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Article

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Overconfidence bias and investment performance: A mediating effect of risk propensity

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Abstract

This study examines the determinants of overconfidence bias that, in turn, influence investment performance via risk propensity. This study also investigates the three cognitive biases that lead to overconfidence bias, influence investment performance, and establish the indirect relationship through risk propensity. The mixed methodology is applied to examine the proposed research model. The results depict that all the cognitive biases influence the risk propensity and investment performance via risk propensity. The illusion of control is the strongest predictor of risk propensity and investment performance. Furthermore, findings imply that all the cognitive biases have a positive relation with investment performance. This study provides policy implications to practitioners and individual investors.

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Keywords: Individual investors; Overconfidence bias; Illusion of control; Optimism; Self-attribution; Investment performance

1. Introduction

A stock market is beneficial for investors due to its wealth creation opportunities. Well-functioning stock markets can play a significant role in mobilizing savings and investments and in organizing the production of goods and services that generate employment opportunities. This ultimately helps to enhance the overall economic development of the country. Especially, the long term investors contribute their wealth to the productive capacity of the economy. Individual investors have a prominent role to play in the financial markets as their

preferences for companies' stocks regarding risks, liquidity, returns, and other non-financial criteria.

The rationality of individual investors in the financial markets has been challenged in the last few decades, and a paradigm shift can be witnessed among the investors who are influenced by both rational as well as psychological biases. This evolution can be described by two prime factors: the fresh evidence depicting the impact of psychological bias on the economic actors' behavior and the deficiencies of the rational investment models in explaining the stock market trading volumes and returns (Daniel & Hirshleifer, 2015). Therefore, the emergence of behavioral finance literature and its dominance can be discerned. Behavioral finance can be used to explain the psychological principles of investment decision-making (Kapoor & Prosad, 2017), and the implications of psychology for financial markets (Paule-Vianez, Gomez-Martinez, & Prado-Román, 2020) can clarify the puzzles that prevail in a standard conventional paradigm where mismatches between the optimal choices exist. This aspect can be used for

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explaining the actual choice of investment. In this paper, the influence of behavioral factors, namely, the determinants of overconfidence bias of individual investors, is studied.

Investment performance is the prime drive for investors to invest in stocks. According to previous findings, most investors get a reasonable return on their wealth invested in common stock (Campbell, Ramadorai, & Ranish, 2019; Dai & Zhu, 2020). However, some individual investors consistently confront poor performance because of a lack of theoretical understanding of the stock market as well as the presence of behavioral biases (Chhapra, Kashif, Rehan, & Bai, 2018; Shah, Ahmad, & Mahmood, 2018). These biases sometimes lead to poor performance in the stock market and make the market inefficient. Overconfidence bias of the individual investors in this regard plays a significant role. Overconfidence bias relates to the unfounded valuations of stocks and believing in those confidently. Odean (1998) argued that overconfident investors can cause the market to underreact the information of rational investors. Investors believe that in the presence of anomalies, they can make an excess return (Entrop, McKenzie, Wilkens, & Winkler, 2016) using their cognitive behavior (Tekçe, Yılmaz, & Bildik, 2016). Daniel and Hirshleifer (2015) reported that overconfidence bias is a widespread and tragic bias in all cognitive biases. Overconfidence bias is one of the most examined biases with respect to presence (Kumar & Goyal, 2016; Tekçe et al., 2016), origination (Merkle, 2017), and outcomes (Sahi, 2017). The overconfident investors are more engaged in trading (Daniel & Hirshleifer, 2015) than any other investor to get higher returns (Barber & Odean, 2001). Nevertheless, findings show that overconfident investors most often fail to get a higher return from their investments (Baker & Ricciardi, 2014). Overconfident investors with neutral risk may make a higher expected return than rational ones (Benos, 1998). Overconfident investors may not only make a positive return from their rational opponent also higher return if they were also rational (Kyle & Wang, 1997). Previous researchers have shown that the overconfidence bias of individual investors leads to market volatility (Mushinada & Veluri, 2018). Therefore, it is of great importance to study the stock market investors' overconfidence bias effects in their investment performance (Pikulina, Renneboog, & Tobler, 2017; Trejos, van Deemen, Rodríguez, & Gómez, 2019). In addition, an individual investor's satisfaction from the investment decision made has compelling importance. Investment performance signifies the attainment of the expected financial level and being satisfied with that desired level (Parmitasari, Hamzah, Alam, & Laba, 2018). Due to the rational economic models' incapacities to predict investment performance and limitation of studies focusing on another side of the cognitive bias that can be favorable for the market and individual, such as satisfaction toward their investment decision, the present study proposes a behavioral model to measure the investment performance of individual investors.

Various studies have been conducted to investigate the impact of overconfidence bias on investment decisions with respect to geographical, demographic, and investment characteristics. The findings of these studies are quite mixed. This

research aims to increase the understanding of why individual investors behave differently in the stock. Asian stock market differs from the eastern stock market (Ul Abidin et al., 2017) because of three main reasons: economic conditions (Johnson & Soenen, 2002), lack of information regarding most of the companies (Yousaf, Ali, & Shah, 2018), and cultural difference (Johns, 2006). The Pakistani Stock Exchange is located in an Islamic religiosity dominant country, where 96.28% of the population is Muslim (Pakistan Bureau of Statistics, 2017). Thus, religiosity is the main indicator that makes the Pakistan stock market different from developed countries. Further, this research enriches the literature by providing a comprehensive examination of overconfidence bias in the perspective of individual investors. Pragmatic results provide new insight to understand the overconfidence, risk propensity, and investment performance of individual investors. Previous studies measure investment performance by two indicators, namely, return and risk, whereas this study highlights the importance of the level of satisfaction toward their investment decision. Many investors get poor returns on their investment; however, they remain satisfied with their trading behavior. Hence, this research provides a new understanding of investment performance from the perspective of behavioral finance. Stanovich and West (2000) examined the individual difference by providing alternative explanations for the normative and descriptive gap. However, this research examines the behavior of overconfident individuals. Further, Stanovich and West (2000) attempted to identify the error in the actual performance of an individual, whereas this research explains the perceived performance.

Overconfidence bias is not a unitary facet, but a series of overlapping ones (Hilton, Regner, Cabantous, Charalambides, & Vautier, 2011). Overconfidence bias can be described in three mainstreams (Akhtar & Das, 2020). These are miscalibration, better than average effect, and illusion of control. In addition, overconfidence bias can be described in the other three streams such as overplacement, overprecision, and overestimation (Daniel & Hirshleifer, 2015). Previous studies (Williams & Gilovich, 2008; Kansal & Singh, 2018) on overconfidence bias mainly focused on the determinants of overconfidence bias. For instance, Kansal and Singh (2018) ascertained the four determinants of overconfidence bias: "better than average effect," "planning fallacy," "self-attribution," and "positive illusion." Williams and Gilovich (2008) examined the other determinants of overconfidence bias: availability, optimism, egocentric tendencies, or hindsight bias. However, very few studies so far have investigated the determinants of overconfidence bias. Moreover, limited research is conducted to identify the determinants of overconfidence bias in the perspective of individual investors.

Hence, the current study aims to examine how the determinants of overconfidence bias (self-attribution, illusion of control, and optimism) are suitable for measuring the investment performance of individual investors via risk propensity. These three determinants of overconfidence bias are selected based on the interview. The in-depth interviews were conducted to explore the determinants of overconfidence bias.

Further, the present study analyzes the differential effect of the identified determinant of overconfidence bias on investment performance and assesses how the mediation is suitable regarding the determinants of overconfidence bias and investment performance. The study argues that individual investors are risk-takers because of their overconfidence bias. Hence, risk propensity is introduced as a mediator in the proposed relationship.

Behavioral finance literature has vast scopes for exploring divergent factors influencing individual investors' investment decisions and performance mainly in the context of satisfaction. Risk attitude is also indicated as a crucial factor of stock market participation such as the investors' propensity to gamble, uncertainty dispersion, religion-persuaded gambling attitudes, corporate fraud revelation, and high hedging potential (Cheng, Mutuc, Tsai, Lu, & Lin, 2018). Risk propensity is defined as the readiness of individuals to take risks (Alleyne, 2011). It is witnessed that the overconfident investors trade aggressively in the stock market in an attempt to earn the advantage of mispricing. Moreover, overconfident investors underestimate the risk (Merkle, 2017). Overconfidence bias is defined as the unwarranted faith in their belief, intuition, skills, knowledge, experience, and personal characteristics. Hence, risk propensity should be explored further to gain more insights into the behavioral preferences of individual investors (Combrink & Lew, 2020). Therefore, this study also incorporates the risk of propensity to measure the current tendency of individual investors toward risk-taking and willingness to invest in the stock.

Pakistan, an emerging economy, has been gaining momentum in the last decade (Ali, 2018). The Pakistan Stock Exchange (PSX), with a market capitalization of approximately \$50 billion and 546 listed companies, is becoming a major contributor to economic advancement (Henricks, 2021). Studies are relentlessly conducted to identify various factors impacting the investment decisions, performances, and satisfaction of the investors. For instance, factors affecting the investors' opinions on Initial Public Offering valuation (Mehmood, Mohd-Rashid, Che-Yahya, & Ong, 2020), the impact of market, prospect, anchoring, and other behavioral factors on investment decision (Javed & Marghoob, 2017; Khan, Naz, Qureshi, & Ghaffoor, 2017), the effect of risk aversion, heuristic, financial techniques, day-to-day experience, and firm's corporate governance on investment decision (Mumtaz, Saeed, & Ramzan, 2018), the influence of heuristics on investment choices (Shah et al., 2018), etc. However, the effect of overconfidence bias on investment performance via risk propensity is scantily studied despite the research community's call to explore these factors (Bouteska & Regaieg, 2018; Combrink & Lew, 2020; Trejos et al., 2019). Therefore, the present study addresses this gap and aims to explore the above-mentioned variables among the individual stock market investors of the PSX.

The contribution of this research is threefold. First, this study investigates the differential effect of each determinant of overconfidence bias on investment performance with the mediation process of risk propensity. The study addresses the following research questions: (1) what are the main

determinants of overconfidence bias in individual investors? (2) Do the determinants of overconfidence bias impact the investment performance of the individual investors? (3) What is the extent of the effect of each determinant on the investment performance? (4) Does the mediation work in the relationship of determinants of overconfidence bias and investment performance? Thus, the study is a rare attempt in nature to identify the determinants of overconfidence bias and the causal effect of each determinant on investment performance through the mediation process of risk propensity.

Second, this study ascertains the determinants of overconfidence bias for investment performance in behavioral finance suggesting that individual investors are not perfectly rational when they trade in the stock market. In the process of identifying the determinants of *overconfidence bias* in the individual investors, 15 individual investors were interviewed. Based on the interview feedback, the proposed hypotheses were tested among 378 individual investors in a survey. The results show that all determinants of overconfidence bias are positive and have a significant influence on risk propensity and investment performance. In the direct and indirect hypotheses, the illusion of control is the strongest predictor of investment performance via risk propensity. The rest of the hypotheses are also positive and have significantly affected the risk propensity and investment performance.

Third, this research contributes to the cognitive theory literature by emphasizing the behavioral finance perspective on decision biases. Previous literature indicates the effect of cognitive ability in explaining stock market participation. Among others, financial literacy, financial awareness, financial knowledge, personal values, and wealth inequality are some of those factors (Cheng et al., 2018). In the present study, the *cognitive theory* base is expanded through the exploration of certain behavioral factors regarding investment performance.

Furthermore, the study provides policy implications to practitioners and individual investors. The rest of the paper is divided into the following sections. Section 2 delineates the relevant literature and hypotheses development. Section 3 discusses the methodology. Section 4 describes the results. Section 4 shows the discussion. Finally, Section 5 presents the conclusion.

2. Literature review and hypotheses development

Behavioral finance literature has grown rapidly in the recent decades, adding more insights in understanding the investors' behavior and expanding the finance literature. It is rather a compelling field of finance that is trying extensively to explain the investors' economic decisions from the behavioral, cognitive psychology, and conventional decision-making perspective. Therefore, to broaden the behavioral finance literature, this study aims to identify the biases that make the individual investors overconfident in the stock market. Previous studies have discussed the causes of overconfidence bias of investors in the context of demographics (Barber & Odean, 2001; Kansal & Singh, 2018) and socioeconomic (Friehe & Pannenberg, 2019; Belmi, Neale, Reiff, & Ulfe, 2020) indicators but

remained silent to discuss the behavioral biases that make them overconfident. Therefore, this study attempts to fill this gap by identifying the biases that make the individual overconfident. These biases are self-attribution, illusion of control, and optimism. In addition, the tendency of taking risks can be different among the investors. Therefore, this study also examines the relation of these biases with risk propensity that explains the current period tendency of risk-taking.

2.1. Self-attribution bias, risk propensity, and investment performance

Self-attribution is a cognitive and mental process bias in an individual personality. It explains the tendency of investors that give the credit of success to themselves and inversely blame others and external factors for their failure (Czaja & Röder, 2020). Individuals tend to give credit for their success to their skills such as natural talent, capabilities, and thinking abilities while condemning failure to uncontrollable factors such as luck.

Self-attribution is gaining attention in the field of behavioral finance that can make individuals overconfident. The literature supports that successful individuals are sometimes overconfident in their decision-making; however, they may suffer unexpected loss and gain from their investment. If the investors succeed from their investment, it leads them to take more risks. Dawson (2019) argued that risk creation is motivated by the self-attribution bias of individuals. For instance, the investor who is a victim of self-attribution bias believes that he is always performing well in the market and willing to invest in the stock. Trehan and Sinha (2017) also delineated that self-attribution bias is the major determinant of investors' risk trading behavior. Similarly, Koo and Yang (2018) stated that overconfidence bias is intensified by self-attribution bias (Gervais & Odean, 2001). Therefore, the victim of self-attributed investors is a risk-taker and willing to invest in the stock. Chou, Li, Yin, and Zhao (2021) showed that the self-attribution bias addresses the well-known phenomena of earning announcement anomaly in the stock market.

Individual investors have unwarned belief in their attribution and ignore the error to be committed and take the higher risk in the market. Thus, the individual investors who are victims of biases are risk-takers. Risk propensity is the tendency of an individual toward risk-taking for the current period (Combrink & Lew, 2020). Risk-taker investors usually underperform in the market (Otuteye & Siddiquee, 2020). Furthermore, individuals are willing to invest in the stock because of the risk propensity (Alquraan, Alqisie, & Al Shorafa, 2016) and get a loss in their investment (Parveen, Satti, Subhan, & Jamil, 2020). Similar findings are indicated by Sachse, Jungermann, and Belting (2012), in which they inferred that individuals get a poor return on their investment because of higher risk. Individual investors often do excess trading and ignore the fundamental factors, such as risk and get less return in their investment (Aduda, Odera, & Onwonga, 2012). Similarly, Chou et al. (2021) indicated that investors lead to poor returns because of self-attribution.

Unfortunately, a nonprofessional individual underperforms in the market because of his overconfidence bias related to self-attribution bias (Trehan & Sinha, 2017; Czaja & Röder, 2020). Conversely, Hoffmann and Post (2014) argued that investors who get higher returns are associated with the self-attribution bias. Furthermore, the results of the study by Muthumeenakshi (2017) have shown that risk-taker investors get a reasonable return on their investment. Hence, the risk-taker individual believes in getting a higher return on their stock. There are inconclusive results on self-attribution. Thus, there is a need to fill the gap to assess investment performance with respect to risk-return and satisfaction (Parmitasari et al., 2018) while previous studies consider risk and return as a component of investment performance. Investment performance is the measure of return, risk, and level of satisfaction toward investment decisions. There is a need to investigate the investment performance with respect to satisfaction as well as risk and return. Self-attribution bias causes an investor to become more overconfident as his past better performance is confirmed. This, in turn, makes the investors take a high risk in the decision-making and affect their investment performance, and makes them active participants in the market. After the attainment of multiple successes from the investments, the investors become more confident that ultimately can affect their risk-taking behavior and investment decision.

Previous studies show mixed findings on the overconfidence bias of where it is found that most often individual investors underperform, and sometimes they can attain normal or above-normal returns from their investments (Muthumeenakshi, 2017; Czaja & Röder, 2020; Trehan & Sinha, 2017). Therefore, it is important to measure the predictors of their investment performance. The conceptual linkage between self-attribution and investment performance is a path from risk perception. Hence, based on the above discussion and mismatches in the previous findings, the following two hypotheses are constructed.

H1. There is a significant relationship between self-attribution bias and risk propensity.

H1a. There is a significant relationship between self-attribution bias and investment performance through risk propensity.

2.2. Risk propensity and investment performance

Risk propensity is the tendency to measure risk-taking for the present period (Combrink & Lew, 2020). According to the theories of homo economicus, investors are rational human beings. However, the behavioral finance literature explains that individual investors' tendency toward risk is independent of their behavior (Kim & Nofsinger, 2007). Most of the investors are risk-takers because of their tendency of gaining more profits from their investments. The investment performance is not directly influenced by cognitive biases, because the tendency to take risks is influenced by the investors' behavior.

Investors are risk-takers because of their behavior (Ahmad & Maochun, 2019). Hence, it is necessary to propose risk propensity as a mediator. This behavior of individual investors can influence their investment performance. Standard finance measures the investment performance with respect to risk and returns, whereas it is mostly ignored to measure the satisfaction toward the investment decision (Parmitasari et al., 2018).

Risk propensity may influence the investors' investment performance (Hamid, Rangel, Taib, & Thurasamy, 2013). The willingness to invest in the stock shows that investors are risk-takers that can eventually influence their investment performance. Individuals perceive a higher level of risk to get a higher return from the stock market. Thus, this study investigates investment performance with respect to risk, return, and investment satisfaction. Hence, the hypothesis is constructed below to test the relationship between risk propensity and investment performance.

H1b. There is a significant relationship between risk propensity and investment performance.

2.3. Optimism bias, risk propensity, and investment performance

Optimism is the tendency to perceive the most favorable events (Dawson, 2017). It is considered a cognitive bias that perceives high significance because it is linked with other cognitive biases. Individual cognitive capacity is limited; hence, investors use cognitive heuristics to process the information. Optimistic individuals believe that events or actions are expected to result in favorable outcomes (Chung, Lee, & Park, 2020) and this leads them to their willingness to invest in stock (Liu, Dai, Chang, Lin, & Lee, 2020). Therefore, optimistic investors prefer to invest in a risky asset as compared to a risk-free asset. An optimistic person normally tends to be overconfident (Zacharakis & Shepherd, 2001) and takes a higher risk (Marwan & Sedeek, 2018) than pessimists. Hence, most individuals are taking the high risk with belief that results will always favor them and they can earn an abnormal return. Optimism bias increases the tendency to take the risk on their investment (Trehan & Sinha, 2017). The optimism leads them to become overconfident and choose risky stocks for investment. Optimism is one of the most dominant causes to make investors overconfident. Overconfident investors because of optimism ignore the stocks' fundamentals. Optimistic individuals assign a high probability to positive outcome events and lower to negative outcome events by ignoring the fundamentals, and this leads them to take more risk in financial decision-making (Anderson & Galinsky, 2006). As indicated in the research, the opposite of their expectation happens in practice. The optimistic persons get a poor return on their investment unless they do proper analysis (Bonaparte, Kumar, & Page, 2017). Glaser and Weber (2007) found an increase in trading activity after bull markets; stock trading volume is

positively related to lagged stock returns. Hence, previous studies present positive and negative effects of optimism on the investors' investment (Malouff & Schutte, 2017; Concetto & Ravazzolo, 2019).

Therefore, optimistic individuals invest in the stock and hence take higher risks. Moreover, if the individual is optimistic about the outcomes, then there are fewer tendencies to think about the potential loss because of the risky choice of an asset. The overestimation of positive outcomes results in a negative effect on the asset allocation of the investors (Jacobsen, Lee, Marquering, & Zhang, 2014). The investors ignore the negative side of the event because of optimism bias. In this sense, the investors who are always assigning the high probability to the events in their favor are risk-taker and choose the risky asset for the portfolio. The traditional model of investment shows the investors as risk-averse (Chan, Clark, Guo, & Wong, 2019). However, in the behavioral finance literature, individuals can also become risk-takers in the market. Risk-taker investors believe that they can earn an abnormal return by their behavior and one of the behaviors that make them risk-taker is optimism (Ciccone, 2011). The risk-taker investors ignore the transactional cost and get a poor return on their investments (Baker & Nofsinger, 2002). However, Parveen et al. (2020) argued that within the rational boundary, risk-takers earn an abnormal return on their investment. Investment returns are not reasonable for the individual investor because of their behavior (Bonaparte et al., 2017), and that behavior is optimism. Most of the individual investors get a poor return on their investment, but they are satisfied with their investment decision that might be due to their overconfidence bias. Therefore, investment satisfaction should be parallel to risk and return to measure the investment performance. Investment performance is measured by various previous studies (Mansor, Bhatti, Rahman, & Do, 2020; Akhtar, Thyagaraj, & Das, 2018) with respect to risk and return (He, He, & Wen, 2019). Nevertheless, previous studies remained silent to measure the investment satisfaction of individual investors, whereas risk and return are mainly measured by historical data and show that an individual most of the time underperforms (Barber & Odean, 2001; Chang & Shi, 2011). However, individual investors are increasingly participating in the stock markets worldwide. Therefore, there is a need to know the other side of investment performance other than risk and return and that is investment satisfaction. The optimistic behavior of an individual makes him a risk-taker and, in turn, affects his investment performance with respect to risk, return, and satisfaction. Investment satisfaction is the key component of performance. In behavioral finance, the most dominant behavior is overconfidence bias, in general, which is led by many other biases such as optimism. Optimistic investors become overconfident and believe that their satisfaction with a decision is more important than risk and return. Thus, the above stipulation summarizes the following hypotheses.

H2. There is a significant relationship between optimistic bias and risk propensity.

H2a. There is a significant relationship between optimistic bias and investment performance through risk propensity.

2.4. Illusion of control, risk propensity, and investment performance

The illusion of control describes the tendency of individuals that strongly believe that they can control the outcomes of an event (Pompian, 2012). The individually assigned probability to the personal successful event is inappropriately higher than the actual probability would warrant (Langer, 1975). When subject to the illusion of control, individuals feel that they can exert more control on their investment than they can do in an actual scenario (Wohl & Enzle, 2009). Researchers found that choices, task familiarity, competition, active involvement (Pompian, 2012), prior knowledge, and the control process itself (Czupryna, Kubińska, Markiewicz, & Tyszka, 2020) can inflate illusion and generate overconfidence bias (Khan, Tan, & Chong, 2019). The positive illusion of control indicates the renowned bias of overconfidence (Sahi, Arora, & Dhameja, 2013). Therefore, the illusion of control bias is the major determinant of overconfidence bias in individuals. The bias leads individuals to do excess trading rather than sensible ones, and investors do believe that they can control the outcomes of their investment and as a result poor return in their investment (Baker & Nofsinger, 2002). Individuals prefer to invest in the underdiversified portfolio because they only choose the companies where they own some amount of control (Merkle, 2020). The illusion of control makes individuals use the limit order or other trading techniques to experience a wrong sense of control over the outcomes of their investment (Wohl & Enzle, 2009). Therefore, individuals ignore the fundamental information of stock such as the cost of excess trading and invest in underdiversified stock. They apply traditional trading techniques that lead to a reduction in their investment returns. Furthermore, individuals tend to take higher risks in the current period because of an illusion of control (Keller & Gollwitzer, 2017). Fellner (2009) identified that individuals invest more in the stock to exercise control over the outcomes of the investment. Hence, the individuals' behavior to invest in the stock while ignoring the stock's fundamentals makes them risk-takers for the current period of investment. The subjects who prefer to invest in risky securities are risk-takers because of their illusion of control. The investors get a positive return in the long term (Fellner, 2009) in an account of the illusion of control. The victim of the illusion of control does excess trading to seek a higher return. The standard finance measures the investment performance using risk and returns while it has rarely measured the investment satisfaction. The literature on behavioral finance introduces the concept to measure investment satisfaction. Most of the individual investors get a poor return on their portfolio; however, they are satisfied with their investment decision. The positive side to this bias is a lack of

attention. The investment performance is positive in the presence of an illusion of control. In the account for the illusion of control, the investors prefer to invest in risky securities and, in turn, influence their investment performance. In this sense, an illusion of control bias can influence the investors to take higher risks to get a higher return from the market and finally affect their investment performance. Based on the above discussion, the hypotheses are drawn as follows.

H3. There is a significant relationship between the illusion of control bias and risk propensity.

H3a. There is a significant relationship between the illusion of control and investment performance through risk propensity.

Fig. 1 shows the research model of the present study.

3. Research methodology

A mixed-method approach is used for this research. The study applies both qualitative and quantitative techniques. In an attempt to understand the causes of overconfidence bias in the individual investors, it is crucial to investigate the behavior of the individuals and develop the meaning for the manifestation of the overconfidence bias, which was done through semi-structured interviews. The collected information when justified with the literature was used to adapt the instruments that matched with information for the individual investors. The crucial part of the exploratory investigation is not to ask the participants clearly about the causes of overconfidence bias but try to understand their beliefs, perception, and preferences of participants that were analyzed by the researchers to understand the determinants of overconfidence bias. A brief set of questions was set to screen the participants and identify overconfident investors.

Therefore, in the qualitative part of the research, interviews were performed to investigate the determinants of overconfidence bias that influence the investment performance of individual investors. In-depth interviews were performed with 15 individual investors to understand the causes of overconfidence bias. The interviews are necessary to identify the determinants of overconfidence bias. The interviewees suggest the necessary items that address the overconfidence bias. This interview analyzed the behavior of investors that persuade

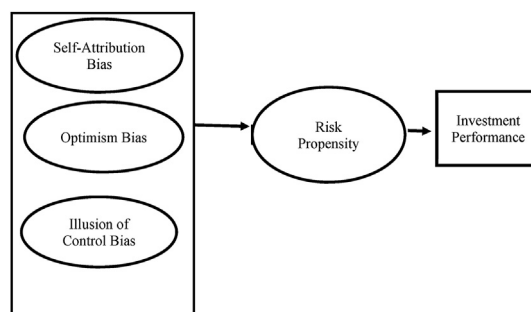


Fig. 1. Cognitive based hypothesized Model.

them to be overconfident. Further, this study refines the items and strengthens the observations to discuss with the five financial experts including two academic experts. The purpose is to discuss with the experts to name the determinants of overconfidence bias that are explained by the individual investors in the interviews and refine the item particularly. The discussion with the experts focused on the points mentioned in [Appendix I](#).

The interview questions (see [Appendix I](#)) proved to help identify the relevant causes, understand the constructs, lead to practical implications, and concern data collection. The literature review, expert opinion, and semi-structured interview helped to refine the constructs; the scale is adopted for the individual investors.

This study approached 1000 individual investors for the questionnaire survey through the help of a brokerage house. Only 400 individuals agreed to participate in the study. The response rate is approximately 40%. The total collected useable samples were 378. A significant number of investors who participated in this study were those who invest in various securities of the PSX. The investing class in Pakistan is a combination of the middle and upper classes. This combination has a mix of divergent economic, occupational, and educational levels. Hence, this study intentionally aimed at the upper-class individual investors. The evidence shows that they have a higher earning level than any other class of investors. This class of investors is best suited to identify the determinants of overconfidence in individual investors. Furthermore, this study targeted those investors who have more than five years of trading experience and were active investors. It is important to categorize the class of investors to achieve the aim of the study.

3.1. Participant selection

3.1.1. Sampling technique and data collection method

In this study, a nonprobability sampling technique was used. The non-probability sampling technique is feasible because the study aims to examine the relationships between constructs and it does not study the statistical generalization ([Gliner, Morgan, & Leech, 2009](#)). In the scenario of non-probability sampling, the population is unknown, and the researchers choose the unit purposively. It is the best technique to investigate and postulate research problems. Moreover, the nonprobability sampling technique is best when the researchers are primarily interested in the investigation and relationship of constructs and believe that the relationship will vary as the participant changes ([Gliner et al., 2009](#)). The nature of this study is to investigate the financial information of investors. Therefore, only those individual investors who were willing to fill out the questionnaire were selected, and they were ensured that their information will be kept confidential. Therefore, the non-probability sampling technique was the best for this particular investigation.

For the qualitative part of the study, purposive sampling was used to select the individual for the interview, and criterion sampling was used to target the professional and academic experts. The criteria that were used to select the experts are that a person have relevant experience and knowledge of the

particular domain. The interviewees were selected with the help of the brokerage house to target the individual investors. Interviewees are selected on the characteristics that diagnosed individuals were overconfident investors and have strong financial knowledge (such as portfolio allocation, diversification, and economic indicators). For distributing the final questionnaire, the *snowball sampling technique* ([Raut, 2020](#)) was used to target the individual investors for collecting the final response.

3.1.2. Unit of analysis

The investment performance is defined with respect to return, risk, and satisfaction from the individual investors' perspective. Therefore, the individual investors in the stock market were the unit of analysis. All the variables were measured from the perspective of individual investors. For studying the unequal distribution of income in the stock market, there is a need to study the causes and determinants of biases that deviate the market from the equilibrium point. Individual investors' behavior is the major reason, and overconfident bias is the most dominant bias. Therefore, individual investors are targeted as a unit of analysis to achieve the purpose of the study.

3.1.3. Criteria for the selection of the respondents

These are the following criteria and limits to target the unit of analysis:

- 1 An active participant in the Pakistan stock market.
- 2 The respondent should have 5 years of trading experience.
- 3 A respondent has a major equity investment.
- 4 A respondent belongs to Pakistan.
- 5 A respondent should understand the basic level of English and financial terms.

3.1.4. Preliminary questions

The researchers asked some fundamental questions before filling the final survey from the respondents. These questions are as follows:

- 1 Do you actively participate in the stock market?
- 2 If the answer of 1 is yes, then how many transactions do you perform in the last month?
- 3 Do you believe that investment in the stock market is secured and is a good investment?
- 4 Are you satisfied with your investment decision?

3.1.5. Respondent profile

In the respondent section, researchers have explained the results of demographic variables. There is no gender discrimination, but in Pakistan, most of the investors of the stock market are men. Therefore, approximately 92% were men who filled this survey. The rest of the 8% were women. Among the participants, 69% were from the age group of 45–60 years, 27% were from the age group of 35–44 years, and the rest of the 4% were from the age group of 20–34 years. Approximately 59% were businessmen and 41% were salaried people.

Within the sample, approximately 97% were married and only 3% were single. Approximately 37% were postgraduate, 54% were graduate and 9% were undergraduate. The respondents have a diversified range of experiences. The largest bracket for the experience was approximately 73% having above 10 years of stock market investment. The remaining 27% had 5–9 years of experience in investing stocks.

3.2. Questionnaire and pilot testing

The pilot study was performed to confirm the validity and reliability of the instrument. In total, 378 useable final responses were collected from individual investors. The collected data were used to test the seven proposed hypotheses. The questionnaire also asked about the demographics and socio-economic information of individual investors. This study adopted the instruments of investment performance from [Ul Abdin et al. \(2017\)](#) for determining investment performance. [Ul Abdin et al. \(2017\)](#) operationalized the investment performance for the individual investors. Risk propensity was also measured for this research and used the adapted scale of [Keller and Siegrist \(2006\)](#). [Keller and Siegrist \(2006\)](#) used risk attitude in two dimensions: willingness to invest in stock and financial risk attitude. In this study, these two dimensions were used to measure the risk propensity because these two dimensions are significantly correlated. Risk propensity is defined as investors’ current period risk-taking tendency in their financial decision. In the pilot study, the analysis was also performed for these two dimensions to confirm that it relates to a single factor. Furthermore, the scale development procedure is discussed in the next section.

3.3. Sample size

This study aims to achieve the theoretical propositions as well as a statistical proposition. Therefore, this research used the G power to target a reasonable sample. The determination used to get the sample size is as follows.

Effect Size f^2	0.15
A error prob	0.05
Power (1- β err prob)	0.95
Number of predictors	3

Therefore, the total sample size should be 119. This sample size was minimum. However, this research targets the maximum to achieve a better result, so the final study was conducted with 378.

3.4. Scale development

The irrational intuition and belief in their abilities, skills, and capabilities that ignore the facts are called biases. In the literature of behavioral finance, the overconfidence bias is considered as a prominent and dominant bias among individual and institutional investors. However, the literature is silent to identify the determinants of overconfidence bias. Furthermore, the scale is not well established from the perspective of

individual investors. Hence, to achieve the purpose of this study, a scale has to be developed. The set of items is designed for each construct that was initially analyzed with exploratory factor analysis (EFA) and literature support. In the next phase, each item is evaluated by the expert for reducing and modifying the constructs. The three or four items are designed for each construct. A total of 14 items were analyzed by experts for the biases that are the determinants of overconfidence bias. All the items are final with some minor changes in the statement. Seven-point Likert scales were used in the questionnaire to collect the response from the individual investors. Within the scale, “1” represents “strongly disagree,” and “7” represents “strongly agree.” In the process of refining the items or constructs, the researchers conducted a pilot study with a sample of 204 individual investors. The results of the pilot study show that 16 items distribute into four factors that explain 72.76% of the variance of the data. All the four factors achieve the minimum thresholds of reliability that are greater or equal to 0.7. All items achieve the criteria for loading that is greater than 0.5.

The results show that there are three investors’ biases that make them overconfident in the stock market and impact their risk propensity and, in turn, investment performance. The criteria to retain the factors are eigenvalues that are greater than 1 ([Patil, Singh, Mishra, & Donovan, 2008](#)), loading less than 0.5, and loading into multiple factors were removed. Hence, only one item of self-attribution bias is removed because of cross loading and less than 0.5 loadings in the respective factor.

It was further observed that when willingness to invest in stock and financial risk attitude constructs are analyzed independently, these two constructs show their combined effect, namely, risk propensity. The numbers of items and reliabilities are shown in [Table 1](#). After confirming the reliability of the construct in the pilot study, the questionnaire was circulated for the collection of final data. The final version of the questionnaire was collected from 378 investors with reducing one item in the self-attribution bias.

Initially, the data were checked for normality of the various metrics. The final data again analyzed the factor analysis to recheck the structure of the factors. The Kaiser–Meyer–Olkin Measure of Sampling Adequacy was 0.841, and Bartlett’s Test of Sphericity was significant at 3941.892 with a p-value of 0.000 as shown in [Table 2](#). The results of the EFA are present in [Table 3](#). [Table 3](#) shows that the final data are sufficient for the factor analysis and results indicate that four factors are found that have eigenvalue greater than 1 and these four factors explained approximately 72.76% of the variance in the data. Among four factors, three factors, namely, self-attribution,

Table 1
Reliability of developed constructs.

Constructs	Reliability
Self-attribution	0.852
Illusion of control	0.858
Optimism	0.905
Risk Propensity	0.919

Table 2
Adequacy measure: Factor analysis.

KMO and Bartlett's Test		
Bartlett's Test of Sphericity	Approx. Chi-Square	3941.892
	df	136
	Sig.	0
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.841

Table 3
Factor analysis.

Rotated Component Matrix				
	Component			
	1	2	3	4
You are responsible for all your past successes.		.875		
You are responsible for all your past failures.		.913		
I am capable of identifying the low point of the market.		.893		
My instinct has often helped me make a good investment.		.912		
^a When I think about financial investment, I will spend more time thinking about potential gain rather than the potential loss.		0.077 ^a		
I always know the status of my finances.			.835	
I control my personal finances.			.838	
I control, and I am fully responsible for, the results of my financial decisions.			.824	
I expect superior returns on my investment in the future.				.923
I expect to achieve my investment goals in the future.				.903
I expect to improve my investment performance in the future.				.880
Stock markets are unpredictable, which is why I would never invest in stocks ^b	.831			
I would invest a larger sum of money in stocks	.863			
The uncertainty of whether the markets will rise or fall keeps me from buying stocks ^b	.726			
When I hear the word “stocks”, the term “possible loss” comes to mind.	.801			
I am willing to take financial risks in order to substantially increase my assets.	.861			
In money matters, I tend to be willing to take risks.	.758			

^a Deleted.

^b Inversed.

illusion of control, and optimism, are designed by the researchers to investigate the causes of overconfidence bias, and the fourth factor, namely, risk propensity, is the results of a combination of two constructs. The factor analysis results show that it relates to a single factor.

The mean, standard deviation, item loading, composite reliability, and average variance extracted (AVE) are given in Table 4. The inter-correlation between the variables should be

less than the square determinant of AVE, to confirm the discriminant validity.

The outcome variable investment performance that consists of three items was also checked for item loading, reliability, and AVE, and the values are reported in Table 4. Furthermore, the correlation result of all three biases and risk propensity with investment performance was found significant.

3.5. Analysis technique

To test the hypotheses that are proposed in the study, structural equation modeling is used in three steps to confirm the results. In the first step, EFA was followed by confirmatory factor analysis (CFA) to confirm the quality of the model. For the confirmation of quality, the reliability, item loadings, discriminant, and convergent validity are tested. Second, we test the structural effects to show the influences of investors' biases on investment performance through risk propensity. This study aims to investigate the direct and indirect influence of determinants of overconfidence bias on risk propensity and investment performance. In the third and final step, the specific indirect effect is also calculated. The *SmartPLS* is used to perform the results.

4. Data analysis and results

The present study conducted the data analysis in three phases before running the structural analysis. First, EFA was executed with three main facets to determinants of overconfidence bias to reduce the items and explore the underlying common factor for each item. Second, the PLS measurement

Table 4
Items descriptive, composite reliability, and convergent validity.

Items	Mean	SD	Item Loading	CR	AVE
Self-Attribution				0.95	0.81
SA1	3.59	1.501	0.89		
SA2	3.40	1.446	0.89		
SA3	3.33	1.489	0.88		
SA4	3.31	1.442	0.94		
Optimism				0.93	0.82
OP1	4.03	1.574	0.91		
OP2	4.02	1.503	0.92		
OP3	4.17	1.431	0.89		
Illusion of Control				0.87	0.69
IC1	5.90	1.140	0.81		
IC2	5.90	1.139	0.84		
IC3	5.87	1.165	0.85		
Risk Propensity				0.93	0.68
RP1	4.09	1.427	0.84		
RP2	4.06	1.377	0.88		
RP3	4.15	1.444	0.72		
RP4	4.14	1.404	0.82		
RP5	4.01	1.349	0.88		
RP6	4.12	1.387	0.81		
Investment Performance				0.88	0.71
IP1	4.03	1.574	0.85		
IP2	4.02	1.503	0.86		
IP3	4.17	1.431	0.83		

Table 5
Discriminant validity.

	1	2	3	4	5
Self-Attribution	0.901				
Optimism	-0.022	0.905			
Illusion of Control	0.051	0.032	0.830		
Risk Propensity	0.174	0.132	0.338	0.826	
Investment Performance	0.084	0.029	0.75	0.36	0.844

model was confirmed by CFA, followed by outer loadings and reliability. In the third phase, convergent and discriminant validities are tested for all variables. The outer loadings explain that each item is loaded in the respective factor and the minimum criteria are 0.6. Hence, all the constructs achieved the minimum criteria that were 0.6. The best measure to confirm the internal consistency of the constructs is composite reliability (Ma & Agarwal, 2007). The minimum threshold for the composite reliability is 0.7. Thus, all the constructs achieve the minimum criteria (see Table 4). The convergent validity is confirmed by the AVE value that should be greater than 0.5 (Fornell & Larcker, 1981). The 0.5 criteria explain that variation in the constructs is because of the specific items. Therefore, all the constructs in this study achieved the minimum thresholds that are 0.5 (Table 4). Furthermore, in the data analysis, discriminant validity needs to be confirmed. It shows how each construct is different from the others. The discriminant validity is confirmed if the square determinant of the AVE for each construct is greater than the correlation of all other constructs. Table 5 shows that all variables achieve discriminant validity as the diagonal value (square determinant of AVE) was greater than the bivariate correlation of other constructs. Therefore, the model achieves discriminant validity. In the final phase, the goodness of fit formula was used to confirm the hypothesized model. The criteria are R² and Q².

4.1. Structural paths

The present study used 500 bootstrapping with 378 respondents to assess the path coefficient for the statistical significance of the model. Table 6 shows the complete estimates of the structural model. The first hypothesis (H1) is indirect and positively proposed between self-attribution to investment performance via risk propensity. The finding shows the

positive ($\beta = 0.06$) and significant ($p = 0.0006$) relationship between the proposed hypothesis. Hence, H1 is supported. The second hypothesis is direct and positively proposed between self-attribution and risk propensity. The results show that self-attribution positively influences ($\beta = 0.16$) risk propensity at the confidence level of 1%. Hence, the proposed hypothesis is supported. In the third hypothesis, a direct and positive relationship is proposed between risk propensity and investment performance. The finding shows that risk propensity has a significant ($p = 0.000$) and strongest predictor ($\beta = 0.36$) of investment performance. The fourth hypothesis is one tail and positively proposed the indirect relationship between optimism and investment performance mediated by risk propensity. The structural model shows that optimism has a positive ($\beta = 0.05$) influence on investment performance through risk propensity at the 95% level of confidence. The optimism that has a positive influence on risk propensity is the fifth hypothesis. The finding shows that optimism has a positive impact ($\beta = 0.13$) on risk propensity at the confidence level of 99%. The sixth relationship is proposed between the illusion of control and investment performance via risk propensity. The results show that illusion of control has a positive and significant ($\beta = 0.12$; $p = 0.000$) influence on investment performance via risk propensity. The last hypothesis is to test the influence of the illusion of control and investment performance. The result shows that illusion of control has a positive ($\beta = 0.33$) and significant ($p = 0.000$) influence on risk propensity. The determinant of the coefficient represents the goodness of model fit. The percentage shows the variation in the dependent variables by the independent variables. R² is used to explain the variance in the model. R² is the statistical technique that explains the regress relation of the proposed relationships. R² for the risk propensity is 0.16 that indicates only a 16% variation in risk propensity by the three determinants of overconfidence bias. R² for the investment performance is 0.13 that represents only a 13% variation by the risk propensity. R² value is moderate in the current study (Chin, 2010). Q² is an indicator of the model's predictive relevance known as the criterion of predictive accuracy. It is also known as Stone–Geisser's Q² (Geisser, 1974). Q² should be greater than 0. Less than zero indicates that all independent variables cannot explain the dependent variables. In this study, Q² for the risk propensity is 0.089 and 0.102 for investment performance. In this study, Q² is greater than 0. Therefore, the predictors are relevant that explain the model.

Table 6
Path analysis.

Hypothesis	Independent Variables	Dependent variable	Beta	P-Value	Results
H1	Self-Attribution	Risk Propensity	0.16	0.0005	Supported
H1a	Self-Attribution	Investment Performance via Risk propensity	0.06	0.0006	Supported
H1b	Risk Propensity	Investment Performance	0.36	0.000	Supported
H2	Optimism	Risk Propensity	0.13	0.0096	Supported
H2a	Optimism	Investment Performance via Risk Propensity	0.05	0.0141	Supported
H3	Illusion of Control	Risk Propensity	0.33	0.000	Supported
H3a	Illusion of Control	Investment Performance via Risk Propensity	0.12	0.000	Supported

5. Discussion

The primary objective of this study is to identify the determinants of overconfidence bias, its relationship with risk propensity, and its influences on investment performance. To the best of our knowledge, this study is the first attempt to investigate the determinants of overconfidence bias with respect to individual investors. Little literature is available for individual investors identifying the determinants of overconfidence bias in the behavioral finance literature. However, individual investors play a major role in the stock market and the country's economy. Thus, the results of the current study confirmed the importance of individual investors and their behavior in the stock market. The three main facets of overconfidence bias have a significant influence on risk propensity (Table 6). Self-attribution has a positive and significant impact on risk propensity. This hypothesis supports the result of Trehan and Sinha (2017) that investors are taking a risk because of self-attribution. Furthermore, Hsu, Chen, Huang, and Lin (2020) argued that the level of risk-taking behavior does matter in gender difference—men are more biased with self-attribution. The subject of the study is mostly men; hence, this study supports the argument of Hsu et al. (2020). Successful individuals are overconfident in their decision-making and make an unexpected loss and gain on their investment. The successful outcome from the investment decision pushes the investors to take more risk. Dawson (2019) asserted that risk creation is motivated by the self-attribution bias of individuals. An investor who is the victim of self-attribution bias believes that he is always performing well in the market and willing to invest in the stock. The second direct hypothesis has shown that optimism has a positive and significant impact on risk propensity. Thus, this hypothesis supports the results of Trehan and Sinha (2017) that believe the tendency to take the risk is higher in the presence of optimism bias. An optimistic investor will tend to be overconfident (Zacharakis & Shepherd, 2001) and willing to take the higher risk (Marwan & Sedeek, 2018). The optimistic investors are very enthusiastic to invest in risky securities. Optimistic individuals invest in the stock and, in a sense, take higher risks. Therefore, if the individual is optimistic about the outcomes, then there is less tendency to think about the potential loss because of the risky choice of an asset. The illusion of control has the strongest positive and significant impact on risk propensity. Fellner (2009) identified that individuals invest more in risky assets to exercise control over the outcomes of the investment. Individuals prefer to invest in the underdiversified portfolio because they only choose the companies over they have an amount of control (Merkle, 2020). Hence, an illusion of control is the strongest predictor to make the investors risk-takers. The risk propensity has a positive and significant influence on the investment performance of individual investors. This relates to the findings of previous literature where it was indicated that individuals are willing to invest in equity because of risk propensity (Alquraan et al., 2016). Muthumeenakshi (2017) showed that risk-taker investors get a reasonable return on their investment. Furthermore, the risk-taker individual believes in getting a higher

return on their investment. Hence, this study confirms that risk-taker investors are satisfied with their investment performance. The first indirect hypothesis is also supported that self-attribution bias has a positive influence on the investment performance of investors through risk propensity. Self-attribution bias causes an investor to become more overconfident as his past better performance is confirmed. Therefore, investors take high risks in the decision-making and affect their investment performance. The second indirect hypothesis is optimism bias that has a positive and significant effect on the investment performance of individuals via risk propensity. This is consistent with the work of Riaz and Iqbal (2015) who argue that the investors who are always assigning the high probability to the events in their favor are risk-takers and choose the risky asset for portfolio and indirectly influence their investment performance. The strongest indirect influence of an illusion of control on investment performance through risk propensity is due to investors that are willing to take higher risks in the aim to get a higher return from the market and finally affect their investment performance. This hypothesis supports the findings of Riaz and Iqbal (2015). Finally, this study explains the cognitive bias tendencies to influence the investors' investment performance. Individual investors become overconfident because of cultural, social, and demographic factors. Religiosity is the most influential factor that changes investors' decisions in relation to risk (Chircop, Johan, & Tarsalewska, 2020). Religious investors have a great propensity to invest more in mature companies (Chircop et al., 2020). Previous studies ignore the mechanism by which certain biases influence investment performance. The cognitive biases lead the investors to make a higher risk to earn an abnormal return. Hence, this study introduces risk propensity as a mediator by combining the two dimensions of risk. Furthermore, cognitive biases are selected qualitatively because this study identifies the biases that make investors overconfident. Hence, this study proposed the model from the perspective of individual investors.

6. Conclusion

Behavioral finance believes that cognitive errors do not always lead to negative returns. It is inherent in every individual investor that they can use them to correct their investment decision. This study contributes to the literature of behavioral finance to understand the phenomena of individual investors' cognitive biases with the relationship of investment performance and risk propensity. The current study proposes the relationship between cognitive biases of individual investors, risk propensity, and investment performance using mixed methodology. Moreover, the study develops an instrument for the cognitive biases (overconfidence) that cause the individual to become overconfident. The determinants of overconfidence bias for the individual investors are explored based on an interview with the individual investors. The intuitions from the interviews and literature review developed the foundation for the development of instruments for this research. The cognitive biases for the individual investors are

formed and put through a systematic method of reliability and validity checks, before the circulation of the final survey. Results show that illusion of control is the strongest predictor of risk propensity and investment performance. Further explicitly, the research displays that all the cognitive biases have a positive relation with investment performance. All the upper-class investors are overconfident because of an illusion of control, optimism, and self-attribution. The findings imply that every individual is the victim of natural tendencies that appear like an error in standard finance. These tendencies help them to make a better decision with respect to investment risk, return, and satisfaction that is called investment performance.

7. Limitations and directions

The current study is limited to individual investors who believe that their cognitive biases lead them to satisfy investment decisions. Future studies could be conducted on other biases such as emotional or preferences biases from the perspective of individual investors using the prospect theory. In addition, the coefficients of the cognitive biases are weak toward risk propensity and investment performance due to the minimum number of items to measure cognitive biases. The rationale to use the minimum items is to avoid respondent bias. The study could be extended by adding more variables to investigate the proposed model. Moreover, the other socio-economic segments could be considered that will help to understand whether the results from this research are stable across the other segments. Further future studies may use longitudinal data to confirm that cognitive biases and investment performance remain constant at a different period. In addition, introducing financial literacy as a moderator could be an interesting avenue for future research.

Conflict of interest

There is no conflict of interest.

Appendix-I.

The following are the questions asked from the interviewee.

1. How do you define overconfidence?
2. What do you think that investors become overconfident because of?
3. Do you think that causes of overconfidence bias can be eliminated by time?
4. What factors increase their overconfidence level?
5. Do you believe that overconfident investors are satisfied with their investment decision?
6. Are Asian individual investors more irrational than eastern investors?
7. To what extent do overconfident investors consider others advice?
8. Are overconfident investors risk-takers?
9. What is the role of individual investors in the stock market?
10. Does investment satisfaction matter?

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