversions to loss may be primal and hark back to situations where losses are potentially fatal (Camerer, 2005), and there is evidence that loss aversion is more the result of emotional than cognitive factors (Ashraf et al., 2005). Baker and Nosfinger (2002) suggest that 'psychological biases' and emotions will harm investment decisions, leading to lower returns, and Lo et al. (2005) show that survey participants with stronger emotional reactions performed considerably worse in trading simulations than those who were less emotionally responsive. Strong positive emotions are linked with a higher tendency to make irrational purchases on trends and to buy into speculative bubbles (Breaban and Noussair, 2018). More generally, emotional reactions to market events are argued to give rise to irrational behaviour leading to financial market inefficiencies (Lo and Repin, 2002) and asset mispricings (Heap and Zizzo, 2011).

On the other hand, emotions can support good choices. For example, Seo and Barrett (2007) find that people who are able to marshal their feelings can use this to good effect in improving their decision-making effectiveness so that those experiencing stronger emotions make better decisions. Indeed, there is a sizeable neurological literature documenting cases of individuals with abnormally low tendencies to feel emotions who have significantly lower abilities to make sensible decisions (Damasio, 1994). Emotions can galvanise efforts to pursue particular goals, providing motivation and positive feedback in the event of success (Bagozzi et al., 2000). Emotions can also support decision-making when agents are faced with considerable complexity and

[1] Before proceeding, it is worth us explaining our use of the terms 'mood', 'feelings' and 'emotions'. Mood and emotion are closely related but some psychologists view them as separate experiences, with mood being more general, longer-term and less strongly tied to the cause of the sentiment (e.g., Beedie et al., 2005). On the other hand, emotions tend to be more intense and usually focused on a specific occurrence (Nguyen and Noussair, 2014). Nonetheless, the distinction between the two is blurred and one can transform into the other (Hume, 2012). Therefore, we follow Delis and Mylonidis (2015) in not dwelling on the distinction between them.

uncertainty and are attempting to simultaneously pursue several goals (Oatley and Johnson-Laird, 1987). Emotional reactions to external circumstances are often faster than those arising from cognitive analysis (Zajonc, 1980). For instance, fear can lead to more vigilant consideration of information, reducing the scope for adverse outcomes (Tiedens and Linton, 2001).

The current literature is somewhat mixed regarding the impact that emotions will have on the tendency to take risks. Concerning first negative emotions, there are at least two possible reasons why those with negative feelings may choose more risky options than they otherwise would. One possible explanation links with the 'mood repair hypothesis', which suggests that the risks are taken in order to have the chance to experience a positive outcome, which would improve their mood as if its subjective utility is raised. Hence the observation that when people are sad, they are more prone to excessive spending, possibly giving rise to growing debts, in an attempt to cheer themselves up (Cryder et al., 2008). Following a similar line of reasoning, according to Conte et al.'s (2018) experimental findings, sadness, fear, and anger all cause a rise in risk-taking behaviour, a conclusion they attribute to this mood repair hypothesis. It has also been found that neurotic people (who would have tendencies to feel sad, fearful, angry) have high levels of financial risk tolerance (Kübilay & Bayrakdaroğlu, 2016).

However, Leith and Baumeister (1996) do not find support for this reasoning, and instead, their experimental evidence is indicative that being 'in a bad place' emotionally encourages individuals to take ill-thought-out decisions that ultimately lead them to engage in self-defeating behaviour. Losing their usual self-regulatory mechanism means that their cognitive function is diminished, and people then behave impulsively without fully considering all the risks involved in the course of an action. Yet Breaban et al. (2016) find that stronger negative emotional states are linked with more prudence in decision making.

One way to reconcile these apparently contradictory findings is that emotional effects on risky choices are, according to the mood regulation theory, dependent on the level of risk involved in the task. For relatively low-risk decisions, a positive mood encourages the person to take the gamble. In contrast, if the chance of loss is higher, those in a good mood are more likely to reject it for fear of damaging their positive mind-set (Hockey et al., 2000).

People in positive moods may become more cautious (i.e., less risk-tolerant) in the context where they are facing potential losses as they go into 'protection mode' to improve the chances that they can remain in that state (Isen and Patrick, 1983; Isen et al., 1988). Those in good moods typically make more use of rules of thumb rather than detailed calculations, while those in bad moods will process information more carefully and will make more use of analytical thinking to make decisions (Bless et al., 1996; Sinclair and Mark, 1995). However, there is also support from the literature for precisely the opposite effects – namely that positive emotions, including excitement and hope, encourage risk-taking while anxiety or concern discourage it (Kuhnen and Knutson, 2011).

Given the contradictory findings arising in existing studies, a deeper understanding of the processes by which people make these decisions is of paramount importance. In this paper, we examine the link between emotions and attitude to risk in a comprehensive manner using a multi-causal framework. Our study is given motivation by the creeping 'financialisation of everyday life' and the declining role of the state that have led to a growing expectation that people will make their own financial decisions and be responsible for the outcomes. In the UK, such changes in the financial landscape include the transition from defined benefit to defined contribution pension schemes, and the growth of self-invest pension plans and Stocks and Shares ISAs, which constitute potential new sources of risk for retail investors (Hall, 2016).

Although the number of studies examining the impact of emotions on risk attitudes is non-trivial, the literature is disparate, contradictory and domain-dependent. Using questionnaire data comprising attitude to risk, emotions towards investments and life, financial knowledge and experience, and demographic information for a thousand UK retail investors, we are able to make several novel contributions to the literature.[2] Unlike many existing studies, our data are drawn from a real-life context rather than a lab-based experimental setting or a simulation. We allow for a variety of confounding influences such as age, gender, and investment experience that the existing literature has argued is relevant for explaining cross-sectional variations in risk tolerance, and which could potentially act as mediators between attitude to risk and emotions.

As well as anticipation of the emotions that are expected to be felt contingent upon the outcome of a particular eventuality (e.g., losing money when a gamble does not pay off), the process of making the decision itself may elicit particular feelings independent of the consequences. For instance, taking a risky investment choice might cause the person to feel nervous or excited linked with actually making the decision (Schlösser et al., 2013). Hence, in this study, we separately examine the impact of integral (towards finance specifically) and background (towards life more generally) emotions on attitude to risk. Although numerous studies have documented and tested the impact of background emotions on decision-making, as far as we are aware, ours is the first to systematically compare the strength of background versus integral emotions in a financial context.

We investigate the impact of emotions towards investments and towards life on risk tolerance and find that emotions towards investments are the most important in explaining the variation in financial risk tolerance of retail investors. In terms of explanatory power, emotions towards investments are followed by cognitive factors, demographics and emotions towards life. Moreover, we allow for a broader range of emotions than previously employed in the literature where fear or anger is the predominant focus, and we show that positive emotions have a more significant impact on attitude to financial risk than negative emotions.

We are also the first to investigate whether and why the impacts on risk tolerance of background and of integral emotions differ. For example, does an investor who is happy towards investments but less happy towards life take more financial risk than an investor who is equally happy in both domains? We find that when a retail

[2] We interchangeably use the terms 'emotions towards investments', 'emotions towards investing' and 'emotions towards finance'.

investor is more positive (or less negative) towards investments than towards life, his/her risk tolerance increases. We interpret these results as evidence of a cross-over effect of background emotions towards life on financial decision-making.

The remainder of this paper is organised as follows. We first discuss the context and features of our data in Section 2. Here we also present the methodology and analytical models that we estimate. The core results and findings are discussed in Section 3. The conclusions and implications of our findings are drawn out in Section 4.

2. Methodology and Data

2.1 Hypotheses Development

Emotions towards investing

In order to capture a wide range of potential emotional influences, we employ an adaptation of the Positive and Negative Affect Scale (PANAS, Watson et al., 1988). In terms of positive emotions, we ask respondents (with separate questions for each emotion) to what extent on a 1-to-5 scale, on average they have felt happy, excited, inspired or enthusiastic about financial investing; the negative emotions were fearful, ashamed, sad, angry and nervous. We then combine the negative emotions into a single, equally-weighted index and likewise for the positive emotions. This combination not only improves the parsimony of the models, but existing research has suggested that employing these two independent, aggregate dimensions of mood can facilitate measurement and comparison (Izard, 1977; Watson and Tellegen, 1985). *Positive Emotions Towards Investing* and *Negative Emotions Towards Investing* are measured as continuous scores from 1 to 5 and are computed as the simple average of the scores for individual positive and negative emotions towards finance, respectively. Our broad, over-arching theory is the appraisal tendency framework of Lerner and Keltner (2001), which stipulates that each emotional states will engender a particular cognitive reaction leading to a specific choice being made.

Emotion can influence financial decision making through two channels: through its effects on expected returns contingent upon a good or bad state occurring after the asset purchase, and also on the subjective probabilities that the agent attaches to each outcome, with Fehr-Dua et al. (2011) suggesting that the latter is more vulnerable to emotional effects than the former. Intuitively, those in a good mood tend to be optimistic about likely outcomes from decisions while those in a bad mood are more prone to be pessimistic (Bower, 1991; Wright and Bower, 1992). People tend to focus on information that corresponds with their spirit, so that those in a good mood will pick out the positive aspects of a news story while those in a bad mood will home in on the negatives (Forgas and Bower, 1987), and people also tend to readily recollect previous experiences that correlate with their current mood (Mayer et al., 1990).

Therefore, according to Forgas (1995), those in good moods make more optimistic choices (e.g., a higher tendency to buy risky rather than safer assets). On the other hand, those in bad moods tend to be less risk tolerant,

although this may only apply to male investors with women's investing behaviour being less influenced by mood (Harding and He, 2016) despite common perceptions and some evidence that women are more driven by emotions than men (Croson and Gneezy, 2009; Eriksson and Simpson, 2010). More remarkably, it has been suggested that those in a good mood underestimate risks (Finucane et al., 2000) and overestimate the probability of positive outcomes (Johnson and Tversky, 1983), which can lead traders to be excessively confident and make worse decisions (Au et al., 2003).

We now briefly discuss some motivations from the relevant literature for the impact on risk tolerance of individual emotions.

Negative emotions

Fear is clearly the most relevant negative emotion in the context of financial decision making. People feel fear in situations where they face uncertainty or circumstances that they cannot control (Lerner and Keltner, 2001), and most retail investors would consider taking financial decisions to represent precisely such a situation (Lee and Andrade, 2011). Fear naturally leads to avoidance of the activity in question amidst doubts about whether the decision-maker could cope with the negative outcome if it happened (Frijda, 1987). Fearful investors also sell stocks more quickly, as Lee and Andrade (2011) observe from their experiments. Anxious people may choose to avoid engaging with risky financial products at all, thus losing out on the opportunity to gain investment experience over time and thus exacerbating this emotional trait (Gambetti and Giusberti, 2012). In an experimental setting, Schulreich et al. (2016) find that showing participants faces with scared expressions leads to increased risk aversion, a finding they attribute to heightened loss aversion. Overall, the literature is reasonably unambiguous in suggesting a negative relationship between fear and risk tolerance. Similarly, the consensus is that sadness reduces risk tolerance (Campos-Vasquez and Cuilty, 2014) as it makes people feel less in control (Lerner and Keltner, 2000).

Moving now to consider anger, evidence on the impact of anger on financial decision-making is much more mixed. Anger can cause recklessness, and in their experimental study, Campos-Vasquez and Cuilty (2014) find that it reduces loss aversion by half, particularly in the context of gains. Fessler et al. (2004) show that increased risk-taking when angry takes place, particularly among men, which they attribute to the differential evolutionary role that this emotion plays between genders. Angry people have a heightened feeling of confidence regarding the causes of an event (Lerner and Tiedens, 2006). In an experimental setting where subjects are presented with lotteries, and their emotions are captured by a facial recognition software, Nguyen and Noussair (2014) find anger to be positively correlated with risk aversion. Angry people appear to prefer medium or long-term investments while those who feel anxious prefer the kind of immediate access to their money that is only available through certain savings accounts (Gambetti and Giusberti, 2012). Anger seems to affect decision-making through its effects on the perceived characteristics of a setting, encouraging the individual to feel more in control and that outcomes are more predictable (Ellsworth and Scherer, 2003).

Positive Emotions

Delis and Mylonidis (2015) find that happiness reduces the likelihood of purchasing risky assets, consistent with the mood maintenance hypothesis whereby investors are wary of taking on risk for fear of damaging their current good mood state. On the other hand, in a simulated trading experiment, Breaban and Noussair (2018) show that happiness is positively correlated with higher price levels of assets, confirming that its positive valence negatively relates to loss aversion.

Albeit informative, the literature on gain versus loss domains is not directly applicable in our case since the attitude to risk (ATR), as the process with most financial advisors, precedes any actual investment. Given the somewhat mixed and context-dependent evidence in the literature on the link between risk tolerance and attitude to risk, we refrain from establishing separate hypotheses regarding each individual emotion, and we instead focus on the aggregate picture.

We follow Breaban and Noussair (2018) in using the terms positive and negative 'emotional valence' as catchall terms for the strengths of the positive or negative emotional state, respectively. A handful of studies have shown how more positive (more negative) emotional valence is associate with more (less)risk-taking (e.g. Wright and Bower, 1992; Nygren et al., 1996; and Breaban and Noussair, 2018).

Consistent with the appraisal tendency framework of Lerner and Keltner (2001)[3] and the majority of studies cited above, our first vital hypotheses are, therefore:

H1: Investors who experience more positive (negative) emotions towards investing have a higher (lower) ATR score.

H2: Negative emotions towards investing have a stronger impact on ATR than positive emotions.

Emotions towards life

It is clear that feelings about financial investing are bound to influence selections between more or less risky assets so, for example, somebody for whom the mere thought of stocks and shares instils fear is bound to have a tendency to avoid them. But what about the impact of how the person is feeling more generally? For example, they might be ambivalent about investing but in a bad mood more generally. There is certainly considerable evidence for the impact of 'emotional spillovers' – in other words, that general emotional states caused by non-financial factors can cause changes in financial decision-making behaviour. In an experimental setting, Johnson and Tversky (1983) find that showing people a report on a risk in one domain led to an increased estimate of the risks in other, unrelated environments. They term this a 'pervasive global effect in the absence of any local effect of similarity or association' (p.30), leading them to the conjecture that a person may make decisions based on their current mood even when the context of the decision is not linked with the cause of the mood state. This phenomenon has also been termed 'misattribution' in the literature, where people attribute their current mood

[3] The appraisal tendency framework includes both background and integral emotions (Cavanaugh et al., 2007).

to the incorrect source (e.g., Schwarz and Clore, 1983). Many different emotions can have spillovers into contexts other than from where they came: for example, incidental anger leads to a tendency to blame others for the effect of other, unrelated bad events that occur (Keltner et al., 1993).

In this study, we therefore separately evaluate the impact of emotions towards investing (integral emotions) and emotions towards life ('background' emotions) more generally on financial risk tolerance. The emotions towards life are based on the same adapted PANAS scale as described above and are captured by asking respondents to what extent on a 1-to-5 scale, they generally feel interested, excited, strong, enthusiastic, proud, alert, inspired, determined, attentive or active about life in general. The negative emotions towards life were distressed, upset, guilty, scared, hostile, irritable, ashamed, nervous, jittery and afraid. We have deliberately chosen a different set of emotions which seem more relevant for life than for finance. As for emotions towards investing, emotions towards life are grouped into aggregate indexes of positive (*Positive Emotions Towards Life*) and negative emotions (*Negative Emotions Towards Life*).

Therefore, consistent with the affective generalisation hypothesis (i.e., as a result of the cross-over of emotions between contexts), we hypothesise that:

H3: Investors who experienced more positive (negative) emotions towards life have a higher (lower) ATR score.

However, it seems highly likely that emotions integral to investing will have greater strength in affecting financial decision-making than emotions spilling over from other contexts so that:

H4: Positive (negative) emotions towards investment have a greater impact on ATR than positive (negative) emotions towards life.

2.2 Data Collection

We employed an on-line questionnaire via the Qualtrics platform, where UK-based retail investors were quizzed under several different headings (demographics, attitude to financial risk, investment experience, investment knowledge, emotions towards life, emotions towards investment). The survey took place in June 2017, and Qualtrics obtained participants from their database and remunerated them following their standard approach. The collection of data took place in a single country and over a one-week period, and we can therefore be reasonably assured that a set of homogeneous external circumstances took place for all participants. For example, it will not have been the case that some respondents completed the questionnaire during a bull market and others following a market correction.

Specific quotas were established along age, income, gender and investment experience dimensions in order to ensure that the sample reflected a good spread according to these variables to approximately match the general investing population at large. Following the removal of 195 responses where it was clear that the respondent had not performed the task with integrity throughout (e.g., providing the same answer repeatedly), the final sample contained 970 fully completed questionnaires for analysis.

Attitude to Financial Risk

Our core models seek to determine the influence of emotions on attitude to financial risk. In order to measure the latter, we employ an aggregate measure based on 20-items. The questions are used by Distribution Technology in their Dynamic Planner system employed by large numbers of independent financial advisors in the UK as part of their selection of appropriate proposition for retail clients. The individual items in the questionnaire are all measured on a 5-point Likert scale (from 'Strongly Disagree' to 'Strongly Agree')[4] and then aggregated into a single measure capturing the investor's risk tolerance.[5]

Given that our dependent variable, attitude to risk, is measured on an integer scale from 1 (lowest possible level of risk tolerance) to 10 (highly risk-tolerant), and is consequently limited and ordinal rather than cardinal, we can only state that a respondent with a score of six is more risk-tolerant than someone with a score of three; we cannot make any inferences about how much more risk-tolerant. We therefore employ ordered probit models,[6] estimated using maximum likelihood, throughout. All specifications take the same general form:

$$Prob.\ Calculated\ ATR_i = \alpha' + \beta_1 Male_i + \beta_2 Age_i + \beta_k Emotions_{ki} + \gamma_i' X_i + \epsilon_i \quad (1)$$

where α' is a vector of cut-off points estimated in ordered probit models[7] (constant terms); $Emotions_{ki}$ is a set of variables measuring the respondent's emotional state (as discussed in more detail below); ϵ_i is the i.i.d. standard normal error term; Age_i is the respondent's age category ; $Male_i$ is a dummy variable equal to one if the investor's gender is male, and zero otherwise; X_i is a vector of three additional explanatory variables: investment experience, investment knowledge and education.

2.3 Control Variables

The extant literature on the determinants of risk tolerance has identified several relevant causal factors, including demographics which we include in the model as controls (see, for instance, Prasad et al., 2020a). Since the relationships between these variables and ATR is already well discussed in the literature, we refrain from setting up formal hypotheses using them.

Age

A considerable stream of research has observed a decline in risk tolerance with age (Brooks et al., 2018; Bucciol and Miniaci, 2011; McInish, 1982). Although the precise reasons for this are still subject to debate, possible

[4] The questions '*Compared to the average person, I would say I take more risks*' and '*To achieve high returns, it is necessary to choose high-risk investments*' are examples of two items used to measure attitude to financial risk in the Dynamic Planner system. The complete list of 20 items cannot be fully disclosed since it is proprietary.

[5] Note that, strictly, the scale measures risk tolerance where a higher number indicates a greater appetite for risk, rather than risk aversion, which is its opposite.

[6] In ordered probit models, the estimated dependent variable is a latent unobserved probability which is computed as a z-score. The probability of an ATR score *j*=1,2, …, 10 is measured as the probability that the estimated regression model, plus an error term, is within a range of values (cut-off points) specific to the outcome *j*, which is the overall calculated ATR score. Note that *i* indicates a single investor and differs from *j* which is the possible ATR outcome ranging from 1 to 10.

[7] The estimated cut-off points are not reported for brevity.

causes include the complexity of the information (Tun et al., 1998), a weakening of the analytical processes needed to make financial decisions with age (Hess, 2015), a declining tolerance of ambiguity and uncertainty (Kurglianski and Webster, 1996). It has also been argued that emotional arousal can be more important in influencing decision-making for older investors as a counteract to declining cognitive abilities (Pu et al., 2017). The variable used in our regressions is the age category of the respondent and takes integer values from 1 to 7 if his/her age is 18-23 years, 24-29 years, 30-39 years, 40-49 years, 50-59 years, 60-69 years and 70 years or older.

Gender

There is strong evidence in the literature that women are more risk-averse than men, investing a lower proportion of their wealth in risky assets (Bernasek and Schwiff, 2001; Brooks et al., 2019; Chow and Riley, 1992; Gilliam et al., 2010; Jianakoplos and Bernasek, 1998). Women are also more loss averse than men (Olsen and Cox, 2001) and this may be due to the former making lower assessments of expected returns as they are more pessimistic (Felton et al., 2003; Harris et al., 2006; Jacobsen et al., 2014). Women tend to trade less often than men even when working with the same types of assets, perhaps indicating less inclination towards competition (Fellner and Maciejovsky, 2007), although there is evidence that among women, those in high-status roles may be more competitive (Whiting and Wright, 2001).

It is also possible that gender is a mediator between attitude to risk and emotions. It appears that men are particularly susceptible to the influence of 'incidental anger', where men's risky behaviour is driven by anger about something totally unrelated, even though on average they are no angrier than women (Ferrer et al., 2017).

Among possible gender-specific emotional drivers of risk aversion, men's risk preferences are affected more by sadness while women's are more influenced by joviality; both are significantly influenced by fear (Conte et al., 2018). Mood seems to have a more substantial effect on women's weightings of the likelihood that specific outcomes will occur than men, with women in a good mood attaching higher probabilities to positive returns than men in a comparable mood state (Fehr-Dua et al., 2011). Gender is included in the models as a dummy variable *Male* taking the value 1 for male and 0 for female respondents.

Investment experience

Emotions might have a more substantial effect on individuals when they face new situations than settings that are familiar to them (Fenton-O'Creevy et al., 2011, p.1046) and we know that people have a preference for situations where they feel in control (Klein and Kunda, 1994). Attitude to financial risk is also heavily dependent on previous outcomes: individuals who faced worse outcomes in the past become more risk-averse while those who faced better outcomes previously become less so, partly because people evaluate the situation compared with what might alternatively have happened (Barreda-Tarrazona et al., 2014). Personal experiences of financial loss can make investors steer clear of risks in the future, although the 'second hand' experiences of friends or relatives cannot (Andersen et al., 2019).

There is evidence that an experience of having taken risks in the past leads to increased willingness to take risks in the future (Slovic et al., 2000) and therefore we would expect that the more experienced a respondent is in financial investing, the more risk-tolerant they are likely to be. The variable *Self-Assessed Experience* is based on the responses to the question, 'Overall, how would you describe your level of investment experience? (a) Not at all experienced: I'm not very comfortable with investing; (b) Somewhat experienced: I understand the basics but still want some things explaining; (c) Experienced: I'm comfortable with investing and have some understanding of the potential risks and rewards.' These three responses are coded as 0, 1 and 2, respectively.

Investment knowledge

It is worth noting that the investment experience variable described above is self-assessed by the respondent, and there might exist systematic variations across groups in the tendency to report this accurately (e.g., men versus women). Greater investment knowledge or improved financial literacy is likely to be linked with increased risk tolerance (Dwyer et al., 2002; Prasad et al., 2020b) and a lack of knowledge or feeling unable to control a situation can heighten perceptions of risk and further encourage its avoidance (Slovic et al., 2000). We therefore also employ an objective measure of investment understanding, *Assessed Financial Knowledge*, which is based on a five-question quiz that is a subset of the FINRA knowledge test.[8] Each question in the quiz has a correct answer, and therefore the sum of the number of correct answers provides an unbiased estimate of the respondent's real level of financial knowledge. A score of 0 indicates very poor financial understanding, while a score of 5 indicates excellent investment knowledge. We find that around 12% of respondents were able to get no correct answers at all; 22% got one correct; 23% two correct; 26% three correct; 13% four correct; and only 4% got the right answers for all five questions.

Educational level

Several studies have observed a positive relationship between an individual's educational level and their degree of risk tolerance (e.g., Chang et al., 2004; Grable, 2000; Grable and Joo, 1999). We thus include a separate explanatory variable for each respondent's general level of education as a higher value of this variable is likely to reduce risk aversion even for those with little domain-specific knowledge or experience in finance. *Education* is measured as a score variable (0-2), according to whether the investor has a low level of education (school leaver), whether he/she has a medium level of education (high school or equivalent or vocational/technical school), or whether he/she is highly educated (bachelor's degree, master's degree, professional degree or doctorate).

[8] https://tools.finra.org/knowledge_quiz/

2.4 Data Summary

Table 1 presents summary statistics for all key variables employed in this study. Panel A summarises the attitude to risk and positive and negative emotional composite scores separately for men and women, who are roughly equally represented in the sample, and overall. It is clear that women are less risk-tolerant than men, and they have lower positive emotions scores and higher negative emotion scores towards financial investments. Also, the standard deviations of ATR, positive and negative emotions towards investments are all higher for female than male investors, perhaps indicating greater heterogeneity among the former group.

[Insert Table 1 about here]

The relationship between ATR and emotions towards investing is illustrated in Figure 1, which plots the probability distributions of attitude to risk for each level of positive (Panel A) and negative (Panel B) emotions. The figure shows the estimated absolute probabilities (percentages) of respondents falling into a particular attitude to risk category (ATR), measured in integer scores from 1 to 10, by positive or negative emotions towards financial investments, measured as scores from 1 to 5.[9] For a given level of either positive or negative emotion, the distribution of risk tolerance is very approximately bell-shaped. While there is some overlap in the curves as emotion scores increase, there is a monotonic shift in the curve from left to right for positive emotions and right to left for negative emotions. The way that these curves can be interpreted is as follows. Investors with positive emotions towards investing equal to 1, 2, 3, 4 and 5 respectively on a 5-point scale where 5 is most positive, are most likely to have an ATR score of 3, 4, 6, 6 and 7 respectively with corresponding absolute probabilities equal to 30%, 25%, 28%, 31% and 29% of falling into these ATR categories respectively. For negative emotions towards investing with aggregate scores equal 1, 2, 3, 4 and 5, the most probable ATR scores are 6, 6, 3, 3 and 1 with probabilities equal to 31%, 24%, 26%, 31% and 32%, respectively. Altogether, Table 1 and Figure 1 show that, as anticipated, risk tolerance is positively linked with positive emotions and negatively linked with negative emotions, albeit before any controls or confounding factors are accounted for.

[Insert Figure 1 about here]

Table 1, Panel B examines whether and how gender and age interact to affect the link between emotions and attitude to risk.[10] We find that, while women are more risk-averse than men at all ages, the difference peaks in middle age (40-69 years old), and this also coincides with the highest difference between the emotion measures across men versus women. For example, men in their 60s on average have a 0.58-point higher score on positive emotions towards finance, a 0.40-point lower score on negative emotions and a 1.86-point higher risk tolerance

[9] In order to construct the plot, we use our baseline specification, discussed in more detail below, which is an ordered probit with robust standard errors, a gender dummy and age. Gender and age are assumed to be at their sample mean values. All probabilities are significant at the 1% level.

[10] We re-run the probit regression with ATR as the dependent variable and including interaction terms between the two aggregate emotion measures and the gender dummy variable. Since the estimated coefficients on these interaction terms are not statistically significant in most specifications, we do not report the results.

measure. This again demonstrates that both positive and negative emotions drive attitude to risk, and all three vary systematically with age.

In Table 1, Panel C we home in on the impact of self-assessed investment experience, and we show attitude to risk and emotions scores for each of its three possible values. As perhaps expected, women tend to state that they have lower levels of investment experience than men: in unreported results, we find that just over 50% of women put themselves in the lowest experience category whereas this is the case for only 21% of men. It is clear that while risk tolerance is increasing in investment experience, the gender difference in attitude to risk does not vary systematically with investment experience. But the difference between men's and women's positive emotions towards investments changes with experience. Specifically, men have highly significantly more positive feelings about investment than women when both have the lowest levels of investment experience but when men and women have high levels of previous experience the gender difference in emotions towards finance disappears. In other words, one might state that men are happy to invest in ignorance, while women are not. The same is not valid for negative emotions towards finance, however, where there are no significant gender differences for any level of investment experience.

We cannot identify the direction of causality from these results, i.e., whether women accumulate less investment experience because it does not make them happy, excited or inspired, or whether women feel less positive about finance because they have less experience of it. But these results are nonetheless interesting and surprising given the existing literature: it is not that women feel more scared or fearful of investing that is driving their financial choices towards safer assets compared with men; instead, it is that women lack positive emotions about finance. It seems that investment simply does not resonate with women who claim to have low levels of experience of it, and this has a potentially important policy implication for providers of financial products and regulators. The relatively low proportion of women compared with men who are saving adequately for their retirement is a well-documented problem (Lusardi and Mitchell, 2008; Almenberg and Dreber, 2015; and Dwyer et al., 2002) and our findings suggest that this may be because finance does not excite or inspire them and not because they are more frightened of risky investments as indicated in the existing literature. Put another way, it is positive, rather than negative, emotions that hold the key to explaining gender differences in risk appetites. Overall, the results here also suggest that investment education is not the key to reducing gender differences in risking investing, echoing the findings of Brooks et al. (2019).

Table 2 homes in on the individual emotions towards finance and summarises their link with attitude to risk. Panel A presents summary statistics for both positive (happy, excited, inspired and enthusiastic) and negative (fearful, ashamed, sad, angry and nervous) emotions towards finance overall and separated by gender. Considering first the emotions themselves in Panel A, in general finance elicits more positive than negative feelings: the median score on all positive emotions is 3, while for the negative emotions it is 1 for ashamed, sad and angry and 2 for fearful and nervous, although in all cases across the whole sample respondents cover the full range from 1 to 5. It is clear that the terms 'fearful' and 'nervous' resonate more with respondents in the

context of investing, although they mostly do not feel ashamed or angry. It is clear from the table that men have more positive feelings about investing than women, and on average the former have 0.5-unit (on a 5-point scale) higher scores. While the gender differences in average scores are statistically significant at the 1% level for all of the positive emotions, this is only true for fearful and nervous among the negative emotions. For the other three negative emotions (ashamed, sad, angry), the average scores are low (median = 1, mean ≈ 1.4) and with no gender difference. Women are, however, more fearful and more nervous than men (highly significant differences between the means).

[Insert Table 2 about here]

Table 2, Panels B and C show the link between risk tolerance and positive or negative emotions (individual and composite scores), respectively, and separated by gender. The average ATR score monotonically increases as the emotion score increases from 1 through 5 for all the positive emotions, although slightly more strongly for 'excited' and 'enthusiastic'. On the other hand, regarding the negative emotions, 'nervous' and especially 'fearful' have a monotonic decline in average risk tolerance as the emotional score declines. At the same time 'sad' also has some discriminatory power for risk tolerance but 'angry' has very little, with only a 0.5 difference (on a 10-point score) between the risk tolerances of those who are least and most angry. Also, as expected, average ATR scores are growing monotonically with increasing composite scores of positive emotions and declining monotonically with increasing composite scores of negative emotions.[11]

With respect to gender, the main result is that for all of the emotions towards finance – both positive and negative – men are significantly more risk-tolerant than women for every given emotion score. That is, for example, even among respondents with the lowest fear of investing (score = 1), women have an average ATR of 5.7 on a 10-point scale whereas, for men, it is 6.2. There is not a single emotion score where women are more risk tolerant. We also observe that, for the positive emotions 'happy', 'excited', and 'inspired', the gender difference in risk tolerance is largest for those who are least positive. Or, to put this in other words, a given one-unit increase in the positive emotion has a larger effect on the risk tolerance of women than that of men. This indicates that as well as having differing base levels of feelings about investing, men's and women's attitudes to risk are affected differently by emotions.

Next, we focus on the link between emotions towards life and attitude to risk. Table 3, Panel A shows summary statistics for both positive (interested, excited, strong, enthusiastic, proud, alert, inspired, determined, attentive and active) and negative (distressed, upset, guilty, scared, hostile, irritable, ashamed, nervous, jittery and afraid) emotions towards life, and their composite emotions scores (Positive Emotions towards Life and Negative Emotions Towards Life). In line with the results presented for emotions towards investing and ATR, we find that scores are greater for positive emotions when compared to negative feelings, with composite scores equal

[11] In unreported results, we show that almost half investors have positive composite scores of between 3 and 5. On the other hand, nearly two-thirds of investors in the sample have negative emotions scores in the lowest possible range (between 1 and 2).

to 3.3 and 1.7, respectively. The median score for positive emotions is 3 for 6 out of 10 feelings, and 4 for 'interested', 'alert', 'determined' and 'attentive', while for negative emotions it is 1 for the majority of emotions and 2 for 'upset', 'irritable' and 'nervous'. Table 2, Panel B represents the relationship between ATR and emotions towards life. The mean ATR scores monotonically increase with positive emotions for all individual feelings and for the compositive score. ATR values by scores of individual positive emotions towards life (from 1 to 5), and by 1-notch buckets (1 to 2, 2 to 3, 3 to 4, and 4 to 5) of the composite score of positive emotions are also statistically significantly different from the overall mean ATR. However, for negative emotions the ATR is monotonically decreasing with emotion scores for 'upset', 'scared', 'nervous', and 'afraid' only with statistically significant differences with respect to the overall average ATR.

[Insert Table 3 about here]

Returning to Table 3, Panel C presents Spearman correlations between the key variables and shows several additional interesting findings. For instance, having a strong negative emotion towards finance does not imply having a low positive score on emotions as the correlation is reasonably close to zero (-0.16). This justifies the use of separate positive and negative indices rather than, for example, constructing a net measure combining the two. We also observe that the correlation between the corresponding emotions towards investment and towards life are high, but not close to one, and therefore they are capturing different information.[12]

To gain more insight into the relationship between ATR and emotions towards investing and life, in Table 3, Panel D we show model implied ATR scores[13] for positive and negative emotions, respectively. There is a positive monotonic relationship between risk tolerance and positive emotions towards finance and life. However, when considering the relationship between ATR and emotions towards life conditional on the scores for emotions towards investing, ATR scores are marginally decreasing with emotions towards life, indicating that on average, for a given level of emotions towards finance, investors are more risk tolerant if they are less positive towards life. Similarly, for negative emotions, ATR is decreasing with both emotions towards life and investing. When we condition ATR on the scores of negative emotions towards finance, risk tolerance is marginally increasing with negative emotions towards life.

In Figure 2 we plot the estimated absolute probabilities (percentages) of an investor falling into an ATR category (from 1 to 10) for each level of positive emotions (Panel A) and negative emotions (Panel B) towards life and investing jointly (measured as score combination of emotions towards investing and life from 1-1 to 5-5).[14] As discussed in Figure 1, there is a clear monotonic shift from left to right as positive emotions towards investing increase, and a shift from right to left for negative emotions towards investing. However, for a given level of

[12] Panel C also shows that the education and income bands have a relatively strong positive correlation (0.43) while respondent self-assessed financial experience and their objectively measured financial knowledge also have a correlation of 0.43, illustrating that some participants claim to be comfortable with investing but actually have little knowledge and vice versa.

[13] We use the same model specification used to plot Figure 1 with a gender dummy and age as control variables.

[14] For simplicity, we have computed probabilities for possible combinations of positive emotions towards investing and life (Panel A), and negative emotions towards investing and life (Panel B), leading to 25 combinations of emotions scores for each panel of Figure 2.

positive emotions towards finance, the probability distributions of positive emotions towards life are marginally shifting towards the left as emotions towards life score increases, confirming the results reported in Table 3, Panel D. For negative emotions towards life conditioned on scores of emotions towards investing, the distributions are marginally shifting towards the right as the emotions towards life scores increase.

[Insert Figure 2 about here]

Considering the evidence provided in Table 3 and Figure 2, it is possible for an individual to be happy in their life in general and not fearful or angry, but they are nervous and unhappy when considering financial matters, with different impact on the risk tolerance, a point to which we will return in section 3.2. Overall, the summary results presented thus far highlight that individual emotions can have heterogenous effects on ATR with some being more strongly associated with it than others. It is also clear that there are gender effects in both emotions and attitudes to risk, which provides a strong further motivation to examine their relative impacts in a multiple variable framework that allows for both as well as the levels of education and investment experience, and considers possible interactions between them.

3. Results

3.1 Core Results on the Effect of Emotions Towards Investing on ATR

Table 4 presents the first table of key results from the ordered probit regressions of negative and positive emotions towards finance on attitude to risk score.[15] Column (1) shows the impact of the two composite emotions indices alone, indicating that they are highly significant and drive a pseudo-R^2 of 14% with the expected signs.[16] Including only the positive emotional measure or only the negative one does not increase their explanatory power compared with including both together, again indicating that they contain separate information and that people with high scores on the positive emotions towards finance do not necessarily have low scores on the negative emotions and *vice versa*. A one-unit change in positive emotions towards investing corresponds to a 10.7% change in the marginal probability of an ATR equal to six, ceteris paribus.[17] The marginal likelihood of a one-notch change in negative emotions towards investing is –9.4%.

[Insert Table 4 about here]

[15] We report Y-standardised coefficients to compare estimates from different specifications of the model. See for instance Long and Freese (2006).

[16] Ordered probit models are usually characterised by low goodness of fit (Pseudo R^2). When we estimate identical model specifications using OLS, the adjusted R^2 is approximately two to three times larger.

[17] For all regression results and predictors, we report the marginal probability of an ATR equal to six - a level of risk slightly greater than the sample median ATR. We interpret these probabilities as the marginal likelihood changes corresponding to a one unit increase in the independent variables.

Adding additional control variables moving from left to right in the table – gender, age, income, investment experience, financial knowledge, and general education controls, only very slightly diminishes the magnitudes and statistical significances of the emotion measures. The results from the controls themselves reassuringly confirm the findings in previous studies that men are more risk-tolerant than women and that risk appetite declines with age.[18] We also find that risk tolerance rises with income, and rises with self-assessed investment experience, with objectively assessed financial knowledge, and with educational level. While the latter three variables are very highly significant when included in the model individually, when all three are incorporated simultaneously, the individual significance diminishes somewhat due to the overlapping information provided by the three measures, and the general educational level becomes statistically insignificant in some specifications. Interestingly, the respondent's own view of their investment experience has more explanatory power than their objectively assessed actual knowledge. The importance of income also diminishes when education is included since they too are positively correlated.

Furthermore, we control for the moderating role that demographic and cognitive factors have on the relationships between emotions and ATR by including interaction terms between the control variables and emotions scores.[19] Columns (8) and (9) show that the interactions between negative emotions towards investing and age, and negative emotions towards investing and assessed financial knowledge are both statistically significant and negatively related to ATR. This finding indicates that the impact that negative emotions towards investing have on ATR is marginally greater the older and more knowledgeable investors are. In unreported results, we also show that gender, income, investment experience and education are not statistically significant moderators of the relationship between emotions towards investing and financial risk tolerance.

We now proceed to examine the links between attitude to financial risk and the scores for individual emotions, where previously we had employed aggregate emotions measures. Hence Table 5 repeats the analysis presented in Table 4 but with individual emotions; note that while we still incorporate gender, age, income, investment experience, investment knowledge and education as control variables, we do not include their estimates and standard errors in the table in order to preserve space.

[Insert Table 5 about here]

We find that the parameters on all of the individual emotions have their expected signs (positive signs for positive emotions and negative for negative) and are statistically significant at the 5% level or lower). All of the

[18] In unreported results, we run regressions with independent variables that have more than two categories (age, income, investment experience, self-assessed financial knowledge and education) included as a set of binary categorical variables, with the value 1 if that particular category is true, and zero in all other cases. The results are quantitatively similar to those of Tables 4,5 and 7. However, in the paper we employ the model specifications where the independent variables are used as scores rather than a set of binary categorical variables for the following reasons: i) to avoid a proliferation of the variables; ii) to avoid losing degrees of freedom; and iii) due to the role of these categorical variables as only control variables, and not co-variables. This model specification with independent variables used as scores embodies the assumption that the impact of a control variable moving from a level to the next has the same impact on the ATR whatever the current level of that variable. For this reason, it can be interpreted as a parsimonious, restricted version of the model estimated using a set of binary variables corresponding to each possible sub-category.

[19] We thank an anonymous reviewer for this suggestion.

positive emotions have very similar degrees of explanatory power with enthusiasm being very slightly more relevant than the others and having the highest marginal probability equal to 7.8%. On the other hand, the negative emotions have lower explanatory power in general although fear has a similar *z*-ratio to the positive emotions (approximately –11) and the highest marginal probability among negative emotions (-6.4%); 'nervous' also has reasonable statistical significance but 'ashamed', 'sad', and 'angry' are all only marginally relevant. Overall, we conclude from Table 5 that the results vindicate our use of aggregate emotions measures, which have better explanatory power than the individual emotions, and in the interests of parsimony, we continue to focus mainly on the aggregates in all subsequent analysis. We also conclude from the results in Tables 2 to 5 that hypothesis H1 is strongly supported by the data while H2, that negative emotional valence has a more substantial impact than positive valence, is refuted. Our base finding that risk tolerance increases with more positive emotional states and decreases with more negative ones is in line with several studies related to risk-taking tasks (e.g., Wright and Bower, 1992; Nygren et al., 1996; and Breaban and Noussair, 2018).

A casual glance at the relative levels of statistical significance of the emotions versus other indicators in Table 4 is indicative that the former has more explanatory power. In order to test this more formally, in Table 6 we present the results of Shapley-Owen decomposition that identifies the percentage of the overall Pseudo R^2 attributable to each independent variable (third column) or group of variables (fourth column).[20] We separate the variables into three groups: emotional factors (positive and negative emotions towards investments), demographic characteristics (gender, age, and income), and what we loosely term a proxy for cognitive factors (self-assessed investment experience, investment knowledge and general educational level). Perhaps surprisingly, the emotional aspects have higher explanatory power than the cognitive measures with the demographic group having the least (50% vs 33% vs 17% respectively). The demographic variables, almost certainly the most studied in the existing literature in part due to their ease of measurement and the accessibility of data, are actually the least important grouping.

[Insert Table 6 about here]

3.2 Emotions Towards Life, Emotions Towards Investing and ATR

Our survey not only asked respondents how they felt about investing, but it also sought to gauge their emotions about life in general. As we might expect given the literature on emotional spillovers from one domain to another, those who have negative feelings about investing also typically have negative feelings about life (Panel C of Table 3 shows a correlation around 0.5, significantly different from zero at the 1% level). Still, there is almost no relationship between the score on positive feelings about investing and that on positive feelings towards life (correlation around 0.1 and not significant even at the 10% level). Again, as anticipated, both

[20] We have used the *Shapley2* command in STATA for ordered probit models. There are some numerical differences between the percentages by group and the sum of individual percentages of the factors within that group because *Shapley2* is an abbreviated version used to compute the Shapley value, but these numerical differences are very small in general. We thank an anonymous reviewer for suggesting the use of this command. See Huettner and Sunder (2012) for more information about the Shapley-Owen decomposition.

positive and negative emotions towards life are significantly positively and negatively (respectively) correlated with risk tolerance, albeit less strongly so than feelings about finance more specifically.

Since emotions towards life appear to contain some different and potentially relevant information for explaining attitude to risk, we re-run the probit models with this as dependent variable but now including life emotions as explanatory variables. In line with our approach above, we focus on composite rather than individual emotions measures, and the results are shown in Table 7.

[Insert Table 7 about here]

In unreported results we find that when emotions towards life are included on their own as explanatory variables with no controls, they are all statistically significant with their expected signs, albeit positive emotions having much greater explanatory power as the correlations in Panel C of Table 3 predicted. In Table 7, column (1) we include a range of control variables which reduce the significance of both positive and negative emotions towards life, although the former remains statistically significant at the 1% level (column (1)). One notch increases in positive and negative emotions towards life correspond to marginal probabilities equal to 3.0% and -1.3%, respectively (column (1)). Similar to hypothesis H1, we also find, therefore, that hypothesis H3 is validated by the data.

If we include both emotions towards life and towards investing more specifically at the same time in the ordered probit regression (e.g., column (2)), the latter retain their significance and correct signs, but the former become insignificant or flip signs, which arises due to the high correlation between positive emotions towards life and positive emotions towards investing. As we would expect, while they still have significant explanatory power, emotions towards life have lower impacts on attitude to risk than emotions towards finance – compare, for example, the pseudo-R^2 of 0.138 in column (1) of Table 7 for a model including only emotions towards life and controls with the corresponding value of 0.204 in column (7) of Table 4 for a model containing only emotions towards finance.[21] Therefore, we find support for hypothesis H4.

As discussed in section 2.4, it is of relevance to examine the effect of the relationship between emotions towards life and towards finance, so we also include an interaction term between the two aggregate measures of positive (or negative) emotions, again observing the expected signs (column (5); the interaction terms seem to capture the covariance of the two variables. However, only the interaction term for negative emotions is significant (and positive).[22]

[21] As an alternative approach to capture the difference between emotions towards finance and towards life, we run a regression of the former on the latter and then we take the residuals from this specification and use them as an explanatory variable in our probit regressions to explain risk tolerance. We also employ a factor analysis to solve the issue of high correlation between positive attitude towards life and towards investing. The results from these models are qualitatively identical to those in Table 7 and therefore we do not report them here for brevity.

[22] Individual marginal effects for variables that appear more than once in a model specification – for instance, variables in the interaction terms between positive (or negative) emotions towards investing and life – could be over-estimated. Therefore, we report only the overall marginal probability for individual variables and omit the marginal effect of their interaction terms.

In general, emotions towards finance and towards life are positively related, so someone experiencing, say, strong negative emotions about finance, is also likely to be experiencing negative feelings about their life more broadly. Informed by the evidence reported in Table 3, Panel D and Figure 2, particularly interesting cases are those relatively rare instances where there is an inconsistency – i.e., they are positive about finance but not about life, or vice versa. Therefore, in columns (3), (4), (6) and (7) we compute the spread between the finance and life emotions measures. When included without controls (column (3)), these terms are highly significant and indicate that the most risk-tolerant investors are those who are more positive and less negative about investing than about life, with associated marginal probabilities equal to 1.9% and -2.3%, respectively. This is quite intuitive as the extent to which the respondent is satisfied with their life in general provides a person-specific baseline for comparing their satisfaction with finance.

In unreported results we find that men and younger people are significantly more positive and significantly less negative about investing than about life than women and older people. Respondents with greater investment experience or investment knowledge have more positive and less negative feelings about investing relative to life. Therefore, to gain further insight into the role that demographic and cognitive factors play in moderating the relationships between emotions towards investing, life and ATR, we interact emotions scores with our control variables. Columns (6) and (7) show that only age and assessed financial knowledge are statistically significant moderators, in line with the results presented in Table 4. In column (6), the interaction term between age and the spread between negative emotions towards investing and life is statistically significant and positively related to ATR. This result indicates that while being more negative towards investing than life leads to a lower ATR score, this effect is marginally less strong for older investors. Column (7) confirms the result presented in Table 4 on the negative moderating role that self-assessed knowledge has on the relationship between negative emotions towards investing and risk tolerance. Once again, the interaction terms between emotions scores and the remaining control variables are not significant.

4. Discussion and Conclusions

This study has conducted a thorough assessment of the link between emotions and attitude to financial risk. In general accordance with the appraisal tendency framework (Lerner and Keltner, 2001) and drawing on the concept of emotional valance (Breaban and Noussair, 2018), we show that risk tolerance monotonically increases with positive emotions towards investments and towards life and decreases with negative emotions. We control for a higher number of emotions than is the case in any of the existing literature, and perhaps counter-intuitively, we show that aggregate positive emotions have a greater impact on risk tolerance than negative emotions.

We observe that investors who are more positive (or less negative) towards investments than towards life are more risk-tolerant than investors who are equally positive (or negative) towards investments and life. These findings are generally in line with the affective generalisation hypothesis (Johnson and Tversky, 1983), and

provide novel empirical evidence on the interaction between integral and background emotions and the risk-taking behaviours of retail investors.

We investigate the explanatory power of gender, age, income, assessed financial knowledge and investment experience, finding that these variables all play a significant role. We do, however, find that emotions towards investments have a considerably greater explanatory power for the cross-section of risk tolerance than emotions towards life, cognitive or demographic factors. Psychologists have argued that when cognitive and emotional assessments of the risks inherent in a situation diverge, the ultimate decision often arises from the latter (Loewenstein et al., 2001). This statement might be somewhat surprising to many economists, but we provide evidence for its support in the financial context.

Our research sheds lights on the role that integral and background emotions (investments versus life) have on the financial decision-making process of retail investors and demonstrates the importance of mood and feelings in influencing risk tolerance. It is clear that omitting emotional factors from theoretical or empirical models is likely to result in a very incomplete view of how people make financial decisions. Allowing for the impact of emotions on investor behaviour is expected to provide a way to improve asset pricing models and to deal with the large number of anomalies that have been documented (Shu, 2010).

Our study paves the way for a rich agenda of future scholarship in this area. Additional research could investigate whether repeatedly measuring risk tolerance for the same individual at different points in time when the person is experiencing other mood states might be beneficial to smooth out the effects. Some psychologists believe that risk tolerance is genetically predisposed (Hanna and Chen, 1997), is stable over time (Van de Venter et al., 2012), and is not much affected by macroeconomic events such as the financial crisis of 2008 and the ensuing recession (Roszkowski and Davey, 2010). This view is contested, however, with others (e.g., Cordell, 2001) arguing that it varies with significant changes in life circumstances. Given the strength of the explanatory power of emotions for attitude to risk, and that fact that mood can change substantially over time, re-assessing the extent to which risk tolerance varies over time with changing mood *for a given individual* would be worthwhile.

Future research could also investigate a broader range of emotional states that might be relevant to decision making, which would be possible in an experimental setting which allowed for social interactions between participants and the observation of relative performance measures to influence subsequent decisions. This is particularly relevant in the era of social media, chatrooms and electronic financial news bulletin boards since people tend to become more loss averse when part of a social grouping as a result of peer pressure not to significantly underperform the rest of the crowd (Heimer, 2016). Other relevant emotions include, for instance, embarrassment, which appears to have a similar effect to anger (Leith and Baumeister, 1996, p.1250). Embarrassment can have substantial impacts when the outcomes from trading are made public as people develop trading strategies aiming to ensure that they do not finish as the worst performer (Goulart et al., 2015). Finally, the impact of disgust, a somewhat neglected emotion in terms of empirical testing, on attitude to financial risk

could also be investigated; in other contexts, it has been associated with a tendency to dispose of objects, even when the source of disgust is unlinked to that object (Han et al., 2012).

Our findings also have implications for financial advisors and the setting in which they meet with their clients. Advisors need to be aware of the impact that their client's emotional state may have – not only how the latter feels about making financial decisions and whether this induces, for example, fear or excitement, but also what sort of mood the client was in before they arrived, do they seem harassed, and did they have trouble finding a parking space, could all affect the investment proposition they end up with. It is probably unfortunate that the completion of an ATR questionnaire almost invariably takes place at the very start of the session when emotional states are likely to be at their most extreme, rather than later in the process when the client has had a chance to calm down.

The interface between emotions and trust is also worthy of a more in-depth investigation and is particularly relevant in the context of the interaction of retail investors with those working in the financial services sector where trust is sometimes still compromised following previous mis-selling scandals such as that of payment protection insurance. An example of such work is by Guiso et al. (2008), who find a positive relationship between trust and the likelihood that an investor will purchase risky assets since the absence of trust reduces the perceived expected payoff from the risky investment.

A final message to financial education providers is the importance of encouraging emotional resilience as staying strong and focused in the face of adversity is increasingly recognised as a critical life-skill (Hill et al., 2007). Not only emotions felt, but how individuals cope with and channel those emotions, are essential for the quality of decision-making. 'Emotion regulation' involves the process whereby people control their emotions to influence their intensity or duration. Different approaches to this – such as acceptance of an emotional state and not trying to change it versus rumination (repeatedly going over the reasons for and effects of an emotional state) – have differential impacts on the tendency to take risks (Szasz et al., 2016). Cognitive rationalising of emotions leads to better decision-making than purely suppressing them (Heilman et al., 2010) and training for individuals on, for example, how to cope emotionally with financial losses could be valuable in helping support better decision-making while simultaneously increasing their welfare. Ideally, training in 'emotion regulation' would take place early on in schools or universities, although in practice it may again be advisors who are performing this function in the financial context. The very considerable influence of emotions on risk tolerance that we observe demonstrates a need to take them into account when financial advisors are meeting with their clients. For instance, the advisor may be able to assess the 'mood music' in the discussion and make adjustments in their processes to counteract this. Emotionally more rounded individuals may also become better at their chosen professions as well as being more effective decision-makers in the financial and other arenas.

Data Availability

The data employed in this paper were obtained by the authors via a survey. As part of the ethics approval process required to conduct the survey, it was necessary to assure participants that their responses would be treated

confidentially, that the resulting raw information would only be available to the researchers working on this project, and that it would be destroyed once it was no longer needed. Therefore, we are not at liberty to distribute the data.

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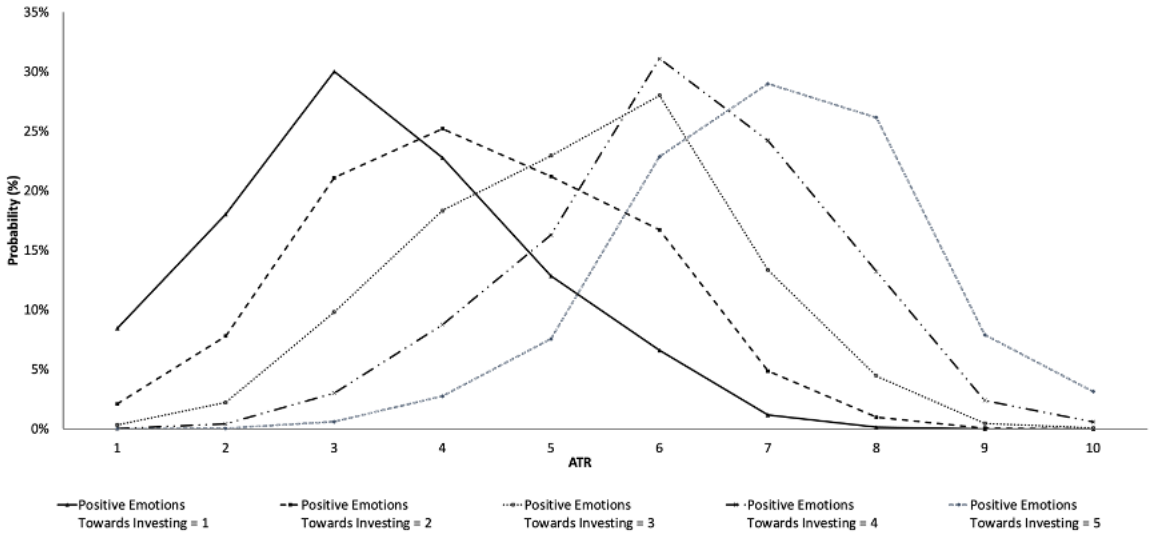
Figures and Tables

Figure 1: Estimated Probability Distribution of Attitude to Risk by Emotions Towards Investing

This figure shows the estimated probabilities (percentage) of a client falling into a certain attitude to risk category (ATR), measured in integer scores from 1 to 10, by Positive Emotions Towards Investing, measured as continuous scores from 1 to 5 in Panel A, and by Negative Emotions Towards Investing, measured as a continuous score from 1 to 5, in Panel B. The estimated model is an ordered probit with robust standard errors, gender dummy and age. Gender and Age are assumed at their sample mean values. All probabilities are significant at the 1% level.

Panel A: ATR and Positive Emotions Towards Investing.



Panel B: ATR and Negative Emotions Positive Emotions Towards Investing.

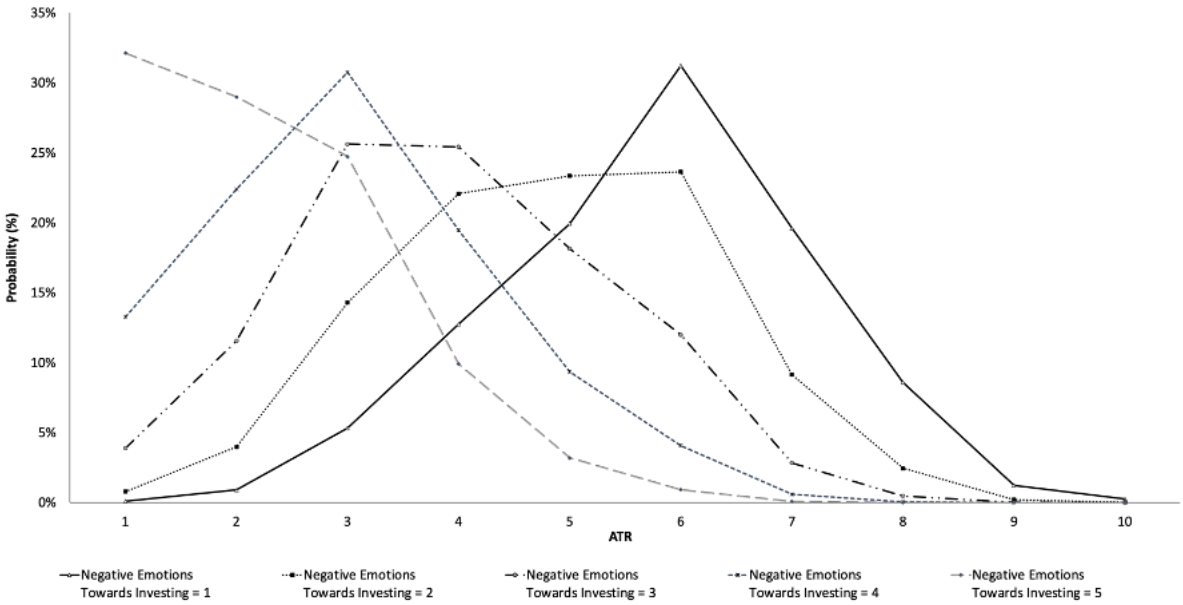


Table 1: Summary Statistics of Attitude to Risk by Emotions Towards Investing, Age, Gender and Self-Assed Investment Experience

This table reports summary statistics of attitude to risk by emotions towards investing, age, gender and self-assessed investment experience. **ATR** is the attitude to risk of the investor (integer scores from 1 to 10, where 10 indicates the highest tolerance risk level and 1 the lowest). **Positive Emotions Towards Investing** is a continuous score from 1 to 5, where 5 indicates the more positive feelings towards investing and 1 the less positive) and computed as the simple average of individual positive emotions of the investors towards finance. **Negative Emotions Towards Investing** is a continuous score from 1 to 5, where 5 indicates the more negative feelings towards investing and 1 the less negative) and is computed as the simple average of individual negative emotions of the investors towards finance. **Age** is the investor's age and is measured in seven buckets ranging from 18 years to more than 70 years. **Self-Assessed Experience** is the investor's self-reported level of experience in investing and is measured as a score variable (0-2) according to whether the investor is not experienced and has no financial knowledge, whether he/she has medium level of experience and financial literacy, or whether he/she is comfortable in investing and understand potential financial risks and rewards. Panel A presents the summary statistics of attitude to risk, positive and negative emotions towards investing by gender; Panel B reports summary statistics of ATR, Positive Emotions towards Investing and Negative Emotions towards Investing by age and gender; Panel C presents summary statistics of ATR, Positive Emotions towards Investing and Negative Emotions towards Investing by Self-Assessed Experience in investing and gender. *, ** and *** indicate significance at the 10%, 5% and 1% levels respectively.

Panel A: Summary Statistics

Statistics	ATR			Positive Emotions Towards Investing			Negative Emotions Towards Investing		
	All	*Female*	*Male*	*All*	*Female*	*Male*	*All*	*Female*	*Male*
Mean	4.995	4.298	5.694	2.737	2.513	2.962	1.835	1.950	1.719
Median	5.000	4.000	6.000	2.750	2.500	3.000	1.600	1.800	1.600
Standard Deviation	1.948	1.883	1.753	1.024	1.040	0.957	0.687	0.694	0.662
Minimum	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Maximum	10.000	9.000	10.000	5.000	5.000	5.000	4.600	4.600	4.600
Observations	970	486	484	970	486	484	970	486	484
Percentage	100.00%	50.10%	49.90%	100.00%	50.10%	49.90%	100.00%	50.10%	49.90%

Panel B: Summary Statistics for Emotions Towards Investing and ATR by Gender and Age

Age Bucket	Obs.	ATR				Positive Emotions Towards Investing				Negative Emotions Towards Investing			
		All	Female	Male	Difference	All	Female	Male	Difference	All	Female	Male	Difference
[18-23]	39	4.615	4.091	5.294	-1.203**	2.936	2.795	3.118	-0.322	2.503	2.509	2.494	0.0150
[24:29]	55	5.655	5.486	5.950	-0.464	3.482	3.364	3.688	-0.323	1.982	1.977	1.990	-0.0129
[30:39]	148	5.459	4.810	5.941	-1.132***	3.002	2.726	3.206	-0.480**	1.912	2.000	1.847	0.153
[40:49]	204	5.225	4.465	5.971	-1.506***	2.701	2.431	2.966	-0.535***	1.839	1.937	1.744	0.193**
[50:59]	283	4.989	4.228	5.694	-1.466***	2.602	2.392	2.796	-0.404***	1.730	1.863	1.607	0.256***
[60:69]	166	4.398	3.544	5.408	-1.863***	2.557	2.292	2.872	-0.580***	1.746	1.927	1.532	0.395***
>=70	75	4.507	4.077	4.972	-0.895**	2.573	2.397	2.764	-0.366*	1.811	1.923	1.689	0.234
All ages	970	4.995	4.298	5.694	-1.395***	2.737	2.513	2.962	-0.448***	1.835	1.950	1.719	0.231***

Panel C: Summary Statistics for Emotions Towards Investing and ATR by Investment Experience

Self-Assessed Experience	Obs.	ATR				Positive Emotions Towards Investing				Negative Emotions Towards Investing				Positive Emotions - Negative Emotions Towards Investing			
		All	Female	Male	Diff.	All	Female	Male	Diff.	All	Female	Male	Difference	All	Female	Male	Diff.
None/Small	346	3.595	3.311	4.275	-0.963***	2.199	2.081	2.480	-0.399***	2.188	2.204	2.149	0.055	0.011	-0.123	0.331	-0.455***
Medium	452	5.482	5.163	5.714	-0.550***	2.951	2.850	3.025	-0.175**	1.696	1.726	1.674	0.052	1.255	1.124	1.351	-0.227***
High	172	6.529	5.769	6.858	-1.089***	3.257	3.313	3.233	0.079	1.491	1.577	1.453	0.124	1.767	1.736	1.780	-0.044
All	970	4.995	4.298	5.694	-1.396***	2.737	2.513	2.962	-0.448***	1.835	1.950	1.719	0.231***	0.902	0.563	1.242	-0.679***

Table 2: Summary Statistics for Attitude to Risk and Individual Positive and Negative Emotions Towards Investing

This table reports summary statistics of attitude to risk by individual emotions towards investing. ATR, Positive Emotions Towards Investing and Negative Emotions Towards Investing are defined in the notes to Table 1. **Happy**, **Excited**, **Inspired** and **Enthusiastic** are individual positive emotions towards investing and are measured as integer scores from 1 to 5, where 5 indicates the more positive emotions towards investing and 1 the less positive. **Fearful**, **Ashamed**, **Sad**, **Angry** and **Nervous** are individual negative emotions towards investing and are measured as integer scores from 1 to 5, where 5 indicates the more negative emotions towards investing and 1 the less negative. Panel A presents the summary statistics of attitude to risk, individual positive and negative emotions towards investing by gender; Panel B reports the summary statistics of attitude to risk by integer score (1 to 5) of individual positive emotions towards investing, and by 1-notch buckets (1 to 2, 2 to 3, 3 to 4, and 4 to 5) of Positive Emotions Towards Investing. Panel C reports the summary statistics of attitude to risk by integer score (1 to 5) of individual negative emotions towards investing, and by 1-notch buckets (1 to 2, 2 to 3, 3 to 4, and 4 to 5) of Negative Emotions Towards Investing. *, ** and *** indicate significance at the 10%, 5% and 1% levels respectively.

Panel A: Summary Statistics

Statistics	ATR	Positive Emotions Towards Investing				Negative Emotions Towards Investing				
		Happy	Excited	Inspired	Enthusiastic	Fearful	Ashamed	Sad	Angry	Nervous
Mean	4.995	2.781	2.714	2.563	2.890	2.385	1.274	1.414	1.431	2.671
Female	4.298	2.512	2.481	2.407	2.652	2.739	1.239	1.424	1.403	2.947
Male	5.694	3.052	2.948	2.719	3.128	2.029	1.310	1.405	1.459	2.395
Mean Diff. (Female - Male)	-1.396***	-0.539***	-0.467***	-0.312***	-0.476***	0.710***	-0.071	0.019	-0.055	0.552***
Median	5.000	3.000	3.000	3.000	3.000	2.000	1.000	1.000	1.000	2.000
Standard Deviation	1.948	1.112	1.171	1.170	1.164	1.164	0.679	0.794	0.788	1.219
Minimum	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Maximum	10.000	5.000	5.000	5.000	5.000	5.000	5.000	5.000	5.000	5.000
No. of Observations	970	970	970	970	970	970	970	970	970	970

Panel B: Summary Statistics for Average ATR and Positive Emotions Towards Investing

Scores	Average ATR																Positive Emotions Towards Investing	
	Happy				Excited				Inspired				Enthusiastic					
	All	Female	Male	Diff. (Female - Male)	All	Female	Male	Diff. (Female - Male)	All	Female	Male	Diff. (Female - Male)	All	Female	Male	Diff. (Female - Male)	All	Mean
1	2.967***	2.630	3.833	-1.204***	3.324***	2.885	4.315	-1.430***	3.739***	3.220	4.600	-1.380***	2.957***	2.762	3.543	-0.781***	[1:2[	3.356***
2	4.430***	4.000	5.031	-1.031***	4.601***	4.098	5.158	-1.061***	4.566***	3.946	5.272	-1.326***	4.378***	3.761	5.048	-1.287***	[2:3[	4.690**

3	5.284**	4.819	5.690	-0.871***	5.135	4.524	5.655	-1.132***	5.416***	4.728	5.906	-1.178***	5.063	4.610	5.487	-0.878***	[3:4[	5.607***
4	6.203***	5.714	6.462	-0.748**	6.160***	5.859	6.372	-0.513**	6.133***	5.705	6.461	-0.756***	6.147***	5.711	6.423	-0.711***	[4:5[	6.648***
5	6.521***	6.167	6.733	-0.567	6.885***	6.200	7.220	-1.020***	6.478***	6.000	6.957	-0.956**	6.658***	5.844	7.213	-1.369***		
All	4.995	4.298	5.694	-1.396***	4.995	4.298	5.694	-1.396***	4.995	4.298	5.694	-1.396***	4.995	4.298	5.694	-1.396***	All	4.995

Panel C: Summary Statistics for Average ATR and Negative Emotions Towards Investing

Score	Average ATR																				Negative Emotions Towards Investing	
	Fearful				Ashamed				Sad				Angry				Nervous					
	All	Female	Male	Diff. (Female - Male)	All	Female	Male	Diff. (Female - Male)	All	Female	Male	Diff. (Female - Male)	All	Female	Male	Diff. (Female - Male)	All	Female	Male	Diff. (Female - Male)	All	Mean
1	6.236***	5.726	6.451	-0.725***	5.029	4.349	5.758	-1.410***	5.112	4.419	5.822	-1.403***	5.085	4.379	5.821	-1.442***	5.878***	5.302	6.211	-0.909***	[1:2[	5.518***
2	5.235**	4.844	5.601	-0.757***	5.075	4.279	5.609	-1.330***	5.066	4.486	5.533	-1.046***	4.938	4.325	5.494	-1.169***	5.451***	4.809	5.945	-1.139***	[2:3[	4.134***
3	4.590***	4.187	5.080	-0.893***	4.225**	3.737	4.667	-0.930***	4.177***	3.382	5.143	-1.761***	4.413**	3.600	5.225	-1.625***	5.171	4.688	5.686	-0.998***	[3:4[	4.014***
4	3.867***	3.478	4.861	-1.383***	4.810	3.444	5.833	-2.389***	4.036***	3.500	4.750	-1.250**	4.786	4.077	5.400	-1.323**	4.176***	3.768	4.788	-1.020***	[4:5[	3.750*
5	2.054***	2.000	2.333	-0.333	4.750	3.500	6.000	-2.500	2.571***	1.000	4.667	-3.667***	4.667	-	4.667	-	2.793***	2.521	3.714	-1.193***		
All	4.995	4.298	5.694	-1.396***	4.995	4.298	5.694	-1.396***	4.995	4.298	5.694	-1.396***	4.995	4.298	5.694	-1.396***	4.995	4.298	5.694	-1.396***	All	4.995

Table 3: Summary Statistics for Attitude to Risk and Individual Emotions Towards Life

This table reports summary statistics of attitude to risk by individual emotions towards life. ATR is defined in the notes to Table 1. **Interested, Excited, Strong, Enthusiastic, Proud, Alert, Inspired, Determined, Attentive** and **Active** are individual positive emotions towards life and are measured as integer scores from 1 to 5, where 5 indicates the more positive emotions towards life and 1 the less positive. **Distressed, Upset, Guilty, Scared, Hostile, Irritable, Ashamed, Nervous, Jittery** and **Afraid** are individual negative emotions towards life and are measured as integer scores from 1 to 5, where 5 indicates the more negative emotions towards life and 1 the less negative. **Positive Emotions Towards Life** is a continuous score from 1 to 5, where 5 indicates the more positive feelings towards life and 1 the less positive) and computed as the simple average of individual positive emotions of the investor towards life. **Negative Emotions Towards Life** is a continuous score from 1 to 5, where 5 indicates the more negative feelings towards life and 1 the less negative) and computed as the simple average of individual negative emotions of the investor towards life. Panel A presents the summary statistics of individual positive and negative emotions towards life, Positive Emotions Towards Life and Negative Emotions Towards Life; Panel B reports the summary statistics of attitude to risk by integer score (1 to 5) of individual positive and negative emotions towards life, and by 1-notch buckets of Positive Emotions Towards Life and Negative Emotions Towards Life. Panel C presents Spearman's correlation matrix of attitude to risk, positive and negative emotions towards investing, control variables and positive and negative emotions towards life. Panel D shows the model implied Calculated ATR by scores of emotions towards investing and life. The estimated model is an ordered probit with robust standard errors, gender dummy and age. Gender and Age are assumed at their sample mean values. *, ** and *** indicate significance at the 10%, 5% and 1% levels respectively.

Panel A: Summary Statistics

Statistics	Positive Emotions Towards Life										
	Interested	Excited	Strong	Enthusiastic	Proud	Alert	Inspired	Determined	Attentive	Active	Positive Emotions Towards Life
Mean	3.805	2.902	3.198	3.378	3.238	3.453	3.066	3.514	3.544	3.299	3.340
Median	4.000	3.000	3.000	3.000	3.000	4.000	3.000	4.000	4.000	3.000	3.400
Standard Deviation	0.860	0.999	1.012	1.012	1.118	0.883	1.035	1.021	0.910	1.064	0.743
Minimum	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.100
Maximum	5.000	5.000	5.000	5.000	5.000	5.000	5.000	5.000	5.000	5.000	5.000
No. of Observations	970	970	970	970	970	970	970	970	970	970	970

Statistics	Negative Emotions Towards Life										
	Distressed	Upset	Guilty	Scared	Hostile	Irritable	Ashamed	Nervous	Jittery	Afraid	Negative Emotions Towards Life
Mean	1.743	1.797	1.571	1.662	1.473	2.021	1.376	2.047	1.713	1.668	1.707
Median	1.000	2.000	1.000	1.000	1.000	2.000	1.000	2.000	1.000	1.000	1.600
Standard Deviation	0.909	0.932	0.862	0.880	0.772	0.979	0.702	1.006	0.921	0.886	0.641
Minimum	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Maximum	5.000	5.000	5.000	5.000	5.000	5.000	5.000	5.000	5.000	5.000	4.100
No. of Observations	970	970	970	970	970	970	970	970	970	970	970

Panel B: Summary Statistics for Average ATR and Emotions Towards Life

Scores	Average ATR and Positive Emotions Towards Life											
	Interested	Excited	Strong	Enthusiastic	Proud	Alert	Inspired	Determined	Attentive	Active	Positive Emotions Towards Life	
1	4.500	3.881***	3.949***	3.711***	3.975***	4.200*	3.900***	4.029**	4.810	3.923***	[1:2[	3.721***
2	4.342***	4.611***	4.459***	4.156***	4.716**	4.298***	4.607***	4.325***	4.053***	4.405***	[2:3[	4.295
3	4.301***	5.156*	4.975	4.961	4.987	4.863	4.981	4.663***	4.825*	4.846	[3:4[	5.106***
4	5.169**	5.523***	5.393***	5.280***	5.27**	5.237**	5.480***	5.303***	5.161*	5.424***	[4:5[	5.807***
5	5.602***	5.075	5.398*	5.679***	5.358*	5.382*	5.455*	5.599***	5.613***	5.528***		
All	4.995	4.995	4.995	4.995	4.995	4.995	4.995	4.995	4.995	4.995	All	4.995

Scores	Average ATR and Negative Emotions Towards Life											
	Distressed	Upset	Guilty	Scared	Hostile	Irritable	Ashamed	Nervous	Jittery	Afraid	Negative Emotions Towards Life	
1	5.143	5.256***	4.995	5.184**	4.902	4.994	4.983	5.247**	5.108	5.21**	[1:2[	5.094
2	4.953	4.852	5.100	4.905	5.198*	5.128	5.052	5.022	4.939	4.756**	[2:3[	4.779*
3	4.704*	4.667*	4.684	4.460***	5.067	4.879	5.189	4.657**	4.819	4.857	[3:4[	4.500*
4	4.510*	4.433***	4.976	4.432**	5.240	4.675	4.111**	4.538**	4.809	4.489*	[4:5[	6.000*
5	5.000	5.400	4.714	4.875	6.000	5.667	6.000	4.944	3.727*	4.500		
All	4.995	4.995	4.995	4.995	4.995	4.995	4.995	4.995	4.995	4.995	All	4.995

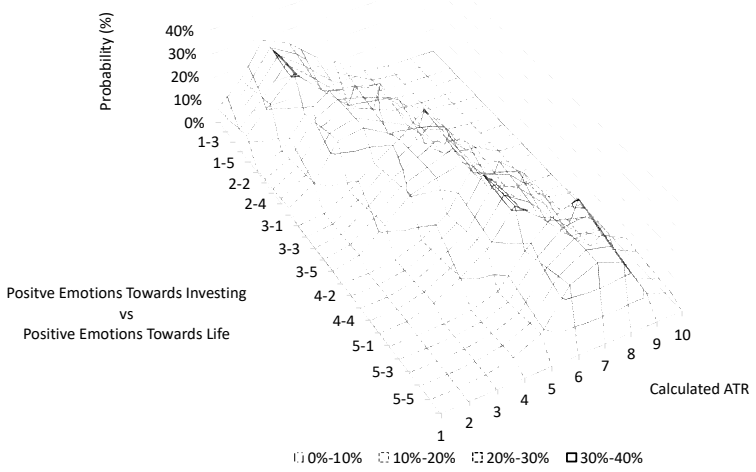
Panel C: Spearman's Correlation										
	ATR	Positive Emotions Towards Investing	Negative Emotions Towards Investing	Male	Age	Income	Self-Assessed Experience	Assessed Financial Knowledge	Education	Positive Emotions Towards Life
Positive Emotions Towards Investing	0.584***									
Negative Emotions Towards Investing	-0.416***	-0.160***								
Male	0.359***	0.218***	-0.193***							
Age	-0.163***	-0.185***	-0.135***	-0.013						
Income	0.393***	0.252***	-0.244***	0.299***	-0.091***					
Self-Assessed Experience	0.570***	0.393***	-0.422***	0.311***	0.057*	0.374***				
Assessed Financial Knowledge	0.430***	0.209***	-0.282***	0.328***	0.029	0.321***	0.432***			
Education	0.263***	0.139***	-0.114***	0.129***	-0.200***	0.430***	0.240***	0.318***		
Positive Emotions Towards Life	0.284***	0.522***	-0.166***	0.079**	-0.001	0.300***	0.273***	0.139***	0.158***	
Negative Emotions Towards Life	-0.087***	0.010	0.487***	-0.053*	-0.241***	-0.100***	-0.136***	-0.055*	0.018	-0.126***

Panel D: Implied Calculated ATR by Emotions Towards Investing and Life					
Positive Emotions towards Life	Positive Emotions towards Investing				
	1	2	3	4	5
1	3.598	4.569	5.548	6.492	7.390
2	3.475	4.441	5.422	6.371	7.275
3	3.353	4.312	5.295	6.250	7.160
4	3.233	4.184	5.167	6.127	7.043
5	3.114	4.057	5.039	6.005	6.926
Negative Emotions towards Life	Negative Emotions towards Investing				
	1	2	3	4	5
1	5.716	4.712	3.706	2.768	1.978
2	5.874	4.875	3.865	2.911	2.091
3	6.031	5.037	4.025	3.058	2.210
4	6.187	5.199	4.187	3.207	2.335
5	6.341	5.361	4.349	3.359	2.464

Figure 2: Estimated Probability Distributions of Attitude to Risk by Emotions Towards Investing and Life

This figure shows the estimated probabilities (percentage) of a client falling into a certain attitude to risk category (ATR), measured in integer scores from 1 to 10, by score combinations (1 to 5 vs 1 to 5) of Positive Emotions Towards Investing and Life in Panel A, and by score combinations of Negative Emotions Towards Investing and Life, in Panel B. The estimated model is an ordered probit with robust standard errors, gender dummy and age. Gender and Age are assumed at their sample mean values. All probabilities are significant at the 1% level.

Panel A: ATR and Positive Emotions Towards Investing and Life.



Panel B: ATR and Negative Emotions Towards Investing and Life.

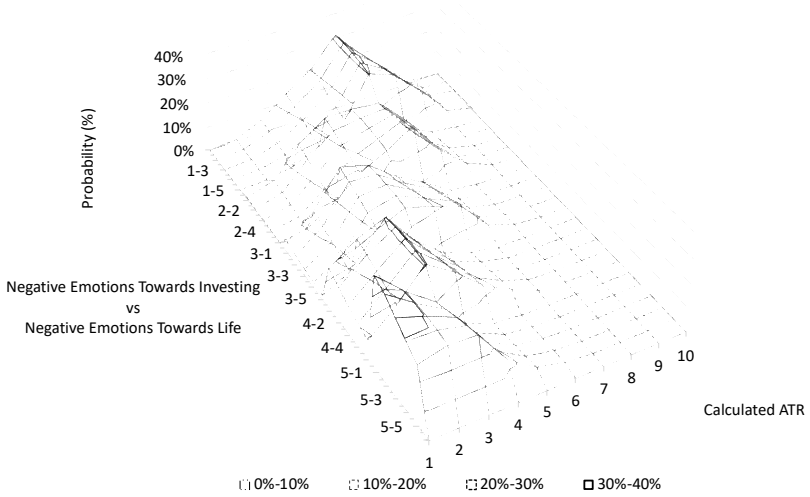


Table 4: Attitude to Risk and Emotions Towards Investing –Ordered Probit Results

This table reports the results of ordered probit regressions estimated with robust standard errors. Other variable definitions and measurements are explained in the notes to Table 1. **Male** is a binary variable which equals one if the investor's gender is male, and zero if female. **Income** is the investor's personal income (measured in seven categories ranging from £10,000 or less to more than £100,000). **Assessed Financial Knowledge** is the investor's level of financial knowledge and is measured as a score variable (0-5) corresponding to the number of correct answers out of five questions adopted from the FINRA's (2012) real knowledge quiz task. A score of 0 indicates very poor financial knowledge while a score of 5 indicates excellent knowledge. **Education** is the investor's level of education and is measured as a score variable (0-2), according to whether he/she has low level of education (school leaver), whether he/she has medium level of education (high school or equivalent or vocational/technical school), and or whether he/she is highly educated (bachelor's degree, master's degree, professional degree or doctorate degree). Z-tests are reported in parentheses. Marginal effects (in italics) are reported in percentages. *, ** and *** indicate significance at the 10%, 5% and 1% levels respectively.

Dependent Variable: ATR	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Independent Variables:									
Positive Emotions Towards Investing	0.5277***	0.4407***	0.4137***		0.3759***		0.3669***	0.4147***	0.3735***
	(16.84)	(14.53)	(14.16)		(12.81)		(12.62)	(6.02)	(8.36)
	10.667%	*10.672%*	*11.056%*		*10.039%*		*10.673%*	*10.641%*	*11.319%*
Negative Emotions Towards Investing	-0.4649***	-0.4221***	-0.2799***			-0.3234***	-0.3002***	-0.1352	-0.1359**
	(-11.56)	(-10.93)	(-7.63)			(-8.48)	(-8.35)	(-1.54)	(-2.54)
	-9.396%	*-10.221%*	*-7.480%*			*-6.986%*	*-8.732%*	*-9.382%*	*-10.031%*
Male		0.3314***		0.2760***	0.2150***	0.2676***	0.2087***	0.2075***	0.2128***
		(6.69)		(4.97)	(4.31)	(5.01)	(4.36)	(4.35)	(4.44)
		8.024%		*5.482%*	*5.742%*	*5.779%*	*6.070%*	*6.120%*	*6.435%*
Age		-0.0678***		-0.1140***	-0.0581***	-0.1375***	-0.0813***	0.0321	-0.0842***
		(-4.10)		(-6.38)	(-3.62)	(-7.69)	(-5.08)	(0.54)	(-5.28)
		-1.641%		*-2.264%*	*-1.552%*	*-2.971%*	*-2.366%*	*-2.234%*	*-2.547%*
Income		0.0859***		0.0684***	0.0482***	0.0592***	0.0401***	0.0389***	0.0383***
		(6.19)		(4.11)	(3.15)	(3.65)	(2.69)	(2.61)	(2.59)
		2.081%		*1.359%*	*1.287%*	*1.279%*	*1.165%*	*1.146%*	*1.157%*
Self-Assessed Experience			0.3311***	0.5773***	0.3910***	0.4863***	0.3109***	0.3105***	0.2989***
			(7.64)	(12.96)	(9.21)	(11.15)	(7.34)	(7.34)	(7.03)
			8.847%	*11.468%*	*10.441%*	*10.504%*	*9.042%*	*9.157%*	*9.010%*
Assessed Financial Knowledge			0.1207***	0.1284***	0.1201***	0.1094***	0.1026***	0.1006***	0.2653***
			(6.66)	(5.77)	(6.37)	(5.14)	(5.74)	(5.60)	(4.15)
			3.226%	*2.551%*	*3.207%*	*2.364%*	*2.983%*	*2.967%*	*2.996%*
Education			0.1339***	0.0336	0.0556	0.0301	0.0522	0.0537	0.0635
			(3.52)	(0.72)	(1.29)	(0.67)	(1.26)	(1.30)	(1.52)
			3.580%	*0.667%*	*1.484%*	*0.651%*	*1.519%*	*1.584%*	*1.920%*
Positive Emotions Towards Investing x Age								-0.012	
								(-0.79)	
								-	
Negative Emotions Towards Investing x Age								-0.0408***	
								(-1.97)	
								-	
Positive Emotions Towards Investing x Assessed Financial Knowledge									0.0004
									(0.02)
									-
Negative Emotions Towards Investing x Assessed Financial Knowledge									-0.0911***
									(-3.97)
									-
Observations	970	970	970	970	970	970	970	970	970
Pseudo R^2	0.141	0.172	0.189	0.133	0.186	0.150	0.204	0.205	0.207

Table 5: The Impact of Individual Emotions Towards Investing on Attitudes to Financial Risk

This table reports the results of ordered probit regressions estimated with robust standard errors. Variable definitions and measurements are explained in the notes to Tables 1, 2 and 4. Z-tests are reported in parentheses. Marginal effects (in italics) are reported in percentages. *, ** and *** indicate significance at the 10%, 5% and 1% levels respectively.

Dependent Variable: ATR	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Positive Emotions Towards Investing:									
Happy	0.2885***								
	(10.97)								
	7.005%								
Excited		0.2847***							
		(11.74)							
		7.093%							
Inspired			0.2527***						
			(11.06)						
			6.061%						
Enthusiastic				0.3047***					
				(12.36)					
				7.834%					
Negative Emotions Towards Investing:									
Fearful					-0.2744***				
					(-10.93)				
					-6.439%				
Ashamed						-0.0685**			
						(-2.22)			
						-1.367%			
Sad							-0.0923***		
							(-3.25)		
							-1.852%		
Angry								-0.0546**	
								(-1.97)	
								-1.124%	
Nervous									-0.1903***
									(-7.91)
									-4.126%
Observations	970	970	970	970	970	970	970	970	970
Gender	Y	Y	Y	Y	Y	Y	Y	Y	Y
Age	Y	Y	Y	Y	Y	Y	Y	Y	Y
Income	Y	Y	Y	Y	Y	Y	Y	Y	Y
Self-Assessed Experience	Y	Y	Y	Y	Y	Y	Y	Y	Y
Assessed Financial Knowledge	Y	Y	Y	Y	Y	Y	Y	Y	Y
Education	Y	Y	Y	Y	Y	Y	Y	Y	Y
Pseudo R^2	0.168	0.174	0.166	0.178	0.165	0.134	0.135	0.134	0.151

Table 6: Results of a Shapley-Owen Decomposition to Determine the Most Important Variables in Explaining Attitude to Risk

This table presents the results of Shapley-Owen decomposition that identifies the percentage of the overall goodness of fit attributable to each independent variable (third column) or group of variables (fourth column). The estimated model is an ordered probit with robust standard errors. Variable definitions and measurements are explained in the notes to Table 1, 2 and 4. The variables are grouped into the following factors: emotion towards investing (positive and negative emotions towards investing), demographic factors (gender, age, and income), and a proxy for cognitive factors (self-assessed investment experience, assessed financial knowledge and education level). Z-tests are reported in parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% levels respectively.

Dependent Variable: ATR	Estimated Coefficients	Shapley-Owen % of R^2	
		Independent Variable	Independent Variable Category
Independent Variables:			
Emotions Towards Investing			50.135
Positive Emotions Towards Investing	0.3669***	35.972	
	(12.62)		
Negative Emotions Towards Investing	-0.3002***	12.902	
	(-8.35)		
Demographic Factors			17.029
Male	0.2087***	6.718	
	(4.36)		
Age	-0.0813***	3.421	
	(-5.08)		
Income	0.0401***	6.419	
	(2.69)		
Cognitive Factors			32.841
Self-Assessed Experience	0.3109***	21.578	
	(7.34)		
Assessed Financial Knowledge	0.1026***	10.291	
	(5.74)		
Education	0.0522	2.704	
	(1.26)		
Observations	970		
Pseudo R^2	0.204		

Table 7: The Impact of Emotions Towards Investing versus Emotions Towards Life on Attitude to Risk

This table reports the results of ordered probit regressions estimated with robust standard errors. **Positive Emotions Spread (Investing - Life)** is the difference between scores of positive emotions towards investing and life of the investor. **Negative Emotions Spread (Investing - Life)** is the difference between scores of negative emotions towards investing and life of the investor. Other variable definitions and measurements are explained in the notes to Tables 1, 2, 3 and 4. Marginal effects (in italics) are reported in percentages. *, ** and *** indicate significance at the 10%, 5% and 1% levels respectively.

Dependent Variable: ATR	(1)		(2)		(3)		(4)		(5)		(6)		(7)	
Independent Variables:	Coeff.	Z-stat.	Coeff.	Z-stat.	Coeff.	Z-stat.	Coeff.	Z-stat.	Coeff.	Z-stat.	Coeff.	Z-stat.	Coeff.	Z-stat.
Positive Emotions Towards Investing			0.4126***	13.22	0.4626***	11.75	0.2856***	7.88	0.4891***	4.87	0.3953***	4.26	0.2543***	4.47
			12.248%		*9.537%*		*8.478%*		*12.392%*		*8.339%*		*9.275%*	
Negative Emotions Towards Investing			-0.3307***	-8.27	-0.4182***	-9.05	-0.2841***	-6.87	-0.5299***	-5.78	-0.2370***	-2.18	-0.1050	-1.61
			-9.817%		*-8.621%*		*-8.433%*		*-10.767%*		*-8.728%*		*-9.568%*	
Male	0.2881***	5.18	0.1901***	3.99			0.1901***	3.99	0.1846***	3.9	0.1882***	3.98	0.1979***	4.16
	5.889%		*5.643%*				*5.643%*		*(3.90)*		*5.640%*		*6.107%*	
Age	-0.1216***	-6.57	-0.0710***	-4.38			-0.0710***	-4.38	-0.0693***	-4.28	0.0430	0.5	-0.0740***	-4.6
	-2.485%		*-2.108%*				*-2.108%*		*-2.097%*		*-1.951%*		*-2.283%*	
Income	0.0511***	2.99	0.0512***	3.35			0.0512***	3.35	0.0490***	3.19	0.0481***	3.12	0.0471***	3.08
	1.045%		*1.521%*				*1.521%*		*1.480%*		*1.443%*		*1.452%*	
Self-Assessed Experience	0.5417***	12.13	0.3093***	7.4			0.3093***	7.4	0.3041***	7.32	0.3088***	7.4	0.2999***	7.12
	11.070%		*9.183%*				*9.183%*		*9.196%*		*9.253%*		*9.257%*	
Assessed Financial Knowledge	0.1283***	5.9	0.0998***	5.61			0.0998***	5.61	0.0980***	5.55	0.0989***	5.55	0.1892***	2.12
	2.622%		*2.962%*				*2.962%*		*2.963%*		*2.964%*		*2.951%*	
Education	0.0306	0.67	0.0574	1.38			0.0574	1.38	0.061	1.46	0.0611	1.48	0.0696*	1.67
	0.626%		*1.704%*				*1.704%*		*1.845%*		*1.832%*		*2.149%*	
Positive Emotions Towards Life	0.1487***	3.96	-0.1270***	-3.69					-0.063	-0.86				
	3.040%		*-3.770%*						*-3.874%*					
Negative Emotions Towards Life	-0.0624	-1.55	0.0466	1.18					-0.1631*	-1.66				
	-1.276%		*1.384%*						*0.722%*					
Positive Emotions Towards Investing x Positive Emotions Towards Life									-0.0238	-0.85				
									-					
Negative Emotions Towards Investing x Negative Emotions Towards Life									0.1019**	2.44				
									-					
Positive Emotions Spread (Investing - Life)					0.0928**	2.51	0.1270***	3.69			-0.0723	-0.65	0.1860***	3.61
					1.913%		*3.770%*				*3.902%*		*3.517%*	
Negative Emotions Spread (Investing - Life)					-0.1123***	-2.62	-0.0466	-1.18			-0.1794*	-1.65	-0.0899	-1.44
					-2.316%		*-1.384%*				*-1.515%*		*-1.558%*	
Positive Emotions Towards Investing x Age											-0.0261	-1.28		
Negative Emotions Towards Investing x Age											-0.0121	-0.47		
Positive Emotions Spread (Investing - Life) x Age											-0.0129			

Negative Emotions Spread (Investing - Life) x Age						0.0513**		
Positive Emotions Towards Investing x Assessed Fin. Knowledge							0.0215	1.01
Negative Emotions Towards Investing x Assessed Fin. Knowledge							-0.0954***	-3.38
Positive Emotions Spread (Investing - Life) x Assessed Fin. Knowledge							0.0335	1.49
Negative Emotions Spread (Investing - Life) x "Assessed Fin. Knowledge							-0.0183	-0.61
Observations	970	970	970	970	970	970	970	
Pseudo R^2	0.138	0.208	0.144	0.208	0.209	0.210	0.212	