MITIGATING OVERCONFIDENCE BIAS: EXPLORING THE ROLE OF EXPERIENCE, SELF-REFLECTION, AND FINANCIAL LITERACY IN A MODERATED MEDIATION MODEL

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Abstract

This study aims to explore a relatively under-explored issue of how individual investors can mitigate overconfidence bias that occurs when investing in stocks. Although investment experience and financial literacy are recognized in the literature as potential mitigators of overconfidence bias, their findings are inconsistent. As a result, the mechanisms that effectively reduce overconfidence bias remain unclear. As a novel attempt, this study introduces a moderated mediation model to explore this phenomenon. Based on the literature on cognitive psychology and behavioral finance, it hypothesizes that investors can mitigate their overconfidence bias by engaging in self-reflection on their past investment experiences and enhancing their financial literacy to strengthen this self-reflection process. The data is collected through a self-administered questionnaire distributed to a sample of active individual investors at the Colombo Stock Exchange of Sri Lanka. The mediation and moderated mediation hypotheses were examined using the PROCESS procedure. The results reveal that investors' past investment experiences do not merely reduce their overconfidence bias, rather, self-reflection upon the experiences reduces their overconfidence bias. The results further show that financial literacy alone does not reduce overconfidence bias. Instead, financial literacy moderates the indirect effect of investment experience on overconfidence bias through the mediation of self-reflection. Thus, financial literacy can amplify the positive impact of investment experience on self-reflection and reduce overconfidence bias through enhanced self-reflection. Accordingly, the study concludes that individual investors can mitigate their overconfidence bias by engaging in self-reflection on their investment experiences and improving their financial literacy to strengthen their self-reflection ability. Based on these findings, this study outlines contribution to academia and practical implications for individual investors, financial practitioners and policymakers.

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1 Introduction

The behavioral finance literature often reveals that financial market participants exhibit bounded rationality due to the effects of various factors, including their cognitive and psychological limitations, social and cultural influences, time pressure and information asymmetry, which leads to irrational decisions (Mittal, 2022; Zahera & Bansal, 2018). This irrationality results in mispriced securities and, consequently, inefficient capital markets (Barber & Odean, 2013; Gokhale et al., 2015; Shefrin, 2002; Zahera & Bansal, 2018). Specifically, previous studies in the context of stock investment largely find that individual investors demonstrate irrational behaviors, commonly referred to as "behavioral biases", in their decision-making processes (Mittal, 2022).

The overconfidence bias is one of the more prevalent behavioral biases among individual investors (de Oliveira Cardoso, 2024). It leads to excessive investment and trading in financial markets, triggering other behavioral biases in decision-making (Bazerman & Moore, 2012; Grežo, 2021). Hence, it can be labelled as the "root cause of all biases". This bias, on one hand, can dramatically impact the entire decision-making process of investors, adversely affecting their investment performance (Barberis & Thaler, 2003; Che Hassan et al., 2023; Cao et al., 2021; Filbeck et al., 2017; Hirshleifer, 2015). On the other hand, it causes securities prices to deviate from their fundamentals, resulting in inefficient financial markets (Badola et al., 2024). Therefore, understanding ways to mitigate this bias is crucial.

Although the overconfidence bias is a widely studied phenomenon, the literature still does not sufficiently explain how individual investors can mitigate it in their investment decisions. One stream of research suggests that investment experience may help in mitigating this bias (Gervais & Odean, 2001; Koestner et al., 2017; Menkhoff et al., 2013). Another line of inquiry proposes that financial literacy can minimize it (Jain, 2023; Weixiang et al., 2022). However, the findings in both areas are mixed and therefore inconclusive. Thus, the mechanisms that effectively mitigate overconfidence bias remain unclear. This study aims to address this gap by exploring cognitive, psychological and behavioral mechanisms that can reduce overconfidence judgments among individual investors in their stock investment decisions. As a novel attempt, we introduce a moderated mediation model to explore this phenomenon.

By investigating this phenomenon, we intend to contribute to academia and practice as follows. We contribute new insights to financial literacy and behavioral finance literature on how overconfidence bias is mitigated to improve

individual investors' decision-making capabilities. For practitioners, we recommend a learning approach that should be fostered among individual investors to minimize their overconfident attitude, thereby causing the associated negative consequences to their wealth. The findings of the study will provide a clear understanding of the cognitive and educational interventions to promote better investment practices. Thus, stock exchanges and investment advisors can apply the implications of the study when designing training programs for individual investors. Individual investors can also use the implications of this study to improve their sophistication in order to enhance their investment performance. Accordingly, in line with SDG 8: Decent work and economic growth, this study supports the development of more robust financial markets, ultimately contributing to long-term financial sustainability.

The remaining sections of the paper are organized as follows. Section 2 reviews the relevant literature and develops the hypotheses to examine. The research methodology is detailed in section 3. Section 4 discusses the respondents' demographic and behavioral characteristics, the measurement quality of the constructs of the conceptual model, and hypothesis testing results. Section 5 concludes the paper with its theoretical and practical implications.

2 Literature Review and Hypothesis Development

2.1 Overconfidence Bias of Individual Investors

Overconfidence refers to an individual's unwarranted confidence in their intuitive reasoning, judgments, and cognitive abilities (Pompian, 2006). Daniel et al. (1998) defines an overconfident investor as "one who overestimates the precision of their private information signals but not of publicly received information signals". According to their model, investors, by observing the outcomes of their trading, appraise their trading ability in a biased manner. They tend to attribute successes too firmly to their high ability and failures to external noise, leading to overestimating their ability to generate information and excessive confidence in their private information compared to public information. Accordingly, overconfidence encompasses both over-precision of information and overestimation of ability. Consistent with the attribution theory of Weiner & Weiner (1985), the studies by Barber & Odean (2013), Gervais & Odean (2001), and Ishfaq et al. (2020) demonstrate that overconfidence arises with self-attribution bias that occurs from individuals' failure to assess their abilities accurately. For instance, traders who successfully predict dividends may wrongly attribute their success to superior abilities, thus becoming overconfident. The behavioural finance literature largely reveals that overconfidence leads to excessive investment and trading by investors in financial markets (Grežo, 2021). Consequently, it not only adversely affects their investment decisions, thereby the

performance of their investments (Mittal, 2022), but also the efficient functioning of capital markets (Che Hassan et al., 2023; Filbeck et al., 2017; Hirshleifer, 2015).

2.2 Does Investment Experience Reduce Investor Overconfidence?

The adaptive market hypothesis of Lo (2004, 2005, 2012) implies an experiential learning behavior of investors. As the theory describes, "individuals make choices based on experience and their best guess as to what might be optimal, and they learn by receiving positive or negative reinforcement from the outcomes" (Lo, 2004). It means that investors learn about their biases from their experiences and adapt to the market environment over time. Supporting the adaptive market hypothesis, the behavioral finance literature shows that investment experience positively impacts on overconfidence bias of investors. The positive effect is expected based on the belief that investors accumulate knowledge and skills over time and, hence, are less prone to overconfidence bias as they become more experienced in investing (Dhar & Zhu, 2006; Feng & Seasholes, 2005; List, 2011; Nicolosi et al., 2009). Supporting this prediction, Gervais & Odean (2001), Koestner et al. (2017), and Menkhoff et al. (2013) find that overconfidence bias declines with experience. On the contrary, Bhandari & Deaves (2006), Deaves et al. (2010), Glaser & Weber (2007), Kirchler & Maciejovsky (2002), Mishra & Metilda (2015) and Xiao (2015) reveal that the more experienced investors are more prone to overconfidence bias. Baker et al. (2019) and Chen et al. (2007) also find that the experienced individual investors demonstrate higher level of overconfidence than the inexperienced investors. Accordingly, the literature is inconclusive as to whether investment experience reduces investor overconfidence bias.

2.3 Mediation of Self-Reflection in Mitigating Overconfidence Bias

In view of the inconclusive results indicated by previous studies relating to this experiential learning hypothesis, Shantha et al. (2018) propose a model of investor learning behavior, arguing that past investment experiences do not merely produce learning effects to minimize behavioral biases. As predicted by the transformative learning theory of Mezirow (1994), the learning effects rather occur when the experiences are cognitively reflected upon (referred to as 'self-reflection'), which involves cognitive evaluation about the validity of mental frames (for example, beliefs, thoughts and assumptions) underlying the past decisions by reflecting upon the associated experiences (Mezirow, 2018). It enables the investors to appropriately revise biased mental frames, leading to their behavioral biases. Supporting this self-reflective learning approach, Skagerlund et al. (2018) also find this cognitive reflection as a driving force of superior decision-making. Further, Shantha (2019a), Shantha (2019b) and Shantha (2024) empirically show that the investment experience does not have a direct effect in mitigating herd bias

and overconfidence bias, which rather occurs through a mediation effect of self-reflection.

This self-reflection behavior is generally expected to occur by deliberate reasoning. The behavioural finance literature reveals that individual investors' behaviour is typically bounded by their cognitive and psychological limitations, time pressure, the cost of information search and acquisition, limited attention, and social influences (Che Hassan et al., 2023; Filbeck et al., 2017; Khan et al., 2021). Consequently, investors would be less inclined to deliberate reasoning when engaging in self-reflection. This notion is supported by the dual process theory of Chaiken & Trope (1999). It suggests that humans exhibit a solid propensity to avoid such deliberate information processing, rather, they prefer intuitive reasoning in decision-making (Evans & Stanovich, 2013). Intuition is a rapid, automatic process, not involving extensive analytical procedures, and enables individuals to understand a situation or problem instantaneously. Intuitive insights often originate from the subconscious mind, where vast amounts of information and experiences are processed outside of conscious awareness by integrating past experiences, patterns, and knowledge to generate quick judgments or decisions (Evans & Stanovich, 2013). De Neys & Pennycook (2019), through the review of experimental paradigms relating to the dual process theory, show that biased individuals demonstrate some sensitivity to their errors by intuitively processing logical principles without engaging in deliberate reasoning. This "intuitive logical thinking" emerges through a learning process where previously applied logical principles become automatized, leading to subsequent logical intuition (De Neys, 2012; Kahneman, 2012). Accordingly, due to individual investors' bounded rationality, they are more likely to engage in self-reflection through intuitive logical thinking to mitigate their overconfidence bias.

Accordingly, based on the implications of the dual process theory and the model of learning behavior proposed by Shantha et al. (2018), it can be expected that a higher investment experience leads to a higher level of self-reflection, thereby reducing overconfidence bias. Thus, we hypothesize that the investment experience (IEXP) reduces overconfidence bias (OCON) through the mediation effect of self-reflection (SREF), as indicated by hypothesis 1 below.

Hypothesis 1 (H1): IEXP reduces OCON bias through the mediation effect of SREF.

2.4 Role of Financial Literacy to Mitigate Herd Bias

Financial literacy is defined in several ways. Lusardi & Mitchell (2011) defined it as "the knowledge of basic financial concepts and the ability to perform simple calculations." Huston (2010) expands this definition to include both the knowledge of personal finance and the application of that knowledge. According

to the Organisation for Economic Cooperation and Development (OECD, 2014), financial literacy is "the knowledge and understanding of financial concepts and risks, and the skills, motivation and confidence to apply such knowledge and understanding in order to make effective decisions across a range of financial contexts, to improve the financial well-being of individuals and society, and to enable participation in economic life." Thus, financial literacy arguably includes cognitive, psychological, and behavioural structures, leading to one's financial well-being. Cognitively, it involves the knowledge and understanding of financial concepts and principles, which enable the appropriate processing of information to make financial decisions. Psychologically, it influences attitudes and motivation towards financial management, risk-taking, and decision-making, shaping how individuals perceive and react to financial situations. The behavioural aspect of financial literacy involves its practical application in financial decision making.

Concerning the behavioural aspect of financial literacy, previous studies show that financial literacy positively influences financial decisions and investment performance (Awais et al., 2016; Banks & Oldfield, 2007; Jappelli & Padula, 2013; Lusardi et al., 2010). In addition, the literature reveals that financial literacy can reduce the overconfidence bias of individual investors (Ashfaq et al., 2024; Jain et al., 2023). Further, financial literacy has been shown to moderate positively the relationship between overconfidence bias and investment decision-making (Ahmad & Shah, 2020; Hayat & Anwar, 2016; Ullah, 2015) as well as the relationship between overconfidence bias and investment performance (Ahmad & Shah, 2020; Lusardi & Mitchell, 2014).

On the other hand, Kawamura et al. (2021) find that high financial literacy tends to be associated with more daring and reckless financial decisions, such as investing a higher share of risky assets, overborrowing, and financial naivety. Hsu (2022) finds that financially literate investors are more exposed to overconfidence bias. As a result, they have more tendency to make decisions autonomously without seeking professional advice. Previous studies also reveal no association between financial literacy and overconfidence bias (Gerth et al., 2021; Kasoga, 2021). These findings are consistent with the argument that financial literacy alone does not affect financial behaviour (Maheshwari et al., 2024). In a meta-analysis of the role of financial literacy on financial behavior, Fernandes et al. (2014) show that financial literacy could only explain 0.1% of the variance in financial behavior and suggest that individuals' financial behavior is mainly driven by their cognitive ability. Skagerlund et al. (2018) empirically show that cognitive reflection and emotional factors account for a major part of the financial behavior of individuals. Accordingly, the literature emphasizes the necessity of associating cognitive and psychological aspects of financial literacy when determining its influence on financial behavior to mitigate behavioral biases such as overconfidence.

2.5 The Moderated Mediation of Financial Literacy in Mitigating Overconfidence Bias

Based on the literature discussed above, we argue that financial literacy does not have a direct effect in reducing overconfidence bias. Concerning its cognitive and psychological effects, we suggest that financial literacy enhances the intuitive logical thinking process, thereby making self-reflection more effective in minimizing overconfidence bias, as explained below. Since financial literacy enhances the ability to understand and analyze information, financially literate investors can better utilize their investment experience and effectively self-reflect by analyzing past investment decisions and outcomes. It leads to a greater awareness of behavioral biases such as overconfidence, thereby facilitating to correct such biases. In addition, financial literacy provides a more realistic understanding of one's abilities and skills. When combined with self-reflection, this leads to a balanced view of one's competencies and helps alleviate overconfidence in decision-making (Hastings et al., 2013; Lusardi & Mitchell, 2011; Lusardi et al., 2010). Accordingly, financial literacy can amplify the positive effects of investment experience on self-reflection and reduce overconfidence bias through enhanced self-reflection. Thus, we hypothesize that financial literacy (FINL) strengthens the indirect impact of investment experience in reducing overconfidence bias through the mediation of self-reflection. It means that investment experience enhances self-reflection and, thereby, reduces the overconfidence bias of individual investors with higher financial literacy compared to those with lower financial literacy, as indicated by hypothesis 2 below.

Hypothesis 2 (H2): FINL moderates the indirect effect of IEXP on OCON through the mediation of SREF.

Figure 1 presents the conceptual framework of the study, demonstrating the mediation of SREF (as given by H1) and moderation of FINL (as given by H2).

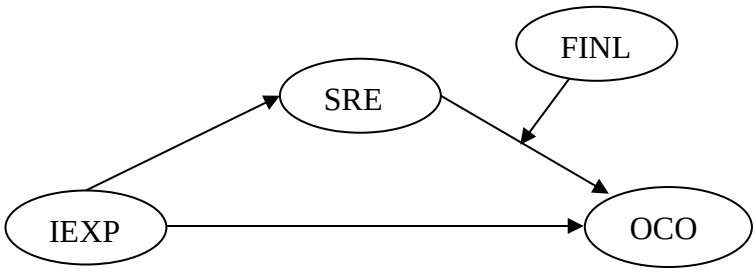

Figure 1: Conceptual Framework of the Study

3 Methodology

The population of the study comprises individual investors of the Colombo Stock Exchange (CSE) who have maintained active security accounts over the past six months. A self-administered questionnaire was distributed to a sample of 600 investors, selected through convenient sampling, during the period from August to December 2023. The valid responses received to the questionnaire were 253, representing a response rate of 42.2%. The questionnaire consists of nine items to obtain information on the respondents' demography and investment characteristics. To ensure the content validity, the prior literature was adopted to measure the model's constructs. The number of years of stock trading was used to measure IEXP (Mishra & Metilda, 2015; Yalcin et al., 2016). As Kember et al. (2000) suggested, SREF was measured on three items relating to the process reflection and four items relating to the premise reflection. Based on the scales Yalcin et al. (2016) developed, OCON was measured by four items. FINL was measured by five items on financial knowledge, skills, and attitudes by adopting the study of Dewi et al. (2020). Except for IEXP, all other constructs were measured by employing a five-point Likert scale: 1 for strongly agree and 5 for strongly disagree.

A pilot study with a sample of 15 respondents further ensured the content validity. In addition, the meaning and phrasing of the question items and the instructions given for responding to the questionnaire were discussed with three investment advisors and three academics to enhance their clarity further. Harman's one-factor test also finds that the responses received are free of common method bias. Further, the responses received appear to be free of non-response bias since the examination, based on the procedure suggested by Dooley & Lindner (2003), finds no significant difference between early and late responses.

In the data analysis, first, it was ensured that the constructs exhibited an acceptable level of reliability. The reliability of the constructs was assessed using Cronbach's alpha and composite reliability. The chi-square and SRMR (standardized root mean square) were estimated to assess the goodness of fit of the model. The mediation and moderated mediation hypotheses were examined using the PROCESS procedure developed for SPSS (Hayes, 2018). It estimates the existence of mediation and moderated mediation effects based on the bootstrap confidence intervals at a 95% level. The mediation and moderated mediation effects are significant if the confidence intervals do not contain 0.

4 Results and Discussion

4.1 Demographic and Behavioural Characteristics of Respondents

Of the survey participants, the majority (64.8 percent) are male investors, which aligns with the cultural norm in Sri Lanka, where men predominantly make investment decisions. About 38 percent of respondents are below 35 years old, and roughly 50 percent are between 35 and 54 years old. Most respondents hold a bachelor's degree or higher. Regarding occupation, 75.9 percent work in the private sector, 10.3 percent in the public sector, 6.7 percent are self-employed, 4.7 percent are retired, and 2.4 percent are unemployed. Thus, the sample fairly represents the demographic of individual investors in the CSE.

The respondents have an average investment experience of 10.5 years and a standard deviation of 6 years. The sample includes both highly experienced investors (13 percent with 18+ years of experience) and less experienced ones (5.9 percent with two years or less). Only 13.4 percent trade stocks daily, most trading once weekly or less. About 30 percent have a low-risk appetite, and another 30 percent exhibit high risk-taking behaviour. Many respondents appear to invest conservatively since 26.5 percent hold less than 5 percent of their wealth and 29.2 percent hold 5-15 percent in stocks. This low preference for stock investments should have been caused by the recent economic crises, political instability, and the COVID-19 pandemic, leading to significant investment losses and increased risk aversion. The mean overconfidence bias is 3.4, indicating a general tendency towards overconfidence bias in stock trading decisions.

4.2 Assessment of Measurement Model

The measurement model confirmed a good fit, as indicated by a Chi-square of 1675.35 ($p < 0.001$) and SRMR of 0.074 lower than the cut-off value of 0.08 (Hu & Bentler, 1999). All standardized loadings were above 0.5 and significant at 1% level, as shown in Table 1. The composite reliability and Cronbach's alphas of each construct are above 0.7, which supports the reliability of the constructs (Gefen et al., 2000; Nunnally & Bernstein, 1994). The descriptive statistics of the constructs are reported in Table 2.

Table 1: Measurement Quality of Constructs

Construct and indicator items	Loading	Cronbach's alpha	Composite reliability
Financial literacy (FINL)		0.862	0.867
Finl_1	0.790		
Finl_2	0.915		
Finl_3	0.872		
Finl_4	0.885		
Finl_5	0.708		
Self-reflection (SREF)		0.947	0.948
Sr_1	0.836		

Sr_2	0.815		
Sr_3	0.901		
Sr_4	0.908		
Sr_5	0.846		
Sr_6	0.905		
Sr_7	0.889		
Overconfidence bias (OCON)		0.856	0.872
Oc_1	0.845		
Oc_2	0.854		
Oc_3	0.855		
Oc_4	0.783		

Note: All loadings are significant at $p < 0.001$.

Table 2: Descriptive Statistics of the Model's Constructs

Construct	Mean	Standard deviation	Excess kurtosis	Skewness
FINL	3.556	0.879	-0.659	0.270
IEXP	10.471	6.315	2.614	1.259
OCON	3.413	1.231	-0.512	-0.610
SREF	3.785	1.072	-0.196	-0.765

4.3 Hypothesis Testing

Tables 3, 4 and 5 summarize the key findings relating to the hypotheses of the study. The variance explained (R^2) in SREF and OCON constructs are 20.14% and 41.96% respectively. The results presented in Table 3 show that IEXP has a significant positive impact on SREF ($p<0.01$), indicating that the past investment experience of investors is a predictor of their self-reflective thinking. The findings also reveal that SREF has a significant negative impact on OCON ($p<0.01$), while IEXP has no direct effect on OCON. These findings support our argument that past investment experiences do not merely reduce overconfidence bias. Self-reflection upon experiences mitigates overconfidence bias in decision-making.

Table 3: Direct Effects of Path Model

Path	Coefficient	Standard error	*t*-statistic	*p*-value
Constant	0.144	0.055	2.619	0.009*
IEXP→SREF	0.448	0.056	7.957	0.000*
IEXP→OCON	-0.008	0.054	-0.155	0.876
SREF→OCON	-0.658	0.065	-9.981	0.000*
FINL→OCON	0.013	0.062	0.829	-0.109
FINL×SREF→OCON	-0.272	0.049	-5.466	0.000*
OCON: R^2 = 0.4196, $F(4, 248)$= 44.8183*				
SREF: R^2 = 0.2014, $F(4, 248)$= 63.3173*				

Note: * indicates the significance at 1 percent level.

The results relating to the mediation analysis presented in Table 4 further confirm this argument. It shows that the indirect effect of IEXP on OCON through SREF

(as indicated by the path IEXP→SREF→OCON) is significantly negative (p<0.01), indicating that SREF mediates the impact of IEXP on OCON. Since the direct effect of IEXP on OCON is insignificant, SREF has a full mediation on the effect of IEXP on OCON (Zhao et al., 2010), which is consistent with those of Shantha (2019a) and Shantha (2024) on the CSE, revealing a which supports hypothesis H1 of the study. These findings reveal all mediation effects of self-reflection. Accordingly, it is evident that not just past investment experiences of the investors but also self-reflection upon the experiences reduce their overconfidence bias. This means that biases are not minimized when self-reflection is absent, and for a given level of experience, a higher level of self-reflection results in a lower level of overconfidence bias.

Table 4: Mediation Analysis Results

Path	Total effect	Direct Effect	Indirect effect	95% Confidence Interval		*t*-statistic
				LL	UL	
IEXP→SREF→OCON	-0.254*	0.008	-0.263*	-0.385	-0.172	-4.809

Note: This table presents the results relating to the indirect effect of IEXP on OCON through SREF, as hypothesized by H1. * indicates the significance at 1 percent level. The number of bootstrap samples is 5,000.

When the effect of financial literacy is concerned, the results given in Table 3 show that its direct effect on overconfidence bias (as indicated by the path FINL→OCON) is statistically insignificant (p>0.05), while its moderating effect (as given by the path FINL×SREF→OCON) is significantly negative (p<0.01). Thus, the results indicate that financial literacy moderates the effect of self-reflection in reducing overconfidence bias. It explains that financial literacy strengthens the effect of self-reflection in reducing overconfidence bias. These findings support our argument that financial literacy alone does not reduce overconfidence bias. Overconfidence bias is reduced when financial literacy is combined with the cognitive reflection of mental frames, leading to such bias. This argument can be further supported through the moderated mediation analysis results presented in Table 5.

Table 5: Moderated Mediation Analysis Results

	Effect	Standard error	95% Confidence Interval		*t*-statistic	*p*-value
			LL	UL		
Panel A: Conditional indirect effect of IEXP on OCON through SREF						
Lower level (M -1 SD) of FINL	-0.172	0.048	-0.278	-0.084	-3.543	0.0005*
Mean level (M) of FINL	-0.295	0.062	-0.438	-0.194	-4.711	0.0001*

Higher level (M +1 SD) of FINL	-0.417	0.088	-0.630	-0.278	-4.742	0.0001*
Panel B: Index of moderated mediation						
Index	-0.122	0.033	-0.208	-0.076	-3.636	0.0003*

Note: Panel A of this table presents the results relating to the indirect effect of IEXP on OCON through SREF conditional on FINL, as hypothesized by H2. Panel B shows the index of moderated mediation. * indicates the significance at 1 percent level. The number of bootstrap samples is 5,000.

Panel B of Table 5 shows that the index value of moderated mediation is statistically significant at 1 percent level (Index at 95% CI =-0.1222). Thus, supporting hypothesis H2, it indicates that financial literacy moderates the indirect effect of investment experience on overconfidence bias through the mediation of self-reflection. Accordingly, financial literacy can amplify the positive effects of investment experience on self-reflection, thereby reducing overconfidence bias through enhanced self-reflection. It can be better explained by following the approach suggested by Aiken & West (1991). Panel A of Table 5 shows this indirect effect of investment experience on overconfidence bias through the mediation of self-reflection at lower level (M -1 SD), mean level (M) and higher level (M +1 SD) of financial literacy. It is found that the effects at these three levels are negative and statistically significant ($p<0.01$). As shown in Panel A, this negative effect appears to increase when the financial literacy level moves from its lower level to a higher level. It implies that the effect of self-reflection in reducing overconfidence bias is stronger at a higher level of financial literacy and weaker at a lower level of financial literacy.

The moderated mediation analysis results can be further elaborated by using Figure 2. It depicts that all three lines show negative slopes regardless of the level of financial literacy. Thus, the relationship between self-reflection and overconfidence bias is negative at higher mean and lower levels of financial literacy, indicating that overconfidence bias decreases as self-reflection increases. However, the steepness of the slope varies at different levels of financial literacy. The negative slope is the steepest at the higher level of financial literacy, whereas it is the least steep at the lower level. Hence, the effect of self-reflection in reducing overconfidence bias is stronger at a higher level of financial literacy and weaker at a lower level of financial literacy.

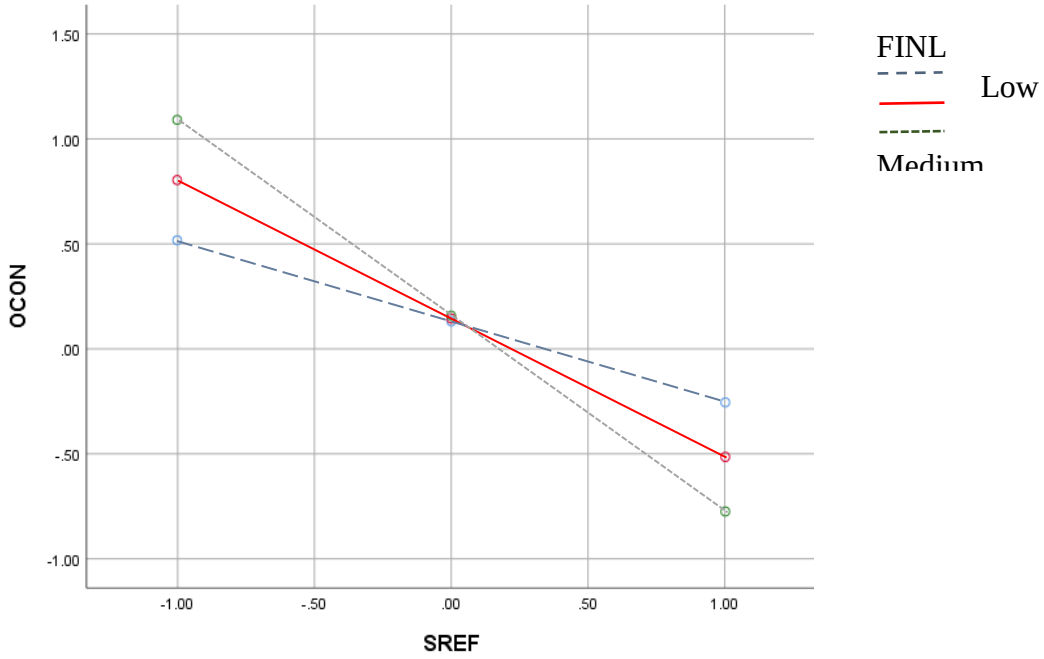

Figure 2: Financial literacy as a moderator of the effect of self-reflection on overconfidence bias

5 Conclusions and Recommendations

This study aims to explore a relatively under-explored issue of how individual investors can mitigate overconfidence bias that occurs when investing in stocks. Although investment experience and financial literacy are recognized in the literature as potential mitigators of overconfidence bias, the findings relating to both aspects are mixed. Therefore, it is unclear what mechanisms effectively mitigate overconfidence bias. As a novel attempt, this study introduces a moderated mediation model to explore this phenomenon. The results relating to the mediation analysis suggest that not just past investment experiences of the investors but also self-reflection upon the experiences reduce their overconfidence bias. This means that biases are not minimized when self-reflection is absent, and for a given level of experience, a higher level of self-reflection results in a lower level of overconfidence bias. In addition, the moderated mediation analysis results imply that financial literacy can amplify the effect of investment experience on self-reflection in reducing overconfidence bias since it is stronger at a higher level of financial literacy and weaker at a lower level of financial literacy.

This study contributes to academia and practice as follows. It provides new insights into financial literacy and behavioral finance literature on how

overconfidence bias is mitigated to improve individual investors' decision-making capabilities. The study shows that individual investors can mitigate their overconfidence bias by engaging in self-reflection on their investment experiences and enhancing their financial literacy to strengthen their self-reflection ability. We recommend financial practitioners adopt it as a learning approach that should be fostered among individual investors to minimize their overconfidence bias. Accordingly, stock exchanges and investment advisors can apply it when designing training programs for individual investors. The individual investors can also apply this learning approach to mitigate their overconfidence bias, thereby, the associated negative consequences to their wealth. Further, the findings of this study can be used by policymakers when developing educational initiatives. It is important that educational initiatives focusing on knowledge about financial concepts and the ability to use them are imperative for making effective financial decisions. In the light of our model and the associated empirical results, the mechanism that minimizes bias for desirable investment decision making can be traced to investors' ability to engage in self-reflection. Thus, we suggest that while focusing on knowledge and skill components, the education initiatives should be targeted towards improving self-reflection capabilities that mitigate behavioral biases.

6 Future Research

Our conceptual model resulted in R^2 of 20.14% and 41.96%, respectively, for SREF and OCON constructs, which raises that there may be other unexplored variables that can predict self-reflection and mitigation of overconfidence bias. For example, it may be the case that the desire for learning, which includes affective states such as interest in learning, emotions experienced and attention to mistakes, could be a potential factor that mitigates the overconfidence bias of individual investors (Shantha et al., 2018). Apart from biological mechanisms and psychological constructs, it is important to consider other structures and mechanisms by which overconfidence bias is mitigated. For instance, social mechanisms such as the extent of interaction with investment advisors for financial advice could be an influential mitigator of overconfidence bias (Hsu, 2021). Future studies should also extend to other frontier markets as well as developed and emerging stock markets. In addition, as noted by Shantha (2019a), it is likely that the predictive power of self-reflection and, thereby, mitigation of overconfidence bias may be driven by market conditions. We suggest longitudinal studies to examine the role of cognitive, psychological, and social factors in mitigating overconfidence bias under different market conditions.

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